

SANCTUARY® Architectural Binder











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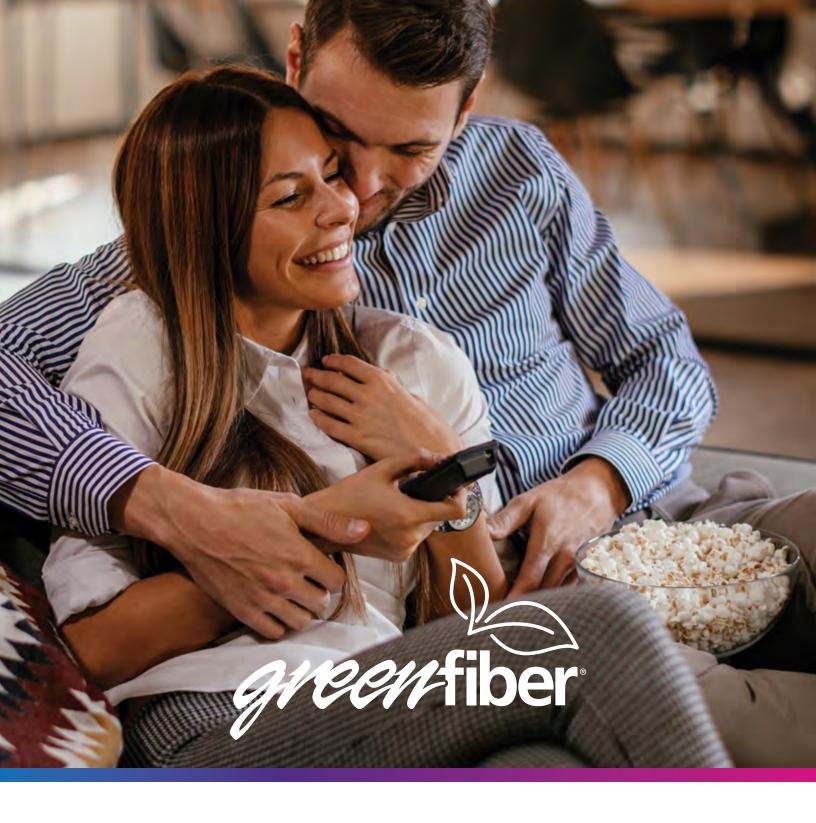
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SANCTUARY® Home Overview

• SANCTUARY® Home Brochure



S A N C T U A R Y° HOME

The Built-In Wellness Your Clients Are Expecting

Your Home Should Be Your Sanctuary

The world is changing, becoming more volatile and less environmentally stable. It's becoming increasingly more difficult for people to find the quiet, comfort and safety that they need to live happily and maintain a healthy mental life.

Wellness is simply a way of life for the new generation of homebuyers, and the home is seen as essential to mental, physical and emotional well-being. In this environment, wellness-branded homes are a necessity from your clients' perspective and your opportunity to differentiate yourself in your local market.

Of all the amenities or technologies that could appeal to today's homebuyers, nothing surpasses the quiet, comfort and safety of a SANCTUARY® Home.

A focus on wellness in homes can result in up to a 35% price premium for single-family homes.1

An impressive 83% are willing to pay more for healthier homes.2

high cholesterol

Noise exposure is a contributing factor in both hypertension and high cholesterol cases.3

Built-In Well-Being Sets Your Homes Apart

SANCTUARY® cellulose insulation by Greenfiber® is easy to integrate into existing building packages and plans. It's engineered to fill the tiny joints, crevices and gaps in attics, walls, floors and ceilings, creating a dense barrier capable of reducing air infiltration and mitigating sound.

Thanks to its multiple benefits, SANCTUARY® improves quality of life and promotes wellness, helping you build homes that are quieter, safer and more comfortable — homes that are simply more appealing at every level.





SANCTUARY® Homebuilder

- attic or roof-deck
- insulation in all exterior walls

¹ Dodge Data & Analytics (2015). 2 The Farnsworth Group / KB Analytics

³ American Journal of Industrial Medicine in 2018 - Centers for Disease Control and Prevention's National Institute for Occupational Safety and Health (NIOSH).



¹ Based on the CIMA/CIMAC LCA for manufacturing and WWF Biogenic Carbon Footprint Calculator for Harvested Wood Products. Tree sequestration statistics are based on the EPA Greenhouse Gas Equivalencies calculator @ https://www.epa.gov/energy/greenhouse-gas-equivalencies-calculator. 2 Comparison based on an R-30 value at one square foot coverage area. This comparison includes the production and energy used in the insulation manufacturing process. Based on Sustainability Impact Index - Prepared by Principal Partners. 3 Based on installing 235 bags of SANCTUARY in attic and walls of home.

⁴ Greenhouse gas equivalencies calculator (1.5 acres - based on planting trees 5 feet apart, equaling 2400 trees per acre)

Unmatched Performance Every Time



60% Reduction in Sound Power¹

Reduced noise from the outside



High Efficiency Lower heating and cooling costs



More time to escape



Equalized Temperatures³

Elimination of "hot spots" leads to improved comfort from room to room and across multiple floors



Reduce Carbon Emissions⁴

Made with 85% recycled content with the lowest embodied carbon of any major insulation product

Why SANCTUARY® by Greenfiber®

- ✓ Suitable for all climates humid or dry
- ✓ Unmatched performance in wellness and comfort
- ✓ Optimized coverage
- ✓ Carbon neutral manufacturing
- ✓ Humanizes the conversation.



- Can be quickly applied in open-blown attic applications or dense-packed into cathedralized slopes based on climate zones
- Performs well in extreme cold and hot climates



- Can be spray-applied or dense-packed into walls, ceilings and floors
- Perfectly fills tight spaces around electrical, plumbing or HVAC features
- Reduces air infiltration and mitigates sound
- Repeatable process eliminates the need to fit, cut or split the insulation and ensures a consistent install every time

Learn About Building a SANCTUARY® Home

With SANCTUARY® insulation, you'll have much more to offer today's home buyers than traditional means of differentiating quality. To achieve the wellness-branded advantage of a Sanctuary Home, connect with a representative by visiting greenfiber.com/sanctuary or calling 800-228-0024.

CONNECT TODAY TO LEARN MORE

greenfiber.com/sanctuary 800-228-0024

1 In field testing on identical 2x4 exterior wall types, Greenfiber® R-13 Stabilized Spray-Applied insulation outperforms R-15 unfaced fiberglass batts by 4 NC rating points (-60% reduction in sound power). The weak point in the assembly such as flanking through windows and doors will diminish the value of the reduction in sound power. Reduction in sound power is achieved through retrofitting, dense-packing or spray applying Greenfiber into walls (contractor installation is recommended for these applications). See manufacturer's installation guide for full details on how to install to meet specifications.

2 Greenfiber® offers a full breadth of fire assemblies. Based on 1305 assembly.

When spray-applied or dense-packed in all exterior walls

4 Comparison based on an R-30 value at one square foot coverage area. This comparison includes the production and energy used in the insulation manufacturing process. Based on Sustainability Impact Index - Prepared by Principal Partners.





CSI Master Specifications & Submittals

- Greenfiber® Submittal Form
- CSI 3-Part Specification SANCTUARY® by Greenfiber®
- CSI 3-Part Specification Greenfiber® FIRE RATED MATERIAL (FRM100) for U370 Assembly



SUBMITTAL FORM All Greenfiber Products



WALL AND ATTIC APPLICATIONS

Submitted To:	
Submitted By:	
Job Reference	×
Job Name:	

Greenfiber Product Attributes

Fire Safety

All Greenfiber Products meet CPSC Flame Spread (>/= 0.12 Wcm²) and Smolder Combustion (<15% weight loss) requirements. The ASTM E84 Results for SANCTUARY are Smoke Developed = 0 and Flamespread is at 10. Simulated building test have shown that structures insulated with cellulose insulation can stand up to 60% longer in the event of a fire compared to structures insulated with fiberglass batts¹. Greenfiber has a number of proprietary Underwriters Laboratories Fire-Resistance Rated assemblies using various products.

Declare Compliant

All Greenfiber® products are Declare compliant. Declare is a transparency platform that is changing the materials marketplace. It answers the following questions about a product: Where does a product come from? What is it made of? Where does it go at the end of its life?

Declare has been approved as a compliance pathway for the LEED v4 Building Product Disclosure and Optimization Credit, Option. The LEED v4 credit calls for the chemical inventory of a product to at least 1000ppm; Declare labels that achieve a declaration status of "Red List Free" or "Declared" fulfill the credit disclosure requirements.

Additionally, any fully disclosed "LBC Compliant" label and any "LBC Compliant" label using the I10-E4 Proprietary Ingredients Exception, with a minimum disclosure threshold of 99.9%, meets the LEED v4 Building Product Disclosure and Optimization Credit, Option reporting requirements.



Declare certifies that Greenfiber will maintain a minimum of 85% recycled content.



Environmental Attributes

Greenfiber Cellulose Insulation is made from up to 85% recycled paper, and cardboard—higher recycled content than almost any other commonly used building material. This plant-based, or biogenic, material locks carbon into the paper for the life of the product. Couple this with low-energy manufacturing and short-haul transportation, and it's clear why cellulose insulation is the responsible choice for homeowners and the planet.

Selecting low-carbon building material options can dramatically reduce emissions while providing the same level of building performance, or higher. As insulation levels in buildings increase to meet higher energy efficiency requirements, choosing

insulation products based on their embodied carbon is crucial. Since cellulose insulation is derived from trees, it sequesters carbon in the walls and ceilings of homes, a feature not seen in other types of insulation products that are commercially available. As a result, Greenfiber Cellulose Insulation has the lowest embodied carbon of any other major insulation product.



Read more from our EPD here

ENERGY STAR Certified

SANCTUARY Blow-In or Spray-Applied Insulation and FRM for SANCTUARY Two-Hour Firewall by Greenfiber are ENERGY STAR certified products, meeting strict energy efficiency specifications set by the U.S. EPA.

View the UL Report that certifies the test results for Loose-Fill Insulation manufactured by Greenfiber as compared to the criteria provided by the Seal and Insulate with ENERGY STAR Insulation Definitions and Testing Requirements for Residential Insulation Version 1.0 and the relevant building and energy codes.





To learn more about the long list of Environmental attributes of all these products, please visit Greenfiber's website at www.greenfiber.com/homeowners/what-is-cellulose.

Better Sound Control

Greenfiber insulation is engineered to fill the tiny joints, crevices and gaps hidden within your attic, walls, floors and ceilings. Proven to reduce the power of sound by up to 60%, it serves as a scientifically advanced barrier capable of muffling sounds that typically infiltrate and reverberate through our homes.

Underwriters Laboratories Classification

Evaluated by UL for the ICC with AC10 Audits under file ICC- ER- 15890. All Greenfiber products are UL Classified and carry the Classification mark with the relevant properties and other information on the bags. This is true for both the United States and Canada. See a complete listing of UL assemblies at https://www.greenfiber.com/builders-architect

Test Requirements

Greenfiber insulation meets all test requirements of ASTM C739-08 (US), CAN/ULC-S703-09 in Canada, CPSC 16 CFR 1209, 400, FTC 16 CFR 460, 1404, and all FHA, VA HUD and building code requirements. Tests include but are not limited to:

- Corrosiveness
- Fungi Resistance
- Surface Burning Characteristics
- Critical Radiant Flux
- Moisture Vapor Sorption
- Thermal Resistance
- Design Density
- Odor Emission
- Open Flammability
- Separation of Chemicals
- Permanency
- Smoldering Combustion

Product	Product Description Code	Description	R-Value	Minimum Thickness (Inches)		Applicable Standards/
Type C			Installed	Settled	Specifications	
All-In-1 SANCTUARY	Designed for new	R-19	5.7	5.3	Flame spread of 10 and smoke	
All Borate Loose-Fill and		construction and retrofit. Spray applied wall applications, stabilized attic, loose fill attic and	R-30	8.9	8.3	developed of 0
Spray Applied Insulation			R-38	11.2	10.4	
	any dry dense-pack applications. Made of	R-49	14.3	13.3		
	85% recycled paper fibers treated for fire resistance.	R-60	17.3	16.1		

United States – Spray Applied										
Application	Product Code	R-Value	Wall Framing	Minimum Thickness	Applicable Standards/ Specifications					
Spray Applied	SANCTUARY	R-13	(2x4)	3.50	Flame spread of 10 and smoke developed of 0					
		R-21	(2x6)	5.50						

United State	United States - Dry Dense Pack										
Application	Product Code		Wall Framing	Minimum Thickness	Applicable Standards/ Specifications						
Dry Dense Pack	SANCTUARY	R-13	(2x4)	3.50	Flame spread of 10 and smoke developed of 0						
		R-21	(2x6)	5.50							
		R-28	(2x8)	7.50							

United States – Loose-Fill										
Product	Product Product Type Code	Description	R-Value	Minimum Thi (Inches)	ckness	Applicable Standards/				
туре				Installed	Settled	Specifications				
Cellulose	Cellulose Supreme Plus	Cellulosic Fiber Loose- Fill Insulation to be	R-13	4.3	3.8	CPSC Standard HH-I-515E				
Insulation		blown dry or with moisture into attics.	R-19	5.9	5.3	Federal Regulation 16 CFR				
		Made of 100% recycled newsprint treated	R-22	6.8	6.1	1209, 1404, ASTM C739,				
		with Zone Defense insecticide.	R-30	9.1	8.2	ASTM E84				
		insecticide.	R-38	11.4	10.3					
			R-49	14.7	13.2					

United States – SANCTUARY Two-Hour Firewall										
Application	Product Code	Installed	Density and Cove	Applicable Standards/ Specifications						
Spray Applied	FRM100	Target Finished Density (Dry pcf)	8" Cavity	12" Cavity	Minimum Finished Density (Dry pcf)*	Flame spread of 10 and smoke developed at 20				
		4.0	12.0	7.5	3.35					

^{*}If any part of the assembly has a dry (10% or less moisture by weight) density less than 3.35 PCF, the wall is no longer an approved UL two hour fire assembly.

Product Type	Product Code	Description		Minimum Thickness (Inches)		Applicable Standards/
уре	Code			Installed	Settled	Specifications
All-In-1	INSSANC-CAN	Designed for new construction and retrofit.	R-40	11.9	10.8	CAN/ULC-S703-09
All Borate Loose-Fill and		Spray applied wall applications, stabilized	R-50	14.9	13.5	CAN/ULC-S102.2
Spray Applied		attic, loose fill attic and	R-60	17.8	16.2	ASTM S-703
Туре 1		any dry dense-pack applications. Made of 85% recycled paper fibers	R-70	20.8	18.9	
Туре 2		85% recycled paper fibers treated for fire resistance.	R-80	23.8	21.6	
					,	
_oose-Fill nsulation	INS553-CAN	Designed for new construction or retrofit	R-40	12.1	10.8	CAN/ULC-S703-09
nsulation Type 1 Open		loose fill attic and wall applications. Made	R-50	15.1	13.5	CAN/ULC-S102.2
		with up to 85% recycled paper fibers treated for	R-60	18.2	16.2	ASTM S-703
		fire resistance.	R-70	21.2	18.9	
			R-80	24.2	21.6	
	I					
oose-Fill	INS517-CAN	Designed for loose-	R-40	11.8	10.5	CAN/ULC-S703-09
ormula ype 1 Open		fill attic and wall applications. Made	R-50	14.7	13.2	CAN/ULC-S102.2
	with up to 85% recycled paper fibers treated for	R-60	17.7	15.8	ASTM S-703	
	fire resistance.	R-70	20.6	18.4		
			R-80	23.6	21.1	





[&]quot;Stabilized" in the document refers to blown-in-products that require water to activate an adhesive, for either Stabilized attic or Spray Applied application. "Loose-fill" in the document refers to blown-in-products that do not require water for application, for either loose fill attic or Dry Dense-Pack application.

<sup>As demonstrated by The Large Scale Outdoor Fire Test Program comparing the fire performance of three structures:
(1) an uninsulated structure;
(2) a structure insulated with R-13 fiberglass batts (wall cavities) and blown-in, loose fill insulation (attic floor); and (3) a structure insulated with Greenfiber's cellulose insulation using spray applied cellulose insulation (wall cavities) and blown-in, loose-fill cellulose insulation (attic floor) - Prepared by Steven Winter Associates Inc.

2 Estimates based on our raw material usage, https://www.usi.edu/recycle/paper-recycling-facts/
3 https://www.cellulose.org/Cellulose-insulation-2nd.php?pagename=low_embodied_energy_insulation&dirname=CIMA, https://www.transparencycatalog.com/company/cima-cimac</sup>

SANCTUARY® by Greenfiber® Cellulose Insulation C.S.I. 3-Part Specification



07 20 00 Thermal Protection

Section 07 21 00 Thermal Insulation

Sub-Section 07 21 23 Loose-Fill Insulation

Sub-Section 07 21 26 Blown Insulation

Sub-Section 07 21 29 Sprayed Insulation

Part 1 - General

1.01 Summary:

A. SANCTUARY® by Greenfiber® cellulose insulation is formulated to be used as either Stabilized Insulation, or Loose-Fill Insulation, used as nonstructural thermal insulating materials in buildings of all types of construction. The insulation is for use on or within floors, floor-ceiling or roof-ceiling assemblies, attics, crawl space, ceilings, walls, and partitions. The insulation is recognized for use in sound transmission reduction, fire blocking and in both non-fire-resistance rated and fire-resistance rated construction applications in accordance with IBC Section 703. SANCTUARY Fire Rated Material (FRM100) is for use in specific fire-resistance rated construction in accordance with IBC Section 703 and applicable Underwriters Laboratories and/or other fire rating testing organizations' assembly listings.

1.02 Reference:

- A. American Society for Testing and Materials (ASTM).
 - 1. E 84-20 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. C 518-21 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. C 739-21 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
 - 4. E 970-17 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.
 - 5. C 1149-17 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation.
 - 6. E 136-19 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
 - 7. C 1015-17 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 - 8. E 119-20 Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Consumer Products Safety Commission (CPSC) 16 CFR Part 1209, Interim Safety Standard for Cellulose Insulation, and 16 CFR Parts 500 and 1404 where applicable.
- C. Federal Trade Commission (FTC) 16 CFR Part 460, Labeling and Advertising of Home Insulation.
- D. Environmental Protection Agency (EPA) 40 CFR Part 247.12 Comprehensive Procurement Guideline For Products Containing Recovered Materials.
- E. CAN / ULC S-703-09 Standard for Cellulose Fiber Insulation for Buildings.
- F. CAN / ULC S-102.2-10 Standard Method Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous materials and assemblies.
- G. Underwriters Laboratories (UL) Product Classification Marks are found on all bags.

- H. State of California Section 1350 California Department of Public Health Standard Practice for VOC Testing
- 1.03 Work Included: The work performed under this section shall include all materials, equipment, labor and services required to install SANCTUARY Insulation in accordance with these specifications and the manufacturer's installation instructions, and as indicated on the drawings if applicable.
- 1.04 Related Work: All electrical, plumbing, and mechanical penetrations must be completed prior to application. Air sealing, either fire-resistance rated, or non-fire-resistance rated, must be completed where required as well. Certain exceptions may apply, for example, when using SANCTUARY Insulation as a fire block in interstitial spaces between floors. Follow all Code and local jurisdiction requirements in the application of these products.
- **1.05 Submittals:** Submit SANCTUARY Insulation product literature, current Evaluation Report, and installation instructions for specified products and their application. A Submittal Form that may be applicable in many applications and may be found at greenfiber.com/support.

1.06 Delivery:

- A. Protect insulation from physical damage to the bag or the product itself, and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B. Insulation package labels include a production code that indicates date and place of manufacture, and all required current statutory and classification marks.

1.07 Limitations:

- A. Avoid heating the work area with propane or kerosene space heaters. Use electric heaters and ventilation to avoid adding excessive moisture vapor to the building envelope.
- B. Do not install SANCTUARY Insulation where it may be exposed to rain or ground water. Do not install SANCTUARY in contact with masonry walls below grade. In any application where SANCTUARY may be exposed to high humidity, a detailed moisture control design must be used.
- C. Do not allow SANCTUARY to contact any surface above 194°F (90°C).
- D. Keep insulation away from exhaust flues of furnaces, water heaters, space heaters, chimney flues or other heat or combustion producing devices. ASTM C 1015-17 recommends that a minimum of three inches of air space should be maintained between the insulation and heat source. Do not install SANCUARY around heat or ignition sources or operations such as welding, metal cutting, grinding or other potentially flammable situations.
- E. SANCTUARY Insulation is not classified as noncombustible according to ASTM E 136-09b.
- F. SANCTUARY may not be used in thermal insulation applications where there is not an approved coverage chart on the bag. Some applications do not require the use of a thermal insulation coverage chart. SANCTUARY can be used in these applications provided manufacturer's installation instructions and all other applicable Code, fire safety and other requirements are met.

Part 2 - Products

2.01 Manufacturer: Greenfiber

2.02 Materials: SANCTUARY Cellulose Insulation

- A. Complies with 16 CFR Parts 460, 500, 1209 and 1404, ASTM C 1149-17, ASTM C 739-21, ASTM C 518-21, ASTM E 970-17, ASTM E 84-20, CAN / ULC S-102.2-10, CAN / ULC S-703-09 Type 1 and Type 2.
- B. Surface Burning Characteristics:
 - 1. ASTM E 84-20: Flame spread <25, Smoke Developed Index <50
 - 2. CAN / ULC S 102.2: Maximum Flame Spread 90.
- C. SANCTUARY, when used in fire-resistance rated wall assemblies, are allowed to increase the fire-resistance rating by fifteen (15) minutes per IBC 2021 Table 722.6.2(5) provided the cavity is completely filled with a minimum density of 2.6 pounds per cubic foot.
- D. Complies with all building code requirements for cellulose fiber thermal insulation. Provide ICC ESR2021 or CCMC Listings 12911-L and 13162-L as required.
- E. Complies with EPA 40 CFR Part 247.12.
- F. No asbestos, mineral fibers, or formaldehyde are used in the manufacturing process.
- G. Thermal Performance:
 - 1. ASTM C 518-21, thermal performance varies with density and thickness. See the appropriate product coverage chart to calculate the R-value per inch if needed. All C 518-21 testing is done at a representative thickness of 4".
 - 2. CAN / ULC S-703-09, varies depending on whether the product is Type 1 open or closed, or Type 2 open or closed.

Part 3 – Execution

3.01 Inspection:

- A. Examine the areas and conditions under which work will be installed.
- B. Verify adjacent materials are dry and ready to receive insulation.
- C. Verify mechanical, plumbing, and electrical services within walls have been inspected.
- D. Provide a written report to the architect, builder or general contractor listing conditions that require correction prior to installation.
- E. Do not proceed with installation until conditions as identified in 3.01-D have been corrected.

3.02 Preparation:

- A. Remove any loose dust, dirt, foreign material, or films that may impair adhesion to application surfaces.
- B. Verify adhesion requirements and compatibility of all surfaces to receive thermal insulation materials.
- C. Protect all nearby surfaces that are not intended to receive thermal insulation, e.g., outlets, windows, and doors.
- D. Make sure there are no assembly details that appear to be preventing the application of the product per the manufacturer's instructions.

3.03 Installation:

- A. Read, understand and comply with manufacturer's instructions for particular conditions of installation.
- B. Wear proper clothing and eye protection.
- C. For breathing protection, use a NIOSH approved N95 or higher disposable or reusable particulate respirator per 29 CFR 1910.134.
- D. The work shall be coordinated with other trades whose work may be affected by, or have an effect on, the installation.
- E. SANCTUARY Spray-applied and Stabilized Insulation shall be installed with equipment specifically designed for its application.
- F. Drying time varies due to local climate conditions including temperature, humidity, and the installed moisture. Do not cover the insulation until the insulation moisture levels, measured, and documented after a minimum period of 24 hours from the time of installation, reach a moisture reading of 25% or less in accordance with SANCTUARY'S Wall Spray Manual.

3.04 Clean-up:

- A. Remove sprayed material from surfaces not specifically required to be insulated.
- B. Broom-clean work areas affected by the work of this section.

3.05 Documentation:

- A. The installer must provide a completed SANCTUARY Attic Card with the installed thickness and R-value claims or other documentation of the installation quality and performance, per 16 CFR Part 460. The installer must also apply attic rulers where appropriate per Code and FTC requirements.
- B. When installing SANCTUARY as spray-applied, record the data on a quality control moisture measurement control log, as included in the SANCTUARY Wall Spray Manual.
- C. When installing SANCTUARY as stabilized insulation for attics, record the data on a quality control moisture measurement control log.

Greenfiber does not provide architectural, inspection, engineering or building science services and disclaims any responsibility with respect thereto. Greenfiber does not guarantee, warrant or attempt to determine whether a building structure, design or the use of material therein complies with any applicable Codes, standards, guidelines or standards of workmanship. Adding insulation to any part of a home's envelope will cause changes in air, heat and moisture flow. The user must understand how the use of insulation will change the performance of a dwelling prior to installation. The user maintains the full and complete responsibility to comply with all Codes, laws and regulations applicable to the safe and proper use, handling and installation of the product and should consult with an architect, engineer, building scientist, and/or a rater/energy specialist for all construction, design and performance related questions. The information contained herein is believed to be accurate as of the time of preparation. However, Greenfiber makes no warranty concerning the accuracy of this information. Greenfiber will not be liable for claims relating to the use of information contained herein, regardless of whether it is claimed that the information or recommendations are inaccurate, incomplete or incorrect.

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Greenfiber® FIRE RATED MATERIAL (FRM100) For SANCTUARY Two-Hour Firewall, U370 Assembly



C.S.I 3-Part Specification

07 20 00 Thermal Protection
Section 07 21 00 Thermal Insulation
Sub-Section 07 21 29 Sprayed Insulation

Part 1 - General

1.01 Summary:

A: GREENFIBER® FIRE RATED MATERIAL (FRM100) by Greenfiber® cellulose insulation is formulated to be used as either Spray-Applied used as nonstructural thermal insulating fire resistance materials in buildings of all types of construction. The insulation is for use on or within UL U-370 and UL U-377 Fire Resistance Rated Wall Systems. The insulation is recognized for use in sound transmission reduction, fire blocking and in both non-fire-resistance rated and fire-resistance rated construction applications in accordance with IBC Section 703. Greenfiber Fire Rated Material (FRM100) is for use in specific fire-resistance rated construction in accordance with IBC Section 703 and applicable Underwriters Laboratories and/or other fire rating testing organizations' assembly listings.

1.02 Reference:

- A: American Society for Testing and Materials (ASTM).
 - 1. E 84-20 Standard Test Method for Surface Burning Characteristics of Building Materials.
 - 2. C 518-21 Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
 - 3. C 739-21 Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
 - 4. E 970-17 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.
 - 5. C 1149-17 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation.
 - 6. E 136-19 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750°C.
 - 7. C 1015-17 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 - 8. E 119-20 Standard Test Methods for Fire Tests of Building Construction and Materials.
- B: Consumer Products Safety Commission (CPSC) 16 CFR Part 1209, Interim Safety Standard for Cellulose Insulation, and 16 CFR Parts 500 and 1404 where applicable.
- C: Federal Trade Commission (FTC) 16 CFR Part 460, Labeling and Advertising of Home Insulation.
- D: Environmental Protection Agency (EPA) 40 CFR Part 247.12 Comprehensive Procurement Guideline For Products Containing Recovered Materials.
- E: CAN / ULC S-703-09 Standard for Cellulose Fiber Insulation for Buildings.
- F: CAN / ULC S-102.2-10 Standard Method Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous materials and assemblies.
- G: Underwriters Laboratories (UL) Product Classification Marks are found on all bags. State of California Section 1350 California Department of Public Health Standard Practice for VOC Testing
- 1.03 Work Included: The work performed under this section shall include all materials, equipment, labor and services required to install Greenfiber Fire Rated Material (FRM100) in accordance with these specifications and the manufacturer's installation instructions, and as indicated on the drawings if applicable.
- 1.04 Related Work: All electrical, plumbing, and mechanical penetrations must be completed prior to application. Air sealing, either fire-resistance rated, or non-fire-resistance rated, must be completed where required as well. Certain exceptions may apply, for example, when using Greenfiber Fire Rated Material (FRM100) Insulation as a fire block in interstitial spaces between floors. Follow all Code and local jurisdiction requirements in the application of these products.

1.05 Submittals: Submit Greenfiber Fire Rated Material (FRM100) Insulation product literature, current Evaluation Report, and installation instructions for specified products and their application. A Submittal Form that may be applicable in many applications and may be found at greenfiber.com/support.

1.06 Delivery:

- A: Protect insulation from physical damage to the bag or the product itself, and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage, and protection during installation.
- B: Insulation package labels include a production code that indicates date and place of manufacture, and all required current statutory and classification marks.

1.07 Limitations:

- A: Avoid heating the work area with propane or kerosene space heaters. Use electric heaters and ventilation to avoid adding excessive moisture vapor to the building envelope.
- B: Do not install Greenfiber Fire Rated Material (FRM100) Insulation where it may be exposed to rain or ground water. Do not install Greenfiber Fire Rated Material (FRM100) in contact with masonry walls below grade. In any application where Greenfiber Fire Rated Material (FRM100) may be exposed to high humidity, a detailed moisture control design must be used.
- C: Do not allow Greenfiber Fire Rated Material (FRM100) to contact any surface above 194°F (90°C).
- D: Keep insulation away from exhaust flues of furnaces, water heaters, space heaters, chimney flues or other heat or combustion producing devices. ASTM C 1015-17 recommends that a minimum of three inches of air space should be maintained between the insulation and heat source. Do not install Greenfiber around heat or ignition sources or operations such as welding, metal cutting, grinding or other potentially flammable situations.
- E: Greenfiber Fire Rated Material (FRM100) Insulation is not classified as noncombustible according to ASTM F 136-09b
- F: Greenfiber Fire Rated Material (FRM100) may not be used in thermal insulation applications where there is not an approved coverage chart on the bag. Some applications do not require the use of a thermal insulation coverage chart. Greenfiber Fire Rated Material (FRM100) can be used in these applications provided manufacturer's installation instructions and all other applicable Code, fire safety and other requirements are met.

Part 2 - Products

2.01 Manufacturer: Greenfiber

- 2.02 Materials: Greenfiber Fire Rated Material (FRM100) Cellulose Insulation
 - A: Complies with 16 CFR Parts 460, 500, 1209 and 1404, ASTM C 1149-17, ASTM C 739-21, ASTM C 518-21, ASTM E 970-17, ASTM E 84-20, CAN / ULC S-102.2-10, CAN / ULC S-703-09 Type 1 and Type 2.
 - B: Surface Burning Characteristics:
 - 1. ASTM E 84-20: Flame spread <25, Smoke Developed Index <50
 - 2. CAN / ULC S 102.2: Maximum Flame Spread 90.
 - C: Greenfiber Fire Rated Material (FRM100), when used in fire-resistance rated wall assemblies, are allowed to increase the fire- resistance rating by fifteen (15) minutes per IBC 2021 Table 722.6.2(5) provided the cavity is completely filled with a minimum density of:
 - 1. 3.35 pounds per cubic foot for U370 2 Hour fire resistance rated wall
 - 2. 3.89 pounds per cubic foot for U370 3 Hour fire resistance rated wall
 - D: Complies with all building code requirements for cellulose fiber thermal insulation. Provide active UL ER or CCMC Listings 12911-L and 13162-L as required.
 - E: Complies with EPA 40 CFR Part 247.12.
 - F: No asbestos, mineral fibers, or formaldehyde are used in the manufacturing process.
 - H: Thermal Performance:
 - ASTM C 518-21, thermal performance varies with density and thickness. See the appropriate product coverage chart to calculate the R-value per inch if needed. All C 518-21 testing is done at a representative thickness of 4".
 - 2. CAN / ULC S-703-09, varies depending on whether the product is Type 1 open or closed, or Type 2 open or closed.

Part 3 - Execution

3.01 Inspection:

- A: Examine the areas and conditions under which work will be installed.
- B: Verify adjacent materials are dry and ready to receive insulation.
- C: Verify mechanical, plumbing, and electrical services within walls have been inspected.
- D: Provide a written report to the architect, builder or general contractor listing conditions that require correction prior to installation.
- E: Do not proceed with installation until conditions as identified in 3.01-D have been corrected.

3.02 Preparation:

- A: Remove any loose dust, dirt, foreign material, or films that may impair adhesion to application surfaces.
- B: Verify adhesion requirements and compatibility of all surfaces to receive thermal insulation materials.
- C: Protect all nearby surfaces that are not intended to receive thermal insulation, e.g., outlets, windows, and doors.
- D: Make sure there are no assembly details that appear to be preventing the application of the product per the manufacturer's instructions.

3.03 Installation:

- A: Read, understand and comply with manufacturer's instructions for particular conditions of installation.
- B: Wear proper clothing and eye protection.
- C: For breathing protection, use a NIOSH approved N95 or higher disposable or reusable particulate respirator per 29 CFR 1910.134.
- D: The work shall be coordinated with other trades whose work may be affected by, or have an effect on, the installation.
- E: Greenfiber Fire Rated Material (FRM100) Spray-applied and Stabilized Insulation shall be installed with equipment specifically designed for its application.
- F: Drying time varies due to local climate conditions including temperature, humidity, and the installed moisture. Do not cover the insulation until the insulation moisture levels, measured, and documented after a minimum period of 24 hours from the time of installation, reach a moisture reading of 25% or less in accordance with Greenfiber Fire Rated Material (FRM100)'s Spray-Applied Installation Manual.

3.04 Clean-up:

- A: Remove sprayed material from surfaces not specifically required to be insulated.
- B: Broom-clean work areas affected by the work of this section.

3.05 Documentation:

- A: The installer must provide a completed Greenfiber Fire Rated Material (FRM100) Attic Card with the installed thickness and R- value claims or other documentation of the installation quality and performance, per 16 CFR Part 460. The installer must also apply attic rulers where appropriate per Code and FTC requirements.
- B: When installing Greenfiber Fire Rated Material (FRM100) as spray-applied, record the data on a quality control moisture measurement control log, as included in the Greenfiber Fire Rated Material (FRM100) Wall Spray Manual.
- C: When installing Greenfiber Fire Rated Material (FRM100) as stabilized insulation for attics, record the data on a quality control moisture measurement control log.

Greenfiber does not provide architectural, inspection, engineering or building science services and disclaims any responsibility with respect thereto. Greenfiber does not guarantee, warrant or attempt to determine whether a building structure, design or the use of material therein complies with any applicable Codes, standards, guidelines or standards of workmanship. Adding insulation to any part of a home's envelope will cause changes in air, heat and moisture flow. The user must understand how the use of insulation will change the performance of a dwelling prior to installation. The user maintains the full and complete responsibility to comply with all Codes, laws and regulations applicable to the safe and proper use, handling and installation of the product and should consult with an architect, engineer, building scientist, and/or a rater/lenergy specialist for all construction, design and performance related questions. The information contained herein is believed to be accurate as of the time of preparation. However, Greenfiber makes no warranty concerning the accuracy of this information. Greenfiber will not be liable for claims relating to the use of information contained herein, regardless of whether it is claimed that the information or recommendations are inaccurate, incomplete or incorrect.

Greenfiber ■ 5500 77 Center Drive, Suite 100, Charlotte, NC 28217 (800) 228-0024 ■ Fax (704) 379-0685 ■ www.greenfiber.com





Sound & Fire Library

- Greenfiber® Sound Wall Assemblies Catalog
- Greenfiber® Fire Rated Material (FRM) U370 Assembly Guide



FOR SOUND ATTENUATION, CELLULOSE INSULATION OUTPERFORMS ALL OTHER INSULATION SYSTEMS

SOUND AND INSULATION

Installing cellulose insulation like Greenfiber® within a wall cavity provides a significant improvement of the STC rating and brings a notable peace and quiet to the living environment.

Cellulose installed within a 2x4 wall cavity adds approximately 5 dB of sound reduction, while cellulose in a 2x6 wall cavity adds about 9 dB to the STC rating, according to acoustic performance tests.

For sound absorption and noise reduction benefits, Greenfiber offers blown-in or spray-applied cellulose insulation.

What is STC?

Sound Transmission Class (STC) is a numerical rating in decibels (dB) of an assembly's ability to reduce airborne sound transmission over a limited frequency range. ASTM Test Method E90 is used to generate transmission loss data on an assembly, and ASTM E413 uses this data to calculate an STC rating. The single-number ratings correlate with sound transmission for speech, radio, television, and similar sources of noise.

STC Ratings Compared

STC Rating	What Can Be Heard	Performance
25	Normal speech is easily heard	Very Poor
30	Loud speech is easily heard	Poor
35	Loud speech is heard, but not understood	Average
40	Loud speech is heard, but only as murmur	Good
45	Loud speech is not heard. Music and heavy traffic may be a problem	Very Good
50	Only very loud sounds are faintly heard	Excellent
60+	Virtually little to no sound is heard	Outstanding

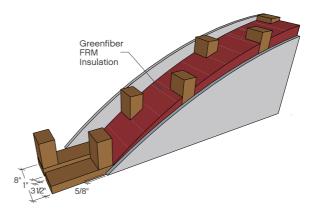
BUILDING MATERIALS AND SOUND TRANSMISSION

Materials and Construction

Metal framing reduces sound transmission significantly better than equally dimensioned wood, as does wider spacing between framing members, regardless of material.

Likewise, a break or separation between materials in the path of sound, the vibration path, can significantly reduce sound transmission. Staggering the studs, as specified in the Greenfiber U370 - SANCTUARY 2-Hour Firewall, can provide a substantial increase in sound isolation, ranging from a STC rating of 60 in an 8" cavity with one layer of drywall to 66 with two layers of drywall.

The mass or weight of an assembly's membrane also contributes to sound control. For example, added sheets of gypsum board absorb more sound.



- 2x4 double wall 16" on center staggered
- 1" gap between walls
- FRM100 spray applied
- 5/8 sheet rock Type C or Type ULIX

THE PROOF IS IN THE PERFORMANCE



New homes and communities throughout North America are increasingly built in closer proximity to each other and next to airports, highways and noisy urban corridors. As

a result, noise pollution is rapidly becoming a key factor in homeowner comfort; leading local, county, and federal regulators to set standards that require Noise Level Reductions (NLR) of 25 decibels (dB) or greater in certain areas.

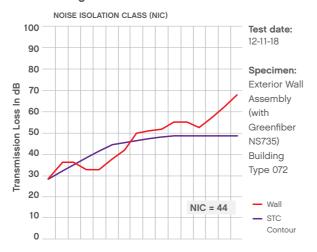
Noise Level Reduction (NLR) testing was conducted on a project in the Las Vegas area that specified Greenfiber insulation. The results met the stipulated 25 decibel reduction by at least 5 decibels – a "clearly noticeable" amount.

Field NIC Testing

Field Noise Isolation Class (NIC) testing was conducted on identical homes with 2x4 wall types in order to compare the performance of R-13 Greenfiber insulation and R-15 fiberglass batts within exterior wall construction.

The testing proved a reduction of 44 NIC points with Greenfiber vs. 40 NIC points with fiberglass batts. This difference of a 4 point performance is equivalent to a 60% reduction in sound power.

Field Testing Results



* Field STC testing was completed using NIC methodology.

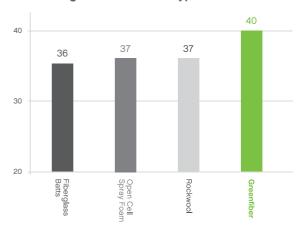
Note: Windows within the receive room could have allowed a flanking path. This potential weak-point could have biased (understated) these results.

CELLULOSE INSULATION OUTPERFORMS

Where air flows, sound follows. Because Greenfiber is denser than other types of insulation and is blown in to fill each space, it breaks the path of sound, providing superior reduction of noise transfer when applied to exterior and interior walls.

The chart below shows the improvements in STC ratings for different types of insulation in a 2x4 wood stud wall that is 16" oc with 5/8" drywall on both sides.

STC Ratings And Insulation Types



Note: Based on STC ratings for the same assembly for Owens Corning 3.5" Quiet Zone Batt, Rockwool 3.5" Comfortbatt, Icynene 3" Open-cell spray foam, Greenfiber 3.2 pcf dense-pack cellulose. 2x4 wood stud wall, 16" oc with 5/6" drywall on both sides.



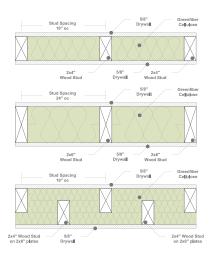
Greenfiber cellulose insulation fills cavities from side-to-side and top-to-bottom, without gaps or voids around obstructions like blocking or bridging, and it fits tightly around wiring or electrical boxes within the cavity for a Grade-1 install that blocks sound and resists air infiltration.

WALL/FLOOR & CEILING ASSEMBLIES

Below is a comprehensive list of wall assemblies tested for their acoustic performance, including STC and fire ratings for wood and steel stud walls.

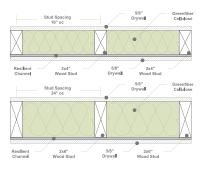
Wood Stud Wall Assemblies

Test Number	Wood Stud Dimensions	Stud Spacing	5/8" Drywall	Resilient Channel	Insulation	STC	Fire Rating
TL24-455	2" x 4"	16" oc	Single Both Sides	None	Greenfiber Cellulose	40	1-hr
D0568.01D	2" x 6"	24" oc	Single Both Sides	None	Greenfiber Cellulose	44	1-hr
RAL-TL93-102	2" x 4" on 2" x 6" plates	16" oc staggered	Single Both Sides	None	Greenfiber Cellulose	52	1-hr



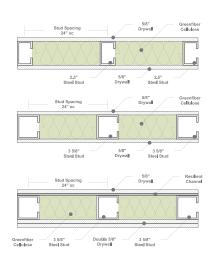
Wood Stud Wall Assemblies With Resilient Channel

Test Number	Wood Stud Dimensions	Stud Spacing	5/8" Drywall	Resilient Channel	Insulation	STC	Fire Rating
TL24-456	2" x 4"	16" oc	Single Both Sides	One Side	Greenfiber Cellulose	51	1-hr
D0568.01E	2" x 6"	24" oc	Single Both Sides	One Side	Greenfiber Cellulose	54	1-hr



Steel Stud Wall Assemblies With Resilient Channel

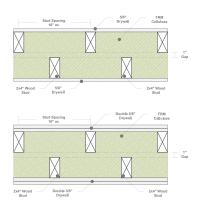
Test Number	Steel Stud Dimensions	Stud Spacing	5/8" Drywall	Resilient Channel	Insulation	STC	Fire Rating
RAL-TL93-7	2.5"	24" oc	Single Both Sides	None	Greenfiber Cellulose	50	1-hr
TL93-187	3-5/8"	24" oc	Single Both Sides	None	Greenfiber Cellulose	54	1-hr
RAL-TL93-72	3-5/8"	24" oc	Double Both Sides	One Side	Greenfiber Cellulose	56	1-hr



WALL/FLOOR & CEILING ASSEMBLIES

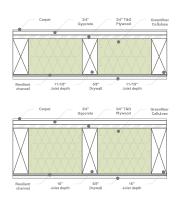
U370 Fire Rated Wall Assemblies - Staggered Stud

Test Number	Wood Stud Dimensions		5/8" Drywall	Resilient Channel	Insulation	STC	Fire Rating
RAL-TL25-222	2 - 2" x 4" walls, 1" gap in between	16" oc staggered	Single Both Sides	None	FRM Cellulose	60	2-hr
RAL-TL25-223	2 - 2" x 4" walls, 1" gap in between	16" oc staggered	Double Both Sides	None	FRM Cellulose	66	3-hr



Floor And Ceiling Assemblies

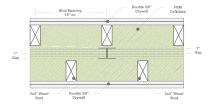
Test Number	Joists	Ceiling	Subfloor	Carpet	Insulation	STC	IIC
B5323.03B	11-7/8" Joist depth	5/8" Drywall - Resilient Channel	3/4" T&G Plywood - 3/4" Gypcrete	Yes	Greenfiber Cellulose	53	54
B5323.01B	16" Joist depth	5/8" Drywall - Resilient Channel	3/4" T&G Plywood - 3/4" Gypcrete	Yes	Greenfiber Cellulose	53	56



AREA SEPARATION WALL ASSEMBLIES (ASW) WITH CELLULOSE INSULATION

ASW Shaftliner assemblies are non-load bearing. These assemblies, built with 1-inch gypsum shaftliner panels and metal studs, allowing installation from one side where access is limited. In select tested designs, cellulose insulation can be specified within ASW assemblies, delivering proven sound performance while maintaining the required fire rating.

Greenfiber can be used in the following ASW assemblies: U347, V351 and V375.





Learn About Building a SANCTUARY® Home

With SANCTUARY® insulation, you'll have much more to offer today's home buyers than traditional means of differentiating quality. To achieve the wellness-branded advantage of a Sanctuary Home, connect with a representative by visiting greenfiber.com/sanctuary or calling 800-228-0024.

greenfiber.com/sanctuary = 5500 77 Center Drive, Suite 100 Charlotte, NC 28217
greenfiber.com = twohourfirewall.com



Explore a Better Two-Hour Firewall Solution

INTRODUCING THE PROPRIETARY UL TESTED GREENFIBER U370, SANCTUARY TWO-HOUR FIREWALL, FOR MULTI-FAMILY AND TOWNHOME CONSTRUCTION

It delivers time and money saving performance with:

- Streamlined installation
- Assists in meeting stringent energy efficiency codes (3 ACH50 to 5 ACH50)
- · Superior unit-through-unit sound blocking
- Trades work simultaneously, normalizing construction sequence

The SANCTUARY Two-Hour Firewall has undergone rigorous testing by UL to guarantee the safety of your clients. There are local insulation contractors specifically trained in this assembly. In addition, Greenfiber® offers on site training with Greenfiber Trusted Installers (free of charge).

- · Requires Greenfiber® FRM Insulation
- · R-value of 3.7 per inch
- · 85% recycled content
- · Reduced weather-related damage
- Shortened construction cycle using efficient techniques
- Exceptional sound reduction between units (STC 60 to 66)
- · Lower ACH / reduced air infiltration
- · Reduces odor transmission between units



U370 FACTS

UL Approved Design Options

- Townhome construction
- Multi-family construction
- Chase design for in-wall mechanical
- OSB wind shear wall design

· Electrical and Penetrations

- UL approved electrical (wiring & boxes)
- Through penetration when in compliance with local building codes

· UL Listed Load Bearing Fire Wall

- U370 2-hour
- U370 3-hour

Building Code References

- International Code Council
- UL Evaluation Report 15890-01
- 2018 and 2021 International Residential Code (IRC) Section R317: dwelling unit separation
- 2018 and 2021 International Building Code (IBC) Section 705: fire walls

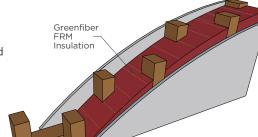
· Acoustical Ratings

SANCTUARY

TWO-HOUR FIREWALL

- 2-hour firewall
 STC 60 minimum wall thickness of 9 ¼"
- 3-hour firewall STC 66 – minimum wall thickness of 10 ½"

The UL-U370 is constructed of two opposing and offset studded walls. Each wall's studs are set to standard 16" o.c. distance. When offset, the actual distance between opposing studs is 8" o.c., creating an 8" cavity into which FRM is spray applied.



by GREENFIBER

- · 2x4 double wall 16" on center staggered
- 1" gap between walls.
- FRM100 spray applied at 3.35pcf density
- 5/8 sheet rock Type C or Type ULIX

Compare, head-to-head, the real world project requirements of shaftwall vs. SANCTUARY Two-Hour Firewall.

Why is SANCTUARY Two-Hour Firewall, U370, the Better Choice vs. Shaftwall All units of the building are framed at the same time, under one roof and out of the elements. Installed after all mechanicals are roughed in.

Saves 3" of concrete slab/footer due to smaller footprint (8" vs 11"). Sub-friendly which retains workers and helps productivity.

Shaftwall installation typically takes six to eight man hours of labor per floor.

FILL IN THE BLANKS AND COMPARE	Structure Dimensions Wall Depth	Stories Wall Ht. Story 1 Wall Ht. Story 2 Wall Ht. Story 3		Wa	II Sq. Ft
SHAFTWALL					
Shaftwall Materials					Total Cost
Shaftwall Liner (1"x 2' x	10')	# Sheets	Cost	per sheet	
Additional Sheets for S	pacers & Breakage	# Sheets	Cost	per sheet	
2" H Std Track 10'		# Pieces	Cost	per piece	
2" C Track 10"		# Pieces			
Aluminum Breakaway C	Clips	# Pieces	Cost	per piece	
FG Sound Batt (installe	d)	Sq. Ft	Cost	per piece	
Crane Cost for Shaft W	all Liner	Hours	Rate	per hour	
Extra Concrete Used vs	s. Greenfiber® U370 (11"vs 8")	Cu.Yd	Cost	per yard	
Second Floor - 3 Men (Third Floor - 3 Men (Ad	ards, Channels, Clips & Space Add Board and Parts Staging d Board and Parts Staging) rd and Parts Staging & Cutting)	4 Hours at \$ 6 Hours at \$ 6 Hours at \$ 6 Hours at \$	/hr /hr	
				Total Shaftwall Cost	
Extra Construction Pro	ocess Time (Unit time lost by	not being under roof)			
 Framing Time Lost (F 	ramer Labor Time x Crew Size	e)	44 man hours	2 crew days	
 Rain Days, Framer "A" 				3 crew days	
Other Trade/Insp. Del	lays (Working Around Shaft W	alls) - 1 hr per	20 individuals	2 days	
				Days Lost	7 Days
U370					
FRM Material (Includes	Labor)	Sq. Ft. of Wall	per Sa. Ft		
,	Type C or Type ULIX Drywall	•	per Sheet _		
	**		•		
				Total Cost of U370	

CONSIDER THE SANCTUARY TWO-HOUR FIREWALL FOR ALL YOUR FIREWALL REQUIREMENTS





For additional information call 800-224-0028 or visit www.twohourfirewall.com





Evaluation Reports

• UL Evaluation Report



UL Solutions Evaluation Report

UL ER15890-01

Issued: 2013-08-15

Revised: 2025-05-28

Visit the UL Solutions Product iQ® database for current status of report.

UL Solutions Category Code: ULEX - Thermal Protection

CSI MasterFormat®

DIVISION: 07 00 00 – THERMAL AND MOISTURE PROTECTION Sub-level 2: 07 20 00 – Thermal Protection Sub-level 3: 07 21 00 – Thermal Insulation Sub-level 4: 07 21 23 - Loose Fill Insulation Sub-level 4: 07 21 26 – Blown Insulation

Company:

APPLEGATE GREENFIBER ACQUISITION, LLC

5500 77 CENTER DRIVE, SUITE 100 CHARLOTTE, NORTH CAROLINA 28217 (800) 228-0024 www.greenfiber.com greenfiber.info@greenfiber.com

1. Subject

SANCTUARY® Greenfiber Stabilized or Loose Fill Insulation, FRM Greenfiber Fire Rated Material, and SANCTUARY DEFENSE Greenfiber Loose Fill Insulation



Throughout this report, the reference to Greenfiber Insulation will apply to all products described above, except where indicated otherwise and except for Greenfiber FRM.

2. Scope of evaluation

- 2024, 2021, 2018 and 2015 International Building Code ® (IBC)
- 2024, 2021, 2018 and 2015 International Residential Code ® (IRC)
- NFPA 70 National Electric Code ®, 2017 Edition
- ICC-ES Acceptance Criteria for Quality Documentation (AC10)

The products were evaluated for the following properties:

- Surface Burning Characteristics (UL723)
- Physical Properties (ASTM C739)
- Thermal Resistance (ASTM C739, ASTM C518)
- Sound Transmission (ASTM E90, ASTM E413)
- Fire blocking
- Fire-Resistance Rated Construction (UL263)
- Ignition Barrier Attics

3. Referenced documents

- UL723, Test for Surface Burning Characteristics of Building Materials
- UL263, Fire Tests of Building Construction and Materials
- ASTM C739, Standard Specification for Cellulosic Fiber Loose Fill Thermal Insulation
- ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
- ASTM C1015, Standard Practice for Installation of Cellulosic and Mineral Fiber Loose Fill Thermal Insulation
- ASTM E90, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements
- ASTM E492, Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
- ASTM E413, Classification for Rating Sound Insulation
- ASTM C840, Standard Specification for Application and Finishing of Gypsum Board
- CPSC 16 CFR Part 1209, Interim Safety Standard for Cellulose Insulation
- CPSC 16 CFR Part 1404, Cellulose Insulation
- Gypsum Standard GA-216, Application and Finishing of Gypsum Panel Products
- ICC-ES Acceptance Criteria for Quality Documentation (AC10)

4. Uses

Greenfiber Insulation is used as nonstructural thermal insulating material in buildings of all types of construction. The insulation is for use on or within floors, floor-ceiling or roof-ceiling assemblies, attics, crawl spaces, walls and partitions. See Sections 5 and 6 and product coverage charts for specific applications for each product. The insulation is recognized for use in sound transmission assemblies, as fire blocking material, in both non-fire-resistance rated construction and fire-resistance rated construction in accordance with Section 703 of the IBC, and as an ignition barrier over foam plastic in accordance with R303.5.3 of the 2024 IRC and R316.5.3 of the 2021, 2018, and 2015 IRC.

Greenfiber FRM is for use in specific fire-resistance rated construction in accordance with Section 703 of the IBC and as described in Section 6.13 of this report.

5. Product description

Greenfiber Insulation and Greenfiber FRM consist of a uniform low-density mixture of cellulosic fibers and fire-retardant chemicals. Product application methods include stabilized, Wall Spray (spray-applied), loose fill, and Dry Dense-Pack, as described in Section 6. Stabilized and spray-applied applications are applied with water to activate the dry adhesive in the fire retardant treated cellulose fibers. Loose fill and Dry Dense-Pack applications are applied without water. The products used for fire-blocking and in fire-resistance rated applications have not been evaluated for thermal insulation characteristics for use in various structures.

The SANCTUARY® product meets the requirements of CPSC 16 CFR Part 1209 and has a flame spread index of not more than 25, and a smoke developed index of not more than 50 when tested in accordance with UL 723 as prescribed by the requirements set forth in Section 720 of the IBC and Section R302.10 of the IRC. Density and thermal characteristics are provided in Table 1 of this report.

Thermal Applications All Loose Fill Thermal All Dry Nominal Installed **Product** Attics / Stabilized Wall Conductivity R-VALUE1 **SKU Number** Dense-Pack Density **Density Range** Info Manufactured Attics k-VALUE (Btu-Spray (In Floors) (pcf) (pcf) **Housing Floors** in./hr-sq ft °F) SANCTUARY® S, LF YES YES YES YES 1.25-1.75 0.27 3.70 1.5 Varies with FRM FRM NO NO NO NO 1.6 N/A N/A assembly type **SANCTUARY** LF YES NO YES NO 1.6 1.25-1.75 0.27 3.76 **DEFENSE**

Table 1 - Density and Thermal Resistance

Greenfiber Stabilized Insulation = S Greenfiber Loose Fill Insulation = LF

Greenfiber Fire Rated Material = FRM

6. Installation

6.1 General:

Installation of Greenfiber Insulation and Greenfiber FRM must comply with ASTM C1015, as applicable, this report, and the manufacturer's published installation instructions.

Installation must be in accordance with CPSC 16 CFR 1404, Section E4003.2 of the IRC, and NFPA 70 (NEC) 410.116.9 when installation is above or adjacent to recessed luminaires (lighting fixtures) or other heat-producing elements. A permanent barrier is necessary to maintain a 3-inch wide (76 mm) clearance between the item and the insulation, unless the recessed luminaire is identified as Type IC and is listed in accordance with the applicable code for direct contact with insulation, or the heat-producing element is listed for zero clearance to combustibles. The insulation is limited to areas where the temperature will not exceed 194°F (90°C).

The code official may require an approved vapor retarder to be installed in accordance with Section 1404.3 of the 2024, 2021, and 2018 IBC and Section 1405.3 of the 2015 IBC or Section R702.7 of the IRC, as applicable. Protection against condensation in exterior wall assemblies must be provided in accordance with IBC Section 1404.4 or IRC Section R703, as applicable.

Attic ventilation, when required by the code, must not be blocked by the application of the insulation when installed in accordance with Section R806.3 of the IRC.

UL.com/Solutions

¹Per inch of thickness at 4 inches representative thickness

6.2 Fire Resistive Material:

Greenfiber FRM is a spray-applied, uniform, low density mixture of cellulosic fibers and fire retardant chemicals used for concealed applications within walls and partitions of wood and metal construction. The product is spray-applied with water to activate the dry adhesive in the fire retardant treated cellulose fibers at a density of between 3.4 and 6.0 lbs./ft³ (54.4 and 96.1 kg/m³), is assembly specific, and qualifies as a fire blocking material as defined in the IBC and IRC.

Before enclosing Greenfiber FRM in walls, the insulation must be left uncovered for a minimum of 24 hours and the moisture reading must be 25 percent or lower when measured at least 24 hours after installation.

Greenfiber FRM must be installed in accordance with the manufacturer's detailed instructions, published by Applegate Greenfiber Acquisition, LLC.

For installation guides and technical information, please visit www.greenfiber.com/support.

6.3 Stabilized:

Greenfiber Stabilized Insulation is used for exposed, stabilized applications on horizontal or sloped attic floors at a density of between 1.5 and 3.0 lbs./ft³ (24 and 48 kg/m³).

Greenfiber Stabilized Insulation must be installed in accordance with the manufacturer's detailed instructions, published by Applegate Greenfiber Acquisition, LLC, available at:

For installation guides and technical information, please visit www.greenfiber.com/support.

6.4 Wall Spray (Spray-Applied):

Greenfiber Stabilized Insulation may be used in spray-applied, exposed applications as an interior finish and in concealed applications within walls and partitions at a density between 2.75 and 4.0 lbs./ft³ (44.1 and 64.1 kg/m³).

Before enclosing Wall Spray insulation in walls, the insulation must be left uncovered for a minimum of 24 hours and the moisture reading must be 25 percent or lower when measured at least 24 hours after installation.

Greenfiber spray-applied insulations must be installed in accordance with the manufacturer's detailed instructions, published by Applegate Greenfiber Acquisition, LLC, available at:

For installation guides and technical information, please visit www.greenfiber.com/support.

6.5 Loose Fill:

Greenfiber Loose Fill Insulations are used for exposed loose fill applications on horizontal or sloped attic floors at a density of between 1.5 and 3.0 lbs./ft³ (24.0 and 48.0 kg/m³) when installed in accordance with Section R806.3 of the IRC.

Greenfiber Loose Fill Insulation is installed into its final position using a pneumatic device. The insulation may be applied to sloped attic floors having a maximum slope of 5:12 (41.7 percent slope).

Greenfiber Loose Fill Insulation must be installed in accordance with the manufacturer's detailed instructions, published by Applegate Greenfiber Acquisition, LLC, available at:

For installation guides and technical information, please visit www.greenfiber.com/support.

UL.com/Solutions

6.6 Dry Dense-Pack:

Greenfiber Insulation is used in Dry Dense-Pack applications for concealed spaces of walls, partitions, and roof-ceiling or floor-ceiling assemblies. Dry Dense Pack products are installed at a density of between 3.5 and 5.0 lbs/ft³ (56.1 and 80.0 kg/m³) when installed in accordance with Section R806.5 of the IRC, as applicable.

Dry Dense-Pack installation requires pneumatic application of the product in closed or netted cavities. There are several techniques for verifying the installed density of the product, as noted in the instructions Greenfiber Insulation installed in Dry Dense-Pack applications must be installed in accordance with the manufacturer's detailed instructions, published by US Greenfiber, LLC.

For installation guides and technical information, please visit www.greenfiber.com/support

6.7 Installation Directly Beneath the Roof:

Greenfiber Insulation may be installed beneath the roof deck when installed in accordance with Section R806.5 of the IRC for the following applications using the Dry Dense-Pack methodology:

• Exposed Roof Decks and Roof Framing Members:

May be installed beneath exposed roof decks when Dry Dense-Packed behind netting at a density of $3.3-5.0~lbs/ft^3$. Climate Zones 2B and 3B do not require an air impermeable insulation layer to the roof deck in accordance with Section R806.5 of the IRC. All other climate zones must comply with the conditions set forth in 5.1 or 5.2 Section R806.5. Climate zones 1A, 2A and 3A can comply without the use of continuous insulation by meeting the requirements for vapor diffusion and supply distribution as set forth in condition 5.2 of Section R806.5. The use of Greenfiber products in cathedralized attics outside of Zones 2B and 3B needs to be reviewed by a registered design professional to determine the need for air barriers on the exposed side of the insulation.

For detailed instructions, refer to the Cathedralized Attic Applications document published by Applegate Greenfiber Acquisition, LLC, available at www.greenfiber.com/support.

• Enclosed Rafter Spaces (Insulated Cathedral Ceilings):

Insulated cathedral ceilings are rafter spaces, formed where ceilings are applied directly to the underside of the roof framing members, which fully encapsulate the thermal insulation on all sides. In applications with vented rafter spaces, Greenfiber insulation is Dry Dense Packed to a density of 3.5 to 5.0 lbs/ft³ (56.1 to 80.0 kg/m³) and installed in accordance with Section 1202.2 of the 2024, 2021, and 2018 IBC, Section 1203.2 of the 2015 IBC, and Section R806.1 of the IRC, as applicable.

In applications with unvented rafter spaces, Greenfiber Insulation may be Dry Dense Packed over an air impermeable insulation in accordance with Section R806.5 of the IRC, as applicable. The air impermeable insulation must be of a thickness necessary to comply with the R-Value specified in Table R806.5 of the IRC, as applicable.

For detailed instructions, refer to the Cathedral Ceiling Applications document published by US Greenfiber, LLC, available at www.greenfiber.com/support.

6.8 Metal Construction:

Only Greenfiber Stabilized and Greenfiber Loose-Fill insulation may be used in construction using metal studs, metal buildings or any construction in which Greenfiber Insulation will be in contact with metal structural or sheathing members.

6.9 Crawl Space Floors:

Greenfiber Insulation or Greenfiber FRM should not be applied to foundation walls in either vented or unvented crawl spaces. Greenfiber Stabilized Insulation and Greenfiber Loose-Fill Insulation may be used as floor insulation over a crawl space when a vapor retarder is attached to the bottom of the floor joists.

6.10 Fire blocking:

Only Greenfiber SANCTUARY and Greenfiber FRM may be used as fire blocking materials in accordance with Section 718.2.1 of the IBC, Section R302.11.1 and Section R602.8 of the IRC.

The insulation may be placed in concealed spaces of wood or steel stud walls and partitions of combustible construction with stud spacing up to 24 inches (610 mm) on center. When the walls and partitions have existing insulation in the spaces between the studs, access holes measuring from 1-inch (25.4 mm) in diameter to 6 inches (152 mm) square are cut in the wall covering at each space between studs, and the plugs are removed. The existing insulation is cut and pushed away to form a space with a minimum height of 16-inches (406 mm) above the floor level. Greenfiber Insulation is then installed into the open space, filling from the floor a full 16-inch (406 mm) (or greater) height and contacting all surfaces. After installation has been completed, the plugs are replaced, and the wall covering is repaired with tape and joint compound in accordance with ASTM C840 or GA 216.

When there is no insulation in the wall or partition, insulation must completely fill the stud cavity to a minimum depth of 16 inches (406 mm).

6.11 Installation in Attics when used as a Prescribed Ignition Barrier:

Greenfiber Insulation may be used as an ignition barrier over foam plastics in accordance with Section R303.5.3 of the 2024 IRC and R316.5.3 of the 2021, 2018 and 2015 IRC when applied at a minimum thickness of 1-½ inches (38.1 mm) and a minimum installed density of 2.6 lbs/ft³ (43.0 kg.m³).

6.12 Sound Transmission:

Sound testing data can be found in the Superior Sound Control with Greenfiber Insulation published by Applegate Greenfiber Acquisition, LLC at www.greenfiber.com/support.

6.13 Fire-Resistance:

6.13.1 Calculated Fire-Resistance

The fire-resistance rating of wood-stud walls is increased by 15 minutes when calculating fire-resistance in accordance with Table 722.6.2(1) of the IBC, when the spaces between wood studs are completely filled with cellulose insulation having a nominal density not less than 2.6 pcf.

6.13.2 Fire-Resistance Ratings

The assemblies described in Table 2 are fire-resistance rated assemblies complying with Section 703.2 of the IBC. Refer to the UL Fire Resistance Certification information for File R15890 (CCAZ) for applicable design coverage and details of the fire-resistance rated Floor-Ceiling and Wall assemblies covered by this report. Fire-resistance ratings are only applicable when the assemblies are constructed in accordance with the published designs. Stud and joist spacing are a maximum. Lesser spacing is permitted without affecting the fire resistance rating of any assembly.

Table 2 - Fire-Resistance Designs

Product Designation	Applicable Fire-Resistive Design(s)		
FRM (Fire Rated Material)	U370, U377, W305		
SANCTUARY	G524, L521, L528, L546, L574, L576, L582, L587, M509, M512, M562, P522, P531, P533, P545, P552, P556, P579, P580, U023, U032, U036, U053, U305, U309, U311, U317, U321, U326, U330, U331, U333, U338, U339, U340, U341, U342, U344, U347, U348, U349, U350, U354, U355, U356, U375, U376, U398, U403, U411, U412, U420, U425, U426, U428, U429, U434, U438, U440, U460, U462, U463, U465, U466, U467, U469, U470, U471, U477, U478, U495, U498, U499, U528, U622, U646, U647, U648, U651, V302, V303, V310, V321, V323, V324, V341, V344, V345, V346, V351, V401, V410, V414, V416, V421, V455, V472, V481, V493, V495, W307, W405, W419, W451, W456, W461, W469		

7. Wall - Floor Joist Penetration

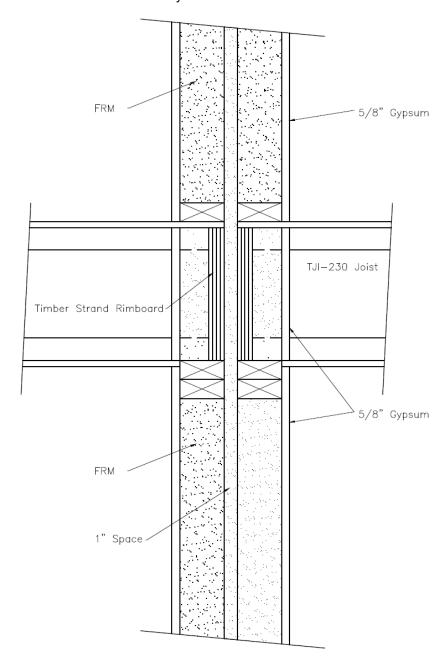
7.1 General

Testing was conducted with a modified ANSI/UL 263, Standard for Fire Tests of Building Construction and Materials, Thirteenth Edition, dated April 4, 2003 system consisting of a load bearing wall assembly and perpendicular wood floor joists penetrating each side of the assembly. The relationship between a wall assembly and wood floor joists is not addressed in UL 263. The test set-up was constructed in accordance with specifications determined by Applegate Greenfiber Acquisition and tested under controlled conditions as described in UL 263. The test was conducted on June 9, 2006.

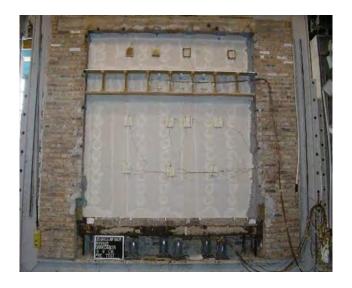
7.2 Description of Test Assembly

The wall portion of the test assembly was constructed in accordance with U370, System A, for a 2-hr Rating (See UL Product iQ for full details). This consisted of a load bearing double wall assembly with a minimum 1-inch gap constructed of two rows of nominal 2 by 4 in. wood studs spaced 16 in. on center with their outer surfaces faced with one layer of nominal 5/8 in. gypsum board with the cavities of each row of studs filled with Greenfiber FRM spray applied cellulose material having a minimum dry density of 3.89 lb/ft³. The test assembly additionally contained a wood floor joist that penetrated the wall. The wood floor joist utilized TJI-230 joists, Timber Strand rim board (1-1/4-inch thick) and Georgia Pacific Quick Fit sub-flooring. Rim board and top plate were cut to fit inside the outer studs of the wall assembly. The joists were cut to 9-inch lengths and were spaced 16-inch on center. The 1-inch gap was maintained through the joist and sub-flooring assembly. The FRM insulation when sprayed into the internal cavity filled the 1-inch gap. The floor joist protruded from both sides of the wall and had a superimposed load applied vertically to the unexposed row of studs and separately to the exposed row of studs by hydraulic equipment to simulate 75% of the maximum working stress.

The picture below details the tested assembly.



7.3 Pictures of Surfaces Pre- and Post- Test



Unexposed Surface - Pre-Test Photo



Unexposed Surface - Post-Test Photo



Exposed Surface - Pre-Test Photo



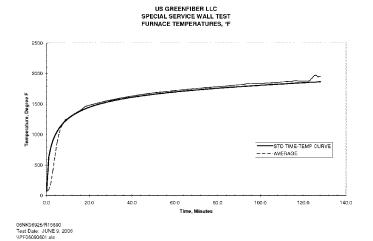
Exposed Surface – Post-Test Photo

7.4 Results

At the completion of 2 hours, it was observed that the assembly sheetrock face exposed to the furnace fire was cracked but remained in place containing the Fire Rated Material. The assembly sustained the test duration without passage of flame or passage of gases hot enough to ignite cotton waste. The transmission of heat through the assembly did not raise the average temperature of the unexposed surface to more than 250°F above its initial temperature. The transmission of heat through the assembly did not raise the maximum individual temperature of the unexposed surface to more than 325°F above its initial temperature. The assembly's unexposed studs continued to maintain load.

Unexposed Surface Temperatures Chart

Furnace Temperatures Chart



7.5 Codes Discussion

The test assembly investigated utilizing the U370 wall design penetrated by wood floor joists may be applied to the following code areas.

- Structural Independence (R302.2.2 and R302.2.6 IRC) Exception 5 of R302.2.6 advises that "townhouses separated by a common wall" are exempt from the structural independence requirement when that common wall is provided in accordance with Section R302.2.2, Item 1 or 2. The U370 wall design without floor penetration meets the requirements of R302.2.2, Item 1 in that it is a 2-hr Rated design. In the test data presented above, the U370 wall design with floor penetration has shown to perform to the temperature requirements detailed in Section 6.4 of UL 263, Thirteenth Edition.
- Structural Stability (706.2 IBC) Section 706.2 of the IBC requires that fire walls meet the
 requirements of NFPA 221 to comply with the structural stability requirements. As stated in NFPA
 221, double fire walls "shall be independent of the fire wall and framing on the opposite side". The
 U370 wall design meets the requirements of a double fire wall when not penetrated by the floor
 joist. When floor joists are used, if the 1-inch gap is maintained between the double fire wall and
 floor, the results as shown above describe the temperatures maintained.

IBC 706.2, Exception: In Seismic Design Categories D through F, where double fire walls are used in accordance with NFPA 221, floor and roof sheathing not exceeding ¾-inch (19.05mm) thickness shall be permitted to be continuous through the wall assemblies of light frame construction.

 Continuity (R302.2.3 IRC) – Section R302.2.3 of the IRC requires that the fire-resistance rating shall extend the full length of the wall or assembly continuously from the foundation to the underside of the roof sheathing, deck or slab. The test data presented above indicates that the specific tested wall section with floor penetration (modified U370 design) demonstrates continuity through the length of the tested assembly.

8. Conditions of Use

8.1 General:

The loose fill insulation described in this report comply with or are suitable alternatives to what is specified in those codes listed in Section 2 of this report, subject to the following conditions:

- 8.2 Installation must comply with this report, the manufacturer's published installation instructions, and the applicable code. If there is a conflict between this report and the manufacturer's published installation instructions, this report governs.
- **8.3** Greenfiber Insulation and Greenfiber FRM may be installed in noncombustible construction without affecting the noncombustible classification as described in Section 603.1 of the IBC.
- 8.4 The installer must provide the code official a signed and dated statement describing the type of insulation installed, including thickness, coverage area, *R*-value and number of bags or pounds of insulation installed.
- 8.5 When the fire-resistance rated wall or floor-ceiling assemblies described in Section 6 are used in multi-family applications, design and details to verify compliance with all of the applicable requirements of any code must be prepared by a registered design professional where required by state or local jurisdictions in which the project is constructed and submitted to the local code official for approval.
- **8.6** For a listing of applicable UL Solutions Certifications, see UL Solutions' Product iQ® for the following categories:
 - Loose fill UL Classified for surface burning characteristics in accordance with UL 723 (BPHX).
 - Loose fill UL Classified for flammability, environmental, and physical characteristics in accordance with ASTM C739 (BPHX).
 - Sprayed fiber UL Classified for fire resistance in accordance with UL 263 (<u>CCAZ</u>).
- 8.7 Greenfiber Stabilized Insulation, Greenfiber Loose Fill Insulation, and Greenfiber FRM are manufactured by Applegate Greenfiber Acquisition LLC located at the manufacturing locations named below, under the UL LLC Classification and Follow-Up Service Program, which includes inspections in accordance with the quality elements of ICC-ES Acceptance Criteria for Quality Documentation, AC10.

City, State	Factory Identification	City, State	Factory Identification
Chandler, AZ	CHANDLER	Norfolk, NE	NE
Chambersburg, PA	CHAMBERSBURG- R15890	Salt Lake City, UT	UT
Decatur, AL	DECATUR-R15890	Tampa, FL	310
Eastonollee, GA	EASTAGGF	Waco, TX	TX
Hickory, KY	HICKORY-R15890	Webberville, MI	WEBBERVILLE- R15890
Lester Prairie, MN	LESTERPRAIRE- R15890	Wilkes-Barre, PA	PA-WB

9. Supporting Evidence

- **9.1** Manufacturer's published installation instructions.
- 9.2 UL test reports and Classification reports in accordance with ASTM C739, UL 263, and UL 723.
- **9.3** Reports of physical property testing in accordance with CPSC 16CFR Part 1209.
- **9.4** Reports of sound transmission testing in accordance with ASTM E90 and ASTM E413.
- 9.5 Report of testing conducted on the U370 wall design penetrated by the floor joist.
- **9.6** Documentation of quality system elements described in AC10.

10. Identification

The loose fill insulations described in this evaluation report are identified by a marking bearing the report holder's name, Applegate Greenfiber Acquisition LLC; the plant identification; the UL Solutions Classification Mark; and the evaluation report number UL ER15890-01. The validity of the evaluation report is contingent upon this identification appearing on the product or UL Solutions Classification Mark certificate. Additionally, each package must bear a label with information required by FTC 16 CFR Part 460, and CPSC 16 CFR, Parts 1209 and 1404.

11. Use of UL Solutions Evaluation Report

- **11.1** The approval of building products, materials or systems is under the responsibility of the applicable code authorities.
- 11.2 UL Solutions Evaluation Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL Solutions.
- 11.3 The current status of this report, as well as a complete directory of UL Solutions Evaluation Reports, may be found at UL.com/Solutions via Product iQ[®].
- **11.4** As stated in UL 263, Section 1.6 (d) "These requirements do not cover [the] simulation of the fire behavior of joints between building elements, such as floor-wall or wall-wall, and like connections."

UL Solutions Evaluation Reports

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This UL Solutions Evaluation Report is not an endorsement or recommendation for use of the subject and/or product described herein. This Report is not the UL Solutions Listing or UL Solutions Classification Report that covers the subject product. The subject product's UL Solutions Listing or UL Solutions Classification is covered under a separate UL Solutions Report. UL Solutions disclaims all representations and warranties whether express or implied, with respect to this Report and the subject or product described herein. Contents of this Report may be based on data that has been generated by laboratories other than UL Solutions that are accredited as complying with ISO/IEC Standard17025 by the International Accreditation Service (IAS) or by any other accreditation body that is a signatory to the International Laboratory Accreditation Cooperation (ILAC) Mutual Recognition Arrangement (MRA). The scope of the laboratory's accreditation shall include the specific type of testing covered in the test Report. As the accuracy of any non-UL Solutions data is the responsibility of the accredited laboratory, UL Solutions does not accept responsibility for the accuracy of this data.

UL Solutions Headquarters 333 Pfingsten Road Northbrook, IL 60062-2096 USA T: 847.272.8800 UL.com/Solutions





Data & Fact Sheets

- Greenfiber® SANCTUARY® MSDS
- Greenfiber® SANCTUARY® Canadian MSDS (French)
- Greenfiber® SANCTUARY® Defense MSDS
- Greenfiber® Fire Rated Material (FRM) MSDS
- Greenfiber® SANCTUARY® Fact Sheet
- Greenfiber® SANCTUARY® Canadian Fact Sheet (French)
- Greenfiber® SANCTUARY® Defense Fact Sheet

Safety Data Sheet



SECTION 1: Identification

Product identifier used on the label:

Product Name: SANCTUARY

Other means of identification:

Synonyms: None known Product Code Number: INSSANC

Recommended use of the chemical and restrictions on use:

Recommended use:

Cellulose based insulation.

Recommended restrictions: Uses other than those described above.

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party (product may be produced in all Greenfiber facilities):

Company Name: Applegate Greenfiber Acquisitions LLC

Company Address: 5500 77 Center Drive Ste 100

Charlotte, NC. 28217, USA

Company Telephone: 800.228.0024 (8am – 4pm)

Company Contact: Jerry Kaputa

Company Email: jerry.kaputa@greenfiber.com

Emergency phone number: 800.228.0024

SECTION 2: Hazard(s) Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200:

Not classified as hazardous under OSHA HSC 2012

GHS Signal word: None Required

GHS Hazard statement(s):

GHS Hazard symbol(s):

GHS Precautionary statement(s):

None required.

None required.

Hazard(s) not otherwise Classified (HNOC):

None known.

Note: This product contains cellulose fiber which may be classified as a combustible dust. However, this product is treated with a fire retardant, and therefore this classification is not applicable.

Percentage of ingredient(s) of unknown acute toxicity: Not applicable

SECTION 3: Composition/Information on Ingredients

Chemical name	CAS#	Concentration (weight %)
Cellulose Fiber	65996-61-4	Up to 85%
Boric Acid	10043-35-3	Up to 15%
Distillate Mineral Oil	8042-47-5	Up to 2%

Note: The balance of the ingredients is not classified as hazardous or are below the concentration limit to be classified as hazardous, under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

SECTION 4: First-aid Measures

Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion:

Inhalation: Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Oxygen should only be administered by qualified personnel. Seek medical advice.

Skin contact: Wash with water and soap and rinse thoroughly. Seek medical advice if irritation or pain develops.

Eye contact: In case of contact with eyes, flush with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Ingestion: Do NOT induce vomiting. If swallowed, wash mouth out with water provided the person is conscious. NEVER GIVE LIQUIDS TO AN UNCONCIOUS PERSON. Call a physician.

Most important symptoms/effects, acute and delayed:

Handling and / or processing this material may generate a dust which can cause irritation of the skin.

Indication of immediate medical attention and special treatment needed:

If any symptoms are observed, contact a physician and give them this SDS sheet. Treat symptomatically.

SECTION 5: Fire-fighting Measures

Suitable (and unsuitable) extinguishing media:

Suitable extinguishing media: Dry chemical, foam, water spray, carbon dioxide.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):

None expected.

Hazardous combustion products may include the following substances: Carbon monoxide, carbon dioxide, sulfur products, boron and calcium oxides.

Special protective equipment and precautions for fire-fighters:

Use water spray or fog for cooling exposed containers. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Evacuate all non-emergency personnel from area. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

SECTION 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures:

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through the spilled material. Avoid breathing vapors. Minimize contact with skin or eyes. Provide adequate ventilation. Wear appropriate protective equipment, as conditions warrant (see Section 8).

See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions:

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways.

Methods and material for containment and cleaning up:

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Dispose of via a licensed waste disposal contractor. See Section 1 for emergency contact information and Section 13 for waste disposal.

SECTION 7: Handling and Storage

Precautions for safe handling:

Use local and general ventilation. Wear recommended personal protective equipment (See Section 8). Avoid breathing dusts. Avoid contact with eyes, skin and clothing. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

Conditions for safe storage, including any incompatibles:

Keep only in original container. Store in a dry, well-ventilated place. Keep container closed when not in use. Make sure containers are properly labeled. Store away from incompatible materials. Incompatible materials: Strong oxidizing agents, strong bases, Incompatible with bromine pentafluoride, sodium nitrate, fluorine

SECTION 8: Exposure Controls/Personal Protection

OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

Substance	OSHA PEL	ACGIH TLV	NIOSH IDLH
Cellulose Fiber	TWA: 15 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 3 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).
Boric Acid	None known	TWA: 2 mg/m³ STEL: 6 mg/m³	None known
Distillate Mineral Oil	None known	None known	None known

Appropriate engineering controls:

- Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.
- Provide eyewash station. Eye wash fountain and emergency showers are recommended.
- Concentrations should be monitored hazardous substances in the workplace in accordance
 with recognized test methods. Mode, method, type and frequency of testing and measurement
 of harmful factors in the working environment should meet the requirements of
 local/regional/national laws.

Individual protection measures, such as personal protective equipment:

Eye/face protection: Wear appropriate protective eyeglasses or chemical safety goggles. Use equipment for eye protection tested and approved under NIOSH standards.

Skin and hand protection: Wear protective gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: Chemical resistant apron.

Respiratory protection: No personal respiratory protective equipment is normally required. Where risk assessment shows the need for respiratory protection, use supplied air or a self-contained breathing apparatus containing air, operated in positive pressure mode which has been recommended or approved by an appropriate agency.

General hygiene considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.

Not determined

SECTION 9: Physical and Chemical Properties

Appearance (physical state, color, etc.):

Physical state:Solid.Color:Gray/BrownOdor:Odorless

Odor threshold: Not determined.

pH: <8.2

Melting point/freezing point: Not determined

Initial boiling point and

Vapor density:

boiling range:

Flash point:

Evaporation rate:

Flammability (solid, gas):

Upper/lower flammability or explosive limits
Flammability limit – lower %):

Flammability limit – upper (%):

Not applicable
Not applicable
Not applicable
Not applicable
Not applicable

Safety Data Sheet

Relative density: 9 lb/ft3 compressed

Solubility (ies): Not soluble

Partition coefficient

(n-octanol/water):Not determinedAuto-ignition temperature:Not applicableDecomposition temperature:Not determinedViscosity:Not determined

SECTION 10: Stability and Reactivity

Reactivity: Not reactive under recommended storage and handling

conditions.

Chemical stability: Stable under recommended storage and handling

conditions.

Possibility of hazardous reactions: None expected under recommended storage and handling

conditions.

Conditions to avoid: Incompatible products. Excess heat. Avoid dust formation.

Exposure to moisture.

Incompatible materials: Strong oxidizing agents, strong bases, Incompatible with

bromine pentafluoride, sodium nitrate, fluorine.

Hazardous decomposition products: Carbon monoxide, carbon dioxide, sulfur products, boron

and calcium oxides.

SECTION 11: Toxicological Information

Information on likely routes of exposure:

Inhalation:Expected to be a route of exposure.Ingestion:Expected to be a route of exposure.Skin:Expected to be a route of exposure.Eyes:Expected to be a route of exposure.

Target Organs: Eyes, Skin, Digestion tract, Respiratory system

Symptoms related to the physical, chemical, and toxicological characteristics:

Handling and / or processing this material may generate a dust which can cause irritation of the skin and eyes.

Delayed and immediate effects and chronic effects from short or long-term exposure:

None known

Numerical measures of toxicity (such as acute toxicity estimates):

Acute toxicity: Does not meet the criteria for classification.

Safety Data Sheet

Substance	Test Type (species)	Value
	LD ₅₀ Oral (Rat)	> 2000 mg/kg
Cellulose Fiber	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg
	LC ₅₀ Inhalation (Rat)	> 5800 mg/m3 4h
	LD ₅₀ Oral (Rat)	3765 mg/kg
Boric Acid	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg
	LC ₅₀ Inhalation (Rat)	> 2.03 mg/L air 5h
	LD ₅₀ Oral (Rat)	> 5000 mg/kg
Distillate Mineral Oil	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg
	LC ₅₀ Inhalation (Rat)	> 5 mg/L air 4h

Skin corrosion/irritation: Does not meet the criteria for classification. Serious eye damage/eye irritation: Does not meet the criteria for classification. Respiratory sensitization: Does not meet the criteria for classification. Skin sensitization: Does not meet the criteria for classification. Does not meet the criteria for classification. Germ cell mutagenicity: Carcinogenicity: Does not meet the criteria for classification. Reproductive toxicity: Does not meet the criteria for classification. Does not meet the criteria for classification. Specific target organ toxicity-

Single exposure:

Specific target organ toxicity-

Repeat exposure:

Does not meet the criteria for classification.

Aspiration hazard: Does not meet the criteria for classification.

Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA:

Component	IARC	NTP	ACGIH	OSHA
Cellulose Fiber	Not listed	Not listed	Not listed	Not listed
Boric Acid	Not listed	Not listed	Not listed	Not listed
Distillate Mineral Oil	Not listed	Not listed	Not listed	Not listed

SECTION 12: Ecological Information

Ecotoxicity (aquatic and terrestrial, where available):

Substance	Test Type	Species	Value
	LC ₅₀	Fish	None known
Cellulose Fiber	EC ₅₀	Aquatic Invertebrates	None known
	EC ₅₀	Algae	None known
	LC ₅₀	Fish Pimephales promelas	79.7 mg/L
Boric acid	EC ₅₀	Aquatic Invertebrates Litopenaeus vannamei	130 mg/L 48h
	EC ₅₀	Algae Pseudokirchneriella subcapitata	52.4 mg/L 72h
	LL ₅₀	Fish Oncorhynchus mykiss	> 100 mg/L
Distillate Mineral Oil	LL ₅₀	Aquatic Invertebrates Daphnia magna	> 100 mg/L
	NOEL	Algae Pseudokirchneriella subcapitata	≥ 100 mg/L

Persistence and Degradability: No data available for the product

Bioaccumulative Potential: No data available for the product

Mobility in Soil: No data available for the product

Other adverse effects (such as hazardous to the ozone layer): None known.

SECTION 13: Disposal Considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

Product

Do not allow product to reach the sewage system. Collect and reclaim or dispose of sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Contaminated packaging

Since emptied containers retain product residue, follow label warnings even after container is emptied. Dispose of as unused product.

SECTION 14: Transport Information

US Department of Transportation Classification (49CFR): Not classified as dangerous for transport

IMDG (Transport by sea): Not classified as dangerous for transport

IATA (Country variations may apply): Not classified as dangerous for transport

Environmental hazards: Marine pollutant: No

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): No further relevant information is available.

Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

Do not transport with food and feedstuffs.

SECTION 15: Regulatory Information

USA:

United States Federal Regulations: This SDS complies with the OSHA, 29 CFR 1910.1200. The product is classified as hazardous under OSHA.

Toxic Substances Control Act (TSCA) – None of the components are listed on the TSCA inventory.

CERCLA RQ (lbs) Ingredients (> 0.1%): None of the components are listed.

SARA Superfund and Reauthorization Act of 1986 Title III sections 302, 311, 312 and 313: Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A) (> 0.1%): None of the components are listed.

Section 311/312 (40 CFR 370) (> 0.1%): None known

Section 313 Toxic Release Inventory (40 CFR 372) (> 0.1%): None of the components are listed.

STATE REGULATIONS:

This SDS contains specific health and safety data that is applicable for state requirements. For details on your regulatory requirements, you should contact the appropriate agency in your state.

California Proposition 65 (California Safe Drinking Water and Toxic Enforcement Act of 1986:

None of the components are listed.

Massachusetts Right to Know:

None of the components are listed on the Massachusetts Right to Know list.

New Jersey Right to Know:

None of the components are listed on the New Jersey Right to Know list.

Pennsylvania Right to Know:

None of the components are listed on the Pennsylvania Right to Know list.

SECTION 16: Other Information

Revision Date: April 20, 2024

DISCLAIMER: To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



SECTION 1 – IDENTIFICATION

IDENTIFICATEUR DU PRODUIT: Isolant cellulosique

NOM DU PRODUIT: SANCTUARY (INSSANC)

FABRICANT: US Greenfiber

5500 77 Center Drive, Suite 100, Charlotte, NC 28217, États-Unis

Numéro de téléphone en cas d'urgence : 1 800 228-0024 (8 h à 17 h HE,

du lundi au vendredi)

SECTION 2 - IDENTIFICATION DES RISQUES

Classification selon la norme de communication des risques OSHA (29 CFR 1910.1200)

Classification: Bien qu'il ne s'agisse pas d'une substance dangereuse selon les règles de l'OSHA sur

la déclaration des matières dangereuses, cette fiche de sécurité contient des

informations essentielles à connaître pour la manipuler sans danger. Elle doit rester à

la disposition des employés et des autres utilisateurs de ce produit.

Mot de signalement: Avertissement

Énoncé de danger: Aucun effet important ou danger critique connu

Symboles:

Autres dangers: La fibre cellulosique est une poussière combustible lorsqu'elle n'est pas traitée avec

une préparation ignifuge

Mises en garde: Prévention : Obtenir des directives spéciales avant utilisation. Ne pas manipuler tant

que toutes les précautions de sécurité n'ont pas été lues et comprises. Utiliser l'équipement de protection individuelle conformément à la section 8. Réponse : En cas d'exposition ou de préoccupation, consulter un médecin.

Élimination : Mettre au rebut de façon réglementaire.

SECTION 3 - COMPOSITION ET DONNÉES SUR LES INGRÉDIENTS

COMPOSANT	Nº CAS	% EN POIDS	EXPOSURE LIMITS
Papier journal (fibre cellulosique)	Nº 65996-61-4	85%	Voir la section 8 pour connaître les limites d'exposition professionnelle.
Acide borique H ₃ BO ₃	Nº 10043-35-3	Pas plus de 15%	Voir la section 8 pour connaître les limites d'exposition professionnelle.
Amylopectine	Nº 113894-91-0	Jusqu'à 2%	Voir la section 8 pour connaître les limites d'exposition professionnelle.
Huile minérale distillée	Nº 8042-47-5	Pas plus de 2%	Voir la section 8 pour connaître les limites d'exposition professionnelle.



SECTION 4 - PREMIERS SOINS

Description des premiers soins nécessaires:

- Yeux: En cas d'exposition à la poussière, rincer immédiatement les yeux à grande eau pendant au moins 15 minutes. Consulter un médecin si l'irritation perdure.
- **Peau**: En cas d'exposition à la poussière, laver la peau à grande eau et avec du savon. Consulter un médecin si l'irritation persiste.
- Inhalation: En cas d'irritation ou de difficulté à respirer, aller à l'air frais. Consulter un médecin si la situation perdure.
- **Ingestion:** Les symptômes peuvent comprendre de la diarrhée, des nausées et des vomissements. Consulter un médecin en cas d'ingestion du matériau et de l'apparition de symptômes.

Principaux symptômes et effets, tant aigus que tardifs:

- Aigus: Irritant respiratoire et oculaire mineur. Ne constitue pas un irritant cutané à moins d'une plaie. Il faut porter des gants dans cette situation.
- Chronique : Rien de connu

Indications que des soins médicaux immédiats et des traitements spéciaux sont nécessaires:

 Note aux médecins: L'exposition à la poussière peut aggraver les symptômes des personnes qui ont déjà des problèmes respiratoires et causer des symptômes cutanés et gastro-intestinaux.

SECTION 5 – MESURES À PRENDRE EN CAS D'INCENDIE

Agents extincteurs appropriés:

• **Agent d'extinction:** Eau, produits chimiques secs et autres agents homologués pour un feu de bois (type A). Utiliser un extincteur de type A.

Agents extincteurs inappropriés:

Aucun connu

Dangers particuliers découlant du produit chimique:

Combustible: Le matériau peut se décomposer au contact de températures extrêmes et de flammes nues.

Équipement de protection spécial et précautions à prendre pour les pompiers:

 Si possible, isoler le feu en déplaçant d'autres matériaux combustibles. Si l'incendie est petit, utilisez une conduite d'incendie ou un extincteur homologué pour un incendie de type A. Si possible, drainer et recueillir l'eau utilisée pour combattre l'incendie. Les pompiers doivent porter un équipement de protection normal (tenue complète) et un appareil respiratoire autonome à pression positive.

SECTION 6 - MESURES EN CAS DE REJET ACCIDENTEL

Précautions personnelles, équipement de protection individuelle et mesures d'urgence:

- Pour le personnel n'étant pas affecté aux urgences:
 - Les lunettes et les gants ne sont pas requis pour les expositions industrielles normales, mais une protection oculaire est requise conformément à la norme Z.87.1 de l'ANSI ou à une autre norme nationale. Envisager l'utilisation d'un respirateur si l'environnement est excessivement poussiéreux.
- Pour les intervenants d'urgence:
 - Les lunettes et les gants ne sont pas requis pour les expositions industrielles normales, mais une protection oculaire est requise conformément à la norme Z.87.1 de l'ANSI ou à une autre norme nationale. Envisager l'utilisation d'un respirateur si l'environnement est excessivement poussiéreux.

Précautions environnementales:

 Contient des sels minéraux inorganiques solubles dans l'eau qui peuvent endommager les arbres ou la végétation exposés à de grandes quantités. Des concentrations élevées peuvent endommager la végétation, les poissons et d'autres organismes aquatiques à proximité. Ce produit est un déchet non dangereux en cas de déversement ou d'élimination comme défini dans la réglementation Resource Conservation and Recovery Act (RCRA) (40 CFR 261).



Méthodes et matériaux pour le confinement et le nettoyage:

- Au sol: Pelleter, balayer ou aspirer le produit. Placer dans un contenant d'élimination. Éviter les plans d'eau.
- Dans l'eau: Le déversement de grandes quantités peut entraîner la contamination des eaux environnantes.

Renvoi à d'autres sections:

• Se reporter à la section 15 pour obtenir de plus amples renseignements sur la réglementation de l'EPA et de l'État de Californie.

SECTION 7 - MANUTENTION ET ENTREPOSAGE

Précautions relatives à la manutention sans risque:

• **Généralités:** Aucune disposition spéciale n'est requise. Il est recommandé d'entreposer les sacs scellés dans un endroit sec, à l'intérieur. Pour maintenir l'intégrité du produit, il faut le traiter selon le principe du premier entré, premier sorti. Utiliser de bonnes mesures d'entretien ménager et d'ingénierie afin de garder les niveaux de pous sière inférieurs aux limites d'exposition indiquées à la section 3.

Conditions de sécurité relatives au stockage (y compris matières incompatibles):

Température de stockage: Ambiante
 Pression de stockage: Atmosphérique

Sensibilité spéciale : Aucune

SECTION 8 - MESURES PRÉVENTIVES ET PROTECTION INDIVIDUELLE

Paramètres de contrôle

Ce produit est répertorié et réglementé par l'OSHA et Cal/OSHA en tant que « particules non réglementées autrement » ou « poussière nuisible ». Ce produit est classé par l'ACGIH comme « particules non réglementées autrement ».

COMPONENT/CAS #	EXPOSURE LIMITS
Papier journal (fibre de cellulose) nº 65996-61-4	OSHA PEL-TWA = 15 mg/m³ de poussière totale (PNOR) PNOR – Particules non réglementées autrement ou poussière nuisible OSHA PEL-TWA=5mg/m³ fraction respirable (PNOR) Cal OSHA PEL = 10 mg/m³ de poussière totale (PNOR) TLV-TWA de l'ACGIH = 10 mg/m³ inhalable (PNOS) PNOS – Particules non spécifiées autrement TLV-TWA de l'ACGIH = 3 mg/m³ respirables (PNOS)
Acide borique H3BO3 nº 10043-35-3	OSHA PEL-TWA = 15 mg/m³ de poussière totale (PNOR) OSHA PEL-TWA = 5 mg/m³ fraction respirable (PNOR) Cal OSHA PEL = 5 mg/m³ ACGIH TLV-TWA = 2 mg/m³ ACGIH TLV-STEL = 6 mg/m³ (fraction inhalable – composés boratés, inorganiques)
Amylopectine nº 113894-91-0	OSHA PEL-TWA = 15 mg/m³ de poussière totale (PNOR) OSHA PEL-TWA=5mg/m³ fraction respirable (PNOR)
Distillat d'huile minérale nº 8042-47-5	Aucune (l'exposition au nuage d'huile ne s'applique pas au produit fini)



Mesures d'ingénierie appropriées:

- Contrôles de l'exposition générale: Aucun contrôle particulier n'est nécessaire. Utiliser les pratiques exemplaires habituelles en matière d'entretien et les mesures d'ingénierie pour réduire au minimum les nuisances.
- Ventilation: Ventilation normale et adéquate.

Mesures de protection individuelle, comme l'équipement de protection individuelle:

- Protection respiratoire: Si les mesures d'entretien ménager et d'ingénierie ne maintiennent pas les niveaux de nuisance en deçà des limites réglementaires ou si la concentration de poussière est inconnue, utiliser un masque approuvé par le NIOSH.
- **Protection oculaire:** Porter une protection oculaire approuvée Z.87.1 de l'ANSI si l'environnement est excessivement poussiéreux.
- Protection des mains: Porter des gants en cas de blessure ou de sensibilité cutanée.
- Autres vêtements de protection: Porter des vêtements appropriés en cas de blessure ou de sensibilité cutanée.
- Pratiques en matière de travail et d'hygiène: Pratiques habituelles en matière d'hygiène.

SECTION 9 - PROPRIÉTÉS PHYSIQUES ET CHIMIQUES

- Aspect: Gris/brunOdeur: Sans odeurSeuil olfactif: S.O.
- pH: <8,2 (2 % de suspension à 25 o C)
 Point de fusion ou de congélation: S.O.
- Point initial d'ébullition et plage d'ébullition: S.O.
- Point d'éclair: S.O.
- Taux d'évaporation : S.O.
- Inflammabilité (solide, gaz) : S.O.

- Limites supérieures/inférieures d'inflammabilité ou d'explosibilité: S.O.
- Pression de vapeur: Négligeable à 20 o C
- Densité de vapeur: S.O.
- Densité relative: 9 lb/pi3 comprimé
- Solubilité: Non soluble
- Coefficient de partage n-octanol/eau: S.O.
- Température d'autoinflammation: S.O.
- Température de décomposition: Inconnu
- Viscosité: S.O.

SECTION 10 - STABILITÉ ET RÉACTIVITÉ

Stabilité: Stable Produits à décomposition dangereuse: Aucune

Réactivité: Rien de connu Stabilité chimique: Stable

- Risque de réactions dangereuses: Une polymérisation dangereuse n'est pas possible.
- Conditions à éviter (p. ex. décharge, choc ou vibration statique): La réaction avec des agents réducteurs puissants comme les hydrures métalliques ou les métaux alcalins produira de l'hydrogène gazeux qui pourrait créer un risque d'explosion. Tenir à l'écart des oxydants puissants, comme l'acide nitrique concentré, le peroxyde d'hydrogène et le chlore.
- Matières incompatibles: Rien de connu
- Produits à décomposition dangereuse: Rien de connu



SECTION 11 – TOXICOLOGICAL INFORMATION

Données toxicologiques Aucune donnée toxicologique n'existe pour ce produit. Les renseignements toxicologiques sur les composants de ce produit sont énumérés ci-dessous.

Renseignements sur les voies d'exposition probables (inhalation, ingestion, contact avec la peau et les yeux):

PAPIER JOURNAL (fibre de cellulose)

- Irritation oculaire: Aucune signalée
- Irritation cutanée: Aucune signalée
- Toxicité aiguë par voie orale: Aucune signalée
- **Toxicité aiguë par inhalation:** LC50, rat, = 5 800 mg/m^{3/4} heures
- Sous-chronique: Aucune signalée

- Chronique: Aucune signalée
- Tératologie: Aucune signalée
- Reproduction: Aucune signalée
- Mutagénicité des cellules germinales: Aucune signalée
- Cancérogénicité: Aucune signalée

ACIDE BORIQUE:

- Irritation oculaire: Pas d'irritation, dommages ou irritation à la cornée éliminés en sept jours. Classification : Selon les scores moyens < 1, et les effets étaient entièrement réversibles dans les sept jours, les critères de classification ne sont pas respectés. De nombreuses années d'exposition professionnelle n'indiquent aucun effet indésirable sur l'œil humain.
- **Irritation cutanée:** Aucune irritation cutanée. Score moyen d'irritation primaire : 0,1. Selon les données disponibles, les critères de classification ne sont pas respectés.
- **Toxicité aiguë par voie orale:** Faible toxicité aiguë par voie orale. Chez les rats, la DL50 (voie orale) est de 3 450 mg/kg pi² pour les mâles et de 4080 mg/kg pi² pour les femelles.
- **Toxicité aiguë par inhalation:** Faible toxicité aiguë par inhalation; la CL50 chez le rat est supérieure à 2,0 mg/l (ou g/m3). Selon les données disponibles, les critères de classification ne sont pas respectés.
- Toxicité aiguë par voie cutanée: Faible toxicité aiguë par voie cutanée; la DL50 chez les lapins est > 2 000 mg/kg de poids corporel. Mauvaise absorption par la peau. Selon les données disponibles, les critères de classification ne sont pas respectés.
- **Reproduction:** La dose sans effet nocif observé (DSENO) chez les rats pour les effets sur le développement du fœtus, y compris la perte de poids du fœtus et des variations squelettiques mineures, est de 55 mg d'acide borique/kg pi² ou 9,6 mg B/kg. Classification: Toxicité pour la reproduction de catégorie 2 (Énoncé de danger: H361: Soupconné de causer des dommages à la fertilité ou à l'enfant à naître.)
- Mutagénicité des cellules germinales: Non mutagène. Selon les données disponibles, les critères de classification ne sont pas respectés.
- Cancérogénicité: Aucune preuve de cancérogénicité. Selon les données disponibles, les critères de classification ne sont pas respectés.

AMYLOPECTINE

- Irritation oculaire: Aucune signalée
- Irritation cutanée: Aucune signalée
- Toxicité aiguë par voie orale: Aucune signalée
- Toxicité aiguë par inhalation: Aucune signalée
- Sous-chronique: Aucune disponible
- Chronique: Aucune disponible
- Tératologie: Aucune disponible
- Reproduction: Aucune disponible
- Mutagénicité des cellules germinales: Aucune disponible



HUILE MINÉRALE DISTILLÉE

- Irritation oculaire: Aucune signalée
- Irritation cutanée: DL50, par voie cutanée, rage, > 2 000 mg/kg, conclusion/résumé non disponible
- Toxicité aique par voie orale: DL50, orale, rat >5 000 mg/kg, conclusion/résumé non disponible
- **Toxicité aiguë par inhalation:** CL50 Inhalation de poussières/nuages, rat, > 5280 mg/m3, conclusion/résumé non disponible
- Sous-chronique: Aucune disponible
- Chronique: Aucune disponible
- Tératologie: Aucune disponible
- Reproduction: Aucune disponible
- Mutagénicité des cellules germinales: Aucune disponible
- Cancérogénicité: Aucune disponible

Symptômes liés aux caractéristiques physiques, chimiques et toxicologiques:

• Les produits ne sont pas destinés à l'ingestion. De petites quantités (p. ex. une cuillère à thé) ingérées accidentellement ne sont pas susceptibles de causer des effets. Les symptômes d'une surexposition accidentelle à de fortes doses de sels boratés inorganiques ont été associés à l'absorption par de grandes zones de peau gravement endommagée. Il peut s'agir de nausées, de vomissements et de diarrhée, avec des effets apparaissant plus tard comme une rougeur cutanée et un décollement de la peau.

Effets immédiats ou apparaissant plus tard, ainsi qu'effets chroniques de l'exposition à court et à long terme:

 Des études épidémiologiques chez l'humain n'ont révélé aucune augmentation de la maladie pulmonaire chez les travailleurs exposés de façon chronique à l'acide borique et à la poussière de borate de sodium. Les études épidémiologiques sur l'être humain n'indiquent aucun effet sur la fertilité chez les populations professionnelles exposées de façon chronique à la poussière boratée et n'indiquent aucun effet sur la population générale fortement exposée aux borates dans l'environnement.

Mesures numériques de la toxicité (comme la toxicité aiguë):

Aucune. Ce produit est un mélange.

SECTION 12 – INFORMATIONS ÉCOLOGIQUES

Écotoxicité:

PAPIER JOURNAL (fibre de cellulose)

- Écotoxicité: Biodégradation lente dans l'eau (demi-vie moyenne de un [1] mois à un [1] an dans l'eau douce et l'eau de mer côtière).
- Persistance et dégradation: Non disponible
- Potentiel de bioaccumulation: Non disponible
- Mobilité dans le sol: Non disponible
- Autres effets néfastes (comme un danger pour la couche d'ozone): Rien de connu

ACIDE BORIQUE

- Écotoxicité: Selon les données sur la toxicité aiguë pour les espèces d'eau douce, l'acide borique n'est pas considéré comme dangereux pour l'environnement.
- **Persistance et dégradation:** La biodégradation n'est pas un paramètre applicable puisque l'acide borique est une substance inorganique.
- Potentiel de bioaccumulation: Ce produit subira une hydrolyse dans l'eau pour former de l'acide borique non dissocié. L'acide borique ne se bioamplifie pas dans la chaîne alimentaire.
 Coefficient de partage octanol/eau : Log Pow = -0,757 0 à 25 °C
- Mobilité dans le sol: L'acide borique est soluble dans l'eau et lixiviable dans le sol normal. L'adsorption sur les sols ou les sédiments est négligeable.
- Autres effets néfastes (comme un danger pour la couche d'ozone): Rien de connu



AMYLOPECTINE

- Écotoxicité: Non disponible
- Persistance et dégradation: Non disponible
- Potentiel de bioaccumulation: Non disponible
- Mobilité dans le sol: Non disponible
- Autres effets néfastes (comme un danger pour la couche d'ozone): Rien de connu

HUILE MINÉRALE DISTILLÉE

- Écotoxicité: CSEO 0,098 mg/l, poisson, 14 jours.
- Persistance et dégradation: Non disponible
- Potentiel de bioaccumulation: Non disponible
- Mobilité dans le sol: Non disponible
- Autres effets néfastes (comme un danger pour la couche d'ozone): Rien de connu

SECTION 13 - CONSIDÉRATIONS RELATIVES À LA MISE AU REBUT

Éliminer comme déchet non dangereux conformément à toute réglementation applicable.

SECTION 14 - INFORMATIONS SUR LE TRANSPORT

Peut être expédié normalement comme une matière non dangereuse.

SECTION 15 - INFORMATIONS SUR LA RÉGLEMENTATION

- Superfonds: CERCLA/SARA. Ce produit n'est pas visé par la Comprehensive Environmental Response Compensation and Liability Act (CERCLA) ni par ses modifications de 1986, la Superfund Amendments and Reauthorization Act (SARA), y compris les substances inscrites en vertu de l'article 313 de SARA, Substances toxiques, 42 USC 11023, 40 CFR 372.65; de l'article 302 (substances extrêmement dangereuses) de SARA, 42 USC 11,002, 40 CFR 355; ou de la liste sur les substances dangereuses de CERCLA, 42 USC 9604, 40 CFR 302.
- RCRA: Ce produit n'est pas considéré comme un déchet dangereux en vertu d'un article quelconque de la Loi sur la conservation et la récupération des ressources ou de ses règlements (40 CFR 261 et suivants).
- Loi sur la salubrité de l'eau potable: Ce produit n'est pas réglementé en vertu de la Loi sur la salubrité de l'eau potable, 42 USC 300g-1, 40 CFR 141 et suivants. Consulter les réglementations nationales et locales pour connaître les avis possibles sur la qualité de l'eau concernant les teneurs en bore et en ammoniac.
- Proposition 65 de la Californie: Ce produit ne figure sur aucune liste de substances cancérogènes ou toxiques pour la reproduction de la Proposition 65.
- Cancérogène de OSHA: Non inscrit.
- Loi sur l'assainissement de l'eau (Loi des États-Unis sur le contrôle de la pollution des eaux): 33 USC 1251 et suivants : Ce produit n'est pas lui-même un rejet visé par les critères de qualité de l'eau de l'article 304 de la CWA, 33 USC 1314. Ce produit ne figure pas sur la Section 307 List of Priority Pollutants, 33 USC 1317, 40 CFR 116. Ce produit n'est pas visé par l'article 311 de la List of Hazardous Substances, 33 USC 1321, 40 CFR 116.
- **No TSCA:** Ce produit ne figure pas sur la liste d'inventaire de la TSCA de l'EPA. Le sulfate d'ammonium et l'acide borique figurent respectivement sur la liste d'inventaire de la TSCA de l'EPA sous les numéros CAS 7783-20-2 et 10043-35-3.
- OSHA/Cal/OSHA: Ce document du SDS répond aux exigences de l'OSHA et des normes de communication des dangers Cal/OSHA. Consulter la section 8 pour connaître les limites d'exposition réglementaires.
- **CIRC:** Le Centre international de recherche sur le cancer (de l'Organisation mondiale de la santé) n'inscrit pas ce produit sur la liste des substances cancérogènes et ne le classe pas dans cette catégorie.
- Rapport annuel sur les substances cancérogènes du National Toxycology Program: Non inscrit.



SECTION 16 – OTHER INFORMATION

LES INFORMATIONS PRÉSENTÉES AUX PRÉSENTES ONT ÉTÉ COMPILÉES À PARTIR DE SOURCES CONSIDÉRÉES FIABLES ET EXACTES AU MIEUX DE NOS CONNAISSANCES ET DE NOS CROYANCES, MAIS NOUS NE POUVONS PAS EN DONNER DE GARANTIE. RIEN DANS LES PRÉSENTES NE DOIT ÊTRE INTERPRÉTÉ COMME RECOMMANDANT UNE PRATIQUE OU UN PRODUIT EN VIOLATION D'UN BREVET OU EN VIOLATION D'UNE LOI OU D'UN RÈGLEMENT. IL INCOMBE À L'UTILISATEUR DE DÉTERMINER SI LE MATÉRIAU CONVIENT À UN USAGE PARTICULIER ET D'ADOPTER LES MESURES DE SÉCURITÉ NÉCESSAIRES. NOUS N'OFFRONS AUCUNE GARANTIE QUANT AUX RÉSULTATS À OBTENIR LORS DE L'UTILISATION DE TOUT MATÉRIAU ET, PUISQUE LES CONDITIONS OU L'UTILISATION NE SONT PAS SOUS NOTRE CONTRÔLE, NOUS DEVONS NÉCESSAIREMENT DÉCLINER TOUTE RESPONSABILITÉ QUANT À L'UTILISATION DE TOUT MATÉRIEL QUE NOUS FOURNISSONS.

Les isolants à base de cellulose qui contiennent des borates ont une longue tradition d'innocuité lorsqu'ils sont utilisés conformément aux directives, mais les critères de classification du SGH sont fondés sur les dangers potentiels. Ces dangers sont associés au fait que les animaux en laboratoire sont exposés à de grandes quantités de borates dans leurs aliments pendant de longues périodes; des expositions qui ne sont pas comparables pour les gens, même ceux qui travaillent avec des borates au quotidien. Néanmoins, afin de se conformer au SGH, Greenfiber a elle-même classé ses produits isolants boratés comme substances toxiques pour la reproduction dans la catégorie qui représente le risque le plus faible.

Cote SIGS		National Fire Protection Association (NFPA)	
Santé	1	Rouge (inflammabilité)	1
Inflammabilité:	1	Jaune (réactivité)	0
Réactivité:	0	Bleu (risque aigu pour la santé)	1*
Protection personnelle	E	* Effets chroniques	

ABBREVIATIONS

CAS	Chemical Abstract Services (identifie un produit chimique particulier)	OSHA	Occupational Safety and Health Administration
1.4 mg/m ³	Milligrammes par mètre cube	PNOR	Particules non réglementées autrement
LCLo	Concentration létale faible	PNOS	Particules non spécifiées autrement
LDLo	Dose létale faible	PEL	Limite d'exposition admissible par l'OSHA :
CL50	Concentration létale 50%	ppm	Parties par million
DL50	Dose létale 50%	DdR	Dose de référence
DMENO	Dose minimale avec effet nocif observé	RTECS	Registre des effets toxiques des
mg/L	Milligrammes par litre par heure		substances chimiques
mg/kg	Milligrammes par kilogramme	TDLo	Dose toxique faible
mg/m³	Milligrammes par mètre cube	TLV Valeur limite de l'ACGIH	
Exposition moyenne pondérée Exposition moyenne pondérée dans le temps sur 8 he		on moyenne pondérée dans le temps sur 8 heures	



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- 5. Integrated Risk Information System, EPA, online.
- 6. Toxicological Profiles, Agency for Toxic Substances and Disease Registry, U.S. Public Health Service, 1997.
- 7. TLVs and other Occupational Exposure Values, American Conference of Governmental Industrial Hygienists, 2010.
- 8. 29 CFR 1910.1000 TABLE Z-1 and Z-3
- 9. California OSHA Title 8, Section 5155, Table AC-1
- 10. OSHA 29 CFR 1910.1200 & related Appendices 2012



SECTION 1: Identification

Product identifier used on the label:

Product Name: SANCTUARY Defense

Other means of identification:

Synonyms: None known Product Code Number: INSSANCDEF

Recommended use of the chemical and restrictions on use:

Recommended use:

Cellulose based insulation.

Recommended restrictions: Uses other than those described above.

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party (product may be produced in all Greenfiber facilities):

Company Name: Applegate Greenfiber Acquisition, LLC

Company Address: 5500 77 Center Drive Ste 100

Charlotte, NC. 28217, USA

Company Telephone: 800.228.0024 (8am – 4pm)

Company Contact: Jerry Kaputa

Company Email: jerry.kaputa@greenfiber.com

Emergency Phone Number: 800.228.0024

SECTION 2: Hazard(s) Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200:

Not classified as hazardous under OSHA HSC 2012

GHS Signal word: None Required

GHS Hazard statement(s):

GHS Hazard symbol(s):

GHS Precautionary statement(s):

None required.

None required.

Hazard(s) not otherwise Classified (HNOC):

None known.

Note: This product contains cellulose fiber which may be classified as a combustible dust. However, this product is treated with a fire retardant, and therefore this classification is not applicable.

Percentage of ingredient(s) of unknown acute toxicity: Not applicable

SECTION 3: Composition/Information on Ingredients

Chemical name	CAS#	Concentration (weight %)
Cellulose Fiber	65996-61-4	Up to 85%
Boric Acid	10043-35-3	Up to 15%

Note: The balance of the ingredients is not classified as hazardous or are below the concentration limit to be classified as hazardous, under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

SECTION 4: First-aid Measures

Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion:

Inhalation: Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Oxygen should only be administered by qualified personnel. Seek medical advice.

Skin contact: Wash with water and soap and rinse thoroughly. Seek medical advice if irritation or pain develops.

Eye contact: In case of contact with eyes, flush with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Ingestion: Do NOT induce vomiting. If swallowed, wash mouth out with water provided the person is conscious. NEVER GIVE LIQUIDS TO AN UNCONSCIOUS PERSON. Call a physician.

Most important symptoms/effects, acute and delayed:

Handling and / or processing this material may generate a dust which can cause irritation of the skin.

Indication of immediate medical attention and special treatment needed:

If any symptoms are observed, contact a physician and give them this SDS sheet. Treat symptomatically.

SECTION 5: Fire-fighting Measures

Suitable (and unsuitable) extinguishing media:

Suitable extinguishing media: Dry chemical, foam, water spray, carbon dioxide.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):

None expected.

Hazardous combustion products may include the following substances: Carbon monoxide, carbon dioxide, sulfur products, boron and calcium oxides.

Special protective equipment and precautions for fire-fighters:

Use water spray or fog for cooling exposed containers. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Evacuate all non-emergency personnel from area. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

SECTION 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures:

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through the spilled material. Avoid breathing vapors. Minimize contact with skin or eyes. Provide adequate ventilation. Wear appropriate protective equipment, as conditions warrant (see Section 8).

See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental precautions:

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways.

Methods and material for containment and cleaning up:

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Dispose of via a licensed waste disposal contractor. See Section 1 for emergency contact information and Section 13 for waste disposal.

SECTION 7: Handling and Storage

Precautions for safe handling:

Use local and general ventilation. Wear recommended personal protective equipment (See Section 8). Avoid breathing dusts. Avoid contact with eyes, skin and clothing. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

Conditions for safe storage, including any incompatibles:

Keep only in original container. Store in a dry, well-ventilated place. Keep container closed when not in use. Make sure containers are properly labeled. Store away from incompatible materials. Incompatible materials: Strong oxidizing agents, strong bases, incompatible with bromine pentafluoride, sodium nitrate, fluorine.

SECTION 8: Exposure Controls/Personal Protection

OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

Substance	OSHA PEL	ACGIH TLV	NIOSH IDLH
Cellulose Fiber	TWA: 15 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 3 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).
Boric Acid	None known	TWA: 2 mg/m ³ STEL: 6 mg/m ³	None known

Appropriate engineering controls:

- Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.
- Provide eyewash station. Eye wash fountain and emergency showers are recommended.
- Concentrations should be monitored for hazardous substances in the workplace in accordance
 with recognized test methods. Mode, method, type and frequency of testing and measurement
 of harmful factors in the working environment should meet the requirements of
 local/regional/national laws.

Individual protection measures, such as personal protective equipment:

Eye/face protection: Wear appropriate protective eyeglasses or chemical safety goggles. Use equipment for eye protection tested and approved under ANSI standards.

Skin and hand protection: Wear protective gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: Chemical resistant apron.

Respiratory protection: No personal respiratory protective equipment is normally required. Where risk assessment shows the need for respiratory protection, use supplied air or a self-contained breathing apparatus containing air, operated in positive pressure mode which has been recommended or approved by an appropriate agency.

General hygiene considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.

SECTION 9: Physical and Chemical Properties

Appearance (physical state, color, etc.):

Physical state: Solid

Color:Gray/BrownOdor:Odorless

Odor threshold: Not determined

pH: <8.2

Melting point/freezing point: Not determined

Initial boiling point and

boiling range:Not determinedFlash point:Not determinedEvaporation rate:Not determinedFlammability (solid, gas):Not applicableUpper/lower flammability or explosive limits

Flammability limit – lower (%):
Flammability limit – upper (%):

Vapor pressure:

Vapor density:

Not applicable
Negligible @ 20C
Not determined

Safety Data Sheet

Relative density: 9 lb/ft3 compressed

Solubility (ies): Not soluble

Partition coefficient

(n-octanol/water):Not determinedAuto-ignition temperature:Not applicableDecomposition temperature:Not determinedViscosity:Not determined

SECTION 10: Stability and Reactivity

Reactivity: Not reactive under recommended storage and handling

conditions.

Chemical stability: Stable under recommended storage and handling

conditions.

Possibility of hazardous reactions: None expected under recommended storage and handling

conditions.

Conditions to avoid: Incompatible products. Excess heat. Avoid dust formation.

Exposure to moisture.

Incompatible materials: Strong oxidizing agents, strong bases, incompatible with

bromine pentafluoride, sodium nitrate, fluorine.

Hazardous decomposition products: Carbon monoxide, carbon dioxide, sulfur products, boron

and calcium oxides.

SECTION 11: Toxicological Information

Information on likely routes of exposure:

Inhalation:Expected to be a route of exposure.Ingestion:Expected to be a route of exposure.Skin:Expected to be a route of exposure.Eyes:Expected to be a route of exposure.

Target organs: Eyes, Skin, Digestion tract, Respiratory system

Symptoms related to the physical, chemical, and toxicological characteristics:

Handling and / or processing this material may generate a dust which can cause irritation of the skin and eyes.

Delayed and immediate effects and chronic effects from short or long-term exposure:

None known

Numerical measures of toxicity (such as acute toxicity estimates):

Acute toxicity: Does not meet the criteria for classification.

Safety Data Sheet

Substance	Test Type (species)	Value
Cellulose Fiber	LD ₅₀ Oral (Rat)	> 2000 mg/kg
	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg
	LC ₅₀ Inhalation (Rat)	> 5800 mg/m3 4h
	LD ₅₀ Oral (Rat)	3765 mg/kg
Boric Acid	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg
	LC ₅₀ Inhalation (Rat)	> 2.03 mg/L air 5h

Skin corrosion/irritation: Does not meet the criteria for classification. Serious eye damage/eye irritation: Does not meet the criteria for classification. Respiratory sensitization: Does not meet the criteria for classification. Skin sensitization: Does not meet the criteria for classification. Germ cell mutagenicity: Does not meet the criteria for classification. Carcinogenicity: Does not meet the criteria for classification. Reproductive toxicity: Does not meet the criteria for classification. Specific target organ toxicity-Does not meet the criteria for classification.

Single exposure:

Specific target organ toxicity-Does not meet the criteria for classification.

Repeat exposure:

Aspiration hazard: Does not meet the criteria for classification.

Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA:

Component	IARC	NTP	ACGIH	OSHA
Cellulose Fiber	Not listed	Not listed	Not listed	Not listed
Boric Acid	Not listed	Not listed	Not listed	Not listed

SECTION 12: Ecological Information

Ecotoxicity (aquatic and terrestrial, where available):

Substance	Test Type	Species	Value
Cellulose Fiber	LC ₅₀	Fish	None known
	EC ₅₀	Aquatic Invertebrates	None known
	EC ₅₀	Algae	None known
Boric acid	LC ₅₀	Fish Pimephales promelas	79.7 mg/L
	EC ₅₀	Aquatic Invertebrates Litopenaeus vannamei	130 mg/L 48h
	EC ₅₀	Algae Pseudokirchneriella subcapitata	52.4 mg/L 72h

Persistence and degradability: No data available for the product

Bioaccumulative potential: No data available for the product

Mobility in soil: No data available for the product

Other adverse effects (such as hazardous to the ozone layer): None known.

SECTION 13: Disposal Considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

Product

Do not allow product to reach the sewage system. Collect and reclaim or dispose of sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Contaminated packaging

Since emptied containers retain product residue, follow label warnings even after container is emptied. Dispose of as unused product.

SECTION 14: Transport Information

US Department of Transportation Classification (49CFR): Not classified as dangerous for transport

IMDG (Transport by sea): Not classified as dangerous for transport

IATA (Country variations may apply): Not classified as dangerous for transport

Environmental hazards: Marine pollutant: No

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): No further relevant information is available.

Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

Do not transport with food and feedstuffs.

SECTION 15: Regulatory Information

USA:

United States Federal Regulations: This SDS complies with the OSHA, 29 CFR 1910.1200. The product is classified as non-hazardous under OSHA.

Toxic Substances Control Act (TSCA) – Components in this product are either listed or exempted from listing on the TSCA inventory.

CERCLA RQ (lbs) Ingredients (> 0.1%): None of the components are listed.

SARA Superfund and Reauthorization Act of 1986 Title III sections 302, 311, 312 and 313: Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A) (> 0.1%): None of the components are listed.

Section 311/312 (40 CFR 370) (> 0.1%): None known

Section 313 Toxic Release Inventory (40 CFR 372) (> 0.1%): None of the components are listed.

STATE REGULATIONS:

This SDS contains specific health and safety data that is applicable for state requirements. For details on your regulatory requirements, you should contact the appropriate agency in your state.

California Proposition 65 (California Safe Drinking Water and Toxic Enforcement Act of 1986):

None of the components are listed.

Massachusetts Right to Know:

None of the components are listed on the Massachusetts Right to Know list.

New Jersey Right to Know:

None of the components are listed on the New Jersey Right to Know list.

Pennsylvania Right to Know:

None of the components are listed on the Pennsylvania Right to Know list.

SECTION 16: Other Information

Revision Date: January 23, 2025

DISCLAIMER: To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet



SECTION 1: Identification

Product identifier used on the label:

Product Name: 30LB FIRE RATED MATERIAL

Other means of identification:

Synonyms: None known **Product Code Number:** FRM100

Recommended use of the chemical and restrictions on use:

Recommended use:Cellulose Insulation for Residential Buildings. **Recommended restrictions:**Uses other than those described above.

Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party:

Company Name: Applegate Greenfiber Acquisitions LLC

Company Address: 5500 77 Center Drive Ste 100

Charlotte, NC. 28217, USA

Company Telephone: 800.228.0024 (8am – 4pm)

Company Contact: Ted Nanko

Company Email: ted.nanko@greenfiber.com

Emergency phone number: 800.228.0024

SECTION 2: Hazard(s) Identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200:

Not classified as hazardous under OSHA HSC 2012

GHS Signal word:

GHS Hazard statement(s):

GHS Hazard symbol(s):

GHS Precautionary statement(s):

None Required.

None required.

None required.

Hazard(s) not otherwise Classified (HNOC):

None known.

Note: This product contains cellulose fiber which may be classified as a combustible dust. However, this product is treated with a fire retardant, and therefore this classification is not applicable.

Percentage of ingredient(s) of unknown acute toxicity: Not applicable

SECTION 3: Composition/Information on Ingredients

Chemical name	CAS#	Concentration (weight %)
Cellulose Fiber	65996-61-4	Up to 85%
Boric Acid	10043-35-3	Up to 15%

Note: The balance of the ingredients is not classified as hazardous or are below the concentration limit to be classified as hazardous, under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.

SECTION 4: First-aid Measures

Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion:

Inhalation: Move affected person to fresh air and keep warm and at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Oxygen should only be administered by qualified personnel. Seek medical advice.

Skin contact: Wash with water and soap and rinse thoroughly. Seek medical advice if irritation or pain develops.

Eye contact: In case of contact with eyes, flush with water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Ingestion: Do NOT induce vomiting. If swallowed, wash mouth out with water provided the person is conscious. NEVER GIVE LIQUIDS TO AN UNCONCIOUS PERSON. Call a physician.

Most important symptoms/effects, acute and delayed: Handling and / or processing this material may generate a dust which can cause irritation of the skin.

Indication of immediate medical attention and special treatment needed: If any symptoms are observed, contact a physician and give them this SDS sheet. Treat symptomatically.

SECTION 5: Fire-fighting Measures

Suitable (and unsuitable) extinguishing media:

Suitable extinguishing media: Dry chemical, foam, water spray, carbon dioxide.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical (e.g., nature of any hazardous combustion products):

None expected.

Hazardous combustion products may include the following substances: Carbon monoxide, carbon dioxide, sulfur products, boron and calcium oxides.

Special protective equipment and precautions for fire-fighters:

Use water spray or fog for cooling exposed containers. As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Evacuate all non-emergency personnel from area. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

SECTION 6: Accidental Release Measures

Personal precautions, protective equipment and emergency procedures:

No action shall be taken involving any personal risk or without suitable training. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through the spilled material. Avoid breathing vapors. Minimize contact with skin or eyes. Provide adequate ventilation. Wear appropriate protective equipment, as conditions warrant (see Section 8).

See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions:

Stop spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways.

Methods and material for containment and cleaning up:

Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation. Dispose of via a licensed waste disposal contractor. See Section 1 for emergency contact information and Section 13 for waste disposal.

SECTION 7: Handling and Storage

Precautions for safe handling:

Use local and general ventilation. Wear recommended personal protective equipment (See Section 8). Avoid breathing dusts. Avoid contact with eyes, skin and clothing. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

Conditions for safe storage, including any incompatibles:

Keep only in original container. Store in a dry, well-ventilated place. Keep container closed when not in use. Make sure containers are properly labeled. Store away from incompatible materials. Incompatible materials: Strong oxidizing agents, strong bases, Incompatible with bromine pentafluoride, sodium nitrate, fluorine

SECTION 8: Exposure Controls/Personal Protection

OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety data sheet, where available.

Substance	OSHA PEL	ACGIH TLV	NIOSH IDLH
Cellulose Fiber	TWA: 15 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 3 mg/m³ (respirable particulate).	TWA: 10 mg/m³ (total particulate) 5 mg/m³ (respirable particulate).
Boric Acid	None known	TWA: 2 mg/m³ STEL: 6 mg/m³	None known

Appropriate engineering controls:

- Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.
- Provide eyewash station. Eye wash fountain and emergency showers are recommended.
- Concentrations should be monitored hazardous substances in the workplace in accordance
 with recognized test methods. Mode, method, type and frequency of testing and measurement
 of harmful factors in the working environment should meet the requirements of
 local/regional/national laws.

Individual protection measures, such as personal protective equipment:

Eye/face protection: Wear appropriate protective eyeglasses or chemical safety goggles. Use equipment for eye protection tested and approved under NIOSH standards.

Skin and hand protection: Wear protective gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.

Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: Chemical resistant apron.

Respiratory protection: No personal respiratory protective equipment is normally required. Where risk assessment shows the need for respiratory protection, use supplied air or a self-contained breathing apparatus containing air, operated in positive pressure mode which has been recommended or approved by an appropriate agency.

General hygiene considerations: Avoid contact with skin, eyes and clothing. When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product.

Not determined

SECTION 9: Physical and Chemical Properties

Appearance (physical state, color, etc.):

Physical state:Solid.Color:Gray/BrownOdor:Odorless

Odor threshold: Not determined.

pH: <8.2 (2% suspension @ 25°C)

Melting point/freezing point: Not determined

Initial boiling point and

boiling range:

Flash point:

Not determined

Not determined

Not determined

Not determined

Not applicable.

Upper/lower flammability or explosive limits

Flammability limit – lower %):

Flammability limit – upper (%):

Not applicable

Not applicable

Not applicable

Not applicable

Not applicable

Not applicable

Vapor density:

Safety Data Sheet

Relative density: Not determined Solubility (ies): Not soluble

Partition coefficient

(n-octanol/water):Not determinedAuto-ignition temperature:Not applicableDecomposition temperature:Not determinedViscosity:Not determined

SECTION 10: Stability and Reactivity

Reactivity: Not reactive under recommended storage and handling

conditions.

Chemical stability: Stable under recommended storage and handling

conditions.

Possibility of hazardous reactions: None expected under recommended storage and handling

conditions.

Conditions to avoid: Incompatible products. Excess heat. Avoid dust formation.

Exposure to moisture.

Incompatible materials: Strong oxidizing agents, strong bases, Incompatible with

bromine pentafluoride, sodium nitrate, fluorine.

Hazardous decomposition products: Carbon monoxide, carbon dioxide, sulfur products, boron

and calcium oxides.

SECTION 11: Toxicological Information

Information on likely routes of exposure:

Inhalation:Expected to be a route of exposure.Ingestion:Expected to be a route of exposure.Skin:Expected to be a route of exposure.Eyes:Expected to be a route of exposure.

Target Organs: Eyes, Skin, Digestion tract, Respiratory system

Symptoms related to the physical, chemical, and toxicological characteristics:

Handling and / or processing this material may generate a dust which can cause irritation of the skin and eyes.

Delayed and immediate effects and chronic effects from short or long-term exposure:

None known

Numerical measures of toxicity (such as acute toxicity estimates):

Acute toxicity: Does not meet the criteria for classification.

Safety Data Sheet

Substance	Test Type (species)	Value	
	LD ₅₀ Oral (Rat)	> 2000 mg/kg	
Cellulose Fiber	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg	
	LC ₅₀ Inhalation (Rat)	> 5800 mg/m3 4h	
	LD ₅₀ Oral (Rat)	3765 mg/kg	
Boric Acid	LD ₅₀ Dermal (Rabbit)	> 2000 mg/kg	
	LC ₅₀ Inhalation (Rat)	> 2.03 mg/L air 5h	

Does not meet the criteria for classification. Skin corrosion/irritation: Does not meet the criteria for classification. Serious eye damage/eye irritation: Respiratory sensitization: Does not meet the criteria for classification. Skin sensitization: Does not meet the criteria for classification. Germ cell mutagenicity: Does not meet the criteria for classification. Carcinogenicity: Does not meet the criteria for classification. Reproductive toxicity: Does not meet the criteria for classification. Specific target organ toxicity-Does not meet the criteria for classification.

Single exposure:

Specific target organ toxicity-Does not meet the criteria for classification.

Repeat exposure:

Aspiration hazard: Does not meet the criteria for classification.

Whether the hazardous chemical is listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by OSHA:

Component	IARC	NTP	ACGIH	OSHA
Cellulose Fiber	Not listed	Not listed	Not listed	Not listed
Boric Acid	Not listed	Not listed	Not listed	Not listed

SECTION 12: Ecological Information

Ecotoxicity (aquatic and terrestrial, where available):

Substance	Test Type	Species	Value
	LC ₅₀	Fish	None known
Cellulose Fiber	EC ₅₀	Aquatic Invertebrates	None known
	EC ₅₀	Algae	None known
	LC ₅₀	Fish Pimephales promelas	79.7 mg/L
Boric acid	EC ₅₀	Aquatic Invertebrates Litopenaeus vannamei	130 mg/L 48h
	EC ₅₀	Algae Pseudokirchneriella subcapitata	52.4 mg/L 72h

Persistence and Degradability: No data available for the product Bioaccumulative Potential: No data available for the product

Mobility in Soil: No data available for the product

Other adverse effects (such as hazardous to the ozone layer): None known.

SECTION 13: Disposal Considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging.

Product

Do not allow product to reach the sewage system. Collect and reclaim or dispose of sealed containers at licensed waste disposal site. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Contaminated packaging

Since emptied containers retain product residue, follow label warnings even after container is emptied. Dispose of as unused product.

SECTION 14: Transport Information

US Department of Transportation Classification (49CFR): Not classified as dangerous for transport

IMDG (Transport by sea): Not classified as dangerous for transport

IATA (Country variations may apply): Not classified as dangerous for transport

Environmental hazards: Marine pollutant: No

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): No further relevant information is available.

Special precautions which a user needs to be aware of, or needs to comply with, in connection with transport or conveyance either within or outside their premises.

Do not transport with food and feedstuffs.

SECTION 15: Regulatory Information

USA:

United States Federal Regulations: This SDS complies with the OSHA, 29 CFR 1910.1200. The product is classified as hazardous under OSHA.

Toxic Substances Control Act (TSCA) – None of the components are listed on the TSCA inventory.

CERCLA RQ (lbs) Ingredients (> 0.1%): None of the components are listed.

SARA Superfund and Reauthorization Act of 1986 Title III sections 302, 311, 312 and 313: Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A) (> 0.1%): None of the components are listed.

Section 311/312 (40 CFR 370) (> 0.1%): None known

Section 313 Toxic Release Inventory (40 CFR 372) (> 0.1%): None of the components are listed.

STATE REGULATIONS:

This SDS contains specific health and safety data that is applicable for state requirements. For details on your regulatory requirements, you should contact the appropriate agency in your state.

California Proposition 65 (California Safe Drinking Water and Toxic Enforcement Act of 1986:

None of the components are listed.

Massachusetts Right to Know:

None of the components are listed on the Massachusetts Right to Know list.

New Jersey Right to Know:

None of the components are listed on the New Jersey Right to Know list.

Pennsylvania Right to Know:

None of the components are listed on the Pennsylvania Right to Know list.

SECTION 16: Other Information

Revision Date: September 28, 2023

DISCLAIMER: To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

S A N C T U A R Y°

by GREENFIBER®

BLOW-IN OR SPRAY-APPLIED

Cellulose Insulation

ATTIC COVERAGE CHART - LOOSE-FILL AND STABILIZED APPLICATIONS

Tabla de Cobertura de Ático - Aplicaciónes de Relleno Suelto y Aplicaciónes Estabilizadas

					SANCTUARY®			
R-Value at 75° F Mean Temp.					et Coverage (no adjustment for framing) Cobertura neta (sin compesación para la estructura)	Net Coverage (adjusted for 2" x 6" framing on 16" centers) Cobertura neta (con compensación para una estructura de 2" x 6" en centros de 16")		
Valor de resistencia termica (valor R) at 75 F de temperature media	STABILIZED Initial Installed Thickness Espesor inicial instalado	L00SE-FILL Initial Installed Thickness Espesor inicial instalado	Settled Thickness Espesor asentado	Maximum Sq. Ft. per Bag Pies cuadrados máximos por bolsa	Minimum Bags per 1,000 Sq. Ft. Cantidad minima de bolsas por 1,000 pies cuadrados	Minimum Weight per Sq. Ft. Peso minimo por pie cuadrado	Maximum Sq. Ft. per Bag Pies cuadrados máximos por bolsa	Minimum Bags per 1,000 Sq. Ft. Cantidad minima de bolsas por 1,000 pies cuadrados
13	3.8	3.9	3.6	65.8	15.2	0.38	72.6	13.8
19	5.5	5.7	5.3	44.2	22.6	0.57	48.8	20.5
22	6.4	6.6	6.1	38.0	26.3	0.66	41.2	24.2
30	8.7	8.9	8.3	25.9	38.6	0.97	27.4	36.5
38	10.9	11.2	10.4	19.0	52.6	1.32	19.9	50.1
44	12.6	12.9	12.0	15.7	63.5	1.59	16.5	60.8
49	13.9	14.3	13.3	14.1	70.8	1.80	14.6	68.5
60	16.9	17.3	16.1	11.6	86.0	2.20	12.0	83.5

LOOSE-FILL APPLICATIONS

THE ABOVE COVERAGE CHART IS BASED ON A NOMINAL BAG WEIGHT OF 25 LBS USING A VOLUMATIC III, 3RD GEAR AND 8" GATE. THE CHART IS BASED ON SETTLED THICKNESS AND IS FOR ESTIMATING PURPOSES ONLY. DO NOT EXCEED MAXIMUM SOUABE FEET COVERAGE PER BAG. THE APPLICATOR MUST INSTALL BOTH THE MINIMUM NUMBER OF BAGS PER 1000 SQ. FT. AND THE MINIMUM INSTALLED THICKNESS TO ENSURE THE STATED R-VALUE HAS BEEN REACHED. FAILURE TO MEET BOTH THESE REQUIREMENTS MAY PREVENT THE APPLICATION OF SPECIFIED R-VALUE. JOB CONDITIONS, APPLICATION OF SPECIFIED R-VALUE. JOB CONDITIONS, APPLICATION TECHNIQUES, EQUIPMENT AND SETTINGS CAN INFLUENCE ACTUAL COVERAGE. MINIMUM NET WEIGHT IS 23.75 LBS. IN ACCORDANCE WITH ASTM C-739.

STABILIZED APPLICATIONS

THE ABOVE COVERAGE CHART IS BASED ON A NOMINAL BAG WEIGHT OF 25.0 LBS USING A VOLUMATIC III, 3RD GEAR AND 8" GATE. THE CHART IS BASED ON SETTLED THICKNESS AND IS FOR ESTIMATING PURPOSES ONLY. DO NOT EXCEED MAXIMUM SQUARE FEET COVERAGE PER BAG. THE APPLICATION MUST INSTALL BOTH THE MINIMUM NUMBER OF BAGS PER 1000 SQ. FT. AND THE MINIMUM INSTALLED THICKNESS TO ENSURE THE STATED R-VALUE HAS BEEN REACHED. FAILURE TO MEET BOTH THESE REQUIREMENTS MAY PREVENT THE APPLICATION OF SPECIFIED R-VALUE. THE INSTALLED MOISTURE CONTENT MUST BE BETWEEN 16% AND 22% IN ATTIC APPLICATIONS. JOB CONDITIONS, APPLICATION TECHNIQUES, EQUIPMENT, AND SETTINGS CAN INFLUENCE ACTUAL COVERAGE. MINIMUM NET WEIGHT IS 23.75 LBS. IN ACCORDANCE WITH ASTM C-1497. THE STABILIZED APPLICATION IS FOR PROFESSIONAL INSTALLERS ONLY USING SPECIALIZED EQUIPMENT.

SIDEWALL & FLOOR COVERAGE CHART - DENSE-PACK APPLICATION

Tabla de Cobertura Lateral y del Piso - Aplicaciónes de Paquete Denso

Dry Den	se-Pack Sidewall	& Floor Applications	3.5 pcf minimum insta	lled density)	SANCTUARY®	
Framing Estructura	Thermal Resistance (R value) Resistencia térmica	Installed Thickness (Inches) Espesor instalado (pulgadas)	Minimum Wt Per Square foot Ib/ft² Peso minimo por pie cuadrado Ib/ft²	(Adjusted	overage per Bag for Framing) on compensación para la estructura)	
	(R)		ib/it-	16 inch o.c. ft²/Bag 16 pulgadas o.c. pie2/bolsa	24 inch o.c. ft²/Bag 24 pulgadas o.c. pie2/bolsa	
2 x 4	13	3.5	1.02	27.0	26.1	
2 x 6	21	5.5	1.60	17.2	16.6	
2 x 8	28	7.5	2.19	12.6	12.1	

This coverage chart is for dry applications only and is based on the Krendl KS200, with material applied dry.

SIDEWALL COVERAGE CHART – SPRAY-APPLIED APPLICATIONS

Tabla de Cobertura Lateral - Aplicaciónes Aplicadas por Spray

Spray-	Spray-Applied Sidwall Applications (2.75 pcf minimum installed density) SANCTUARY®										
Framing Estructura	Thermal Resistance (R value)	Installed Thickness (Inches) Espesor instalado (pulgadas)	Minimum Wt Per Square foot Ib/ft² Peso mínimo por pie cuadrado	(Adji	um Coverage per Bag usted for Framing) olsa (con compensación para la estructura)						
	(R)		Ib/ft²	16 inch o.c. ft²/Bag 16 pulgadas o.c. pie2/bolsa	24 inch o.c. ft²/Bag 24 pulgadas o.c. pie2/bolsa						
2 x 4	13	3.5	0.79	35.0	33.8						
2 x 6	21	5.5	1.24	22.3	21.6						

This coverage chart is based on the Volumatic III, 2nd gear, 6" gate. The installed moisture content must be between 25% and 35% as measured by a hand held moisture meter. Do not cover the insulation until the insulation moisture content, measured and documented after a minimum period of 24 hrs from the time of installation, reaches 25% or less in accordance with Greenfiber's Wallspray Manual. Install dry dense pack Sanctuary insulation in all exterior wall sections where added vapor impediments, such as cabinets, mirrors, tubs, and shower enclosures are located. If unsure where impediments are located, dry dense pack the entire exterior wall section(s). Non-standard or unusual wall configurations (i.e., other than 2x4 and 2x6 walls) can affect thermal and sound properties and require special installation considerations. These types of designs should be analyzed and, if necessary, tested prior to plan review. Contact Greenfiber technical representative for applications or framing that is not included on these charts.









READ THIS BEFORE YOU BUY

WHAT YOU SHOULD KNOW ABOUT R-VALUES

This chart shows the R-Value of this insulation. R means resistance to heat flow. The highter the R-Value, the greater the insulating power. Compare insulation R-Values before you buy. There are other factors to consider. The amount of the insulation you need depends on the climate you live in. Also, your fuel savings from isulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel. To get the marked R-Value, it is essential that this insulation be installled properly.

Manufactured by Greenfiber®

Toll-Free 800-228-0024 www.greenfiber.com

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Made in USA

PM-6.3329 Rev F 03/25

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S A N C T U A R Y°

by GREENFIBER®

SOUFFLÉ OU PULVÉRISÉ

Isolant de

TABLEAU DE COUVERTURE DU GRENIER - ÉPANDAGE EN VRAC ET STABILISÉ

Tabla de Cobertura de Ático - Aplicaciones de Relleno Suelto y Aplicaciones Estabilisadas

	Attics / Entretoit												
Résistance	e Thermique	Épaisseur app	liquée sèche	Épaisseur app	liquée stabilisée	Épaisseu	ır Tassée	Masse par Un	ité de Surface	Couvertu	re par sac	Quantité de	Sacs Requis
RSI Value	R Value	mm	in (po)	mm	in (po)	mm	in (po)	kg/m²	lb/ft² (lbs/pi²)	m²	ft² (pi²)	100 m²	1000 ft² (pi²)
1,8	10	75	2.9	72	2.8	69	2.7	1.6	0.34	6.9	74.0	14.5	13.5
2.3	13	97	3.8	94	3.7	89	3.5	2.1	0.44	5.3	56.9	18.9	17.6
3.3	19	142	5.6	137	5.4	130	5.1	3.1	0.64	3.6	38.9	27.6	25.7
3.5	20	150	5.9	144	5.7	137	5.4	3.3	0.68	3.4	37.0	29.1	27.0
3.9	22	165	6.5	159	6.2	151	5.9	3.6	0.74	3.1	33.6	32.0	29.7
5.3	30	224	8.8	216	8.5	206	8.1	4.9	1.01	2.3	24.7	43.6	40.5
6.7	38	284	11.2	274	10.8	261	10.3	6.3	1.28	1.8	19.5	55.3	51.4
7.1	40	299	11.8	288	11.4	275	10.8	6.6	1.35	1.7	18.5	58.2	54.1
8.6	49	367	14.4	353	13.9	336	13.2	8.1	1.66	1.4	15.0	71.6	66.5
8.8	50	374	14.7	360	14.2	343	13.5	8.4	1.72	1.3	14.5	74.2	68.9
10.6	60	449	17.7	432	17.0	412	16.2	10.6	2.17	1.1	11.5	93.4	86.8
12.3	70	524	20.6	505	19.9	481	18.9	12.9	2.65	0.9	9.4	114.0	105.9
14.1	80	599	23.6	577	22.7	549	21.6	15.4	3.16	0.7	7.9	136.2	126.5
15.9	90	673	26.5	649	25.5	618	24.3	18.1	3.71	0.6	6.7	159.7	148.4
17.6	100	748	29.5	721	28.4	686	27.0	20.9	4.29	0.5	5.8	184.7	171.6

APPLICATION EN VRAC

ALTICATION L'IVING.

LE TABLEAU DE COUVERTURE CI-DESSUS EST BASÉ SUR UN POIDS NOMINAL DE SAC DE 25 LB À L,AIDE D,UN VOLUMATIC III, D,UNE 3èmE VITESSE ET D,UNE VALVE DE 8 PO. LE TABLEAU EST BASÉ SUR UNE ÉPAISSEUR TASSÉE ET DESTINÉ UNIQUEMENT À DES FINS D,ESTIMATION. NE PAS DÉPASSER LA COUVERTURE MAXIMALE EN PIEDS CARRÉS PAR SAC. L,APPLICATEUR DOIT INSTALLER À LA FOIS LE NOMBRE MINIMUM DE SACS PAR 1000 piz ET L,ÉPAISSEUR MINIMALE INSTALLÉE POUR S,ASSURER QUE LE COEFFICIENT RREQUIS SOIT ATTEINT LE NON-RESPECT DE CES DEUX EXIGENCES PEUT EMPÉCHER L,APPLICATION DU COEFFICIENT RREQUIS. LES CONDITIONS DE TRAVAIL, LES TECHNIQUES D,APPLICATION, L,ÉQUIPEMENT ET LES RÉGLAGES PEUVENT INFLUENCER LA COUVERTURE RÉELLE. LE POIDS NET MINIMUM EST DE 23,75 LB CONFORMÉMENT ÀLA NORME ASTM C-739 - CAN/UL703.

APPLICATIONS STABILISÉE

AT LIGHTUNG STABLISTIC

ET ABLEAU DE COUVERTURE CI-DESSUS EST BASÉ SUR UN POIDS NOMINAL DE SAC DE 25'0 LB ÀL'AIDE D'UN VOLUMATIC III'

D'UNE 3ême VITESSE' ET D'UNE VALVE DE 9 PO. LE TABLEAU EST BASÉ SUR UNE ÉPAISSEUR TASSÉE ET DESTINÉ UNIQUEMENT
À DES FINS D'ESTIMATION. NE PAS DÉPASSER LA COUVERTURE MAXIMALE PAR SAC, L'APPLICATEUR DOIT INSTALLER À LA FOIS
LE NOMBRE MINIMUM DE SACS PAR 1000 pi2 ET L'ÉPAISSEUR MINIMALE INSTALLÉE POUR S'ASSURER QUE LE COEFFICIENT
RREQUIS SOIT ATTEINT. LE NON-RESPECT DE CES DEUX EXIGENCES PEUT EMPÉCHER L'APPLICATION DU COEFFICIENT RREQUIS.
LA TENEUR EN HUMIDITÉ À L'INSTALLATION DOIT ÉTRE ENTRE 16% ET 25% DANS LES GRENIERS. LES CONDITIONS DE TRAVAIL'
LES TECHNIQUES D'APPLICATION' L'ÉQUIPEMENT ET LES RÉGLAGES PEUVENT INFLUENCER LA COUVERTURE RÉELLE, LE POIDS
NET MINIMUM EST DE 23'75 LB CONFORMÉMENT À LA NORMÉ ASTIN C-1497 - CANVIL/203. L'APPLICATION STABILISÉE
S'ADRESSE UNIQUEMENT AUX INSTALLATEURS PROFESSIONNELS UTILISANT UN ÉQUIPEMENT SPÉCIALISÉ.

TABLEAU POUR PAROIS LATÉRALES ET DES REVÊTEMENTS DE SOL

APPLICATION DENSE (COMPACTE)

(densité installé	(densité installée minimale de 3.5 lb/po²) SANCTUARY											
Cadrage	Résis Thern	tance nique	ue annliquée		Unit	sse par Couverture nité de par sac urface 16 o.c.		sac	Couverture par sac 24 o.c.			
in (po)	RSI Value	R Value	mm	in (po)	kg/m2	lb/ft2 (lbs/pi2)	m2	ft (pi2)	m2	ft (pi2)		
2x4	2.3	13	97	3.5	5.0	1.02	6.9	26.9	6.9	26.1		
2x6	3.6	21	165	5.5	7.8	1.60	3.9	17.1	3.9	16.6		
2x8	4.9	28	224	7.5	10.7	2.19	2.6	12.6	2.6	12.2		
2x10	6.2	35	284	9.5	13.5	2.77	1.9	9.9	1.9	9.6		

La couverture réelle dépend de la densité instalible. La densité minimale instalible recommandé pour le compact pack est de 17.1 kg/m². La densité réelle varie en fonction du type d'équipement d'application et des paramètres de la machine. La densité appliquée par pulvérisation variera en fonction du type d'équipement d'application, des réglages de la machine, de la technique disstallation et de l'humidifé autoriée.

LISEZ CECI AVANT D'ACHETER

CE QUE VOUS DEVEZ SAVOIR SUR LES VALEURS R

Ce tableau indique la valeur R de cet isolant. La valeur R désigne la résistance thermique de l'isolant. Plus la valeur R est élevée, meilleure est l'isolation. Comparez les valeurs R avant l'achat. Il y a d'autres facteurs à considérer. La quantité d'isolant dont vous avez besoin est fonction du climat dans lequel vous vivez. De même, les économies d'énergie que vous procurera l'isolant sont fonction du climat, de la forme et de la taille de la maison, de la quantité d'isolant déjà présente, de vos habitudes de chauffage et de la taille de votre famille. Si vous achetez trop d'isolant, il vous coûtera plus que ce que vous économiserez en énergie. Pour obtenir le coefficient R indiqué, il est essentiel que l'isolant soit correctement posé.

TABLEAU DE COUVERTURE DES PAROIS LATÉRALES

ISOLANTS APPLIQUÉS PAR PULVÉRISATION

(densité install	ée minimale de 2.	SANCTUARYMD					
Charpente	Résistence Therminque (Coefficient R)	Épaisseur Appliquée (pounces)	Poids minimum par pied	Couverture maximale par sac (ajustée pour la charpente)			
			carré lb/pi2	16 pounces o.c. pi²/sac	24 pounces o.c. pi²/sac		
2x6	21	5.5	1.24	22.3	21.6		
2x8	28	7.5	1.72	16.0	15.5		

Ce tableau de couverture est basé sur une utilisation avec l'appareil Volumatic III, 2e engrenage, attaque de coulée de 6 po. Le taux d'humidité installé doit se situer entre 25 % et 35 %, et 9 (u'il est mesuré à l'aide d'un humidimètre manuel. Ne pas recovier i'solant tant que sa teneur en humidité, mesurée et documentée après une période minimale de 24 heures à partir du moment de l'inslation, n'a pas atteint 25 % ou moins, conformément au manuel sur l'application par pulvérisation pour les murs de Greenfiber. Installez de l'isolant Sanctuary en emballage sec dense dans toutes les sections des murs extérieurs où se trouvent des obstacles à la vapeur supplémentaires, comme des armoires, des miroirs, des baignoires et des boîtiers de douche. Si vous n'êtes pas certain de l'emplacement des obstacles, isolez-les dans leur intégralifé. Les configurations murales non standard ou inhabituelles (c.-à-d. autres que 2 x 4 et 2 x 6) peuvent avoir une incidence sur les propriétés thermiques et sonores et nécessitent des considérations d'installation spéciales. Ces types de conception devraient être analysés et, au besoin, mis à l'essai avant l'analyse du plan. Communiquez avec le représentant technique de Greenfiber pour les applications ou les cadres qui ne figurent pas sur ces graphiques.









Fabriqué par Applegate-Greenfiber Acquisition, LLC

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Fabriqué aux États-Unis

PM-6.3328 Rev E 06/25

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BLOW-IN OR SPRAY-APPLIED

Cellulose Insulation

by GREENFIBER®

ATTIC COVERAGE CHART - LOOSE-FILL AND STABILIZED APPLICATIONS

Tabla de Cobertura de Ático - Aplicaciónes de Relleno Suelto y Aplicaciónes Estabilizadas

					SANCTUARY®			
R-Value at 75° F Mean Temp.					Net Coverage (no adjustment for framing) Cobertura neta (sin compessación para la estructura)			d for 2" x 6" framing on 16" centers) in para una estructura de 2" x 6" en centros de 16")
Valor de resistencia termica (valor R) at 75 F de temperature media	STABILIZED Initial Installed Thickness Espesor inicial instalado	L00SE-FILL Initial Installed Thickness Espesor inicial instalado	Settled Thickness Espesor asentado	Maximum Sq. Ft. per Bag Pies cuadrados máximos por bolsa	Minimum Bags per 1,000 Sq. Ft. Cantidad minima de bolsas por 1,000 pies cuadrados	Minimum Weight per Sq. Ft. Peso minimo por pie cuadrado	Maximum Sq. Ft. per Bag Pies cuadrados máximos por bolsa	Minimum Bags per 1,000 Sq. Ft. Cantidad minima de bolsas por 1,000 pies cuadrados
13	3.8	3.9	3.6	65.8	15.2	0.38	72.6	13.8
19	5.5	5.7	5.3	44.2	22.6	0.57	48.8	20.5
22	6.4	6.6	6.1	38.0	26.3	0.66	41.2	24.2
30	8.7	8.9	8.3	25.9	38.6	0.97	27.4	36.5
38	10.9	11.2	10.4	19.0	52.6	1.32	19.9	50.1
44	12.6	12.9	12.0	15.7	63.5	1.59	16.5	60.8
49	13.9	14.3	13.3	14.1	70.8	1.80	14.6	68.5
60	16.9	17.3	16.1	11.6	86.0	2.20	12.0	83.5

LOOSE-FILL APPLICATIONS

THE ABOVE COVERAGE CHART IS BASED ON A NOMINAL BAG WEIGHT OF 25 LBS USING A VOLUMATIC III, 3RD GEAR AND 8" GATE. THE CHART IS BASED ON SETTLED THICKNESS AND IS FOR ESTIMATING PURPOSES ONLY. DO NOT EXCEED MAXIMUM SOUABE FEET COVERAGE PER BAG. THE APPLICATOR MUST INSTALL BOTH THE MINIMUM NUMBER OF BAGS PER 1000 SQ. FT. AND THE MINIMUM INSTALLED THICKNESS TO ENSURE THE STATED R-VALUE HAS BEEN REACHED. FAILURE TO MEET BOTH THESE REQUIREMENTS MAY PREVENT THE APPLICATION OF SPECIFIED R-VALUE. JOB CONDITIONS, APPLICATION OF SPECIFIED R-VALUE. JOB CONDITIONS, APPLICATION TECHNIQUES, EQUIPMENT AND SETTINGS CAN INFLUENCE ACTUAL COVERAGE. MINIMUM NET WEIGHT IS 23.75 LBS. IN ACCORDANCE WITH ASTM C-739.

STABILIZED APPLICATIONS

THE ABOVE COVERAGE CHART IS BASED ON A NOMINAL BAG WEIGHT OF 25.0 LBS USING A VOLUMATIC III, 3RD GEAR AND 8" GATE. THE CHART IS BASED ON SETTLED THICKNESS AND IS FOR ESTIMATING PURPOSES ONLY. DO NOT EXCEED MAXIMUM SQUARE FEET COVERAGE PER BAG. THE APPLICATION MUST INSTALL BOTH THE MINIMUM NUMBER OF BAGS PER 1000 SQ. FT. AND THE MINIMUM INSTALLED THICKNESS TO ENSURE THE STATED R-VALUE HAS BEEN REACHED. FAILURE TO MEET BOTH THESE REQUIREMENTS MAY PREVENT THE APPLICATION OF SPECIFIED R-VALUE. THE INSTALLED MOISTURE CONTENT MUST BE BETWEEN 16% AND 22% IN ATTIC APPLICATIONS. JOB CONDITIONS, APPLICATION TECHNIQUES, EQUIPMENT, AND SETTINGS CAN INFLUENCE ACTUAL COVERAGE. MINIMUM NET WEIGHT IS 23.75 LBS. IN ACCORDANCE WITH ASTM C-1497. THE STABILIZED APPLICATION IS FOR PROFESSIONAL INSTALLERS ONLY USING SPECIALIZED EQUIPMENT.

SIDEWALL & FLOOR COVERAGE CHART - DENSE-PACK APPLICATION

Tabla de Cobertura Lateral y del Piso - Aplicaciónes de Paquete Denso

Dry Dens	se-Pack Sidewall	& Floor Application	S (3.5 pcf minimum insta	lled density)	SANCTUARY®	
Framing Estructura	Thermal Resistance (R value)	Installed Thickness (Inches) Minimum Wt Per Square foot (Inches) Ib/ft ² (Adjusted for Fr Espesor Instalado (pulgadas) Peso mínimo por pie cuadrado Cobertura máxima por bolsa (con comp		for Framing)		
	(R)		lb/ft²	16 inch o.c. ft²/Bag 16 pulgadas o.c. pie2/bolsa	24 inch o.c. ft²/Bag 24 pulgadas o.c. pie2/bolsa	
2 x 4	13	3.5	1.02	27.0	26.1	
2 x 6	21	5.5	1.60	17.2	16.6	
2 x 8	28	7.5	2.19	12.6	12.1	

This coverage chart is for dry applications only and is based on the Krendl KS200, with material applied dry.

SIDEWALL COVERAGE CHART - SPRAY-APPLIED APPLICATIONS

Tabla de Cobertura Lateral - Aplicaciónes Aplicadas por Spray

Spray-	Spray-Applied Sidewall Applications (2.75 pcf minimum installed density) SANCTUARY®											
Framing Estructura	Thermal Resistance (R value)	Installed Thickness (Inches) Espesor instalado (pulgadas)	Minimum Wt Per Square foot Ib/ft² Peso minimo por pie cuadrado	(Adjusted	overage per Bag for Framing) n compensación para la estructura)							
	(R)		юте	16 inch o.c. ft²/Bag 16 pulgadas o.c. pie2/bolsa	24 inch o.c. ft²/Bag 24 pulgadas o.c. pie2/bolsa							
2 x 4	13	3.5	0.79	35.0	33.8							
2 x 6	21	5.5	1.24	22.3	21.6							

This coverage chart is based on the Volumatic III, 2nd gear, 6" gate. The installed moisture content must be between 25% and 35% as measured by a hand held moisture meter. Do not cover the insulation until the insulation moisture content, measured and documented after a minimum period of 24 hrs from the time of installation, reaches 25% or less in accordance with Greenfiber's Wallspray Manual. Install dry dense pack Sanctuary insulation in all exterior wall sections where added vapor impediments, such as cabinets, mirrors, tubs, and shower enclosures are located. If unsure where impediments are located, dry dense pack the entire exterior wall section(s). Non-standard or unusual wall configurations (i.e., other than 2x4 and 2x6 walls) can affect thermal and sound properties and require special installation considerations. These types of designs should be analyzed and, if necessary, tested prior to plan review. Contact Greenfiber technical representative for applications or framing that is not included on these charts.









READ THIS BEFORE YOU BUY

WHAT YOU SHOULD KNOW ABOUT R-VALUES

This chart shows the R-Value of this insulation. R means resistance to heat flow. The higher the R-Value, the greater the insulating power. Compare insulation R-Values before you buy. There are other factors to consider. The amount of the insulation you need depends on the climate you live in. Also, your fuel savings from insulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel. To get the marked R-Value, it is essential that this insulation be installed properly.

Manufactured by Greenfiber®

Toll-Free 800-228-0024 www.greenfiber.com

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Made in USA

PM-6.3329-SD Rev B 01/25

Casa Grande, AZ 85193
Decatur, AL 35601
Tampa, FL 33605
Eastanollee, GA 30538
Hickory, KY 42051
Springfield, KY 40069
Webberville, MI 48892
Lester Prairie, MN 55354
Norfolk, NE 68701
Chambersburg, PA 17201
Wilkes Barre, PA 18702
Waco, TX 76704
Salt Lake City, UT 84119
Debert, Nova Scotia
Chandler, AZ 85225



ATTIC COVERAGE CHART – ALL BORATE STABILIZED CLASS 1 FIRE RATED MATERIAL

Installed Density and Coverage of	FRM100				
SF PER BAG					
Target Finished Density (Dry pcf)	8" Cavity	12" Cavity	Minimum Finished Density (Dry pcf)*		
4.0	12.0	7.5	3.35		

^{*}IF ANY PART OF THE ASSEMBLY HAS A DRY (10% OR LESS MOISTURE BY WEIGHT) DENSITY LESS THAN 3.35 PCF, THE WALL IS NO LONGER AN APPROVED UL TWO HOUR FIRE ASSEMBLY.

READ THIS BEFORE YOU BUY WHAT YOU SHOULD KNOW ABOUT R-VALUES

This chart shows the R-Value of this insulation. R means resistance to heat flow. The higher the R-Value, the greater the insulating power. Compare insulation R-Values before you buy. There are other factors to consider. The amount of the insulation you need depends on the climate you live in. Also, your fuel savings from isulation will depend upon the climate, the type and size of your house, the amount of insulation already in your house, and your fuel use patterns and family size. If you buy too much insulation, it will cost you more than what you'll save on fuel. To get the marked R-Value, it is essential that this insulation be installed properly.

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Decatur, AL 35601 Tampa, FL 33605 Eastanollee, GA 30538 Webberville, MI 48892 Lester Prairie, MN 55354 Norfolk, NE 68701 Chambersburg, PA 17201 Wilkes Barre, PA 18702 Waco, TX 76704 Salt Lake City, UT 84119 Debert, Nova Scotia Chandler, AZ 85225















Environmental & Sustainability

- ENERGY STAR Report 2023
- Greenfiber® Environmental Product Declaration (EPD) 2023
- Greenfiber® VOC Emissions Test Certificate 2023
- Impact Of Cellulose Insulation On The Affects
 Of Building Assemblies White Paper
- Greenfiber® Health Product Declaration (HPD) 2023
- SANCTUARY® Declare Label 2024
- SANCTUARY® Defense Declare Label 2024



Issue Date: August 18, 2023

U.S. Environmental Protection Agency (EPA) Seal and Insulate with ENERGY STAR® Insulation Product Certification Report – Loose Fill Insulation, "FRM" and "SANCTUARY", Manufactured by Applegate Greenfiber Acquisition LLC

Applegate Greenfiber Acquisition LLC 5500 77 Center Dr Ste 100 Charlotte, NC 28217-0160 US

Report Number: 4790817546

Subject: EPA Seal and Insulate with ENERGY STAR® Insulation Product Certification Report:

Applegate Greenfiber Acquisition LLC Loose Fill Insulation

1. Purpose

The purpose of this report is to certify the test results for Loose Fill Insulation designated "FRM" and "SANCTUARY" manufactured by Applegate Greenfiber Acquisition LLC shown herein have been compared to the criteria provided by the Seal and Insulate with ENERGY STAR Insulation Definitions and Testing Requirements for Residential Insulation Version 1.0 and the relevant building and energy codes. This Report is intended for use by the EPA. UL is an EPA recognized Certification Body.

2. Referenced documents

The following codes and standards were referenced in the development of this report.

- International Building Code (IBC) 2021
- International Residential Code (IRC) 2021
- UL723, "Test for Surface Burning Characteristics of Building Materials" 11th Edition, Revised April 27, 2023
- ASTM C518, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus, Issue Date 09/2021
- Seal and Insulate with ENERGY STAR Insulation Definitions and Testing Requirements for Residential Insulation Version 1.0

UL Solutions Headquarters 333 Pfingsten Road Northbrook, IL 60062 USA

3. Definitions

- **A.** Insulation Any material mainly used to slow down heat flow. It may be mineral or organic, fibrous, cellular, or reflective (aluminum foil). It may be rigid, semi-rigid, flexible, or loose-fill form.
- **B.** Residential Buildings Single family homes (attached or unattached), multifamily buildings with 4 units or fewer, or multifamily buildings (condominiums, apartments) with 3 stories or less in height above grade.
- **C.** Loose Fill Insulation Insulation in granular, nodular, fibrous, powdery, or similar form designed to be installed by pouring, blowing, or hand placement. Materials may include, but are not limited to fiber glass, cellulose, cotton, or wool.
- **D. R-value** The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area. For the purposes of this program, Imperial units will only be accepted [(h · ft² · °F) / Btu].
- **E. Smoke-Development Index –** The characteristic of a material to emit smoke when exposed to flame or fire compared to red oak and inorganic cement.
- **F. Flame-Spread Index –** The characteristics of a material to resist the spreading of flames when exposed to flame or fire compared to red oak and inorganic cement.

4. Product Description

The products covered by this report consist of loose fill insulation designated "FRM" and "SANCTUARY".

The products are nominally 85% by weight recycled paper and 15% fire retardants and other chemicals in composition.

5. Uses

"SANCTUARY" Loose Fill Insulation is intended for use as insulation within attic floors, cathedral ceilings, cathedralized unvented attics, wall assemblies, floors, and retrofitting sidewalls.

"FRM" Loose Fill Insulation is intended for use as insulation within wall assemblies.

6. Field preparation

Installation Instructions attached as Appendix A show detailed methods of application that meet the criteria set forth in the Seal and Insulate with ENERGY STAR Partnership Commitments.

7. Test Results

7.1 Testing laboratories

The laboratories that have conducted this testing have demonstrated compliance to ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*, at the time of testing.

7.2 Physical properties - thermal resistance

Tests were conducted in accordance with ASTM C518-10, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus. There are no significant technical differences between ASTM C518-10 and ASTM C518-21. The tests were conducted in accordance with the latest version of the standard at the time of testing. Tests for settled density were conducted in accordance with ASTM C739.

Test results can be seen below. A mean temperature of 75.0°F was utilized for Thermal Resistance testing below.

SANCTUARY:

Depending on the "SANCTUARY" Loose Fill Insulation formulation used, the following Thermal Resistance data applies.

Option 1 – Design Density of 1.6 pcf utilized

Specimen No.	Thermal Resistance, R/inch
1	3.71
2	3.70
3	3.70
4	3.71
Average	3.71

Option 2 – Design Density of 1.5 pcf utilized

Specimen No.	Thermal Resistance, R/inch	
1	3.67	
2	3.67	
3	3.67	
Average	3.67	

FRM:

Design Density of 1.6 pcf utilized.

Specimen No.	Thermal Resistance, R/inch	
1	3.76	
2	3.70	
3	3.73	
4	3.69	
Average	3.72	

7.3 Surface burning characteristics - flame spread index and smoke developed index

The test determines the surface burning characteristics of the material, specifically the flame spread and smoke developed indices when exposed to fire.

SANCTUARY:

"SANCTUARY" is UL Certified for Surface Burning Characteristics by UL LLC under UL Solution's Classification program for the BPHX – Loose Fill Product Category. The published UL Surface Burning Characteristics are provided below.

Option 1 – Testing was conducted in accordance with UL 723, Tenth Edition, dated September 10, 2008, "Test for Surface Burning Characteristics of Building Materials", (ASTM E84-11). There are no significant technical differences related to this product type for testing to UL 723 between the Tenth Edition and Eleventh Edition. The latest version of the UL 723 Standard (Revised April 27, 2023) is applicable.

Flame Spread	10
Smoke Developed	40-90

Option 2 – Testing was conducted in accordance with UL 723, Eleventh Edition, dated April 19, 2018, "Test for Surface Burning Characteristics of Building Materials", (ASTM E84-21). There are no significant technical differences related to this product type for testing to UL 723 between the Issued Date and Revised Date of the Eleventh Edition. The latest version of the UL 723 Standard (Revised April 27, 2023) is applicable.

Flame Spread	10
Smoke Developed	0

FRM:

"FRM" Loose Fill Insulation is UL Certified for Surface Burning Characteristics by UL LLC under UL Solution's Classification program under product designation "INSTAPLD" or "INSTAPORKLD" for the BPHX – Loose Fill Product Category. The published UL Surface Burning Characteristics are provided below.

Testing was conducted in accordance with UL 723, Tenth Edition, Revised September 13, 2010, "Test for Surface Burning Characteristics of Building Materials", (ASTM E84-12). There are no significant technical differences related to this product type for testing to UL 723 between the Tenth Edition and Eleventh Edition. The latest version of the UL 723 Standard (Revised April 27, 2023) is applicable.

Flame Spread	10
Smoke Developed	20

The values meet the requirements of IBC Section 720 and IRC Section R302.10 having a flame spread index of not more than 25 and a smoke developed index of not more than 450.

8. Use of UL Solutions ENERGY STAR® report

- **8.1** The approval of building products, materials, or systems is under the responsibility of the applicable code authorities.
- **8.2** UL Solutions ENERGY STAR® Reports shall not be used in any manner that implies an endorsement of the product, material or system by UL Solutions.
- 8.3 The current status of this report, as well as a complete directory of UL Solutions ENERGY STAR® Reports may be found at UL.com/Solutions via Product iQ®.

The Classification Marking of UL LLC on the product is the only method provided by UL to identify products which have been produced under its Classification and Follow-Up Service.

Evaluated By:

Courtney Hudson
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Reviewed By:

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LCA RESULTS & INTERPRETATION HOW WE MAKE IT GREENER

SM Transparency Catalog ▶ Applegate — Greenfiber Insulation ▶ SANCTUARY® Loose-Fill or Spray-Applied Insulation by Greenfiber®





SANCTUARY® by Greenfiber® Blow-In or Spray-Applied Insulation

SANCTUARY cellulose insulation can be easily installed in attics, walls, floors, and ceilings to significantly improve the comfort, safety and well-being of any home. The first all-in-one fiber insulation that can be blownin, spray-applied or dense-packed, and it's suitable for all climates and conditions. Capable of reducing sound power by 60% and heating and cooling costs by up to 25%, it's made from recycled plant fibers which locks in carbon for the life of the home.



Performance dashboard



Features & functionality

Fills tiny joins, crevices or gaps, creating a dense barrier capable of muffling sound and reducing air infiltration.

Extremely versatile and easy to use.

Exceptional acoustical properties can abate the power of sound by up to 60% when installed in walls.

Capable of reducing heating and cooling costs by up to 25%.

Carries a Class 1/A fire rating and qualifies as a fire-blocking material for advanced fire resistance.

Locks in carbon for the life of the home to reduce global warming.

Visit Greenfiber for more product information

Sanctuary® Blow-In or Spray-Applied Insulation

MasterFormat® 07 20 00

SANCTUARY Fact Sheet, Guide Specs

For spec help, contact us or call 800.228.0024

Environment & materials

Improved by:

Made with 85% post-consumer recycled paper

Uses low-energy manufacturing and short-haul transportation, resulting in insulation with lower embodied carbon

Free from unhealthy substances such as asbestos and formaldehyde

Lower carbon insulation material with high amount of carbon storage reduces global warming potential

Certifications & rating systems:

ASTM C739

Declare label, Red List Free

Canadian Construction Materials Centre

Energy Star

UL Classified

Health Product Declaration (HPD)

See LCA, interpretation & rating systems













SM Transparency Report (EPD)™

VERIFICATION

3rd-party reviewed

LCA

V

Transparency Report (EPD)

3rd-party verified

V

Validity: 2022/12/09 - 2027/12/08 Decl #: AGG - 20221209 - 001

This environmental product declaration (EPD) was externally verified, according to ISO 21930:2017, UL Part A, and ISO 14025:2006, by Jack Geibig, President, Ecoform.

Ecoform, LLC 11903 Black Road, Knoxville, TN 37932

(865) 850-1883



SUMMARY

Reference PCR

Regions; system boundaries North America; Cradle-to-grave

Functional unit / reference service life: 1 m² of installed insulation material, packaging included, with a thickness that gives an average thermal resistance of RSI=1m²·K/W; 75 years

LCIA methodology: TRACI 2.1

LCA software; LCI database SimaPro Developer 9.4 Ecolnvent 3.8, US-El 2.2

LCA conducted by: Sustainable Minds

Life Cycle Assessment of SANCTUARY Insulation for Applegate-Greenfiber

Greenfiber

5500 77 Center Drive Suite 100 Charlotte, NC 28217 (800) 228-0024

Contact us

PERFORMANCE DASHBOARD

LCA results & interpretation

Life cycle assessment

Scope and summary ○ Cradle to gate ○ Cradle to gate with options **②** Cradle to grave

SANCTUARY is insulation primarily made of postconsumer paper and can be either blown-in or spray-applied in attics, walls, floors, and ceilings. This fiber insulation is suitable for all climates and conditions. SANCTUARY is engineered to fill tiny crevices and gaps, creating a dense, advanced barrier

capable of reducing the power of sound and also heating and cooling costs. It can be easily filled over existing insulation and is designed to fill every gap, void, and hard-to-reach place without time consuming cutting and fitting. **Functional** unit

Reference service life: 75 years. One square meter of installed insulation

material, packaging included, with a thickness that gives an average thermal resistance of RSI=1m2·K/W over a period of 75 years. Reference flow: 0.653 kg Thickness: 0.0378 m Density: 17,1 kg/m3 Manufacturing data Reporting period: January--December, 2021 Representing six locations across the US: Mesa, AZ; Norfolk, NE; Salt Lake

Data quality

Wastepaper

3.00E-02

250E-02

2.00E-02

1.50E-02

1.00E-02

5.00E-03

D.00E+00

Information modules:

no associated activities.

*Module D is excluded.

Included (X) | Excluded* (MND)

Stages B1-B7, C1, and C3 though included, have

outside of the system boundary.

transported to the facilities, incoming wastepaper is shredded and placed into a fiber handling system, which is then moved to the finish mills, where the final grind is conducted and the dry fire-retardant chemicals and then a liquid fire retardant are added. That product is moved to the packaging subsystem, which hydraulically compresses the insulation into its final

City, UT; Tampa, FL; Waco, TX; and Wilkes-Barre, PA. After raw materials are

packaging. Each facility has a dust collection system which traps the dust from the wastepaper processing and is later sent for recycling along with production scrap.

Default installation, packaging, and disposal scenarios At the installation site, insulation products are delivered in 25lb bags, unpackaged, and installed with a blowing machine, assumed to consume

disposal of packaging waste is modeled using US EPA's landfilling rate of 37.1% and recycling rate of 53.9%. No maintenance or replacement is required to achieve the product's life span. After removal, the insulation is assumed to be landfilled. Manufacturing ·Blend fibers ·Add fire Raw material Distribution Installation & maintenance Demolition & landfill acquisition & transport retardant

Primary data was collected for a time period of one year, which represents

considered to have a good precision and provide a representative depiction

of the facilities. Data is also considered to be complete, as no know flows are deliberately excluded from this analysis other than those defined to be

typical operations of Applegate-Greenfiber facilities. Inventory data is

0.003 kWh of electricity during the installation of one square meter. The

Material composition greater than 1% by weight MASS PERCENTAGE

Boric acid 9% Calcium sulfate 2-3% Oil 2% 1% Plastic bag (packaging)

Total impacts by life cycle stages [mPts/per func unit]

LIFE CYCLE STAGE

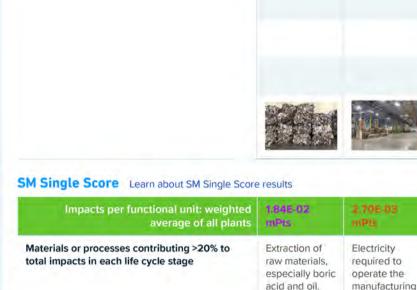
Manufacturing

Distribution

End of life

Installation and use

LCA results



Mesa, AZ - TRACI v2.1 results per functional unit

kg CO, eq

kg CFC-11 eq

CTU,

CTU

kg PM_{2.5} eq

kg O₃ eq

3.34E-08

2.76E-09

4.93E-08

1.99E-04

1.25E-02

also been included. These six impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined, and LCA should continue

All life cycle stages

What's causing the greatest impacts

SANCTUARY® Loose-Fill or Spray-Applied Insulation by Greenfiber®

relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. Overall results are consistent with expectations for SANCTUARY's life cycle, with most of the impacts being generated during cradle-to-gate stages, as insulation is not associated with energy consumption during its installation, use, or disposal stages. Raw materials acquisition and manufacturing The primary finding, across the environmental indicators and for the product considered, was that cradle-to-gate impacts contribute the most impacts to most categories. This is mostly driven by the extraction of

incoming raw materials (A1) and electricity consumed during manufacturing

(A3). Boric acid and oil use are the raw materials that contribute to higher

reported as hazardous are associated with the production of this product.

environmental impacts than the others. No substances required to be

For SANCTUARY insulation, the cradle-to-gate stage (A1-A3) dominates the results for most categories. This study assessed a multitude of inventory and environmental indicators. In addition to the six major impact

categories (global warming potential, ozone depletion, acidification, smog,

eutrophication, and fossil fuel depletion), additional impact categories have

making advances in their development. However, the EPD users shall not

use additional measures for comparative purposes. LCIA results are

Transportation Following the cradle-to-gate stage, the next highest impacts come from the distribution (A4) stage. The impacts associated with outbound transport are comparatively higher than that for inbound due to the further transportation distances.

Installation Installation accounts for a small fraction of overall life cycle impacts. The

only installation impacts are associated with packaging disposal and the energy used for an installation blower machine. No ancillary materials are needed for installation. End of life At the end of life, insulation is removed from the building and landfilled.

For all products, waste was dominated by the final disposal of the product,

The electricity consumed during production drives the overall impacts in

Non-hazardous waste also accounts for waste generated during

manufacturing and installation. No hazardous waste is created.

each impact category. Since the manufacturing stage is one of the major contributors to life cycle impacts, a sensitivity analysis was performed to check the robustness of the results when the energy consumed is varied by ±20%. The resulting variation in the total life cycle impacts is less than

Scaling factors can be used to determine the impacts of each R-value of SANCTUARY Insulation based on different applications (loose and stabilized, dense pack, or spray-filled application). Loose-fill cellulose insulation is typically applied to enclosed areas, unfinished attic floors, and other hard to reach places, so the results per functional unit are presented for a loose-filled and stabilized application at RSI=1 m²·K/W. The scaling

cellulose insulation is the responsible choice for homeowners and the

83-85%

MITS/FUNC UNIT

2.70E-03

4.27E-03

3.90E-05

7.67E-04

A3

Manufacturing

operations

process.

A3 MANUFACTURIN

8.33E-02

2.29E-09

1.62E-10

2.73E-09

1.96E-05

2.80E-03

Raw material supply and transport 1.84E-02

A1 Raw

material

extraction

A2 Transport

to facilities

products that are commercially available. See how we make it greener

C4 Disposal **B4** Replacements **B5** Refurbishment **B6** Operational energy use **B7** Operational water use

Impact category Acidification

Eutrophication

Global warming (embodied carbon)

Ozone depletion

Impact category

Carcinogenics

Smog

Smog

Impact category

Ecotoxicity

Impact category

Ecotoxicity

Impact category

Acidification

Eutrophication

Global warming

Impact category

Carcinogenics

Smog

Ecotoxicity

Impact category

Acidification

Eutrophication

Global warming (embodied carbon) Ozone depletion

Ecological damage

Ecological damage

Impact category Acidification

Eutrophication

Global warming

Ozone depletion

Impact category

impact category

References

PCRs

services"

VERIFICATION

3rd-party reviewed

3rd-party verified

LCA Background Report

Requirements v3.1

ecoinvent (US -El 2.2) database; TRACI 2.1.

(embodied carbon)

Human health damage

Non-carcinogenics

Respiratory effects

(embodied carbon) Ozone depletion

Fossil fuel depletion

Ecological damage

Human health damage

Fossil fuel depletion

Non-carcinogenics

Respiratory effects

Human health damage

Ecological damage

Impact category	Unit							
Fossil fuel depletion	MJ, LHV	0	4.97E-01	1.12E-01	1.13E-01	1.03E-03	0	2.79E-02
Ecotoxicity	сти	0	73,7 %	1.0 %	21.4 %	0.1 %	0 %	3.8 %
see the additional conte	it required by the	OLL F	CK Fait B 101 bu	ilding envelope then	ilai ilisulation on	page 4 of the Ita	isparency Re	port PDF.
CALL NA EAST	616							
lorfolk. NE - TRACI	v2.1 results	per fu	nctional uni	t				
lorfolk, NE - TRACI	v2.1 results	per fu	nctional uni	t				
	v2.1 results	per fu				45	84.07	C1.C4
Norfolk, NE - TRACI	v2.1 results	per fu	A1-A2 RM	AS	A4 DISTRIBUTION	A5	B1-B7	C1-C4
	v2.1 results	per fu	A1-A2 RM SUPPLY &		A4 DISTRIBUTION	A5 INSTALLATION	B1-B7 USE	
	v2.1 results	per fu	A1-A2 RM	AS				
	v2.1 results	per fu	A1-A2 RM SUPPLY &	AS				C1-C4 END OF LIFE
		per fu	A1-A2 RM SUPPLY &	AS				
LIFE CYCLE STAGE		per fu	A1-A2 RM SUPPLY &	AS				
Ecological damage	e Unit		A1-AZ RM SUPPLY & TRANSPORT	A3 MANUFACTURING	DISTRIBUTION	INSTALLATION	USE	END OF LIFE
Ecological damage	e	per fu	A1-A2 RM SUPPLY &	AS				

Additional environmental information

kg O₃ eq

Unit

MJ, LHV

CTU.

LIFE CYCLE STAGE			A1-A2 RM SUPPLY & TRANSPORT	A3 MANUFACTURING	A4 DISTRIBUTION	A5 INSTALLATION	B1-B7 USE	C1-C4 END OF LIFE
Ecological damag	e							
Impact category	Unit							
Acidification	kg SO ₂ eq	0	1.15E-03	2.05E-04	1.77E-04	1.91E-06	0	3.52E-05
Eutrophication	kg N eq	0	1.16E-04	1.72E-05	3.70E-05	4.43E-07	0	5.65E-06
Global warming (embodied carbon)	kg CO ₂ eq	0	1.23E-01	5.28E-02	1.02E-01	7.46E-04	0	1.31E-02
Ozone depletion	kg CFC-11 eg	0	1.41E-08	1.46E-09	2.43E-08	8.62E-11	0	3.00E-09

Waco, TX - TRACI v2.1 results per functional unit A3 MANUFACTURIN

kg SO, eq

kg CO2 eq

kg CFC-11 eq

Wilkes-Barr, PA - TRACI v2.1 results per functional unit

Unit

kg SO₂ eq

kg CO2 eq

kg CFC-11 eq

ka N ea

kg N eq

Unit

Smog	kg O ₃ eq	0	1.12E-02	2.65E-03	1.00E-03	2.38E-05	0	7.13E-04
	1.00		1 -1 -1 -1			1		
Additional enviror	mental informat	ion						
Impact category	Unit							
Fossil fuel depletion	MJ, LHV	0	3.26E-01	1.27E-01	9.52E-02	1.02E-03	0	2.77E-02
Ecotoxicity	сти,	0	71.3 %	1.3 %	22.5 %	0.1%	0 %	4.7 %

A3 MANUFACTURING

2.24E-04

1.88E-05

5.13E-02

2.78E-09

1.36E-05

1.89E-03

6.38E-02

0.8 %

A4 DISTRIBUTION

1.07E-04

2.23E-05

6.17E-02

1.47E-08

2.16E-05

1.38E-03

1.31E-01

25.8 %

Rating systems

performance.

MJ, LHV Fossil fuel depletion 3.74E-01 0 CTU. 69.4 % **Ecotoxicity** See the additional content required by the ULE PCR Part B for building envelope thermal insulation on page 4 of the Transparency Report PDF.

ISO 21930:2017 serves as the core PCR along UL Part A.

content required by the UL Environment PCR.

Transparency Report (EPD)

Validity: 2022/12/09 - 2027/12/08

Decl #: AGG - 20221209 - 001

Unit

Additional environmental information

Consultants); Christoph Koffler, PhD (thinkstep); and Andre Desjarlais (Oak Ridge National Laboratory).
UL Environment General Program Instructions v2.5, March 2021 (available upon request)
ISO 14025, "Sustainability in buildings and civil engineering works Core rules for environmental product declarations of construction products and

on a life cycle basis. Environmental declarations from different programs (ISO 14025) may not be comparable. Comparison of the environmental performance of Bullding Envelope Thermal Insulation using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR. Full conformance with the PCR for Building Envelope Thermal Insulation allows EPD comparability only when all stages of a li ver, variations and deviations a

SM Transparency Report (EPD) ***

SM Transparency Reports (TR) are ISO 14025 Type III environmental declarations (EPD) that enable purchasers and users to compare the potential environmental performance of products

	declaration (EPD) was externally verified, according to ISO 21930:2017, UL Part A, and ISO	Reference ULE PCR Insulation
)	14025:2006, by Jack Geibig, President, Ecoform.	Regions; North Am
	Ecoform, LLC 11903 Black Road, Knoxville, TN 37932	Function 1 m ² of ins packaging gives an a RSI=1m ² -k
	(865) 850-1883	LCIA met

SUMMARY

erica; Cradle-to-grave al unit / reference service life: stalled insulation material, g included, with a thickness that

2022 | The SM Transparency Report [EPD]* Program is operated by Sustain and Minds* (www.sustainableminds.com) | Program |

to building Deconstruction sites **B2** C2 Waste Maintenance transport **B3** Repair C3 Waste processing

kg SO₂ eq 1.27E-03 3.24E-04 9.28E-05 1.93E-06 0 3.55E-05 4.48E-07 5.70E-06 kg N eq 1,44E-04 2.72E-05 1.93E-05 0 2 04F-01 5.34F-02

1.27E-08

4.90E-11

7.49E-09

1.87E-05

1.19E-03

for distribution

of the product.

A4 DISTRIBUTION

Global warming (embodied carbon)	kg CO₂ eq	0	1.90E-01	1.06E-01	6.80E-02	7.46E-04	0	1.31E-02
Ozone depletion	kg CFC-11 eq	0	2.96E-08	3.16E-09	1.62E-08	8.62E-11	0	3.00E-09
Human health dar	mage							
Impact category	Unit							
Carcinogenics	CTU _h	0	2.75E-09	2.61E-10	6.24E-11	2.64E-12	0	1.02E-11
Non-carcinogenics	CTU _h	0	4.76E-08	4.29E-09	9.55E-09	5.10E-11	0	1.36E-09
Respiratory effects	kg PM _{2.5} eq	0	1.98E-04	2.94E-05	2.38E-05	1.19E-06	0	5.48E-06

4.35E-03

8.96E-02

1.5 %

See the additional content required by the ULE PCR Part B for building envelope thermal insulation on page 4 of the Transparency Report PDF.

1.35E-02

4.65E-01

67.8 %

1.52E-03

1.44E-01

26.9%

2.38F-05

1.02E-03

0.1%

0

0

0%

Unit

MJ, LHV

CTU.

Unit

kg SO₂ eq

kg CO2 eq

kg CFC-11 eq

Unit CTU,

CTU,

kg N eq

0

1.16E-03

1.20E-04

1.37E-01

1.77E-08

2.72E-09

4.51E-08

1.86E-04

1.13E-02

65.9 %

1.16E-03

1.16E-04

1.23E-01

1.40E-08

1.21E-03

1.27E-04

1.53E-01

2.20E-08

1.18E-02

0

0

Global warming (embodied carbon)	kg CO₂ eq	0	1.23E-01	5.28E-02	1.02E-01	7.46E-04	0	1.31E-02
Ozone depletion	kg CFC-11 eq	0	1.41E-08	1.46E-09	2.43E-08	8.62E-11	0	3.00E-09
Human health dar	nage							
Impact category	Unit							
Carcinogenics	СТИ	0	2.70E-09	1.05E-10	9.37E-11	2.64E-12	0	1.02E-11
Non-carcinogenics	СТО	0	4.28E-08	1.74E-09	1.43E-08	5.10E-11	O	1.36E-09
Respiratory effects	kg PM _{2.5} eq	0	1.82E-04	1.26E-05	3.58E-05	1.19E-06	0	5.48E-06
Smog	kg O ₃ eq	0	1.14E-02	1.79E-03	2.28E-03	2.38E-05	0	7.13E-04

A3 MANUFACTURING

2.32E-04

1.75E-05

1.16E-01

2.36E-09

1.07E-10

0.9 %

See the additional content required by the ULE PCR Part B for building envelope thermal insulation on page 4 of the Transparency Report PDF.

2.94E-04

2.47E-05

8.43E-02

3.59E-09

A4 DISTRIBUTION

1.21E-04

2.52E-05

6.97E-02

1.66E-08

6.39E-11

1.48E-01

29.2 %

A4 DISTRIBUTION

7.81E-05

1.63E-05

4.49E-02

1.07E-08

Additional environmental information Impact category Unit 2.45E-01 Fossil fuel depletion MJ, LHV 3.58E-01

CTU.

kg PM_{2.5} eq

kg O₃ eq

mpact category	Unit							
Carcinogenics	CTU _h	0	2.76E-09	1.52E-10	4.12E-11	2.64E-12	0	1.02E-11
Non-carcinogenics	CTU _h	0	4.45E-08	2.63E-09	6.31E-09	5.10E-11	0	1.36E-09
Respiratory effects	kg PM _{2.5} eq	0	1,86E-04	1.83E-05	1.57E-05	1.19E-06	0	5.48E-06
Smog	kg O ₃ eq	0	1.12E-02	2.65E-03	1.00E-03	2.38E-05	0	7.13E-04

0 Carcinogenics CTU, 0 Non-carcinogenics CTU, 2.00E-04 Respiratory effects kg PM_{2.5} eq 0

kg O₃ eq

v2.0	rt B: Building Envelope Thermal Insulation EPD Requirements
April 2018. P	CR review conducted by: Thomas Gloria, PhD (Industrial Ecology
Consultants)	Christoph Koffler, PhD (thinkstep); and Andre Desjarlais (Oak
Ridge Nation	al Laboratory).
UL Environn	nent General Program Instructions v2.5, March 2021 (available
upon reques	t)

Applegate-Greenfiber SANCTUARY LCA Background Report (public version),

Applegate-Greenfiber 2022; SimaPro Analyst 9.4; Ecoinvent v3 and US

ULE PCR Part A: Life Cycle Assessment Calculation Rules and Report

U3 Black Road,	
oxville, TN 37932	
w.ecotam.cam	
5) 850-1883	

LCA This environmental product

Contact us

Greenfiber 5500 77 Center Drive

average thermal resistance of K/W; 75 years thodology: TRACI 2.1 LCA software: LCI database SimaPro Developer 9.4 Ecolnvent 3.8, US-El 2.2 LCA conducted by: Sustainable Minds pform Public LCA:

10%, implying that the system is not sensitive to this assumed value. Scaling factors

Sensitivity analysis

factors are based on the mass and thickness of SANCTUARY and can be used to determine the impacts for each R-value when multiplied by the functional unit. See the scaling factors on Page 4 > SANCTUARY® Cellulose Insulation is made from living trees that lock in carbon for the life of the product. Couple this with low-energy manufacturing and short-haul transportation, and it's clear why

planet. Selecting low-carbon building material options can dramatically

reduce emissions while providing the same level of building performance, or higher. As insulation levels in buildings increase to

meet higher energy efficiency requirements, choosing insulation

products based on their embodied carbon is crucial. Since cellulose insulation is derived from trees, it sequesters carbon in the walls and ceilings of homes, a feature not seen in other types of insulation

END OF LIFE A4 Transport A5 Installation B1 Use

7.67E-04 mPts 4.277E-03 3.90E-05 0 mPts Truck Electricity No activities Truck contributing to transportation consumed by transportation

the blower

insulation.

7.53E-04

8.70E-11

2.66E-12

5.15E-11

1.20E-06

2.40E-05

during

INSTALLATION

0

0

0

0

0

0

impacts in the

use stage.

to the disposal

site, and final waste landfill.

1.33E-02

3.03E-09

1.03E-11

1.37E-09

5.54E-06

7.20E-04

4.43E-07 5.65F-06

7.13E-04

2.77E-02

3.7%

3.26E-01 7.32E-02 2.16E-01 1.02E-03 2.77E-02 55.4 % 0% 0.6 % 40.2 % 0.1% 3.7% See the additional content required by the ULE PCR Part B for building envelope thermal insulation on page 4 of the Transparency Report PDF. Tampa, FL - TRACI v2.1 results per functional unit

AS INSTALLATION

1.93E-06

4.48E-07

7.53E-04

8.70E-11

2.66E-12

B1-B7 USE

0

0

0

0

0

0

0

0

0

0

0%

C1-C4 END OF LIFE

3.55E-05

5.70E-06

1.33E-02

3.03E-09

1.03E-11

2.79E-02

3.52E-05

5.65E-06

1.31E-02

3.00E-09

C1-C4 END OF LIFE

3.52E-05 5.65E-06

1.31F-02

3.00E-09

5.48E-06

7.13E-04

2.77E-02

1/2 product

1 product

1 product

2 points

3.9 %

4.0 %

0 2.07E-09 9.78E-09 5.15E-11 1.37E-09 5.54E-06 1.52E-05 2.44E-05 1.20E-06 0 2.43E-03 1.55E-03 2.40E-05 0 7.20E-04

1.03E-03

INSTALLATION

1.91E-06

4.43E-07

7.46E-04

8.62E-11

A5 INSTALLATION

1.91E-06

4.43E-07

7.46E-04

8.62E-11

1.19E-06

2.38E-05

1.02E-03

The intent is to reward project teams for selecting products from

Collaborative for High Performance Schools National Criteria

Mat 02 - Environmental impacts from construction products

manufacturers who have verified improved life-cycle environmental

0.1%

LEED BD+C: New Construction | v4 - LEED v4

Building product disclosure and optimization **Environmental product declarations**

B1-B7 USE

0

0

0

0

0

0%

0.1%

5.66E-11	2.64E-12	0	1.02E-11
8.66E-09	5.10E-11	0	1.36E-09
	10000000	Manager A September 1	Land Carlotte Control Control

February, 2018. Technical Advisory Panel members reviewed and provided feedback on content written by UL Environment and USGBC. Past and present members of the Technical Advisory Panel are listed in the PCR.	LEED BD+C: New Construction v4.1 - LEED v4.1 Building product disclosure and optimization Environmental product declarations	
ULE PCR Part B: Building Envelope Thermal Insulation EPD Requirements	○ Industry-wide (generic) EPD	½ product

Industry-wide (generic) EPD

Product-specific Type III EPD

Product-specific Type III EPD

Third-party certified type III EPD

Product specific EPD

BREEAM New Construction 2018

	Environmental Product Declarations (EPD)	
	○ Industry average EPD	.5 points
Download PDF SM Transparency Report, which includes the additional EPD	Multi-product specific EPD	.75 points

MW 7.1 - Environmental Product Declarations

Building Envelope Thermal Insulation allows EPD comparability only when all stages of a life cycle	
have been considered. However, variations and deviations are possible". Example of variations:	
Different LCA software and background LCI datasets may lead to differences results for upstream	
or downstream of the life cycle stages declared.	

ert B: Building Envelope Thornol EPD Requirements v2.0, 2018 Suite 100 Charlotte, NC 28217 system boundaries (800) 228-0024

PERFORMANCE DASHBOARD

HOW WE MAKE IT GREENER

LCA RESULTS & INTERPRETATION







See LCA results by life cycle stage

Collapse all

RAW MATERIAL ACQUISITION

How we make it greener

85% Recycled Content

SANCTUARY® Cellulose Insulation is made from up to 85% recycled paper, and cardboard-higher recycled content than almost any other commonly used building material. This plantbased, or biogenic, material locks more carbon into the paper (and out of the air) than what was emitted in harvesting and manufacturing. This opens up a new category of building materials with carbon removal and storage potential. When added to homes, cellulose insulation traps that carbon for the life of the home, effectively lowering the carbon footprint of homes.



SANCTUARY® Loose-Fill or Spray-Applied Insulation by Greenfiber®

TRANSPORTATION

Regional Transportation

The Applegate-Greenfiber® supply chain is sustainably focused, as we have a plant in each region of the country to keep the delivery of raw materials and shipping of finished product to within a 500 mile radius of each plant, lowering resulting fuel emissions.

Our SANCTUARY® Insulation is also compressively packaged to 6x, or more, nominal settled density for maximum transportation efficiency. This compressive packaging allows for fewer deliveries and more cellulose insulation on the transportation



MANUFACTURING

Low-Energy Manufacturing

Our electric powered plants use low-energy manufacturing processes that generate zero waste, other than dust, which is confined within the production system and filtered out of the air that gets discharged into the atmosphere. We even recycle that dust, and the paper scrap from production, back into the product. Fire retardants used in our insulation are considered to be of low or no toxicity. Improvements in fire retardant processing and infusion technology have resulted in historically low fire retardant content with no loss of fire safety.

Applegate-Greenfiber's process diverts about 277,000 TONS of paper from landfills each year, equivalent to 157,000 ACRES of



USE AND END OF LIFE

Protecting People and the Environment

With SANCTUARY® Insulation, the same attributes that contribute to the low global warming potential make it a great choice for homeowners who desire more sustainable, healthy homes. If you're torn between cellulose and other insulation alternatives, consider this breakdown of greenhouse gas impact, recycled content and toxic emissions. Non-irritating cellulose insulation requires no special protective clothing during installation. Our insulation products has been tested for VOC emission and have been found to be low VOC sources.

Most construction projects have large dumpsters on site full of construction waste and debris from building products that end up in the waste stream and require shipping to landfills, further impacting the environment. Our insulation is fully recovered and reused on-site when installed, leaving virtually no excess material to return to the waste stream. Special machines used in the blown-in process allow excess or over spayed material to be vacuumed up and be blown back in on site or salvaged for a future installation.



Research on the use of wood-intensive construction and cellulose insulation products in homes shows it is possible to lower the carbon footprint of houses, so they become "carbon sinks" capable of locking in carbon for the life of the dwelling. The carbon rich wood and cellulose wood fiber stays in the home for years effectively trapping the carbon from escaping into the environment.





SM Transparency Report (EPD)™

VERIFICATION

3rd-party reviewed

LCA V

Transparency Report (EPD)

3rd-party verified

Validity: 2022/12/09 - 2027/12/08 Decl #: AGG - 20221209 - 001

This environmental product declaration (EPD) was externally verified, according to ISO 21930:2017, UL Part A, and ISO 14025:2006, by Jack Geibig, President, Ecoform.

Ecoform, LLC 11903 Black Road, Knoxville, TN 37932 (865) 850-1883



SUMMARY Reference PCR

art B; Building Envelope Thermal PD Requirements v2.0, 2018

Regions; system boundaries

North America; Cradle-to-grave Functional unit / reference service life:

1 m² of installed insulation material packaging included, with a thickness that gives an average thermal resistance of RSI=1m²·K/W; 75 years

LCIA methodology: TRACI 2.1

LCA software; LCI database SimaPro Developer 9.4 Ecolnvent 3.8, US-El 2.2

LCA conducted by: Sustainable Minds

Greenfiber 5500 77 Center Drive Suite 100 Charlotte, NC 28217

(800) 228-0024

Contact us



Ozone depletion Globalwarming Non-carcinogenics Respiratory effects Fossil fuel depletion Resource use indicators Renewable primary energy used as energy carrier (fuel) Renewable primary resources with energy content used as material Total use of renewable primary resources with energy content Non-renewable primary resources used as an energy carrier (fuel) Non-renewable primary resources with energy content used as material Total use of non-renewable primary resources with energy content Secondary materials Renewable secondary fuels Non-renewable secondary fuels Recovered energy Use of net fresh water resources Output flows and waste category indicators Hazardous waste disposed Non-hazardous waste disposed High-level radioactive waste, conditioned, to final repository Intermediate- and low-level radioactive waste, conditioned, to final repository Components for re-use Materials for recycling Materials for energy recovery Exported energy Carbon emissions and removals Biogenic carbon removal from product Biogenic carbon emission trom broduct Biogenic carbon removal from packaging Biogenic carbon emission from packaging Biogenic carbon emission from combustion of waste from renewable sources used in production processes Calcination carbon emissions kg CO, Carbonation carbon removals Carbon emissions from combustion of waste from non-renewable sources used in production processes

Scaling factors table 1.09 Mesa, AZ: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI=1m²·K/W)

Sustainable Minds® Additional EPD content required by: ULE PCR Part B: Building Envelope Thermal Insulation EPD Requirements Background This product-specific declaration was created by collecting production data from six Applegate-Greentiber facilities. Secondary data sources include Ecotovent 3,8 and US-EI 2.2. Quality Temporal and technol ogical representativenessare considered to be high. Geographical representativi enessis considered to be good. All relevant process steps for the product systemwiereconsidered and modeled. The process chain is considered sufficiently complete with regards to the goal and scope of this study. The product's ystem was checked for mass balance and compteteness of the inventory, Capital equipment was excluded as required by the PCR. Otherwise, no data were knowingly omitted. For more information on data quality. seell a LCA background report. Major system boundary exclusions: Capital goods & infrastructure; maintenance and operation of support equipment; Manufacture & transport of packaging materials not associated with final product; Human labor and employee transpert; Building operational energy at diwater use not associated with final product. Major assumptions and limitations: · Generic detaisets used for material inputs, transport, and waste processing are considered good quality , butactual impacts from material suppliers, transport carriers, and locally vasteprocessing may vary. The impact assessment methodology categories do not represent all possible environmental impact categories. . Characterization factors used within the impact assessment methodology may contain varying levels of uncertainty. LCA results are relative expressions and do not predict impads on category endpoints, the excaeding of thresholds, safety margins or risks; Relevant technical properties Loose fill applications are in accordance with ASTM C739, and stabilized applications are for professional installers only using specialized equipment in accordance with ASTM C1497. Installation musty comply who ASTM C1015, as applicable, and Applegate- Geenfiber installation instructions for each application. Compliance with model building codes does not always ensure compliancewith state or local building codes, which may be amended versions of these model codes. Always check with local building code officials to confirm compliance. The thermal resistance (R-value) is determined by ASTM C518. **Scaling factors** The scaling factors below are based on the mass and thickness of SANCTUARY and can be used to determine the impacts for each R-v alumination the results per functional unit by the corresponding scaling factor for the R-value of interest in order to get results for your specific application.

these citeria hav/ebeen met. Biogenic carbon is included in /eported results:

Allocation The allocation methods used were examined according to the updated ellocation rules in ISO 21930:2017. All facilities provided annual data for the studied product. Manufacturing inputs wiereallocated by mass using the amount of SANCTUARY produced compared to total production for CY2021. 8ased on annual production mass, the inventory (material and resources inputs and outputs) was developed for each facility for the production of a 25tb bag of SANCTUARY Insulation, which was later scaled to meet the functional unit. No further allocation was performed. Cut-off criteria for the inclusion of mass and energy flows are 1% of renewable primary resource (energy) usage, 1% nonrenewable primary resource tenergy) usage. 1% of the total mass input of that unit process, and 1% of environmental impacts. The total of neglected input flows per module does not exceed 5% of energy usage, mass, and environmental impacts. The only exceptions to these criteria are substances with hazardous and toxic properties, which must be listed even when the given process unit is under the cut-off criterion of 1% of the total mass. No known flows are deliberately excluded from this declaration; therefore,

1.12

Unit

kg CFC-11 eq

kg Co. eq

kg O₃ eq

kg SO₂ eq

kg N eq

CTIA

CTUh

CT'Ue

kg PM_{2.6} eq

MJ surplus

M.J, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ. LHV

MJ. LHV

m3

kg

kg

kg

kg

kg

kg

MJ, LHV

kg CO,

kg CO2

kg CO,

kg CO₂

kg CO,

kg CO.

Parameter

Smog

Acidification

Ecotoxicity

Eutrophication

Non-carcinogenics

Fossil fuel depletion

Resource use indicators

Renewable primary energy used as energy carrier (fuel)

Renewable primary resources with energy content used as material

Total use of renewable primary resources with energy content

Non-renewable primary resources used as an energy carrier (fuel)

Non-renewable primary resources with energy content used as material

Total use of non-renewable primary resources with energy content

Renewable secondary fuels

Non-renewable secondary fuels

Secondary materials

Recovered energy

Use of net fresh water resources

Hazardous waste disposed

High-level radioactive waste, conditioned, to final repositor.

Intermediate- and low-level radioactive waste, conditioned, to final repository

Materials for energy recovery

Biogenic carbon removal from product

Biogenic carbon emission from Product

Biogenic carbon removal from packaging

Biogenic carbon emission from packaging

Biogenic carbon emission from combustion of waste from renewable sources used in production processes

Calcination carbon emissions

Carbonation carbon removals

Carbon emissions from combustion of waste from non-renewable sources used in production processes

Ozone depletion

Global warning

Acidilication

Eutrophication

Carcinogenics

Ecotoxicity

Non-carcinogenics

Respiratory effects

Fossil fuel depletion

Resource use indicators

Renewable primary energy used as energy carrier (fuel)

Renewable primary resources with energy content used as material

Total use of renewable primary resources with energy content

Non-renewable primary resources used as an energy carrier (fuel)

Total use of non-renewable primary resources with energy content

Renewable secondary fuels

Non-renewable secondary fuels

Secondary materials

Recovered energy

Use of net fresh water resources

Hazardous waste disposed

High-level radioactive wasle, conditioned, to final repository

Intermediate- and low-level radioactive waste, conditioned, to final repository

Materials for energy recovery

Biogenic carbon removal from product

Biogenic carbon emission from product

Biogenic carbon removal from packaging

Biogenic carbon emission from packaging

Biogenic carbon emission from combustion of waste from renewable sources used in production processes

Calcination carbon emissions

Carbonation carbon removals

Carbon emissions from combustion of waste from non-renewable sources used in production processes

Parameter

Ozone depletion

Global warming

Acidification

Eutrophication

Carcinogenics Non-carcinogenics

Respiratory effects

Fossil fuel depletion

Resource use indicators

Renewable primary energy used as energy carrier (fuel)

Non-renewable primary resources used as an energy carrier (fuel)

Secondary materials

Recovered energy

Use of net fresh water resources

Hazardous waste disposed

High-level radioactive waste, conditioned, to final repository

Intermediate- and low-level radioactive waste, conditioned, to final repository

Materials for energy recovery

Biogenic carbon removal

Biogenic carbon emission from product

Biogenic carbon removal from packaging

Biogenic carbon emission from packaging

Biogenic carbon emission from combustion of waste from renewable sources used in production processes

Calcination carbon emissions

Carbonation carbon removals

Carbon emissions from combustion of waste from non-renewable sources used in production processes

Parameter

Smog

Acidification

Eutrophication

Carcinogenics

Ecotoxicity

Non-carcinogenics

Respiratory effects

Fossil fuel depletion

Resource use indicators

Renewable primary energy used as energy carrier (fuel)

Non-renewable primary resources used as an energy carrier (fuel)

Non-renewable primary resources with energy content used as material

Total use of non-renewable primary resources with energy content

Renewable secondary fuels

Secondary materials

Recovered energy

Use of net fresh water resources

Hazardous waste disposed

High-level radioactive waste, conditioned, to final repository

Intermediate- and low-level radioactive waste, conditioned, to final repository

Components for re-use

Materials for recycling

Exported energy

Materials for energy recovery

Biogenic carbon removal from product

Biogenic carbon emission from product

Biogenic carbon removal from packaging

Biogenic carbon emission from packaging

Biogenic carbon emission from combustion of waste from renewable sources used in production processes

Calcination carbon emissions

Carbonation carbon removals

Carbon emissions from combustion of waste from non-renewable sources used in production processes

Parameter

Smog

Ozprie depletion

Global warming

Acidification

Eutrophication

Carcinogenics

Ecotoxicity Fossil fuel depletion

Non-carcinogenics

Respiratory effects

Resource use indicators

Renewable primary energy used as energy carrier (fuel)

Total use of renewable primary resources with energy content

Non-renewable primary resources used as an energy carrier (fuel)

Total use of non-renewable primary resources with energy content

Renewable secondary fuels

Non-renewable secondary fuels

Secondary materials

Recovered energy

Use of net fresh water resources

Hazardous waste disposed

High-level radioactive waste, conditioned, to final repository

Intermediate- and low-level radioactive waste, conditioned, to final repository

Components for re-use

Materials for recycling

Exported energy

Materials for energy recovery

Biogenic carbon removal from product

Biogenic carbon emission from product

Biogenic carbon removal from packaging

Biogenic carbon emission from packaging

Biogenic carbon emission from combustion of waste from renewable sources used in production processes

Calcination carbon emissions

Carbonation carbon removals

Carbon emissions from combustion of waste from non-renewable sources used in production processes

Carbon emissions and removals

Non-hazardous waste disposed

Carbon emissions and removals

Non-hazardous waste disposed

Renewable primary resources with energy content used as material

Ozone depletion Global warming

Carbon emissions and removals

Components for re-use

Materials for recycling

Exported energy

Non-hazardous waste

Renewable secondary fuels

Non-renewable secondary fuels

Renewable primary resources with energy content used as material

Carbon emissions and removals

Components for re-use

Materials for recycling

Exported energy

Non-hazardous waste disposed

Smog

Carbon emissions and removals

Components for re-use

Materials for recycling

Exported energy

Non-hazardous waste

Ozone depletion Global warming

kg

1.10

1.13

1.18

A1

6.01E-09

8.82E-02

1.02E-02

1.07E-03

1.02E-04

2.67E-09

3.82E-08

169E-04

43.4%

5.18E-02

2.00E-01

2.52E-01

1.98E+00

1.75E-04

1.98E+00

0

0

0

0

0

0

0

0

0

0

0

0

kg CFC-11 eq 6.01E-09

8.82 E-02

1.02E02

1:07E-03

1.02E-04

2.67E-09

3.82E-08

169F-04

2.54E-01

5.18E-02

2.00E-01

2.52E-01

1.98E+00

1.87E-04

1.98E+00

5.83E-01

0

0

0

0

2.20F-05

5.14E-08

0

0

0

0

0

0

0

kg CFC-11 eq 6.01E-09

kg CO, eq

kg O₃ eq

kg 50, eq

kg PM_{a5} eq

MJ Surplus

MJ, LHV

MJ, LHV

MJ, LHV

MJ. LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

 m^3

kg

kg

kg

kg

kg

kg

kg

M.J, LHV

kg CO2

kg CO,

kg CO,

kg CO₂

kg CO,

kg CO

kg CO.

Unit

kg CFC-11 eq

kg CO, eq

kg O_a eq

kg SO, eq

kg N eq

CTUh

CTUh

kg PM_{2.5} eq CTUe

MJ surplus

MJ, LHV

MJ. LHV

MJ, LHV

Output flows and waste category indicators

kg

kg

kg

kg

kg

kg MJ, LHV

kg CO.

kg CO₂

kg CO₂

kg CO2

kg CO,

kg CO2

kg CO2

kg CO,

Unit

kg CO₂ eq

kg O_{ş eq}

kg \$0, eq

kg N eq

kg PM_{2.5} ¢q

MJ surplus

MJ, LHV

MJ. LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

 m^3

kg

kg

kg

kg

MJ, LHV

kg CO,

kg CO₂

kg CO₂

kg CO2

kg CO,

kg CO.

kg CO.

kg CO,

Unît

kg CO, eq

kg O₃ eq

kg SO, eq

kg N eq

CTUh

CTUh

CTUe

kg PM_{2.5} eq

MJ surplus

MJ, LHV

111³

kg

kg

kg

kg

kg

kg

kg

MJ, LHV

kg CO.,

kg CO₂

kg CO.

kg CO₂

kg CO2

kg CO.

kg CO,

kg CO.

Output flows and waste category indicators

kg MJ, LHV

kg CFC-11 eq 6.29E-09

Output flows and waste category indicators

kg

CT1 Jn

CTUh

CTUe

kg CFC-11 eq 6.21E-09

9.01E-02

1.05E-Ü2

1.10E-03

1.04E-04

2.73E-09

3.99E-08

1.74E-04

2.57E-01

5.35E-02

2.01E-01

2.54E-01

2.00E+00

1.80E-04

2.00E+00

5.83E-01

1.85E-01

0

0

0

0

0

0

0

0

0

A1

8.658-()2

1.03E-02

1.1OE-03

1.03E-04

2.59E-09

3.94E-08

1.77E-04

2.34E-01

5.38E-02

2.01E-01

2.55E-01

1.84E+00

1.84E-04

1.8 4E+00

5.74F-01

0

0

2.12E-01

2.29E-05

5.28E-08

0

0

0

0

1.05E+00

2.54E-04

0

0

41.7%

1.07E+00

2.54E-04

2.25E-05

5.26E-08

0

54.9%

Output flows and waste category indicators

kg

kg ti eq

CTUh

CTUI

CTUe

8.82E-02

1,02E-02

1.07E-03

1.02E-04

2.67E-09

3,825-03

1.69E-04

2.54E-01

5.18E-02

2.00E-01

2.52E-01

1.98E+00

1.75E-04

1.98E+00

5.64E-01

0

0

0

0

O

0

0

0

0

0

0

0

0

A1

6.01E-09

8.82E-02

1.02E-02

1.07E-03

1.02E-04

2,67E-09

3.82 E-08

1.69E-04

45.3%

2.54E-0I

5.18E-02

2.00E-01

2.52E-01

1.98E+00

1.75E-04

1.98E+00

5.83E-01

0

0

0

0

2.18E-05

5.09E-08

1.07E+00

2.54E-04

0

0

0

0

0

2.07E-01

1.04E+00

2.54E-04

2.18E-05

5.09E-08

1.79E-01

42.5%

1.07E+00

2.54E-04

1.79E-01

42.8%

kg CO₂ eq

kg O_s eq

kg SO2eq

kg N eq

CTUh

CTUh kg PM_{2.5} eq

CTUe

M/surplus

MJ, LHV

MJ, LHV

MJ. LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

MJ, LHV

 m^3

kg

kg

kg

kg

kg

kg

kg

MJ. LHV

kg CO.

kg CO₂

kg CO.

kg CO,

kg CO2

kg CO

kg CO.

kg CO

Output flows and waste category indicators

kġ

1.04E+00

2.54E-04

2.18E-05

5.09E-08

179E-01

2,54E-01

1.22

A2

2.73E-08

1.16E-01

2.37E-03

1.94E-04

4.12E-05

9.13E-11

1.11E-08

3.05E-05

30.4%

2.43E-01

1.55E-03

5.65E-04

2.11E-03

1.62E+00

4.85E-06

1,62E+00

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

2.36E-08

1.01E-01

3.35E-03

2.10F-04

3.82E-05

8.27E-11

9.40E-09

2.98E-05

25,1%

2.11E-01

2.54E-03

6.16E-04

3.16E-03

1.42E+00

1.75E-04

1.42E+00

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

0

8.06E-09

3.44E-02

1.24E-03

7.44E-05

1.32E-05

3.24E-11

4.65E-09

1.3IE-05

7.23E-02

9.07E-04

2.14E-04

1.12E-03

4.85E-01

2.19E-06

4.85E-01

0

0

0

0

0

4.04E-07

7.16E-08

0

0

0

0

0

0

0

0

0

0

0

0

A2

1.17E-08

4.90E-02

1.09E-03

8.51E-05

1.77E-05

4,49E-11

6.88E-09

1.72E-05

20.5%

1.04E-01

6.61E-04

2.41E-04

9.02E-04

6.93E-01

2.07E-06

6.93E-01

0

0

0

0

0

2.38E-07

1.03E-07

0

0

0

0

0

0

0

0

0

0

0

7.81E-09

3.28E-02

7.315-04

5.70E-05

1.19E-05

3.01E-11

4.60E-09

1.15E-05

16.4%

6.95E-02

4.42E-04

1.61E-04

6.04E-04

4.64E-01

1.39E-06

4.64E-01

2.30E-03

0

0

0

0

O

0

0

0

0

0

0

0

0

0

A2

1.58E-08

6.61E-02

1.47E-03

1.15E-04

2.39E-05

9.28E-09

2.32E-05

27,6%

1.40E-01

8.92E-04

3.25E-04

1.22E-03

9.35E-01

2.80E-06

9.35E-01

0

0

0

0

3.22E-07

1.38E-07

0

0

0

0

0

0

0

0

0

0

0

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4.64E-03

€.07E-11

1.60E-07

6.86E-08

0

0

3.44E-03

4.53E-03

12.9%

1.14E-06

2.12E-07

1.27E-02

5.59E-07

2.40E-07

8.05E-03

1.25

1.33

A3

2.29E-09

\$.33E-02

2.80E-03

3.24E-04

2.72E-05

1.62E-10

2,73E-09

1.96E-05

1.0%

1.12E-01

2.33E-01

2.56E-02

2.58E-01

1.26E+00

2.37E-06

1.26E+00

0

0

0

4.84E-03

1.86E-03

3.06E-06

3.00E-08

1.78E-02

5.76E-02

2.06E-02

0

0

0

0

LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI=1m²·K/W)

3.16E-09

1.06E-01

4.35E-03

5.13E €)4

4.58E-05

2.61E-10

4.29E-09

2.94E-05

8.96E-02

2.23F-01

1.86E-02

2.42E-01

1.46E+00

6.22E-06

1.46E+00

0

0

0

6.09E-03

1.86E-03

3.33F-06

3,30E-08

3.34E-02

5.76E-02

3.85E-02

0

О

0

0

0

0

LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI=1m²·K/W)

АЗ

1.46E-09

5.28E-02

1.79E-03

2.05E-04

1.72E-05

1.05E-10

1.74E-09

1.26E-05

7.32E-02

1.46E-01

1.60E-02

1.62E-01

8.12E-01

2.36E-06

8.12E-01

0

0

0

4.23E-03

1.86E-03

2.07E-06

1.91E-08

1.49E-02

5.76E-02

1.72E-02

0

0

0

0

LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI=1m²·K/W)

0

0

0

<1%

0

0

0

1.5%

O

0

0

1.35

additional EPD CONTENT

SANCTUARY Insulation

Lorny. 16-32 ton

1/100 km

km (Mesa, AZ)

km (Notfolk, NE)

km (Tampa, FL)

km (Waco, TX)

km (Salt Lake City, UT)

km (Wilkes-Earre, PA)

kg/m³ (compressed in bag)

kWh

kg

kg

kg

ke CO

µg/m³

years

kg

kg

kg

kg

kg

km

kg

2.54

kg CO2

2.54

Total

5.15E-08

3.55E-01

1.73E-02

1.72E-03

196F-01

299E-09

6.09E-08

2.44E-04

100%

7.S1E-01

2.88E-01

2.27E-01

5.14E-01

5.81E+00

1.82E-04

5.81E+00

5.67E-01

0

0

0

1.99E-01

1.04E-02

2.65E-05

4.58E-07

2.43E-02

1.10E+00

1.02E+00

2.54E-04

0

0

0

0

Total

5.15E-08

3.55E-01

1,73E-02

1.72E-03

1.96E-04

2.99E-09 6.09E.08

2 445.04

100%

7.51E-01

2.79E-01

2.20E-01

4.99E-01

6.01E+00

3.71E-04

6.01E+00

5.83E-01

0

0

o

0

2.06E-01

1.04E-02

2.77E-05

4.65E-07

3.98F-02

1.13E+00

1.04E+00

2.54E-04

0

0

0

0

0

Total

4.30 E-08

2.91E-01

1.62E-02

1.67E-03

1.76E-04

2,91E-09

6.03E-08

2.37E-04

6.45E-01

2.01E-01

2.17E-01

4.17E-01

4.92E+00

1,79E-04

4.92E+00

5.64E-01

0

0

0

0

1.99E-01

1.04E-02

2.56E-05

3.81E-07

2.14E-02

1.10E+00

1.02E+00

2.54E-04

0

0

o

0

0

Total

3.98E-08

3.37E-01

1.60E-02

1.55E-03

1.69E-04

2.90E09

583E-08

2.32E-04

100%

7.79E-01

6.61E-02

2.48E-01

3.14E-01

5.83E+00

1.79E-04

5.83E+00

5.83E-01

0

0

0

0

2.32E.01

1.04E-02

2.80E-05

3.74E-07

3.98E-02

1.13E+00

1.04E+00

2.54E-04

0

0

0

0

Total

314E-08

2.66E-01

1.56E-02

1.576-03

1.63E-04

2,97E.09

5.49E-08

2,26E-04

5.77E-01

8.08E-02

2.36E-01

3.16E-01

4.91E+00

1.84E-04

4.91E+00

5.83E-01

1.99E-01

1.01E-02

3.07E-0S

3.14E-07

3.96E-02

1.13E+00

1.04E+00

2.54E-04

0

0

0

0

0

Total

4.26E-08

2.79E-01

1.58E-02

1.58E-03

1.74E-04

2.84E-09

6.06E-08

2.42E-04

5.97E-01

7.18E-02

2.12E-01

2.84E-01

4.89E+00

1.89E-04

4.89E+00

5.74E-01

0

0

2.62E-01

9.77E-03

2.97E-05

4.00E-07

2.51E-02

1.11E+00

1,03E+00

2.54E-04

0

0

0

0

0

0

0

100%

0

0

0

0

0

100%

0

0

0

0

100%

0

0

0

0

Refer to 'Relevant technical properties' Installation as recommended by the

spray-applied in attics, v vals, floors, and

Not expected to require maintenance.

repair, replacement, or refurblishment Expected to be undisturbed during use.

no associated operational energy or

0.648

0

0

0

0

3.28

2.74E-10

1.61E-03

4.68E-04

1.52E-06

4.71E-13

1.86E-11

2.01E-06

<1%

3.41E-03

3.50E-05

3.50E-05

2.23E-02

2,23E-02

0

0

0

0

0

0

0

0

2.39E-09

2.52E-11

0

0

0

0

0

0

0

0

0

0

9.98E-01

3.92E-06

100

0.648

manufacturer, either blown-in o

Diesel

42

558

1,069

729

470

645

76

>1

144

%

0.003

0.0109

Landfill 0.004

0

0

Recycling 0.006

0.00649

751

Scenarios and additional technical information

Transport to the building site [A4]

Distance from manufacturer to installation site

Capacity utilization (mass based)

Capacity utilization volume factor

Installation scrap assumed

Reference Service Life (RSL)

Declared product properties

Design application parameters, indeor

Maintenance process information

Electricity consumption

VOC emissions

Use conditions

Assumptions for

Recovery

Waste transport

1.39

1.27E-08

5.34E-02

1.19E-03

9.28E-05

1.93E-05

4.90E-11

7.49E-09

1.**8**7E-**0**5

21.4%

1.13E-01

7.20E-04

7.20E-04

7.55E-01

7.55E-01

0

O

0

0

0

Ó

0

2.60E-07

1.12E-07

0

0

0

0

0

0

0

0

0

0

0

0

Norfolk, NE: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

1.62E-08

6.80E-02

1.52E-03

118E-04

2.46E-05

6:24E-11

9.5**5**E-09

2.38E-05

26.9%

1.44E-01

9.17E-04

9.17E-04

9.62E-01

9.62E-01

0

0

0

0

0

0

0

3:34E-07

1.44E-07

0

0

0

0

0

0

0

0

0

0

0

0

Salt Lake City, UT: LCIA results, resource use, output & waste flows, & carbon emissions & removals per functional unit

2,43E-08

1.02E-01

2.28E-03

1.77E-04

3.70E-05

9.37E-11

1.43E-08

3.58E-05

40.2%

2.16E-01

1.38E-03

1.38E-03

1.44E+00

1,44E+00

0

0

0

0

0

0

0

0

4.97E-07

2.14E-07

0

Ø

0

0

0

0

0

0

0

0

0

A4

1.66E-C8

6.97E-02

1.55E-03

1,21E-04

2.52E-05

6.39E-11

9.78E-09

2.44E-05

29.2%

1.48E-01

9.40E-04

9.40E-04

9.86E-01

9.86E-01

O

0

0

0

0

0

0

3.39E-07

1.46E-07

O

0

0

0

0

0

0

0

0

0

1.07E-08

4.49E-02

1.00E-03

7.81E-05

1.63E-05

4:128-11

6.31E-09

1.57E-05

9,52E.02

6.06E-04

6.06E-04

6.35E-01

6.35E-01

3.15E-03

0

0

2.19E-07

9.41E-08

0

0

0

0

0

0

0

0

0

0

0

0

Wilkes-Barre, PA: LCIA results, resource use, output & waste flows, and carbon emissions & removals per functional unit

A4

1.47E-08

6.17E-02

1,38E-03

1.07E-04

2.23E-05

5.66E-11

3.66E-09

2.16E-05

25.8%

1.31E-01

8.32E-04

8.32E-04

8.73E-01

8.73E-01

0

0

0

0

0

3.00E-07

1.29E-07

0

0

0

0

0

0

0

0

0

4.33E-03

0

0

0

0

22.5%

Waco, TX: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

4.89E-03

Tampa, FL: LCIA results, resource use, output and waste flows, and carbon emissions & removals per functional unit

A3

2.36E-09

1.16E-01

2.43E-03

2.32E-04

175F-05

1.07E-10

2.07E-09

1.52E-0E

<1%

2.45E-01

1.19E-02

4.68E-02

5.87E-02

1,98E+00

2.38E-06

1.98E+00

0

0

0

0

0

1.25E-02

1.86E-03

4.76E-06

4.98E-08

3.34E-02

5.76E-02

3.85E-02

O

0

0

0

0

0

LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI≃1m²⋅K/W)

3.59E-09

8.13E-02

2.658-03

2.94E-04

2.47E-05

1.52E-10

2.63E-09

1.83E-05

1.27E-01

2.54E-02

3.45E-02

5.99E-02

1.61E+00

2.38E-06

1.61E+00

4.86E-03

1.65E-03

6,88E-06

7.31E-08

3.31E-02

5.76E-02

3.82E-02

0

0

0

0

0

0

LCIA results (per m² installed including packaging, that gives an average thermal resistance of RSI=1m²·K/W)

АЗ

2.78E-09

5.13E-02

1,89E-03

2.24E-04

1.88E-05

1.19E-10

1.82E-09

1.36E-05

6.38E-02

1.54E-02

1.05E-02

2.59E-02

1.04E+00

2.37E-06

1.04E+00

0

0

0

3.70E-02

1.27E-03

5.24E-06

5.44E-08

1.86E-02

5.76E-02

2.15E-02

0

0

0

0

0

0

0

0

<1%

0

0

0

0

0

1.3%

Ò

0

0

7:16E-03

4.77E-03

0

3.74E-03

0

Final disposal (landfill)

1.43

Α5

8.70E-11

7.53E-04

2.40E.05

1.93E-06

4:48E-07

2.66E-12

5.15E-11

1.20E-06

<1%

1.03E-03

6.73E-04

2.05E-04

8.78E-04

1.22E-02

2.40E-08

1.22E-02

0

0

0

2.98E-03

8.50E-03

8.10E-07

1.17E-09

6.47E-03

0

0

0

0

C 0

0

0

0

8.62E-11

7.46E-04

2,38E-05

1.91E-06

4.43E-07

2.64F-12

5.10E-11

1.19F-06

1.02E-03

6.BOE-04

2.05E-04

8.85E-04

1.23E-02

2.87E-06

1.23E-02

0

G

o

0

2.98E-03

8.50E-03

8.10E-07

1.17E-09

6.47E-03

0

0

0

0

0

0

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Collection process

End of life [C1-C4]

scenario development

Gross density of products transported

Installation into the building [A5]

Product loss per functional unit (scrap)

Biogenic carbon contained in Packaging

Waste materials at the construction site before waste

The final evaluation report addressing all standards required for the testings

https:// /www.greenflber.com/uploads/decuments/UL-Evaluation-Report.pdf

evaluation, and approviatof the declared product and its application in building assemblies for building code and other regulation compliance is available at:

75

cellings

Manual deconstruction, sent to landfill by truck

Collected with mixed construction

Reuse

Landfill

Removals of biogenic carbon (excluding packaging)

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processing (product scrap and packaging waste)

Output materials from en-site waste processing

Vehicle type

Liters of fuel

Fueltype



COMPLIANCE TESTED by berkeley analytical

VOC Emission Test Certificate

Product Name: Sanctuary - Loose-Fill Insulation

Product Sample Info	rmation
Company:	Greenfiber
Company Website:	www.greenfiber.com
Product Type:	Thermal Insulation
Date Produced:	1/23/2023

Certificate Inform	nation
Certificate No:	230224-06
Certified By:	far. J
	Raja S. Tannous, Laboratory Director
Date:	February 24, 2023

Reference Standard: California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 (Emission testing method for CA Specification 01350)

Acceptance Criteria and Results Demonstrating Compliance of Product Sample to Referenced Standard:

Exposure Scenario ¹	Individual VOC	cs of Concern ²	Formal	TVOC ⁴	
	Criterion	Compliant?	Criterion	Compliant?	Range
Private Office	≤½ Chronic REL	YES	≤9.0 μg/m³	YES	≤ 0.5 mg/m ³

Product Coverage⁵: Not applicable

- 1. Exposure scenarios & product quantities for classroom & office are defined in Tables 4-2 4-5 (CDPH Std. Mtd. V1.2-2017)
- 2. Maximum allowable concentrations of individual target VOCs are specified in Table 4-1 (ibid.)
- 3. Maximum allowable formaldehyde concentration is ≤9 µg/m³, effective Jan 1, 2012; previous limit was ≤16.5 µg/m³ (ibid.)
- 4. Informative only; predicted TVOC Range in three categories, i.e., ≤0.5 mg/m³, >0.5 4.9 mg/m³, and ≥5.0 mg/m³
- 5. Informative and applicable only to tests of wet-applied products; grams of sample applied per square meter of substrate

Standards & Codes Recognizing CDPH Standard Method V1.2 (partial list)

- USGBC LEED Version 4/4.1, BD&C, ID&C, Residential BD&C Multifamily
- . The WELL Building Standard, WELL v2, Feature X06
- ANSI/GBI 01-2019 Green Globes Assessment Protocol
- CALGreen, CA Code of Regulations Title 24, Part II

Narrative: Greenfiber selected a sample representative of its Sanctuary - Loose-Fill Insulation product and submitted it on 1/26/2023 for testing. Berkeley Analytical measured and evaluated the emissions of VOCs from this sample following CDPH/EHLB/Standard Method V1.2-2017. The results of the test are presented in Berkeley Analytical report, 562-004-01A-Feb2423.

Berkeley Analytical is an independent, third-party laboratory specializing in the analysis of organic chemicals emitted by and contained in building products, finishes, furniture, and consumer products. We are an ISO/IEC 17025 accredited laboratory (IAS, <u>TL-383</u>); all standards used in performing this test are in Berkeley Analytical's scope of accreditation.

DISCLAIMER: THIS CERTIFICATE OF COMPLIANCE AFFIRMS THAT: 1) A SAMPLE OF THE LISTED PRODUCT WAS TESTED ACCORDING TO THE REFERENCED STANDARD;
2) THE MEASURED VOC EMISSIONS FROM THE SAMPLE WERE EVALUATED FOR THE DEFINED EXPOSURE SCENARIO(S); AND 3) THE RESULTS MEET THE ACCEPTANCE
CRITERIA OF THE REFERENCED STANDARD(S). BERKELEY ANALYTICAL IS NOT RESPONSIBLE FOR ANY CLAIMS REGARDING A PRODUCT OR PRODUCTS ENTERED INTO
COMMERCE THAT MAY BE BASED ON THIS TEST. BERKELEY ANALYTICAL PROVIDES THIS CERTIFICATE OF COMPLIANCE "AS IS" WITHOUT WARRANTY OF ANY KIND,
EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR ANY PURPOSE.

Impact of Cellulose Insulation on the Carbon Footprint of Building Assemblies

Report produced for Apple - Greenfiber Insulation

By Builders for Climate Action

October 31, 2022





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Importance of insulation embodied carbon of houses

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Accounting for biogenic carbon content

Carbon Accounting for Buildings: BEAM

Insulation Comparison

Assembly comparison

Conclusions

Appendices

Appendix 1: Assembly details

Appendix 2: Wall model comparison graph

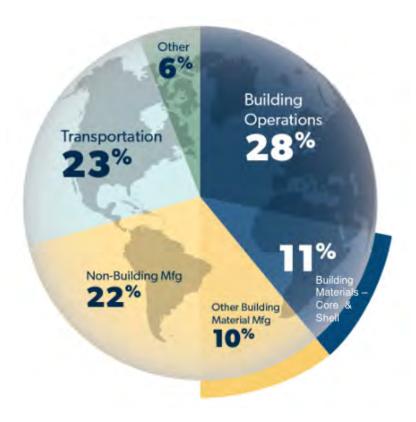
About Builders for Climate Action

Builders for Climate Action is working with builders, designers, developers, policy-makers, researchers and manufacturers to tackle the serious impact of buildings on our climate and work toward real zero carbon buildings.

We want to offer future generations our best efforts to reign in the worst effects of climate change through smart, coordinated and effective action to address emissions in the sector while building a world that is just and equitable.

The importance of embodied carbon in buildings

The US government has committed to reducing total emissions by 50-52% (from 2005 levels) by 2030, and to produce net zero emissions by 2050. The building sector has been recognized as being responsible for a high proportion of emissions as a result of building operations, but only recently has the emissions arising from the life cycle of building materials – often called "embodied carbon" – been recognized as a leading source of greenhouse gasses. Globally, the manufacturing of building materials is estimated to be around 20 percent of total fossil fuel emissions.



Source: © 2018 2030, Inc. / Architecture 2030. All Rights Reserved. Data Sources: UN Environment Global Status Report 2017; EIA International Energy Outlook 2017

It is likely that new home construction in the US is responsible for at least 50-60 million tonnes of greenhouse gas emissions annually.^{2,3} At this level of emissions, the home building sector has a carbon footprint for materials equivalent to the entire production-based emissions of countries such as Hungary, Sweden and Norway.⁴

¹ https://www.whitehouse.gov/climate/ Accessed September 5, 2022

² Carbon Leadership Forum, Embodied Carbon Benchmark Study: LCA for Low Carbon Construction, 2017. https://carbonleadershipforum.org/lca-benchmark-database/ Accessed October 20, 2022.

³ Builders for Climate Action, Achieving Real Net Zero Homes, 2021. DOI: 10.13140/RG.2.2.27404.23680

⁴ Climate Analysis Indicators Tool (CAIT), Climate Watch. 2018. Washington, DC: World Resources Institute (2019).

The scale of embodied carbon in construction has begun to draw attention from regulators at the federal, state and city levels across the US and Canada. The recent Inflation Reduction Act in the US allocates \$4 billion for the development of low-embodied carbon standards and procurement policies for the US government. This is an impactful tactic, as selecting low-carbon building material options can dramatically reduce emissions while maintaining the same level of building performance. Building insulation products in particular have a very wide range of material-related emissions (see Table 1) meaning that selection of low-carbon insulation options can have an outsized impact on the overall emissions of an entire building or renovation project.

Importance of insulation embodied carbon of houses

A study of 503 as-built new homes in the Toronto, Ontario region found insulation to be the second largest source of material-related emissions (after concrete), with 26 percent of total emissions from the sample homes arising from the manufacturing of insulation. An average of 10.4 tonnes of emissions per house are attributable to insulation products in that study.⁵

The important drive to reduce operating emissions from buildings will result in more insulation being required by building codes and voluntary standards. This will lower operating emissions from new homes built with more insulation, but we risk raising the embodied carbon for that additional material and offsetting some or all of the operational reductions due to the pulse of emissions generated by the production of the additional insulation material.

A study for Natural Resources Canada⁶ demonstrated that increasing energy efficiency from current code minimum requirements to "net zero ready" standards could increase the embodied carbon of a two-story house by an average of 30 tonnes if high embodied carbon insulation products are used. In a region with carbon-intensive energy sources, this would offset nearly four years of operational emission reductions. However, in a region with a clean electrical grid, that increase in embodied carbon will take over 480 years to be matched by operational reductions. Clearly, an understanding of the impact of additional insulation materials and their material carbon footprint should be an important part of energy efficiency programs and codes.

⁵ Magwood, C., Bowden, E., Trottier, M. Emissions of Materials Benchmark Assessment for Residential Construction Report (2022). Passive Buildings Canada and Builders for Climate Action. DOI: <u>10.13140/RG.2.2.34242.66243</u>

⁶ Magwood, C., Ahmed, J., Bowden, E., Racusin, J. (2021). ACHIEVING REAL NET-ZERO EMISSION HOMES: Embodied carbon scenario analysis of the upper tiers of performance in the 2020 Canadian National Building Code . DOI: 10.13140/RG.2.2.27404.23680

Carbon accounting for insulation products: EPDs

In order to accurately compare the carbon footprint of competing insulation products, it is becoming common practice to use the Global Warming Potential (GWP) factors from Environmental Product Declarations (EPDs), which are an ISO-standardized way of reporting the results of life cycle assessments (LCAs) so that the results are comparable among products of similar types, such as building insulation. An EPD "quantifies environmental information on the life cycle of a product to enable comparisons between products fulfilling the same function."

Industry-average EPDs gather data from multiple manufacturers and produce a single GWP factor to represent an average of the results from the participating manufacturers. Product-specific EPDs are created by a single manufacturer and the GWP factor is unique to that product.

The building insulation market currently has a mix of these two types of EPDs representing the common product options. Some product types, such as cellulose and EPS foam, have industry-average EPDs. Other product types, such as fiberglass and XPS foam, have product-specific EPDs. Others, such as mineral wool, have both industry-average and product-specific EPDs. Currently, this mix of EPD types enables broad comparisons between product types, with product-specific results being averaged to reflect all available data in the category. As more manufacturers produce product-specific EPDs, building designers and constructors will be able to select products based on their actual carbon footprint.

In this study, Table 1 shows material carbon emissions for cellulose insulation based on both the industry average EPD (produced by the Cellulose Insulation Manufacturers Association) and a third party verified life cycle assessment (LCA, the precursor to publishing an EPD) for SANCTUARY(R) by Greenfiber Insulation.

Accounting for biogenic carbon content

EPDs are currently inconsistent in dealing with biogenic carbon storage in products, despite the importance of durable carbon storage in meeting climate targets. There are three accepted pathways recognized by the current ISO rules for life cycle assessment: biogenic carbon can be ignored, it can be treated as neutral (called -1/+1 because it calculates biogenic carbon in the raw material but assumes that the full carbon content will be released at the end of a product's life), or it can be shown as biogenic carbon storage (a negative number) in the A1 phase and attribute a reasonable amount of carbon release in the C phase at end of life, based on anticipated disposal methods. This type of accounting for biogenic material more accurately reflects the actual climate impact of biogenic materials, as they prevent CO2 from accumulating

⁷ ISO 14025:2006(en): Environmental labels and declarations — Type III environmental declarations — Principles and procedures. https://www.iso.org/obp/ui/#iso:std:iso:14025:ed-1:v1:en

⁸ IPCC, What Transitions Could Enable Limiting Global Warming to 1.5C?. https://www.ipcc.ch/sr15/fag/fag-chapter-4/

in the atmosphere for the duration of time the product is in the building, and perhaps beyond.⁹ It is likely that this will become the accepted methodology as the development of carbon storage methodologies and markets begins to expand, such as the recent release of carbon removal certificates for building materials by Puro.Earth¹⁰ on the NASDAQ exchange and the standard development work of Aureus Earth.¹¹

Carbon Accounting for Buildings: BEAM

GWP factors from EPDs provide important data, but this does not translate into comparable carbon footprint information for actual buildings. Because performance levels (in the case of insulation, the R-value per inch) are different for each product, it will take a unique quantity of material to achieve a particular performance level in a building.

LCA software programs are able to convert GWP factors into actual carbon footprint for a specific quantity of material in a building design.

The Building Emissions Accounting for Materials (BEAM) software was developed by Builders for Climate Action to provide comparative material assessment for low- and mid-rise residential designers and builders. BEAM includes industry-average and product-specific EPDs and shows users which type of EPD was used to generate the results visible in the software. BEAM also provides the carbon storage value for products with biogenic carbon content and applies a consistent methodology for all such products to ensure comparability.¹²

This study uses BEAM to generate comparisons of emissions associated with different product types and assemblies, ensuring that each comparison reflects comparable accounting for material quantities for the stated performance level.

Insulation Comparison

As insulation levels in buildings increase to meet higher and higher energy efficiency requirements, choosing insulation products based on their embodied carbon is crucial. In this study, BEAM was used to assess the comparative carbon footprint of a range of common insulation products, using 100 square feet of coverage area and an R-value of 10 as the performance criteria. Table 1 summarizes the results of this analysis.

⁹ Liz Marshall and Alexia Kelly, "The Time Value of Carbon and Carbon Storage: Clarifying the Terms and Policy Implications of the Debate," World Resources Institute, November, 2010., MPRA paper no. 27326.

¹⁰ Puro Standard Bio-based Construction Materials Methodology.

https://connect.puro.earth/biobased-construction-materials-carbon-removal

¹¹ A Methodology for Building-based Embodied Carbon Offsetting. https://www.aureusearth.com/documents

¹² BEAM Methodology. <u>https://www.buildersforclimateaction.org/beam-estimator.html</u>

Comparison of cavity fill insulation products @ 100 ft² and R-10					
Product type	EPD type	GWP value kg CO2e			
Closed cell polyurethane spray foam, HFC	Industry avg.	215			
Closed cell polyurethane spray foam, HFO	Industry avg.	68			
Mineral wool batt	BEAM avg. of products	28			
Mineral wool loose fill	Industry avg.	26			
Fiberglass loose fill	BEAM avg. of products	16			
Fiberglass batt	BEAM avg. of products	11			
Hemp wool batt	Nature Fibre	-9 (28)*			
Cellulose loose fill	Industry avg.	-17 (8)*			
Cellulose dense packed (3.5 lb/ft³)	Industry avg.	-35 (16)*			
Cellulose loose fill	Applegate-Greenfiber LCA ¹³	-21 (4)*			
Cellulose dense packed (3.5 lb/ft³)	-43 (8)*				
*Value in parentheses indicates emissions from product before biogenic carbon storage value subtracted					

Table 1. GWP values of insulation types

Cellulose insulation has the lowest carbon footprint of all the insulation types prior to the inclusion of carbon storage value. With carbon storage attributed, this type of insulation provides the highest degree of net carbon storage in the study.

It is important to note that individual products with specific EPDs will have values higher and lower than the averages shown in this comparison. Owens Corning Eco-Touch Pink fiberglass batt has a product-specific result of 8 kg CO2e, which is the lowest product specific result available in the BEAM tool. Even this result is significantly higher than the results for cellulose insulation.

¹³ Life Cycle Assessment (LCA) of SANCTUARY(R) Insulation by Greenfiberl, Sustainable Minds, October 2022

Assembly comparison

Greenfiber Insulation provided the research team with six (6) home building assemblies (including wall framing, structure and insulation and roof insulation) that reflect current practice in the home building sector (see Appendix 1 for details of each assembly). The BEAM tool was used to model each of these assemblies, and the results are shown in Figure 1.

All the assemblies are based on typical wood frame construction, and the carbon footprint for the framing (13 kg CO2e) and structural sheathing (29 kg CO2e) are the same across all the samples. The differences between each sample arise entirely from the type of insulation specified.

Each assembly is represented with two different bars in the chart. The gray bars represent the net carbon footprint results (carbon emissions minus carbon storage) and the colored bars represent the contribution of each material in the assembly to the net total. Colored areas below the zero line represent carbon storage and those above the zero line represent emissions.

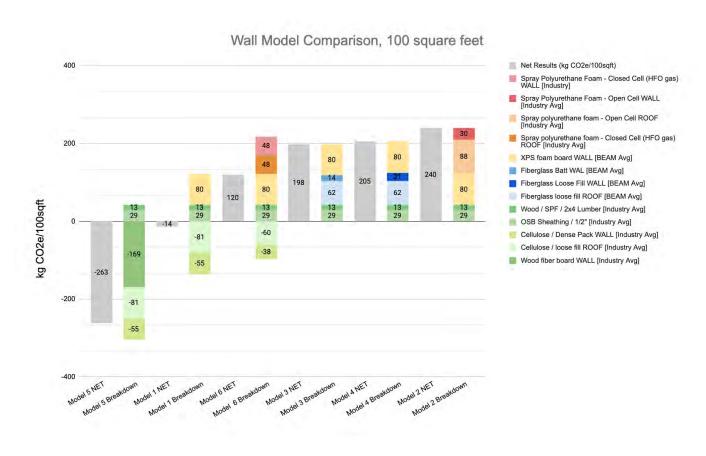


Figure 1. Carbon footprint comparison chart of six assemblies

Assembly 5 is shown to have the lowest net carbon footprint, at -263 kg CO2e. This assembly combines two biogenic insulation materials, with cellulose used in wall and roof cavities and

wood fiberboard used as a continuous exterior wall insulation. This result is 210 percent better than the assembly with the highest carbon footprint, which is a typical assembly using XPS and spray foam insulation products.

The second best result is found in Assembly 1. This assembly uses the same quantities of cellulose insulation in the wall and roof cavities, but uses XPS foam board as the continuous exterior insulation. The carbon storage provided by the cellulose insulation offsets all of the emissions from the other materials in this assembly, with a net result of -14 kg CO2e.

The results demonstrate that insulation choices can have a dramatic impact on the carbon footprint of an entire assembly, and therefore an entire house. Table 2 shows the percentage reduction from the assembly with the highest example.

Comparison of Carbon Footprint for Different Assemblies						
Assembly	Wall R-value	Roof R-value	kg CO2e per 100 ft ²	Percentage reduction		
#2 Open cell spray foam in cavities with XPS continuous wall insulation	23	38	240	0%		
#4 Fiberglass loose fill in cavities with XPS continuous wall insulation	23	38	205	15%		
#3 Fiberglass batt in cavities with XPS continuous wall insulation	23	38	198	18%		
#6 Close cell spray foam and dense-packed cellulose in cavities with XPS continuous wall insulation	26*	35*	120	50%		
#1 Cellulose in cavities with XPS continuous wall insulation	23	38	-14	106%		
#5 Cellulose in cavities with wood fiberboard continuous wall insulation	23	38	-263	210%		
*Slight variation in R-values due to combining two insulation types in cavities						

Table 2. Percentage reduction in carbon footprint from baseline model.

The elements included in the assembly study do not represent the full range of materials that could be used in each assembly. In particular, continuous exterior insulation products were limited to just two options in the study. However, a designer/builder can select from a range of

different options that would impact the carbon footprint of any of these assemblies. Table 3 provides BEAM results for all of the continuous insulation options in the tool.

MATERIAL	NET EMISSIONS (kg CO₂e)	CARBON EMISSIONS (kg CO₂e)	CARBON STORAGE (kg CO₂e)
XPS foam board / DuPont / Styrofoam / Reduced GWP	597	597	0
XPS foam board / [BEAM Avg US & CA]	80	80	0
Mineral wool board - light density / [Industry Avg N.America]	54	54	0
Vacuum Insulated Panel / Porextherm / Vacupor	122	122	0
EPS foam board / Type II / [Industry Avg US & CA]	62	62	0
EPS foam board with graphite / BASF / Neopor / Type II	45	45	0
Polyisocyanurate / Wall Boards / [Industry Avg US & CA]	67	67	0
Cork board insulation / Amorim / Isolamentos / R4/inch	-112	49	160
Wood fiberboard / [Industry Avg US & CA]	-169	174	343

Table 3. BEAM results for continuous insulation products

Additional materials would be required to complete the construction of a wall assembly for a whole house. Appendix 2 includes BEAM results for other key material components of a wall assembly, including cladding and drywall options.

Conclusions

Cellulose insulation provides the lowest carbon footprint and the highest amount of net carbon storage of any insulation product in this comparison. The use of cellulose insulation can reduce the carbon footprint of an assembly – and a whole house. Used in combination with other low-carbon and carbon-storing materials, cellulose insulation can play an important role in bringing the overall carbon footprint of new homes down to zero, or even into the range of net carbon storage.

The wide availability of cellulose insulation and its compliance with all residential building codes offers home builders with an immediately accessible pathway to dramatically reducing the carbon footprint of a new home. The use of cellulose insulation is among the most valuable strategies for achieving large reductions in emissions from home building materials.

Appendices

Appendix 1: Assembly details

	MAIN ASSEMBLIES *Based on 100sqft of wall and roof area											
Assembly	Framina	Framing Factor	R-Value	Continuous Insulation	Sheathing	R-Value	Insulation Cavity	R-Value	Insulation Attic	Attic Type	Roof Pitch	TOTAL kg CO2e
5	2x4 @ 16' OC	25%	R-10	Fiber board	7/16th OSB	R-13	Dense pack cellulose	R-38	Loose fill cellulose	Flat	4:12	-263
1	2x4 @ 16' OC	25%	R-10	XPS	7/16th OSB	R-13	Dense pack cellulose	R-38	Loose fill cellulose	Flat	4:12	-14
6	2x4 @ 16' OC	25%	R-10	XPS	7/16th OSB	R-7	Closed cell spray foam		Closed cell spray foam 1" thick	Flat	4:12	120
						R-9	Dense-pack cellulose	R-28	Loose fill cellulose			
3	2x4 @ 16' OC	25%	R-10	XPS	7/16th OSB	R-13	Fiberglass batts	R-38	Loose fill fiberglass	Flat	4:12	198
4	2x4 @ 16' OC	25%	R-10	XPS	7/16th OSB	R-13	Loose fill fiberglass (BIBS)	R-38	Loose fill fiberglass	Flat	4:12	205
2	2x4 @ 16' OC	25%	R-10	XPS	7/16th OSB	R-13	Open cell spray foam	R-38	Open-cell spray foam	Flat	4:12	240

Appendix 2: Wall model comparison graph





SANCTUARY® Blow-In or Spray-Applied Cellulose Insulation by Applegate - Greenfiber

Health Product Declaration v2.3

created via: HPDC Online Builder

HPD UNIQUE IDENTIFIER: 30588

CLASSIFICATION: 07 21 00 Thermal Insulation

PRODUCT DESCRIPTION: SANCTUARY® Insulation by Greenfiber can be installed in attics, walls, floors, and ceilings to significantly improve the comfort, safety and well-being of any home. This is the first all-in-one fiber insulation that can be blown-in or spray-applied, it's suitable for all climates and conditions. Capable of reducing sound power of sound by 60% and heating and cooling costs by 20%, it's easily installed, environmentally responsible, and packaged to optimize coverage and ease of installation.

Section 1: Summary

Basic Method / Product Threshold

CONTENT INVENTORY

Inventory Reporting Format

Nested Materials Method

Basic Method

Threshold Disclosed Per

Material

Product

Threshold Level

C 100 ppm ⊙ 1,000 ppm

O Per GHS SDS

Other

Residuals/Impurities Evaluation

C Completed

Partially Completed

O Not Completed

Explanation(s) provided:

Yes O No.

For all contents above the threshold, the manufacturer has: Characterized Yes ○ No

Provided weight and role.

Screened ⊙ Yes ○ No

Provided screening results using HPDC-approved

methods.

 Yes No Identified

Provided name and CAS RN or other identifier.

CONTENT IN DESCENDING ORDER OF QUANTITY

Summary of product contents and results from screening individual chemical substances against HPD Priority Hazard Lists and the GreenScreen for Safer Chemicals®. The HPD does not assess whether using or handling this product will expose individuals to its chemical substances or any health risk. Refer to Section 2 for further details.

PRODUCT | MATERIAL OR SUBSTANCE | RESIDUAL OR IMPURITY

GREENSCREEN SCORE | HAZARD TYPE

SANCTUARY® BLOW-IN OR SPRAY-APPLIED CELLULOSE INSULATION [UNDISCLOSED LT-1 | END | REP | DEV | MUL | EYE | MAM | SKI UNDISCLOSED BM-3dg | UNDISCLOSED LT-UNK UNDISCLOSED LT-P1 | CAN | SKI | DEV STARCH LT-UNK RECYCLED PAPER]

Number of Greenscreen BM-4/BM3 contents ... 1

Contents highest-concern GreenScreen score(s) (BM-1, LT-1, LT-P1) ... LT-1, LT-P1

Nanomaterial ... No

INVENTORY AND SCREENING NOTES:

Special Conditions applied: [BiologicalMaterial]

Many of the substances in this product are proprietary. Therefore, the chemical information have not been disclosed.

VOLATILE ORGANIC COMPOUND (VOC) CONTENT

VOC Content data is not applicable for this product category.

CERTIFICATIONS AND COMPLIANCE See Section 3 for additional listings.

VOC emissions: CDPH Standard Method V1.1 (Section 01350/CHPS) -Classroom & Office scenario

CONSISTENCY WITH OTHER PROGRAMS

Pre-checked for LEED v4 Option 1. Pre-checked for LEED v4.1 Option 1.

Third Party Verified?

O Yes No

PREPARER: Self-Prepared

VERIFIER:

VERIFICATION #:

SCREENING DATE: 2022-11-10 **PUBLISHED DATE: 2022-11-10**

EXPIRY DATE: 2025-11-10



This section lists contents in a product based on specific threshold(s) and reports detailed health information including hazards. This HPD uses the inventory method indicated above, which is one of three possible methods:

- Basic Inventory method with Product-level threshold.
- Nested Material Inventory method with Product-level threshold
- · Nested Material Inventory method with individual Material-level thresholds

Definitions and requirements for the three inventory methods and requirements for each data field can be found in the HPD Open Standard version 2.3, available on the HPDC website at: www.hpd-collaborative.org/hpd-2-3-standard

SANCTUARY® BLOW-IN OR SPRAY-APPLIED CELLULOSE INSULATION

PRODUCT THRESHOLD: 1000 ppm

RESIDUALS AND IMPURITIES EVALUATION COMPLETED: Partially

RESIDUALS AND IMPURITIES NOTES: Aside from paper, no significant contaminants are found in the raw material inputs. No residuals and impurities above the inventory threshold are observed during the product manufacturing.

OTHER PRODUCT NOTES:

RECYCLED PAPER ID: Biological Material

HAZARD DATA SOURCE: HPDC Special Conditions Policy

%: 83.5000 - 85.0000 GreenScreen: Not Required RC: PostC NANO: No MATERIAL ROLE: Insulator

HAZARD TYPE AGENCY AND LIST TITLES WARNINGS

Hazard Screening is not applicable to this Special Condition

BIOLOGICAL MATERIALS CATEGORY: Tree-based materials

INGREDIENT DESCRIPTION: 65996-61-4

MATERIAL CONTENT NOTES: Post-consumer recycled wastepaper makes almost 85% of the total mass of our sanctuary insulation. The incoming waste paper is shredded and the addition of other raw materials in several manufacturing operations produces the final sanctuary.

This disclosure does not provide information on allergens, hyper-accumulation of metals, production of any toxic substances during normal metabolic activities, pesticides, and other potential hazards or sources of hazards which may be found in certain biological materials.

UNDISCLOSED ID: Undisclosed

HAZARD DATA SOURCE: Pharos Chemical and Materials Library HAZARD SCREENING DATE: 2022-11-10 7:12:44

%: 8.5000 - 9.3000 GreenScreen: LT-1 RC: None NANO: No SUBSTANCE ROLE: Flame retardant

HAZARD TYPE	AGENCY AND LIST TITLES	WARNINGS
END	TEDX - Potential Endocrine Disruptors	Potential Endocrine Disruptor
REP	EU - SVHC Authorisation List	Toxic to reproduction - Candidate list
DEV	MAK	Pregnancy Risk Group B
REP	EU - Annex VI CMRs	Reproductive Toxicity - Category 1B
MUL	ChemSec - SIN List	CMR - Carcinogen, Mutagen &/or Reproductive Toxicant
REP	EU - SVHC Authorisation List	Toxic to reproduction - Prioritized for listing
END	EU - Priority Endocrine Disruptors	Category 1 - In vivo evidence of Endocrine Disruption Activity
REP	GHS - Japan	H360 - May damage fertility or the unborn child [Toxic to reproduction - Category 1B]
REP	GHS - Australia	H360FD - May damage fertility. May damage the unborn child [Reproductive toxicity - Category 1A or 1B]
REP	EU - GHS (H-Statements) Annex 6 Table 3-1	H360FD - May damage fertility. May damage the unborn child [Reproductive toxicity - Category 1A or 1B]
EYE	GHS - New Zealand	Eye irritation category 2
MAM	GHS - Japan	H370 - Causes damage to organs [Specific target organs/systemic toxicity following single exposure - Category 1]
SKI	GHS - Japan	H315 - Causes skin irritation [Skin corrosion / irritation - Category 2]
REP	GHS - New Zealand	Reproductive toxicity category 2
ADDITIONAL LISTINGS	AGENCY	NOTIFICATION
RESTRICTED LIST	US Environmental Protection Agency (US	US EPA - DfE SCIL
	EPA)	Yellow Triangle - best available in class but some hazard profile issues
RESTRICTED LIST	Cradle to Cradle Products Innovation Institute (C2CPII)	C2C Certified v4 Product Standard Restricted Substances List (RSL) - Effective July 1, 2022
		Biological and Environmentally Released Materials
RESTRICTED LIST	Cradle to Cradle Products Innovation Institute (C2CPII)	C2C Certified v4 Product Standard Restricted Substances List (RSL) - Effective July 1, 2022
		Children's Products
RESTRICTED LIST	Cradle to Cradle Products Innovation Institute (C2CPII)	C2C Certified v4 Product Standard Restricted Substances List (RSL) - Effective July 1, 2022
		Cosmetics & Personal Care Products

 ${\small \texttt{SUBSTANCE NOTES:}} \ \textbf{As this is a proprietary substance, the name and CAS RN number is hidden.}$

UNDISCLOSED	ID: Undisclosed

HAZARD DATA SOURCE:	Pharos Chemical and Materials Library	HAZARD SO	CREENING DATE:	2022-11-10 7:12:44
%: 2.3000 - 3.5000	GreenScreen: BM-3dg	RC: PreC	NANO: No	SUBSTANCE ROLE: Flame retardant
HAZARD TYPE	AGENCY AND LIST TITLES		WARNINGS	
	EC - CEPA DSL		Persistent	
ADDITIONAL LISTINGS	AGENCY		NOTIFICATION	
None found			No	listings found on Additional Hazard Lists

SUBSTANCE NOTES: Plants use different gypsum materials so the CAS numbers varies by plants. Sanctuary plants in Waco, Texas and Norfolk, Connecticut use this CAS# for gypsum.

The name and CAS RN number is hidden since this is a proprietary substance.

UNDISCLOSED ID: Undisclosed

HAZARD DATA SOURCE:	Pharos Chemical and Materials Library	HAZARD SO	CREENING DATE:	2022-11-10 7:12:45
%: 2.3000 - 3.5000	GreenScreen: LT-UNK	RC: PreC	NANO: No	SUBSTANCE ROLE: Flame retardant
HAZARD TYPE	AGENCY AND LIST TITLES		WARNINGS	
None found			No warr	nings found on HPD Priority Hazard Lists
ADDITIONAL LISTINGS	AGENCY		NOTIFICATION	
None found			No	listings found on Additional Hazard Lists

SUBSTANCE NOTES: Plants use different gypsum materials so the CAS numbers varies by plants. Sanctuary plants in Tampa, Florida; Wilkes Barre, Pennsylvania; Salt Lake City, Utah; and Mesa, Arizona use this CAS# for gypsum.

As this is a proprietary substance, the name and CAS RN number is hidden.

HAZARD DATA SOURCE:	Pharos Chemical and Materials Library	HAZARD SCREENING DATE: 2022-11-10 7:12:46			
%: 1.5000 - 2.0000	GreenScreen: LT-P1	RC: None	NANO: No	SUBSTANCE ROLE: Hydraulic fluid	
HAZARD TYPE	AGENCY AND LIST TITLES		WARNINGS		
CAN	GHS - Australia		H350 - May cau 1A or 1B]	se cancer [Carcinogenicity - Category	
01/1	0110 4 . 11				

None found		No listings found on Additional Hazard Lis
ADDITIONAL LISTINGS	AGENCY	NOTIFICATION
DEV	GHS - Australia	H361d - Suspected of damaging the unborn child [Reproductive toxicity - Category 2]
SKI	GHS - Australia	H315 - Causes skin irritation [Skin corrosion/irritation - Category 2]
CAN	GHS - Australia	H350 - May cause cancer [Carcinogenicity - Category 1A or 1B]

UNDISCLOSED

ID: Undisclosed

SUBSTANCE NOTES: Various CAS numbers are available for distillate mineral oil and are used in different plants; all have similar hazards on human health.

As this is a proprietary substance, the name and CAS RN number is hidden.

STARCH ID: 9005-25-8

HAZARD DATA SOURCE:	Pharos Chemical and Materials Library	HAZARD S	CREENING DATE:	2022-11-10 7:12:46
%: 1.3000 - 1.4000	GreenScreen: LT-UNK	RC: None	NANO: No	SUBSTANCE ROLE: Binder
HAZARD TYPE	AGENCY AND LIST TITLES		WARNINGS	
None found			No warni	ngs found on HPD Priority Hazard Lists
ADDITIONAL LISTINGS	AGENCY		NOTIFICATION	
EXEMPT	European Union / European Cor	mmission	EU - REACH Exer	mptions
	(EU EC)		Exempted from R safety	EACH Annex IV listing due to intrinsic
POSITIVE LIST	US Environmental Protection Ag	gency (US	US EPA - DfE SC	IL
	EPA)		Green Circle - Ver	rified Low Concern

SUBSTANCE NOTES: Corn starch can be used as an equivalent to wheat starch, they both have similar chemical performance and function as a binder.



Section 3: Certifications and Compliance

This section lists applicable certification and standards compliance information for VOC emissions and VOC content. Other types of health or environmental performance testing or certifications completed for the product may be provided.

EXPIRY DATE:

VOC EMISSIONS

CDPH Standard Method V1.1 (Section 01350/CHPS) - Classroom & Office scenario

CERTIFYING PARTY: Third Party

ISSUE DATE: 2013-01-04

APPLICABLE FACILITIES: Applicable to all manufacturing

CERTIFIER OR LAB: Berkeley Analytical: The Environmental

facilities of Applegate Greenfiber Insulation.

Testing Laboratory

CERTIFICATE URL:

CERTIFICATION AND COMPLIANCE NOTES: Certificate number: 130104-02; Loose fill insulation demonstrated compliance to school classroom and private office exposure scenario to individual VOCs of concern and formaldehyde.



Section 4: Accessories

This section lists related products or materials that the manufacturer requires or recommends for installation (such as adhesives or fasteners), maintenance, cleaning, or operations. For information relating to the contents of these related products, refer to their applicable Health Product Declarations, if available.

No accessories are required for this product.

Section 5: General Notes

Sanctuary is engineered to fill tiny crevices and gaps, creating a dense, scientifically advanced barrier. As cellulose insulation that can be blown-in or spray-applied, Sanctuary can be easily installed over existing insulation, and unlike batt or roll alternatives, it is engineered to fill every gap, void and hard-to-reach place without time-consuming cutting and fitting.

MANUFACTURER INFORMATION

MANUFACTURER: Applegate - Greenfiber

ADDRESS: 7535 E Ray Road Mesa Arizona 85212, US

WEBSITE: https://www.greenfiber.com

CONTACT NAME: Rick Lieberman

TITLE: Plant Manager PHONE: 216-905-8625

EMAIL: rick.lieberman@aggfinsulation.com

The listed contact is responsible for the validity of this HPD and attests that it is accurate and complete to the best of his or her knowledge.

KEY

Hazard Types

AQU Aquatic toxicity

CAN Cancer

DEV Developmental toxicity

END Endocrine activity

EYE Eye irritation/corrosivity

GEN Gene mutation

GLO Global warming

LAN Land toxicity

MAM Mammalian/systemic/organ toxicity

MUL Multiple

NEU Neurotoxicity

NF Not found on Priority Hazard Lists

OZO Ozone depletion

PBT Persistent, bioaccumulative, and toxic

PHY Physical hazard (flammable or reactive)

REP Reproductive

RES Respiratory sensitization

SKI Skin sensitization/irritation/corrosivity

UNK Unknown

GreenScreen (GS)

BM-4 Benchmark 4 (prefer-safer chemical)

BM-3 Benchmark 3 (use but still opportunity for improvement)

BM-2 Benchmark 2 (use but search for safer substitutes)

BM-1 Benchmark 1 (avoid - chemical of high concern)

BM-U Benchmark Unspecified (due to insufficient data)

LT-P1 List Translator Possible 1 (Possible Benchmark-1)

LT-1 List Translator 1 (Likely Benchmark-1)

LT-UNK List Translator Benchmark Unknown

NoGS No GreenScreen.

GreenScreen Benchmark scores sometimes also carry subscripts, which provide more context for how the score was determined. These are DG (data gap), TP (transformation product), and CoHC (chemical of high concern). For more information, see 2.2.2.4 GreenScreen® for Safer Chemicals, www.greenscreenchemicals.org, and Best Practices for Hazard Screening on the HPDC website (hpd-collaborative.org).

Recycled Types

PreC Pre-consumer recycled content

PostC Post-consumer recycled content

UNK Inclusion of recycled content is unknown

None Does not include recycled content

Other Terms:

GHS SDS Globally Harmonized System of Classification and Labeling of Chemicals Safety Data Sheet

Inventory Methods:

Nested Method / Material Threshold Substances listed within each material per threshold indicated per material Nested Method / Product Threshold Substances listed within each material per threshold indicated per product

Basic Method / Product Threshold Substances listed individually per threshold indicated per product

Nano Composed of nano scale particles or nanotechnology

Third Party Verified Verification by independent certifier approved by HPDC

Preparer Third party preparer, if not self-prepared by manufacturer

Applicable facilities Manufacturing sites to which testing applies

The Health Product Declaration (HPD) Open Standard provides for the disclosure of product contents and potential associated human and environmental health hazards. Hazard associations are based on the HPD Priority Hazard Lists, the GreenScreen List Translator™, and when available, full GreenScreen® assessments. The HPD Open Standard v2.1 is not:

- a method for the assessment of exposure or risk associated with product handling or use,
- a method for assessing potential health impacts of: (i) substances used or created during the manufacturing process or (ii) substances created after the product is delivered for end use.

Information about life cycle, exposure and/or risk assessments performed on the product may be reported by the manufacturer in appropriate Notes sections, and/or, where applicable, in the Certifications section.

The HPD Open Standard was created and is supported by the Health Product Declaration Collaborative (the HPD Collaborative), a customer-led organization composed of stakeholders throughout the building industry that is committed to the continuous improvement of building products through transparency, openness, and innovation throughout the product supply chain.

The product manufacturer and any applicable independent verifier are solely responsible for the accuracy of statements and claims made in this HPD and for compliance with the HPD standard noted.



SANCTUARY® Blow-In or Spray-Applied Cellulose Insulation Greenfiber

Final Assembly: Multiple Locations in North America

Life Expectancy: 100 Year(s)

End of Life Options: Salvageable/Reusable in its Entirety,

Biodegradable/Compostable (85%), Landfill (15%)

Ingredients:

Newspaper (Cellulose Fiber): Pulp, cellulose; Boric Acid: Boric acid; Calcium Sulfate Dihydrate: Calcium sulfate (dihydrate); Distillate Mineral Oil: Distillate Mineral Oil

Living Building Challenge Criteria: Compliant

I-13 Red List:

■ LBC Red List Free

□ LBC Red List Approved

% Disclosed: 100% at 100ppm VOC Content: Not Applicable

□ Declared

I-10 Interior Performance: CDPH Standard Method v1.2-2017
I-14 Responsible Sourcing: Salvaged Wood Content

GRF-0001 EXP. 01 NOV 2025

Original Issue Date: 2022



SANCTUARY® DEFENSE Insulation Greenfiber

Final Assembly: Multiple Locations in North America

Life Expectancy: 100 Year(s)

End of Life Options: Salvageable/Reusable in its Entirety,

Biodegradable/Compostable (85%), Landfill (15%)

Ingredients:

Pulp, cellulose; Boric acid; Distillate Mineral Oil

Living Building Challenge Criteria: Compliant

1-13 Red List:

■ LBC Red List Free

% Disclosed: 100% at 100ppm

LBC Red List Approved

VOC Content: Not Applicable

■ Declared

I-10 Interior Performance: CDPH Standard Method v1.2-2017

I-14 Responsible Sourcing: Salvaged Wood Content

GRF-0002 EXP. 01 DEC 2025

Original Issue Date: 2024





Education & General Technical Documents

- BUILD AMERICA, BUY AMERICA ACT (BABA) Certification 2025
- Greenfiber® 2025 Manufacturers Certification
- Greenfiber® FRM Two-Hour Firewall Limited Lifetime Warranty
- Greenfiber® Limited Lifetime Warranty
- Sprinkler Omission Report
- · Vapor Barrier Bulletin
- · Greenfiber® AIA Curricula



CERTIFICATION OF COMPLIANCE WITH BUILD AMERICA, BUY AMERICA ACT (BABA) PROVISIONS

January 1, 2025

To Whom It May Concern:

This letter certifies that Greenfiber and all its insulation products sold in the United States, are manufactured in twelve manufacturing facilities geographically located in the U.S. These locations are Wilkes Barre, PA; Chambersburg, PA; Eastanolle, GA; Tampa, FL; Decatur, AL, Webberville, MI; Hickory, KY; Waco, TX; Norfolk, NE; Lester Prairie, MN; Salt Lake City, UT; and Chandler, AZ.

Therefore, for purposes of compliance with Public Law 117-58, Build America, Buy America (BABA) included in the Infrastructure and Investment & Jobs Act (IIJA) – also referred to as the Bipartisan Infrastructure Law (BIL) – under Title IX, Subtitle A, Part 1 – Buy America Sourcing Requirements, all **Greenfiber's insulation products sold** in the U.S. for use in projects whether for new construction or renovation projects are produced in the U.S.

Please feel free to contact me if you have any questions.

Sincerely,

Steve Gerber

Vice President Business Development

Phone: 434-233-2846

Email: steve.gerber@greenfiber.com



MANUFACTURER'S CERTIFICATION STATEMENT

For the Non-Business Energy Property Tax Credits and Energy Efficiency Tax Credit 25C

Applegate Greenfiber Acquisition, LLC certifies that any Greenfiber insulation product, including the following listed below, are "Eligible Building Envelope Components" that qualify for the Non-Business Energy Property Tax Credits and Energy Efficiency Tax Credit 25C that are in effect from 1/1/2023 through 12/31/2032.

SANCTUARY® Blow-In or Spray-Applied Insulation (INSSANC) Applegate Stabilized Insulation (ASC) SupremePlus

This tax credit applies to qualified energy efficient products purchased and installed between January 1, 2023 and December 31, 2032. The tax credit amount is 30% of the total insulation cost, up to \$1200 per year (EXCLUDING INSTALLATION). This credit is applicable for the 2025 tax year.

A taxpayer is not required to attach this certification statement to the return on which the credit is claimed. Income tax regulations require taxpayers maintain records enough to establish the entitlement to any credit claimed. This certification statement and installation instructions are provided in printable form at greenfiber.com/support.

Under penalties of perjury, I declare that I have examined this certification statement, and to the best of my knowledge and belief, the facts are true, correct, and complete.

Tom VanAlstine, CEO

Applegate Greenfiber Acquisitions, LLC

Applegate Greenfiber Acquisitions, LLC (AGGF) does not provide architectural, inspection or engineering services and disclaims any responsibility with respect thereto. AGGF does not guarantee, warrant or attempt to determine whether a building structure, design or the use of materials therein complies with any applicable codes, standards, guidelines or standards of workmanship. The user maintains the full and complete responsibility to comply with all codes, laws and regulations applicable to the safe and proper use, handling and installation of the product and should consult with an architect and/or engineer for all construction and design related questions. The information contained herein is believed to be accurate as of the time of preparation. However, AGGF makes no warranty concerning the accuracy of this information. AGGF will not be liable for claims relating to the use of information contained herein, regardless of whether it is claimed that the information or recommendations are inaccurate, incomplete or incorrect.

HOMEOWNER'S CERTIFICATION:

The following product(s) has (have) been installed in the primary residence of the following taxpayer:

Homeowner's Name:				SSN:		
Primary Residence Address:						
Products Installed:						
Price Paid for Products:	Date Purchased:	I	1	Date Installed:	1	I





Limited Lifetime Warranty

Congratulations on having Greenfiber® insulation installed in your new home. With Greenfiber insulation, you're assured of having a comfortable, more energy efficient home. This insulation has been installed with the following rating:



Owner	Builder/Contractor
Address	Builder/Contractor Address
Date Insulation Installed	Builder/Contractor Signature
Insulation Installer	Builder/Contractor License Number

Cut along dotted line

Limited Lifetime Warranty Registration Form

Homeowner Name	Insulation Installer Name	
Property Address	Builder/Contractor Name	
Telephone Number (day time/evening)	Builder/Contractor Address	
Email		
Date Insulation Installed	Owner Signature	Date



ostage



Limited Lifetime Warranty

1. Limited Warranty Coverage

This warranty applies to the original purchaser of Greenfiber Fire Rated Material Insulation (FRM) manufactured by Greenfiber for the U370, SANCTUARY Two-Hour Firewall Assembly, and to any owner of a building in which the Greenfiber FRM Insulation is originally installed. Greenfiber warrants that Greenfiber FRM Insulation will, at the initial date of purchase, meet the requirements of the U370 UL listed assembly specifications, Amended CPSC Standard (16 CFR Part 1209), ASTM C739 and has building code acceptance by the Family of International Codes as published by the ICC and the National Building Code of Canada, Universal Building Code Acceptance including Title 24 Part 3280 for manufactured housing. Greenfiber FRM Insulation has a Class 1/A rating for flame spread when tested in accordance with ASTM E84. Greenfiber further warrants that the Product will, for the lifetime of the structure, a.) be free from manufacturing defects; b.) not deteriorate under normal and proper use, including the chemical fire-retardant treatment if the insulation is installed according to Greenfiber's U370 Assembly instructions.

2. Exclusions From Warranty Coverage

This limited warranty provides a remedy only for nonconformities reported in accordance with paragraph 6 below. This warranty does not provide a remedy for nonconformities caused by:

Product not being installed in compliance with all acceptable building codes and installed in accordance with Greenfiber's instructions.

Defects in the workmanship of the installation of the Product.

Misuse, neglect, or failure to preserve the product or area in which it is applied.

Acts of God such as impact of foreign objects, fire, hurricane, tornado, flood or other violent storm or casualty.

Defects in failure of, or damage to, the wall or ceiling against which the insulation is resting, caused by movement, distortion, cracking, or settling of such wall or ceiling or the foundation of the building.

Defects to or failure of the insulation space arising from water or humidity intrusion caused by improper installation, workmanship, maintenance or repair to plumbing, structural, barrier, electrical, heating, ventilation, cooling or other building systems.

3. Exclusion Of Implied Warranties

THIS LIMITED WARRANTY IS THE ONLY WARRANTY APPLICABLE TO THIS PRODUCT AND EXCLUDES ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTIES, OTHERWISE ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE, EXCEPT WHERE SUCH PRODUCT PURCHASE IS

SUBJECT TO CONSUMER PRODUCT WARRANTY LAW, IN WHICH INSTANCES ANY APPLICABLE IMPLIED WARRANTIES ARE LIMITED TO 25 YEARS OR SUCH SHORTER PERIOD AS PERMITTED OR REQUIRED UNDER APPLICABLE LAW.

Some states do not allow limitations on how long an implied warranty lasts, so the above limitations may not apply to you.

Other than as set forth herein, no other express warranty has been made or will be made on behalf of Greenfiber with respect to this Product.

4. Remedies

This section provides the sole remedy available to the original purchaser or owner from Greenfiber for any nonconformity in the Product. In the event of any nonconformity covered by this, or any implied warranty, Greenfiber at its option will:

- a. Provide the claimant with insulation to repair or replace the defective insulation.
- b. Refund the claimant's actual purchase price if 1.) the claimant is willing to accept a refund; or 2.) Greenfiber deems the repair is not commercially practicable or cannot be made in a timely manner.

5. Exclusion Of Other Remedies

In no event will Greenfiber be liable for labor, installation or any incidental, special, indirect or consequential damages resulting from any defect in the Product supplied including but not limited to damage to property. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation exclusion may not apply to you.

6. Responsibilities Of Owners

Any owner seeking remedies under this warranty must notify Greenfiber in writing within 30 days after discovering a possible nonconformity of the Product, and before beginning any permanent repair. This written notice should describe the possible nonconformity and include the date the Product was installed. It is the owner's responsibility to establish the date of installation.

Immediately upon discovering any possible nonconforming Product, the owner must immediately make temporary repairs at the owner's expense to protect all property that could be affected.

The owner must allow Greenfiber agents to enter the property and building into which the Product is installed to inspect the possibly nonconforming Product.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

Greenfiber® 5500 77 Center Drive, Suite 100 Charlotte, NC 28217

www.areenfiber.com

Email: info@aggfinsulation.com

Toll Free: 800-228-0024 Fax: 704-522-3748





Limited Lifetime Warranty

Congratulations on having an insulation product from Greenfiber® installed in your home. With Greenfiber insulation, you're assured of having a comfortable, more energy efficient home. This insulation has been installed with the following rating:

Ceiling R	Wall R	creators of S A N C T U A R Y
Owner	Builder/Cont	tractor
Address	Builder/Cont	tractor Address
Date Insulation Installed	Builder/Cont	tractor Signature
Insulation Installer	Builder/Cont	tractor License #
	Obtain top portion of form for your red	cords.
	ited Lifetime Warranty Requires send completed form to info@greenfiber.com or n	
Homeowner Name	Insulation Ins	staller Name
Property Address	Builder/Cont	tractor Name
Telephone Number (day time/evening)	Builder/Cont	tractor Address

Owner Signature



Date

Date Insulation Installed

Place



Limited Lifetime Warranty

1. Limited Warranty Coverage

This warranty applies to the original purchaser of any residential insulation product manufactured by Greenfiber (the "Product") and to any owner of a building in which the Product is originally installed. Greenfiber warrants that the Product will, at the initial date of purchase, meet the requirements of the Amended CPSC Standard (16 CFR Part 1209), ASTM C739 and has building code acceptance by the Family of International Codes as published by the ICC and the National Building Code of Canada, Universal Building Code Acceptance including Title 24 Part 3280 for manufactured housing. Greenfiber Insulation has a Class 1/A rating for flame spread when tested in accordance with ASTM E84. Greenfiber further warrants that the Product will, for the lifetime of the structure, a.) be free from manufacturing defects; b.) not deteriorate under normal and proper use, including the chemical fire retardant treatment if the insulation is installed according to Greenfiber's instructions.

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Defects in the workmanship of the installation of the Product.

Misuse, neglect, or failure to preserve the product or area in which it is applied.

Acts of God such as impact of foreign objects, fire, hurricane, tornado, flood or other violent storm or casualty.

Defects in failure of, or damage to, the wall or ceiling against which the insulation is resting, caused by movement, distortion, cracking, or settling of such wall or ceiling or the foundation of the building.

Defects to or failure of the insulation space arising from water or humidity intrusion caused by improper installation, workmanship, maintenance or repair to plumbing, structural, barrier, electrical, heating, ventilation, cooling or other building systems.

3. Exclusion Of Implied Warranties

THIS LIMITED WARRANTY IS THE ONLY WARRANTY APPLICABLE TO THIS PRODUCT AND EXCLUDES ALL OTHER WARRANTIES INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE, AND ANY IMPLIED WARRANTIES, OTHERWISE ARISING FROM A COURSE OF DEALING OR USAGE OF TRADE, EXCEPT WHERE SUCH PRODUCT PURCHASE IS

SUBJECT TO CONSUMER PRODUCT WARRANTY LAW, IN WHICH INSTANCES ANY APPLICABLE IMPLIED WARRANTIES ARE LIMITED TO 25 YEARS OR SUCH SHORTER PERIOD AS PERMITTED OR REQUIRED UNDER APPLICABLE LAW.

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Other than as set forth herein, no other express warranty has been made or will be made on behalf of Greenfiber with respect to this Product.

4. Remedies

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- a. Provide the claimant with insulation to repair or replace the defective insulation.
- b. Refund the claimant's actual purchase price if 1.) the claimant is willing to accept a refund; or 2.) Greenfiber deems the repair is not commercially practicable or cannot be made in a timely manner.

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Immediately upon discovering any possible nonconforming Product, the owner must immediately make temporary repairs at the owner's expense to protect all property that could be affected.

The owner must allow Greenfiber agents to enter the property and building into which the Product is installed to inspect the possibly nonconforming Product.

This warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

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Toll Free: 800-228-0024 Fax: 704-522-3748





SPRINKLER OMISSION

SANCTUARY does not meet the requirements to be considered non-combustible, however as a limited-combustion material, it does meet the requirements of allowable sprinkler omission referenced in NFPA 13, 2022 Edition, Section 9.2.1. Greenfiber recommends confirming this with the code official having jurisdiction, in advance of construction, where this sprinkler omission is being considered.

Section 9.2.1 provides for sprinkler omission locations in concealed spaces, providing certain material attributes are Allowable Sprinkler Omission Locations.

Section 9.2.1.1 states that concealed spaces of noncombustible and limited-combustible construction with minimal combustible loading that has no access shall not require sprinkler protection. A concealed space includes a space even with small openings such as those used as a return are for a plenum

Section 4.9.2.2 in NFPA 13, 2022 Edition provides guidance on the requirements for a limited-combustion material. It states that the material used shall not have a flame spread index greater than 25, now evidence of continued progressive combustion when tested in accordance with ASTM 84 or UL 723. Reference Greenfiber's UL Solutions Evaluation Report UL ER15890-01, issued 08/15/2023 and revised 06/06/24 in Section 5 confirms that SANCTUARY cellulose insulation has a flame spread rating of not more than 25.



Greenfiber® Corporate Office 5500 77 Center Drive, Suite100 Charlotte, NC 28217 800.228.0024 / www.greenfiber.com

Cellulose Insulation, Moisture, and Vapor Barriers

Cellulose is the only insulation in common use that actually manages moisture. Moisture moves by two transport mechanisms: air movement and diffusion. Of these two, air movement is the more significant; accounting for over 98% of the total, and it is the primary cause for moisture related building failures. When cellulose insulation is blown or sprayed into a cavity at a density above 3.2 lbs/cf, the cellulose will impede the movement of air generated by wind, stack effect, and mechanical imbalances within the building. By blocking the movement of moisture-laden air, cellulose will reduce moisture movement to manageable levels within the building assemblies. Any remaining moisture moving by diffusion will be further blocked by primers and paints used on the interior surfaces.

In our Northeast climate, a vapor barrier is not only unnecessary but can also be potentially harmful, especially during the summer months in air-conditioned buildings, when warm moist air passes through wall assemblies and condenses on the outside of the cool poly vapor barrier. The hygroscopic nature of cellulose insulation allows it to manage and wick moisture from areas of greater to lesser concentrations, thus preventing damaging amounts of moisture from accumulating, as long as the path is not blocked by a vapor barrier. During most of the year in the Northeast, a vapor permeable wall will tend to dry to the outside, while in the summer, this same wall will tend to dry to the inside.

The tens of thousands of homes weatherized with cellulose insulation since the 1970's, with no vapor barriers and no evidence of mold or structural damage, are a testament to this claim. Sophisticated moisture modeling by Mark E. Kelley III, PE, demonstrates that cellulose insulated building assemblies without a vapor barrier show faster drying and lower overall moisture levels over identical assemblies with vapor barriers installed.

In summary, we do not recommend the use of vapor barriers with cellulose insulation, except in circumstances of exceptionally high moisture levels, such as an indoor pool facility, and we warrant our cellulose insulation for the life of the building when installed by an approved GreenFiber insulation contractor.

Greenfiber® Continuing Education Opportunities





Greenfiber, the largest manufacturer of cellulose insulation, is at the forefront of insulation technology, continuing to lead the way in sustainability and investment in a decarbonized economy. Greenfiber insulation is made from up to 85% recycled paper and cardboard—higher recycled content than almost any other commonly used building material. Couple this with low-energy manufacturing and short-haul transportation and it's clear why Greenfiber has the lowest embodied carbon of any other major insulation.

Greenfiber is also committed to offering insulation that does more than regulate temperature—it brings more peace, quiet, and comfort to a house while supporting the health and well-being of those who call it home. Greenfiber products reduce sound power by 60%, equalize temperatures from room to room, and qualify as fire-blocking materials.

Our goal is to build a more comfortable world by providing something that has become increasingly harder to find—SANCTUARY®.



Greenfiber AIA Curicula Catalog

Building Science for Residential Buildings

Credit: 2 LU | HSW

Explore how we have used energy and HVAC past, present, and future. We then take a deep dive into building science and how to build as a holistic system to create environments that are healthy, safe, durable, and comfortable.

Understanding the IECC: Energy Code Compliance Options

Credit: 1 LU | Elective

This course provides participants with and understanding IECC Energy Code Compliance Options and the shift to U-Factor as a basis of compliance replacing R-Value. Learn prescriptive and performance options and applicability to above code programs.

Single Family Attached Fire & Sound Rated Wall Assemblies

Credit: 1 LU HSW

This course evaluates two-hour fire-resistance-rated walls used in single-family attached and multifamily residential construction, the options available in today's marketplace, firewall installation requirements, and fire resistance testing.

Introduction to Building Science

Credit: 1 LU | HSW

Learn the seven tenets of Building Science and connect the interconnection of all systems in the building. The course will focus on health, safety, durability, and lastly energy efficiency.

Advanced Cellulose Insulation: Quiet, Comfortable, Safe, and Sustainable

Credit: 1 LU HSW

Cellulose insulation has been used successfully by builders and designers for hundreds of years to provide comfort and warmth and is uniquely positioned for today's modern building environment. This course explains its environmental benefits, including its carbon capture ability, how it improves occupant health and well-being, and its numerous high-performance thermal, acoustic, and fire-resistant attributes

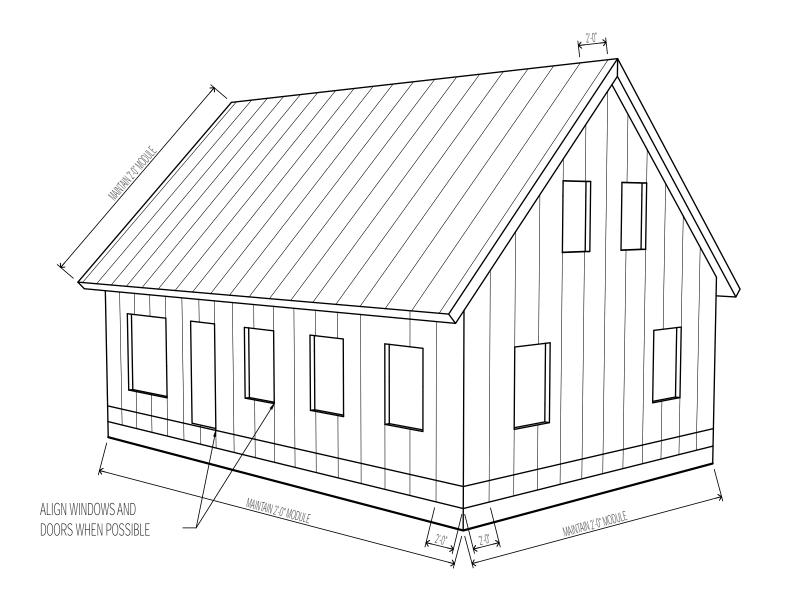




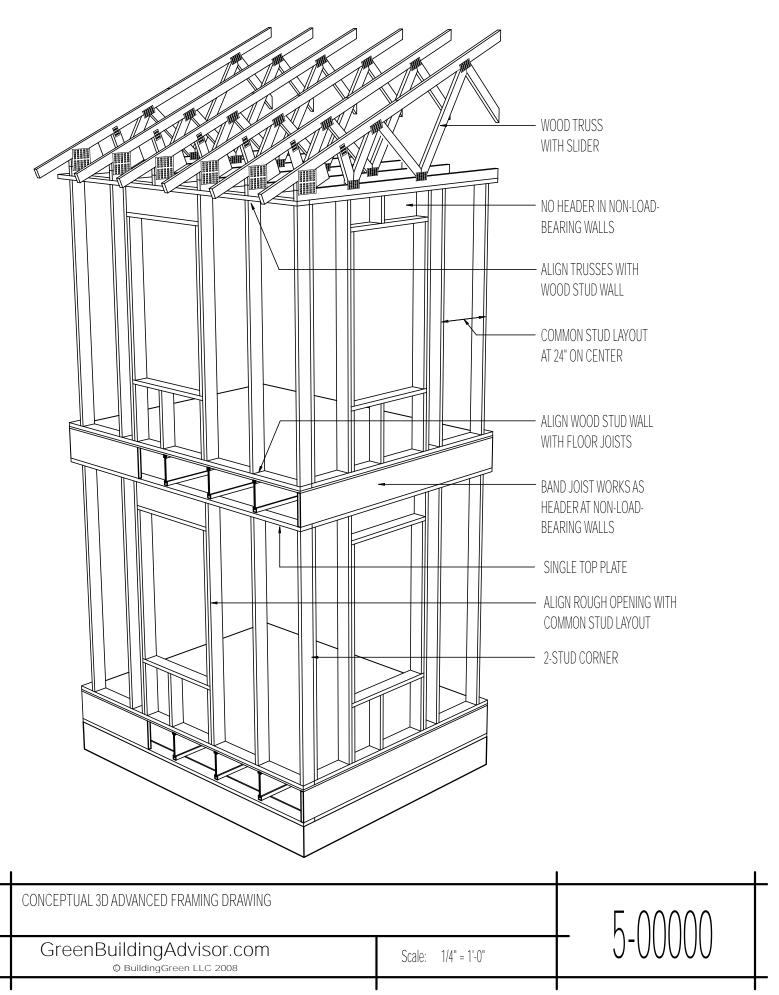


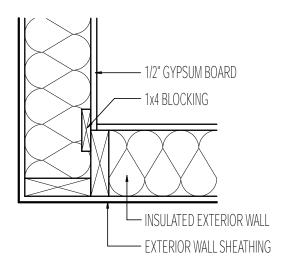
Architectural Detail Library

- Advanced Framing
 Insulated Corners
 Insulated Headers
 Insulated Interior Exterior Wall Intersections
 Minimal Framing At Doors And Windows
 Minimum Wall Studs
- Best Practices for the Design and Construction of the SANCTUARY Two-Hour Firewall with Greenfiber FRM Insulation

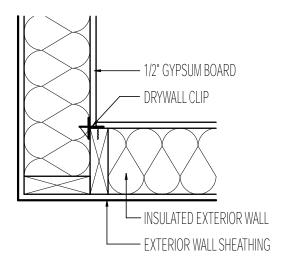


CONCEPTUAL 2'-0" MODULE HOUSE DRAWING		5 NNN1
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: not to scale	7-00001

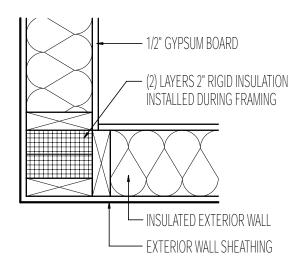




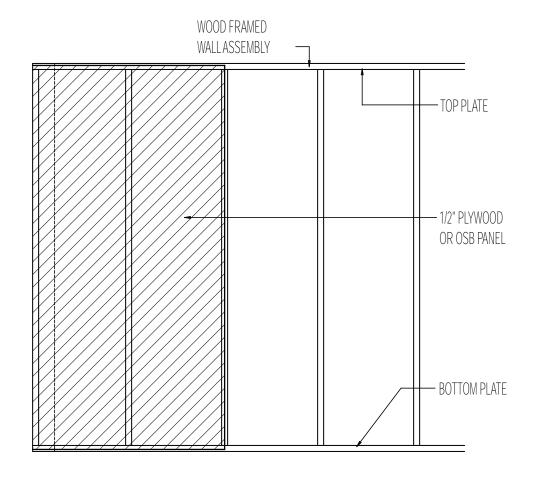
2-STUD CORNER WITH 1x4 BACKER		5 00004
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 11/2" = 1'-0"	T 3-0000



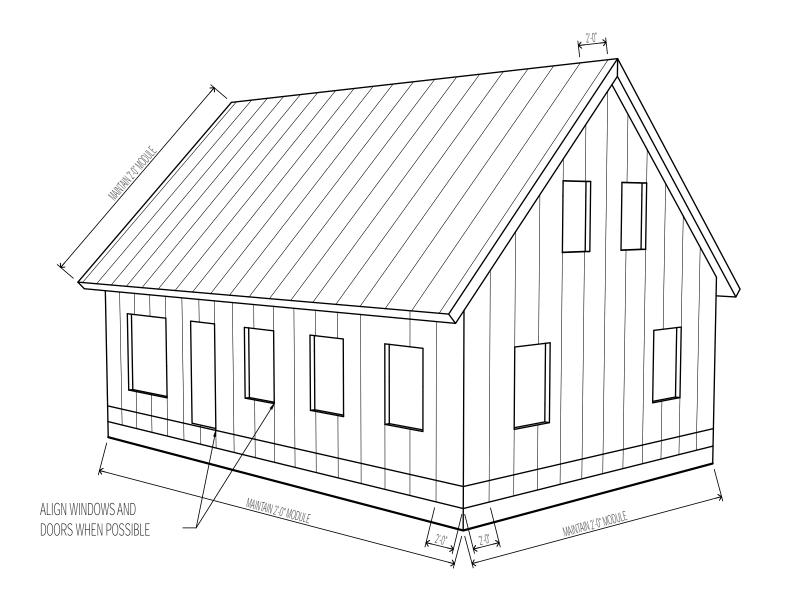
2-STUD CORNER WITH DRYWALL CLIPS		5 00005
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 1 1/2" = 1'-0"	T 3-0000



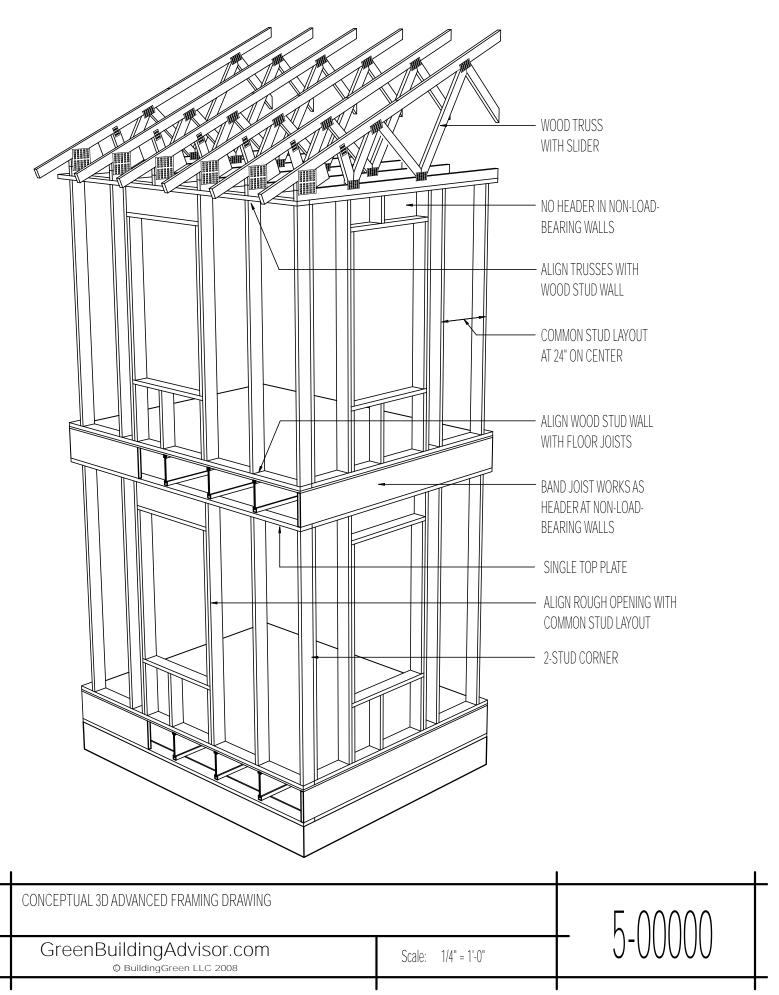
3-STUD CORNER WITH RIGID INSULATION		5 00007
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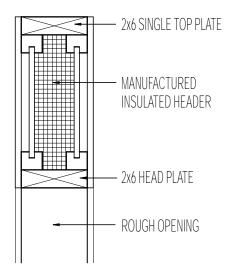


CORNER INSTALLED PLYWOOD OR OSB AS SHEAR BRACING		5 00050
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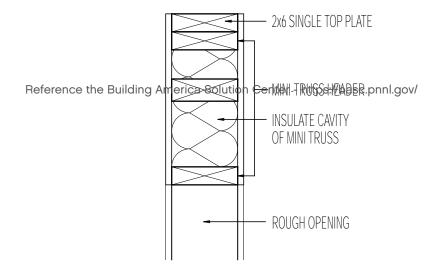


CONCEPTUAL 2'-0" MODULE HOUSE DRAWING		5 NNN1
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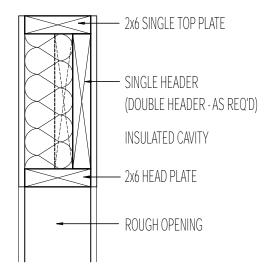




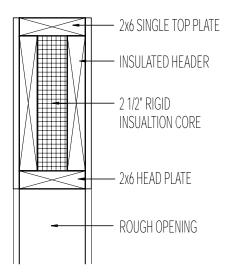
MANUFACTURED INSULATED HEADER		L 5 00015
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 11/2" = 1'-0"	T 3-00013



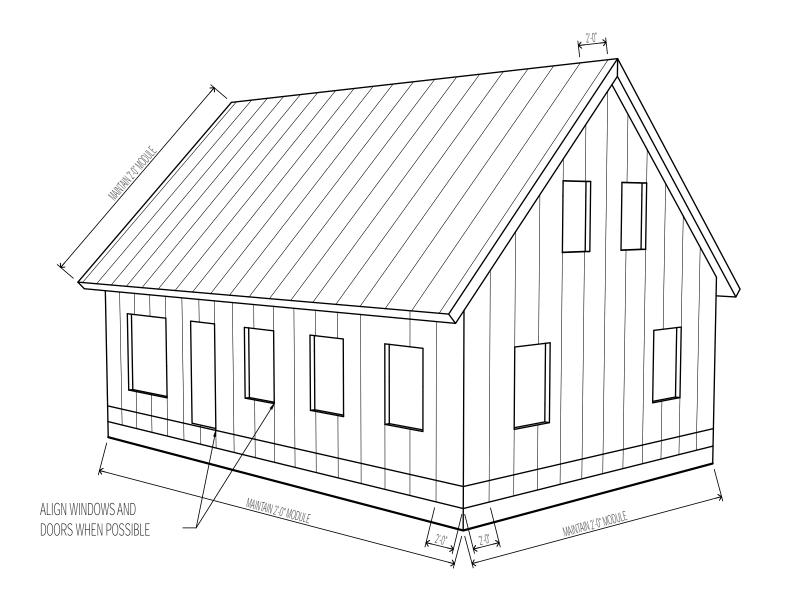
MINI TRUSS HEADER // SECTION		L 5 00016
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 11/2" = 1'-0"	T 3-00010



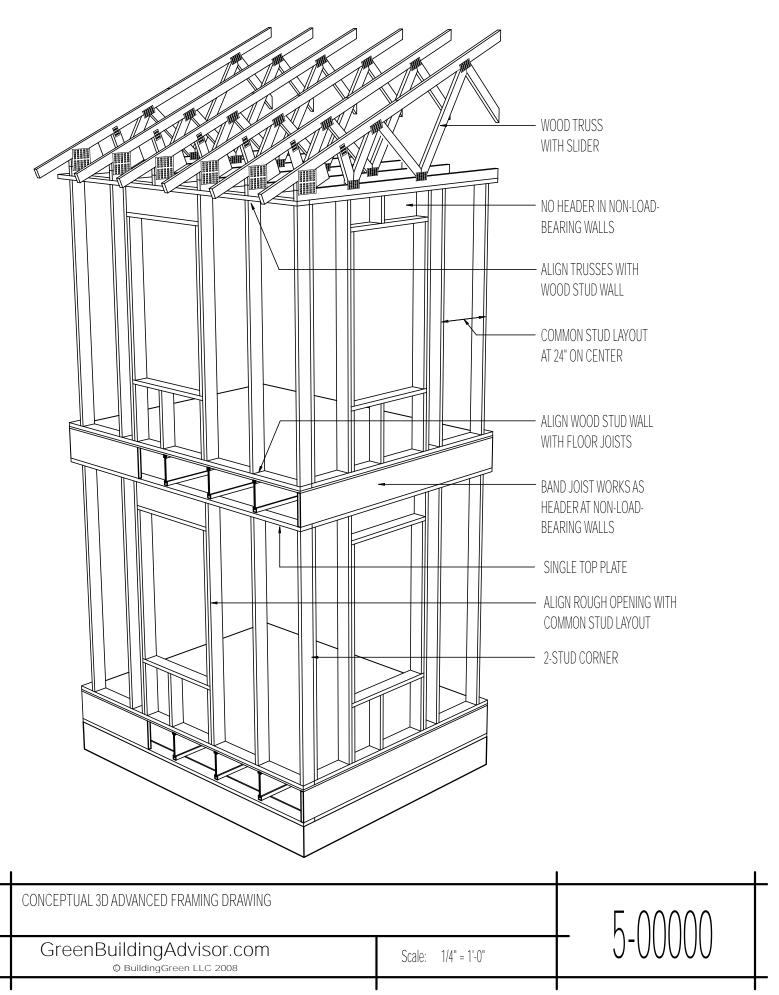
OUTSET HEADER WITH HEAD PLATE		L 5 00012
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 11/2" = 1'-0"	7-00013

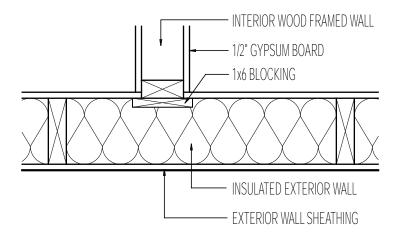


SITE-BUILT INSULATED HEADER		L 5 0001/
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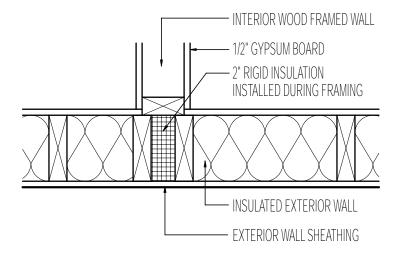


CONCEPTUAL 2'-0" MODULE HOUSE DRAWING		5 NNN1
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: not to scale	7-00001

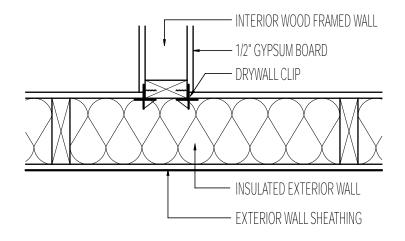




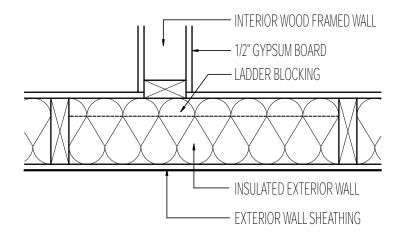
INTERIOR INTERSECTING WALL WITH 1x6		L 5 00010
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 1 1/2" = 1'-0"	T 3-00010



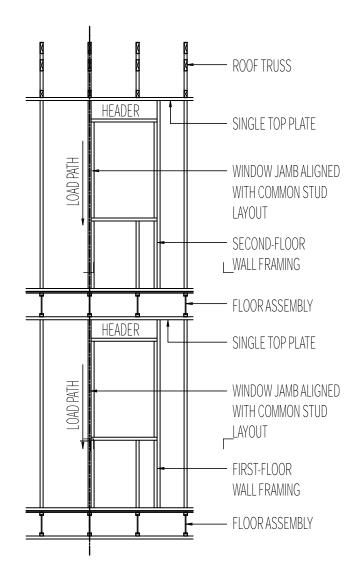
INTERIOR INTERSECTING WALL WITH 2 STUDS AND RIGID INSU	LATION	5 AAA11
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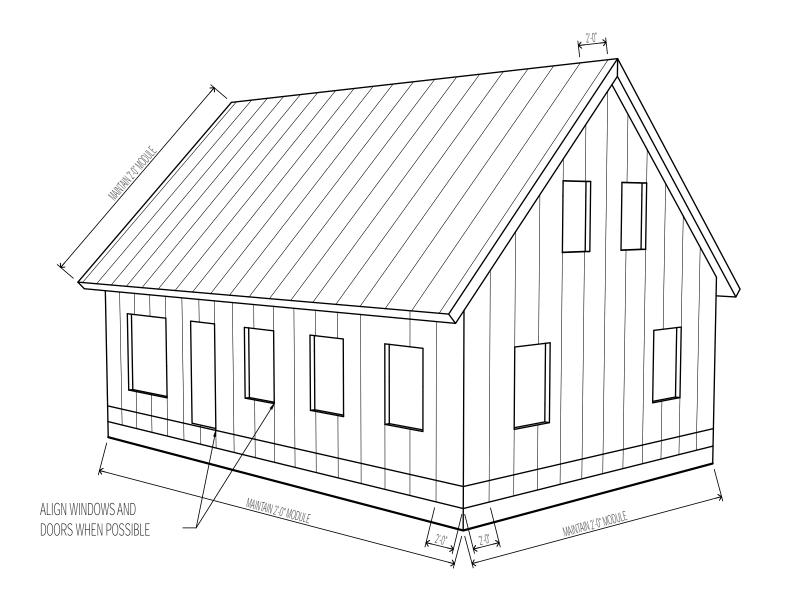
INTERIOR INTERSECTING WALL WITH DRYWALL CLIPS		_ E UUUU
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 1 1/2" = 1'-0"	T 0-00009



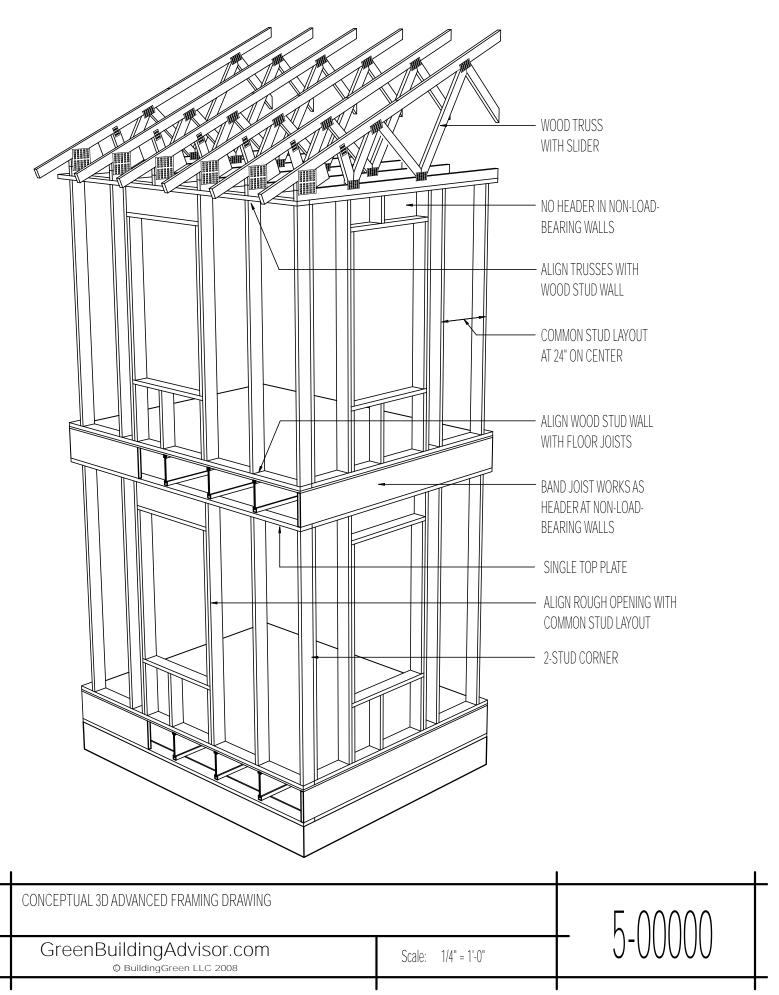
INTERIOR INTERSECTING WALL WITH LADDER BLOCKING		5 NNN12
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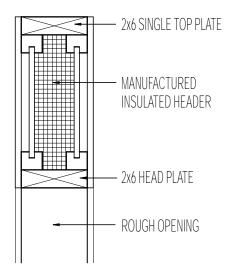


CONCEPTUAL STACK FRAMING DRAWING		2 VVVV3
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 1/4" = 1'-0"	7-0000

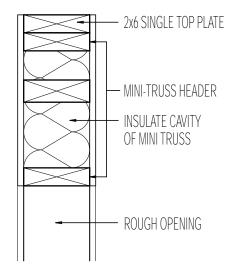


CONCEPTUAL 2'-0" MODULE HOUSE DRAWING		5 NNN1
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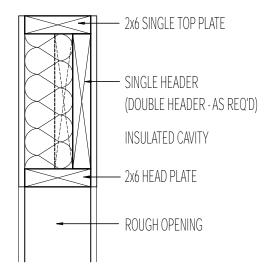




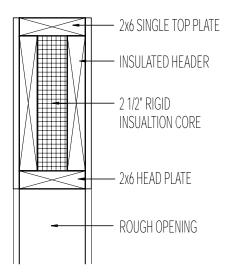
MANUFACTURED INSULATED HEADER		L 5 00015
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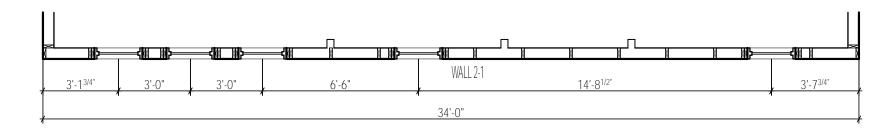
MINI TRUSS HEADER // SECTION		L 5 00016
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 11/2" = 1'-0"	7-00010

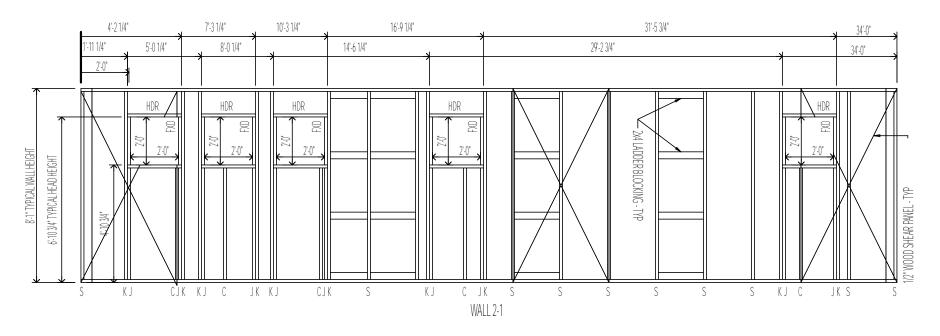


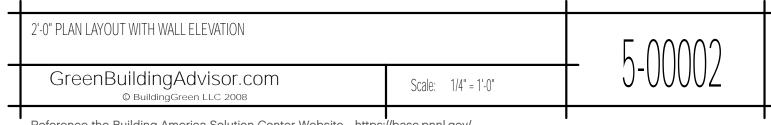
OUTSET HEADER WITH HEAD PLATE		5 00013
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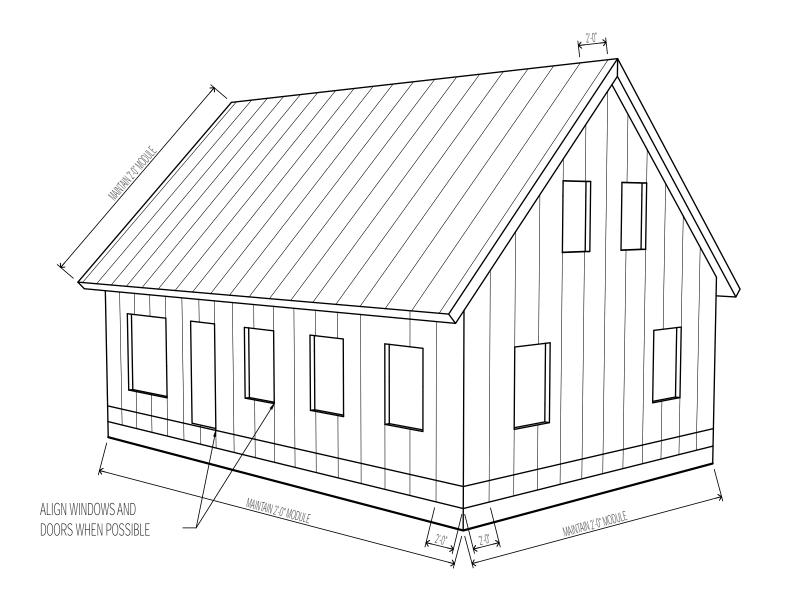
SITE-BUILT INSULATED HEADER	5 NNN1 /	
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: 1 1/2" = 1'-0"	T 9-00014



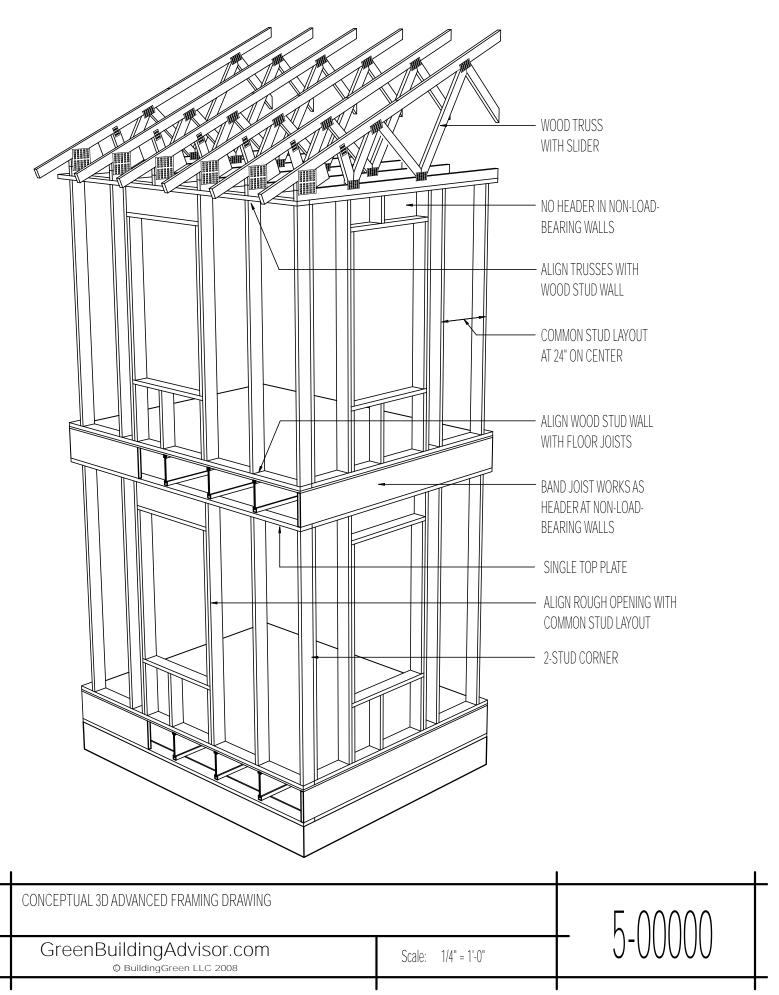




Reference the Building America Solution Center Website - https://basc.pnnl.gov/



CONCEPTUAL 2'-0" MODULE HOUSE DRAWING	5 NNN1	
GreenBuildingAdvisor.com © BuildingGreen LLC 2008	Scale: not to scale	7-00001



BEST PRACTICES

FOR THE DESIGN AND CONSTRUCTION OF THE



by GREENFIBER

THESE BEST PRACTICES SET DOES NOT, IN ANY WAY, SUPERSEDE, NOR REPLACE, THE DETAILS, NOR THE LISTINGS, INCLUDED IN THE PUBLISHED UL ASSEMBLIES FOR THE U370, U377 AND U305 FOUND AS BXUV.U370, BXUV.377 AND BXUV.305, IN THE UL LISTING DIRECTORY. IT IS THE RESPONSIBILITY OF THE DESIGNER OF RECORD AND BUILDER TO ENSURE COMPLIANCE WITH THE LATEST VERSION OF EACH UL LISTING APPLICATION.

A FIRE RESISTANT RATED WALL DRAWING & DETAIL SET APPLICABLE TO UNDERWRITERS LABORATORY ASSEMBLY REFERENCES UL-U370, UL-U377 & UL-U305 & GYPSUM ASSOCIATION GA-FILE-NO-WP-3910 ASSEMBLY FOR SOUND CONTROL

THESE DRAWINGS ARE TO BE USED FOR FIRE RESISTANT WALL DESIGN INFORMATION PURPOSES ONLY AS THEY REFLECT GENERIC CONDITIONS, BEST PRACTICES & DESIGN PRINCIPLES. THEY DO NOT SUBSTITUTE DESIGN SPECIFIC, ORIGINAL & PROPRIETARY DRAWINGS, WHICH SHOULD BE REVIEWED BY A REGISTERED ARCHITECT OR STRUCTURAL ENGINEER AS PER THE LOCAL JURISDICTION & STATE REQUIREMENTS WHERE THE PROJECT IS BEING BUILT. THE USE OF ONE OR MORE OF THESE DRAWINGS WITHOUT THE APPROVAL OF A REGISTERED ARCHITECT OR STRUCTURAL ENGINEER DOES NOT CONSTITUTE APPROVAL BY GREENFIBER/APPLEGATE FOR ANY USE OF THE STRUCTURES SHOWN IN THE DRAWINGS. GREENFIBER/APPLEGATE IS NOT AN ARCHITECTURAL, ENGINEERING OR INSPECTION FIRM, & DOES NOT CREATE OR STAMP DRAWINGS FOR USE IN BUILDING CONSTRUCTION, OR ACT AS AN ARCHITECT OR ENGINEER OF RECORD. THE USER MAINTAINS THE FULL & COMPLETE RESPONSIBILITY TO COMPLY WITH ALL CODES, LAWS, & REGULATIONS APPLICABLE TO THE SAFE & PROPER USE, H&LING \$ INSTALLATION OF GREENFIBER/APPLEGATE'S PRODUCTS \$ SHOULD CONSULT WITH AN ARCHITECT \$/OR ENGINEER FOR ALL CONSTRUCTION & DESIGN RELATED QUESTIONS. THIS SET OF DRAWINGS DOES NOT INCLUDE THE SPECIFIC CALCULATIONS OTHER THAN THOSE IMPLIED, DONE & USED BY UNDERWRITERS LABORATORY IN THEIR TESTING. IN STATES WHERE HIGH WINDS & OR SEISMIC CONDITIONS BY CODES DO EXIST, A STRUCTURAL DESIGN REVIEW BY A LICENSED STRUCTURAL ENGINEER IS MANDATORY. SOME OF THE CONDITIONS SHOWN HEREIN MAY NOT APPLY IN YOUR JURISDICTION, CHECK YOUR APPLICABLE LOCAL CODES. THIS SET DOES NOT REPLACE OR MODIFY THE OFFICIAL UL LISTING. ALWAYS REFER TO THE LATEST ISSUE OF THE UL LISTING AND THIS SET OF DRAWINGS, WHEN CONSULTING ALWAYS REFER TO THIS SET REVISION NUMBER & ISSUE DATE.

SET ISSUE: 11/07/2024 - VERSION #33 - REVO

CURRENTLY THE GREENFIBER STABILIZED

L. FO.D COVER SHEET
2. FO.D GENERAL NOTES

CURRENTLY THE GREENFIBER STABILIZED SPRAYED CELLULOSE, FIRE RATED MATERIAL, FRM, LISTED IN THE UL—U370 AND UL—U377, 2 HOUR FIRE RESISTANCE RATED WALLS ASSEMBLIES, IS BEING USED BY LOCAL JURISDICTIONS IN THE FOLLOWING STATES: ARIZONA, CALIFORNIA, COLORADO, FLORIDA, GEORGIA, ILLINOIS, NEVADA, NORTH CAROLINA, SOUTH CAROLINA, TEXAS AND VIRGINIA.

NUMBER	SHEET	CONTENT	
1.	F 0.0	COVER SHEET	
2.	F O. I	GENERAL NOTES	- b
3.	F 1.0	TYPICAL CONSTRUCTION - FULL VIEW	
4.	F I.A	TYPICAL DETAILS I - PERPENDICULAR FLOOR	
5.	F I.B	TYPICAL DETAILS I I - PARALLEL FLOOR	
6.	F I.C	TYPICAL DETAILS I I I - TOP LOAD BEARING FLOOR TRUSS	DESIGN CONFIGURATION
7.	FI.D	TYPICAL DETAILS IV - TYPICAL ATTIC CONDITIONS	A & E INC.
8.	F 2.0	STEP CONDITION DETAILS AND NOTES	VACE 770-565-5556 NEARCE SIGNORNICE ATTANCOM
9.	F 3.1	SPECIAL CONIDITIONS - DETAILS I	NA DRIVE SITURE DALL FUEL DALL DALL DALL DALL DALL DALL DALL DA
10.	F 3.2	SPECIAL CONDITIONS - DETAILS II	THE STREET OF ARTESTED U.S. IT SALL NOT BE REPORTED.
11.	F 3.3	SPECIAL CONDITIONS - DETAILS III	OF STREET, THE STREET IN ANY ANY WHICH THE WRITTEN AND COM- OF STREET, THE CAN DESIGN COMMENCES A 4 E BC. T CHANGE SHALL NOT BE SCALED, TO DESIGNOD AND DIFF. SH
12.	F 3.4	SPECIAL CONDITIONS - DETAILS IV	
13.	F 3.5	SPECIAL CONDITIONS - DETAILS V	
14.	F 3.6	SPECIAL CONDITIONS - DETAILS VI	SHEET No.1
15.	F 3.7	SPECIAL CONDITIONS - DETAILS VII	1
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17.	F 4.1	3D MODELS PARALLEL FLOOR SYSTEMS	1 1 1/ 1 / 1
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23.	F 5.4	UL-U370 APPLICATION - TYPICAL ELEVATION PLAN	QF 23 SH

- I. ALL COMPONENTS OF THE 2 HOUR AREA SEPARATION WALL SHALL BE FROM A MANUFACTURER LISTED IN THE UL-U370 REFERENCE. USE OF NON-LISTED COMPONENTS MAY MAKE WALL PERFORM IN A MANNER OTHER THAN AS SPECIFIED IN UL U370.
- 2. 2 HOUR AREA SEPARATION WALL ASSEMBLIES REQUIRE SPECIFIC TREATMENT TO ACHIEVE THE REQUIRED FIRE RATING. THE APPLICATION, TESTING AND REPAIR OF SPRAYED CELLULOSE FIRE RATED MATERIAL (FRM) SHALL BE ACCORDING TO MANUFACTURER'S SPECIFICATIONS, BY TRAINED PERSONNEL, AND SHALL BE BY CONTRACTORS APPROVED BY THE MANUFACTURER.
- 3. IT IS HIGHLY RECOMMENDED THAT THE COMPLETED AREA SEPARATION ASSEMBLY WALL BE REVIEWED BY THE DESIGNER OF RECORD, THE REGISTERED ARCHITECT OR PROFESSIONAL ENGINEER WHO PREPARED THE PERMITTED DRAWINGS, FOR COMPLIANCE WITH UL-U370, CODES, AND CONSISTENCY WITH THE PERMITTED CONSTRUCTION DETAILS IN THE DRAWINGS. THE DESIGNER OF RECORD SHOULD BE INVOLVED IN ALL FIELD OR SITE DISCUSSIONS REGARDING THE DESIGN AND CONSTRUCTION OF THE FIREWALL.
- 4. IN THE ROOF AREA ADJACENT TO THE PROPERTY LINE, AS AN ALTERNATIVE TO THE FIRE RATED PLYWOOD SHOWN IN DETAILS, "5/8" FIRECODE CORE GYPSUM PANELS MAY BE USED AS UNDERLAYMENT FOR NON-FIRE-RETARDANT TREATED PLYWOOD ROOF SHEATHING (PER SECTION 317.22 OF FBC-R & IRC 'DWELLING UNIT SEPARATION') FOR A DISTANCE OF 4 FT. FROM THE FACE OF EACH SIDE OF THE TWO (2) HOUR FIRE-RESISTANCE-RATED WALL.
- 5. AREA SEPARATION WALL SHALL EXTEND TO THE INSIDE FACE OF THE EXTERIOR SHEATHING WHEN UNIT ELEVATIONS ARE FLUSH WITH EACH OTHER.
- 6. THE UL-U370 WALL ASSEMBLY AS DESIGNED AND TESTED DOES NOT INCLUDE NOR REQUIRE FIRE CAULKING, THE CAVITY OF THE FIREWALL IS FILLED COMPLETELY WITH THE FIRE RATED MATERIAL, FRM, HENCE PROVIDING A SOLID AND CONTINUOUS MEMBRANE FOR FIRE SEPARATION, IT DOES REQUIRE THAT ALL GYPSUM WALL JOINTS BE TAPED AND BOTH JOINTS AND SCREW HEADS BE COVERED WITH JOINT COMPOUND.
- 7. THE SPECIFIC FIRE WALL ASSEMBLY STUD SIZES SHALL BE DETERMINED BY THE DESIGN PROFESSIONAL OF RECORD. THE UL-U370, UL-U377 AND UL-U305 ASSEMBLIES CALL FOR A 2×4 AS A MINIMUM ASSEMBLY COMPONENT, FOR ANY SUCH ASSEMBLY WITH ANY GIVEN FLOOR CONDITION, THE DESIGN INTEGRITY OF THE ASSEMBLY SHOULD BE MAINTAINED BY KEEPING BOTH SIDES OF THE ASSEMBLY IDENTICAL, IN ITS DIMENSIONING, SPACING, AND SIZING OF THE COMPONENTS.
- 8. ROOF TRUSSES OR ROOF SYSTEMS, PERPENDICULAR TO THE UL-U370 ARE NOT ALLOWED.
- 10. THE 16" STUD SEPARATION IN THE UL LISTING IS A MAXIMUM. HENCE, ALLOWING FOR ADDITIONAL STUDS TO BE IN THE FRAMING CAVITY, REDUCING IT AS NEEDED. NEVER PLACED BACK TO BACK, IN THE OPPOSITE SIDE, ALWAYS STAGGERED.

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ENERAL NOTES

U.I.

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TYPICAL FRONT

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B-B

BOTTOM PLATE

TOP PLATE

BOTTOM PLATE

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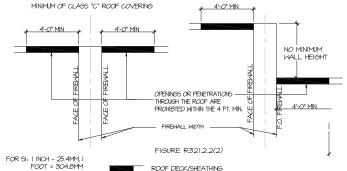
4-4

GREENFIBER® FRM INSULATION FOR SANCTUARY® TWO-HOUR

FIREWALL ASSEMBLY - "FRM"

NOTE: USE GYPSUM BOARD TYPE "C" OR "ULIX" PER THE UL LISTING, ECOSMART FIRECODE X TYPE ULIX BY USG, - CAN BE USED IT IS PER THE UL LISTING.

EXCEPTION TO ELIMINATE PARAPETS



NON-COMBUSTIBLE MATERIAL

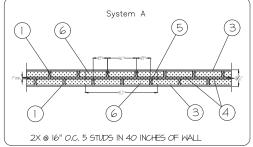
- FIRE-RETARDANT TREATED WOOD, OR
- PROTECTED BY %" TYPE "C" OR "ULIX" PER UL LISTING GYPSUM BOARD

*SEE INTERNATIONAL RESIDENTIAL CODE COMMENTARY - VOLUME I FIGURE R30222(2)-EXCEPTION TO ELIMINATE PARAPET

EXCEPTION TO ELIMINATE PARAPETS F.I.O.

NOTE: BLOCKING BETWEEN STUDS FOR HORIZONTAL BRACING SHOULD BE RELATED TO THE PLATE TO PLATE HEIGHT AND CALLED OUT BY THE ARCHITECTURAL OR STRUCTURAL ENGINEER OF RECORD. ILLUSTRATION SHOWS TYPICAL CONDITIONS FOR A 9FT. CEILING WALL.

FROM UL-U370 LISTING:



TYPICAL SIDE VIEW OF FIREWALL WITH APPLIED ERMIT ቯ

UL-U370 FIRE RESISTANT RATED ASSEMBLY

DESIGN CONFIGURATION

TYPICAL CONSTRUCTION FULL VIEW

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UL-U370 TYPICAL WALL CONSTRUCTION

11/07/2024 ISSUE VERSION # 32 R8

FIRE SEPARATION RATED WA UL - U370 & U377

ASSEMBLY APPLICATIONS

STABILITY, CONTINUITY AND INDEPENDENCE OF THE FIREWALL SIDES, STUD STAGGERING AND ALTERNATING BLOCKING FROM ONE SIDE OF THE FIREWALL TO THE OTHER

VIEW OF FIREWALL WITH APPLIED

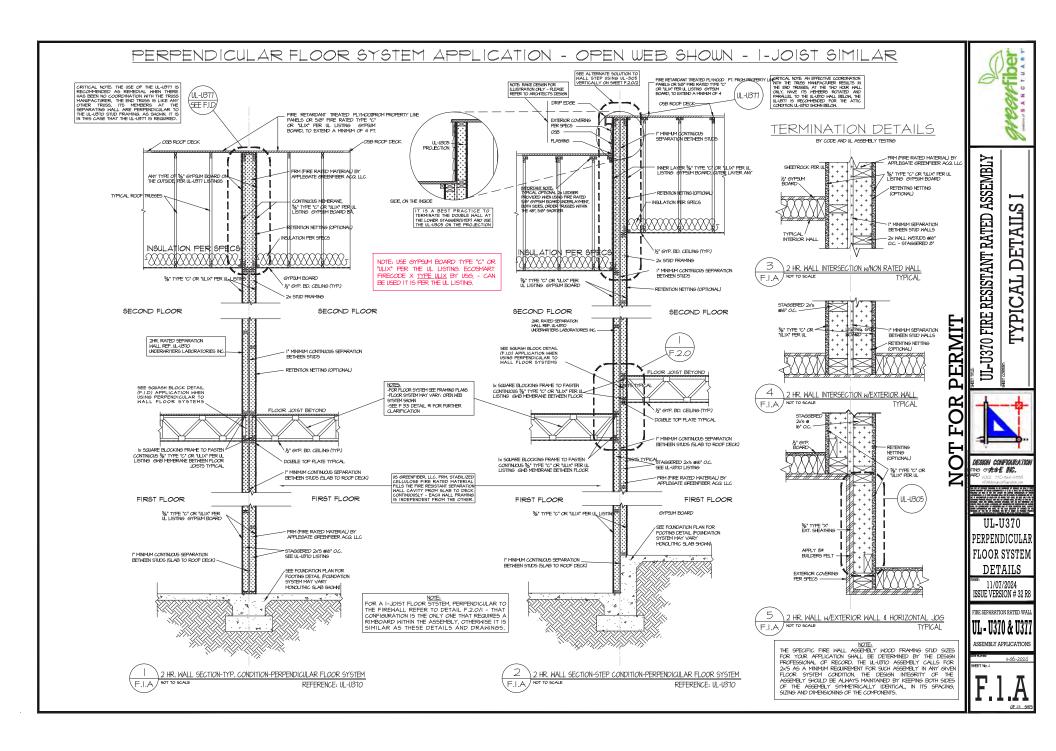
GREENFIBER FRM

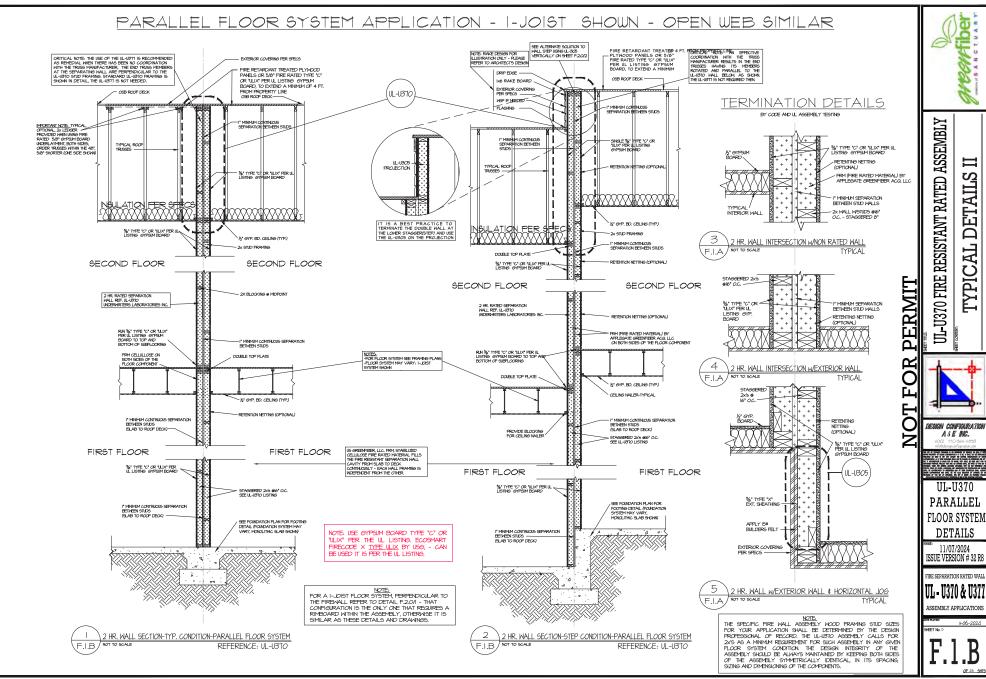
- TYPICAL BUILDING WIDTH -TYPICAL TOP VIEW OF FIREWALL AND STAGGERED STUDS

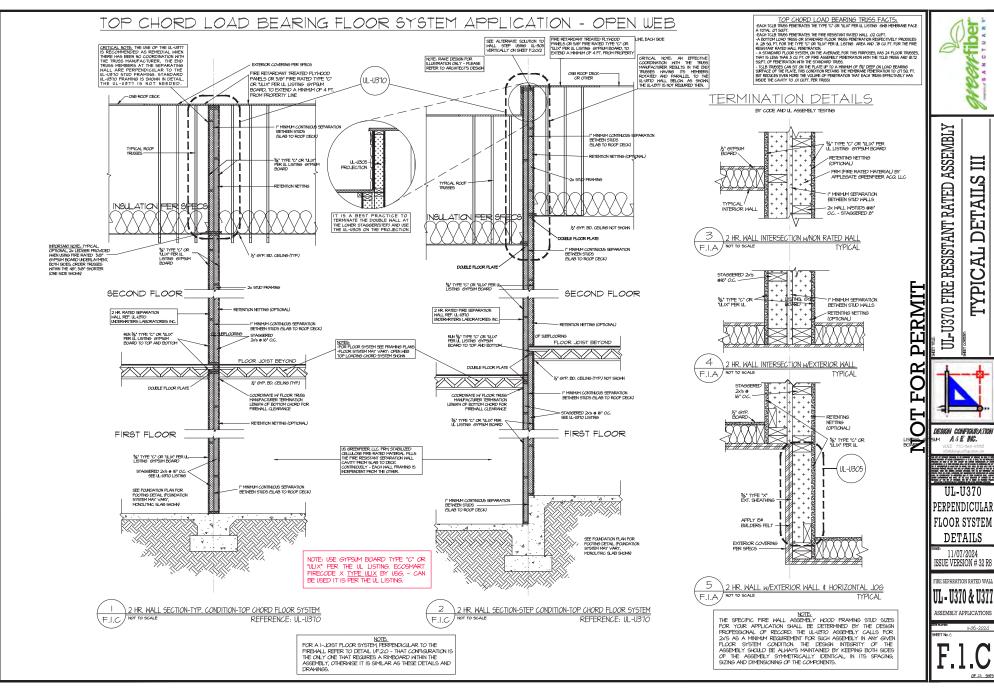
ON EACH SIDE

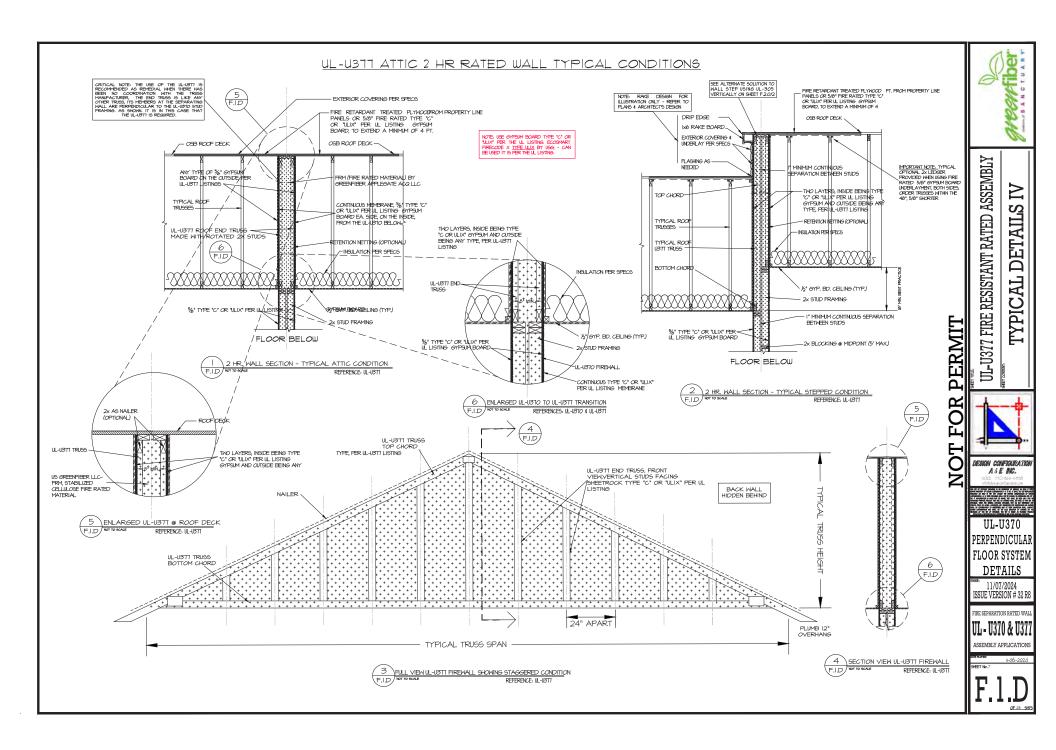
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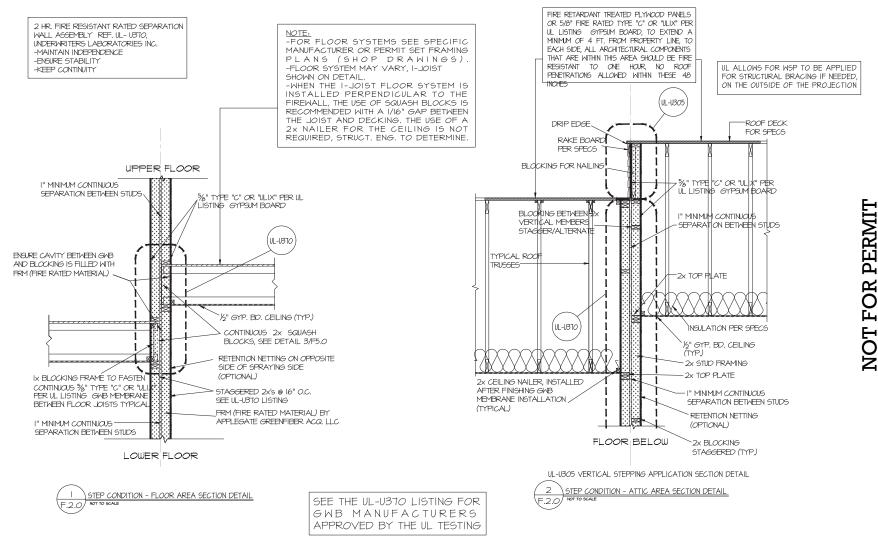








UL-U370 STEPPED CONDITION DETAILS



greenfiber

UL-U370 FIRE RESISTANT RATED ASSEMBLY

CONDITION DETAILS & NOTES

STEP (

DESIGN CONFIGURATION

ENGN CONTRURATO

A & E INC.

VOICE 770-565-5358

Info@destaconfluention.com

FIRE RATED

SEPARATION
TYPICAL
STEP DETAILS

11/07/2024 ISSUE VERSION # 32 R8

FIRE SEPARATION RATED WALL

UL = U370 & U377 ASSEMBLY APPLICATIONS

ASSEMBLY APPLICATION

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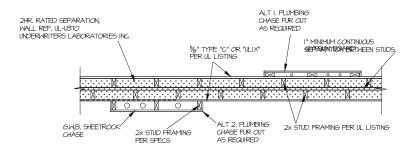
F.2.0

WALL FUR OUT

\UL-U370 SYSTEM "A" FRAMING FUR OUT SECTION @ APPLIANCE (TYP.)

TYPICAL PLUMBING CHASE ALTERNATIVES

System A (W/ Fur Outs)



-MAXIMM 2 CHASE CAVITIES PER IO FT. SPAN ON EACH FACE OF THE WALL, CHASE CAVITIES SPACED A MINIMM IO FT. FROM EACH OTHER AND STASGERED A MINIMM 8" FROM CHASE CAVITIES LOCATED ON THE OPPOSITE SIDE.

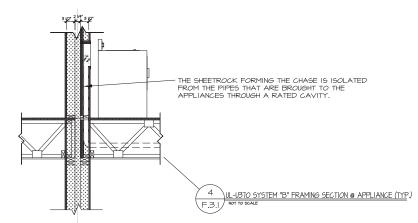
-MAXIMUM TWO 2" DIAMETER SCHEDULE 40 PVC PIPE, THE PVC PIPE MAY BE CONNECTED TO A
MAXIMUM QUANTITY OF 2 PVC TEES, THE PVC PIPE AND TEES MUST NOT PENETRATE THE WOOD STUDS OR GYPSUM WALLBOARD.

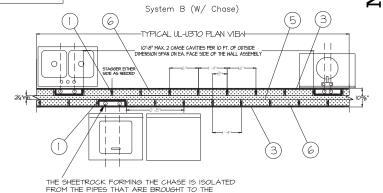
-TO FORM CHASE CAVITIES, WE TWO LAYERS OF % THICK SYPSIM WALLBOARD TYPE % OR "ULIX" FRU LISTINS, WITH TAYPERD EDGES REPOVED, APPLIED VERTICALLY TO THE INTERIOR FACE OF MODO STUDS (BETWEEN THE 2.4% SPACING). THE BASE LAYER OF MALLBOARD ATTACHED WITH 1-%LONG, %" DIA. HEAD, %" SHANK DIA. NAILS SPACED 7" O.C. TO WOOD STUDS AND BEARING PLATES. THE FACE LAYER OF WALLBOARD ATTACHED WITH I-1/6" LONG, 1/6" DIA HEAD, 1/6" SHANK DIA NAILS SPACED TO OC. TO WOOD STUDS AND BEARING PLATES WITH 3-1/2" OFFSET FROM BASE LAYER 3-1/2" WIDE STRIPS ATTACHED TO THE SIDE OF THE STUDS ALONG THE PERIMETER OF THE CHASE CAVITIES. STRIPS WERE SECURED TO THE WOOD STUDS WITH I-1%" LONG NAILS SPACED A MAXIMUM & IN O.C.

-TO ENCLOSE ASSEMBLY, ONE LAYER OF 4 FT. WIDE, 36" THICK GYPSUM WALLBOARD, APPLIED VERTICALLY TO THE EXTERIOR FACE OF WOOD STUDS, GYPSUM WALLBOARD ATTACHED WITH I-1/6" LONG 1/6" DIA. HEAD, 1/6" SHANK DIA. NAILS SPACED T" O.C. WITH SCREWS STARTING 1/6" FROM BOARD.

-FOR CONTINUITY PURPOSES, WHEN USING THE SYSTEM B, THE 2 HOUR FIRE RESISTANT RATED WALL MUST HAVE A CONTINUOUS 2 1/4" SEPARATION BETWEEN BOTH FRAMED WALLS , FROM SLAB TO ROOF UL-U370 WITH PLUMBING CHASES

F.3.1





\UL-U370 SYSTEM "B" FRAMING SECTION @ APPLIANCE (TYP.)

APPLIANCES THROUGH A RATED CAVITY.

UL-U370 FIRE RESISTANT RATED PERMIT

ASSEMBLY

SPECIAL CONDITION - DETAILS

DESIGN CONFIGURATION

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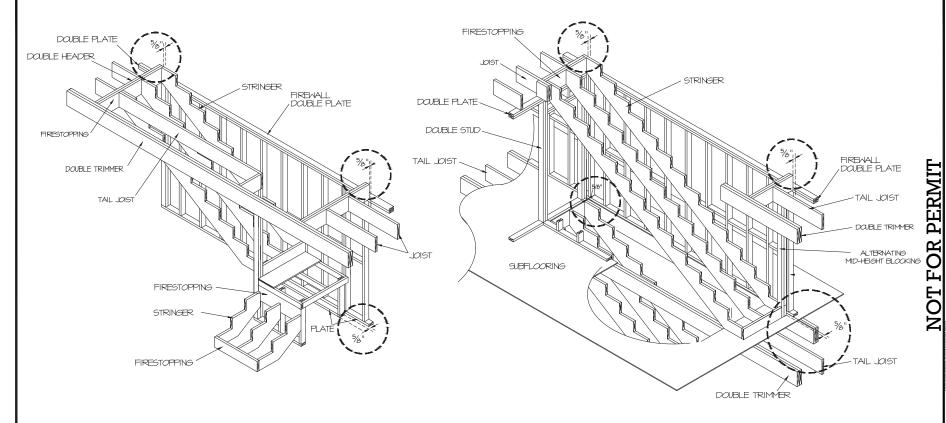
SPECIAL CONDITIONS - DETAILS I

11/07/2024 ISSUE VERSION # 32 R8

FIRE SEPARATION RATED WA

ASSEMBLY APPLICATION

SEPARATION OF THE STAIRS FROM THE FIREWALL ASSEMBLY



STAIR DETAIL - LANDING ADJACENT TO FIREWALL CONDITION

NOTES:

- PROVIDE MIN. 3/4" SEPARATION BETWEEN FIREWALL STUDS AND STAIR STRINGERS, AND / OR LANDING STUDS FOR THE CONTINUOUS %" GWB MEMBRANE INSTALLATION BETWEEN FIREWALL ASSEMBLY AND STAIR SYSTEM.
- 2. STAIR CONSTRUCTION MAY VARY, DRAWINGS ILLUSTRATE MOST TYPICAL CONDITIONS.
- 3. STAIR IS BUILT INDEPENDENTLY FROM FIREWALL. IT IS NOT ATTACHED TO THE FIREWALL.

STAIR DETAIL - FULL STAIR ADJACENT TO FIREWALL CONDITION

SPECIAL CONDITIONS - DETAILS II UL-U370 FIRE RESISTANT RATED ASSEMBLY

DESIGN CONFIGURATION

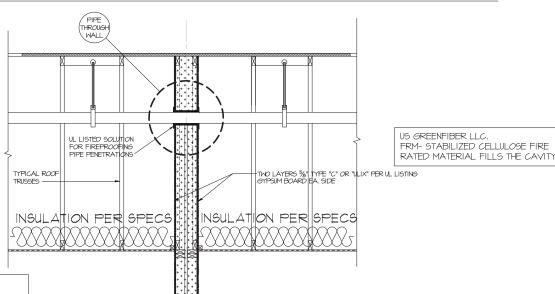
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CONDITIONS: STAIRCASE FIREWALL

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FIRE SEPARATION RATED WAI

PENETRATION OF THE FIRE RATED WALL ASSEMBLY BY STEEL PIPE (EXAMPLE: SPRINKLER PIPE)



UNDERLAYMENT, BOTH SIDES, ORDER TRUSSES WITHIN THE 48", 5/8" SHORTER

IMPORTANT NOTE: TYPICAL OPTIONAL 2x

LEDGER PROVIDED WHEN USING FIRE

RATED 5/8" GYPSIM BOARD

FIRESTOPPING AND FIREPROOFING

FIRE RATED PENETRATION NOTES:

- DEFINITION: FIRESTOPPING IS A MATERIAL OR COMBINATION OF MATERIALS USED TO RETAIN INTEGRITY OF FIRE-RATED CONSTRUCTION BY MAINTAINING AN EFFECTIVE BARRIER AGAINST THE SPREAD OF FLAME, SMOKE AND HOT GASES THROUGH PENETRATIONS IN FIRE RATED WALLS. THE SELECTION OF A FIRESTOP SYSTEM MUST TAKE INTO CONSIDERATION THE TYPE OF PIPE PENETRATING THE RATED ASSEMBLY. NON-METALLIC (PLASTIC PIPE) SYSTEMS ARE TESTED WITH SPECIFIC TYPES OF MATERIALS (IE: PVC, CPVC, CCPVC, ABS, FRP, PVDF) THESE MATERIALS REACT DIFFERENTLY WHEN EXPOSED TO FIRE AND HEAT. THE SPRINKLER CONTRACTOR MUST ENSURE THAT THE SYSTEM TO BE INSTALLED IS TESTED FOR THE SPECIFIC TYPE OF PIPE TO BE USED. AND THAT THE TESTED RESULTS ALSO REFERENCE THE PIPE SIZE TO BE USED IN THE SYSTEM.
- 2. SPRINCLER COMPONENTS SHOWN HERE ARE FOR ILLUSTRATION PURPOSES ONLY. THE SELECTION OF UL PENERATION ASSEMBLIES HERE IS FOR INFORMATION PURPOSES ONLY AND IN NO WAY IMPLIES AN BIODRESMENT OF THE MANUFACTURER OR IT'S PRODUCTS REFERENCED THEREIN. SPRINKLER SYSTEMS ARE TO BE DESIGNED AND SPECIFIED BY OTHERS CERTIFIED TO DO SO
- 3. THE RATED PENETRATIONS SHOWN HERE ARE BY 3M AND HILTI. OTHERS MAY BE AVAILABLE. ALL MUST BE IN COMPLIANCE WITH THE AUTHORITY THAT HAS JURISDICTION AND LOCAL APPLICABLE CODES.
- 4 FIRESTOPPING IS NOT ABOUT PRODUCTS NOR MANUFACTURERS BUT ABOUT TESTED AND LISTED SYSTEMS. PRODUCTS BY THEMSELVES CARRY NO RATING. IT IS THE COMBINATION OF SPECIFIC APPLICATION INSTRUCTIONS AND THE USE OF SPECIFIC PRODUCTS THAT ESTABLISH THE "FIRESTOP SYSTEM" RATING. DO NOT MIX MANUFACTURER'S PRODUCTS, EACH ASSEMBLY IS PRODUCT SPECIFIC, EACH RATED FIRESTOP SOLUTION HAS IT'S OWN CONDITIONS AND SPECIFIC APPLICATIONS WHERE EVERY COMPONENT AND IT'S SPECIFICATIONS CONTRIBUTE TO RATE THE ASSEMBLY. ANY SUBSTITUTION OR REPLACEMENT COMPROMISES THE INTEGRITY OF THE ASSEMBLY.
- 5. INSTALL EACH PIPE PENETRATION ASSEMBLY PER MANUFACTURER INSTRUCTIONS AND IT'S REFERENCES TO PIPE TYPE & SIZE, LOCAL JURISDICTION CODE AND SEISMIC LOCATION DETERMINES THE FASTENING (RIGID SUPPORT) REQUIREMENTS BEFORE AND AFTER THE PENETRATION AND IF ANY IS NEEDED IN BETWEEN, SO PENETRATING PIPE DOES NOT DAMAGE THE FIREWALL OR LESSEN THE
- PLANNING, DURING THE DESIGN AND BEFORE THE START OF CONSTRUCTION,
 REDUCES THE COSTS CONSIDERABLY, AVOIDING FINDINGS THAT THE FIRESTOP SYSTEMS ARE EITHER INSTALLED INCORRECTLY OR ARE TOTALLY MISSING AT INSPECTION TIME, WHEN THE COST CAN BECOME HIGH. REMEDIAL IS USUALLY WHAT MAKES FIRESTOPPING EXPENSIVE.

PIPE PENETRATION TO 2 HR FIRE RATED WALL

PENETRATIONS OF WALL OR FLOOR/CEILING ASSEMBLIES ARE REQUIRED TO BE PROTECTED IN ACCORDANCE WITH 2018 IRC, SECTION 302.4 DWELLING UNIT RATED PENETRATIONS, INCLUDING THESE SECTIONS: R302.4.1, R302.4.1.1, 302.4.1.2, AND 302.4.2 (SEE EITHER NC-RBD OR FBC-R ACCORDINGLY).

UL FIRE RATED PIPE PENETRATIONS ASSEMBLY EXAMPLES:

I. W-L-2088 SECTION A-A

W-L-2078 SECTION C-C

2. W-L-2097 SECTION B-B

W-L-2411 SECTION D-D

3. W-L-2162 SECTION C-C

W-L-2128 SECTION E-E

PENETRATION UL-U370 OR UL-U377 ASSEMBLY LEGEND:

I. 2 HR. FIRE RATED WALL ASSEMBLY, UL-U370 OR UL-U377, CAVITY FILLED WITH GREENFIBER® FRM.

IA. WOOD STUDS, AS PER SPECIFIC UL ASSEMBLY.

IB. 5/8" TYPE "C" OR "ULIX" PER UL LISTING GYPSUM WALLBOARD AS PER SPECIFIC UL ASSEMBLY.

- 2. NON METALLIC PENETRATING PIPE, TYPE AND SIZE DETERMINE THE ASSEMBLY TO USE, SEE SPECIFIC UL REFERENCES.
- 3. FIRESTOPPING MATERIAL OR DEVICE PER ASSEMBLY AND MANUFACTURER, SEE SPECIFIC UL REFERENCES.
- 4. SEE SPECIFIC UL REFERENCE FOR EACH APPLICATION

RATED ASSEMBLY CONDITIONS - DETAILS III JL-U370 & UL-U377 FIRE RESISTANT ERMIT SPECIAL (

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DESIGN CONFIGURATION

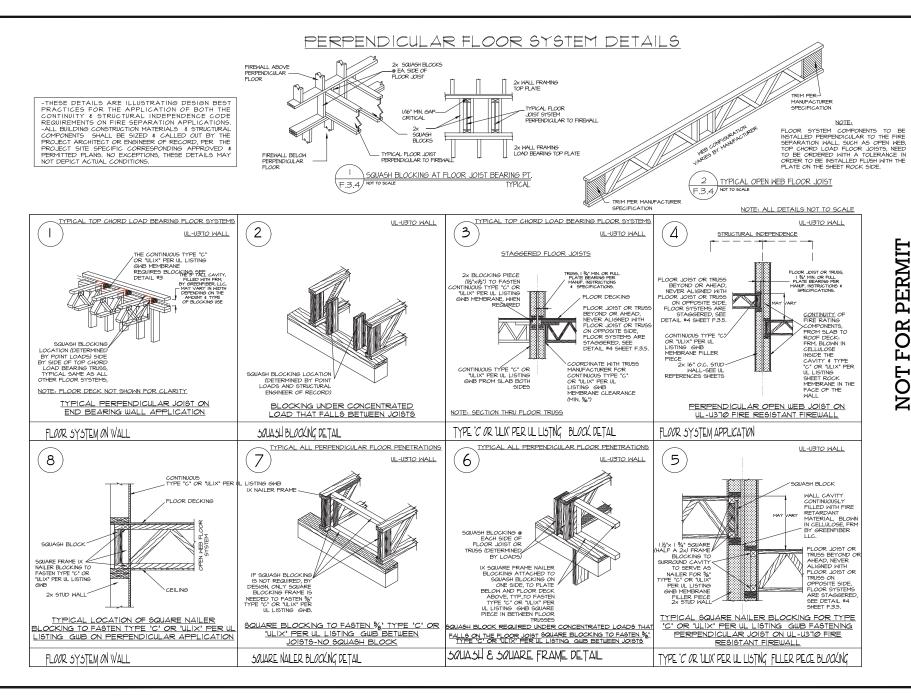
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TYPICAL PIPE PENETRATION DETAILS

11/07/2024 ISSUE VERSION # 32 R8

TRE SEPARATION RATED WA

ASSEMBLY APPLICATION



RATED ASSEMBLY RESISTANT UL-U377.1 UL-U370 & U CONDITIONS - DETAILS IV

SPECIAL (

DESIGN CONFIGURATION

A & E INC.

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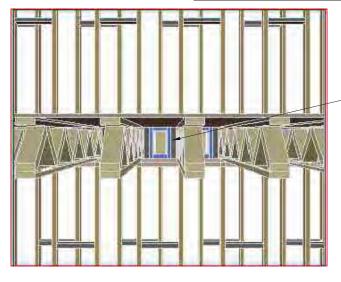
PERPENDICULAR FLOOR SYSTEM DETAILS -SOUASH BLOCK

11/07/2024 ISSUE VERSION # 32 R8

FIRE SEPARATION RATED WA

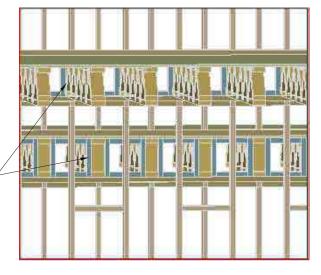
ASSEMBLY APPLICATION

PERPENDICULAR FLOOR SYSTEM DETAILS PICAL FRAMING & DESIGN LAYOUT CONDITIONS



IN THIS DETAIL, THE SQUASH BLOCK AND SQUARE FRAME BLOCKING TO FASTEN THE CONTINUOUS TYPE "C" OR "ULIX" PER UL LISTING GNB MEMBRANE TO THE FAGE OF THE WALL ARE SEPARATE COMPONENTS.

> IN THIS DETAIL, THE SQUASH BLOCK IS PART OF THE SQUARE BLOCKING FRAME TO FASTEN THE CONTINUOUS TYPE
> "C" OR "ULIX" PER UL LISTING
> GWB MEMBRANE TO THE FACE OF THE WALL



STEPPED CONDITION - OPEN WEB FLOOR JOISTS

WW CAR LAND

TYPICAL FRONT VIEW OF PERPENDICULAR CONDITION AT FLOOR SYSTEM

والمراها المراه بعراق بعراق المراها المراه

10 11 EE

NOT TO SCALE

PLATE FROM

WALL BEYOND

FLOOR SYSTEM

SQUASH BLOCKS SIDE BY SIDE FLOOR TRUSS

NON-STEPPED CONDITION - OPEN WEB FLOOR JOISTS TYPICAL FRONT VIEW OF PERPENDICULAR CONDITION AT FLOOR SYSTEM

NOT TO SCALE

IN THIS DETAIL, FLOOR TRUSSES, OR FLOOR

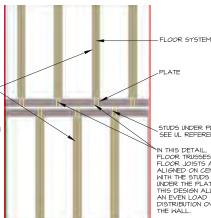
JOISTS ARE LAID
PERPENDICULAR TO THE
WALL AND EACH ONE IS
STAGGERED TO THEIR

OPPOSITE COMPONENT IN THE THE OTHER SIDE OF

THE WALL, THIS LAYOUT

SHOWS A STAGGERING

OF 16" O.C.



STUDS UNDER PLATE, SEE UL REFERENCES

THE WALL

STEPPED CONDITION - TOP CHORD LOAD BEARING FLOOR JOISTS

5 TYPICAL FLOOR SYSTEM - SQUASH BLOCK @ EACH SIDE OF FLOOR JOIST F.3.5

NOTE: FLOOR DECK NOT SHOWN FOR CLARITY

IN THIS DETAIL FLOOR TRUSSES, OR FLOOR JOISTS ARE ALIGNED ON CENTER WITH THE STUDS UNDER THE PLATE, THIS DESIGN ALLOWS AN EVEN LOAD DISTRIBUTION OVER

TYPICAL TOP VIEW - STAGGERED LAYOUT OF PERPENDICULAR FLOOR JOIST

SPECIAL CONDITIONS - DETAILS V UL-U370 & UL-U377 FIRE RESISTANT RATED ASSEMBLY

PERMIT 召 0

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FLOOR TRUSS W/SQUASH BLOCKS SIDE

BY SIDE

FLOOR SYSTEM

STUDS UNDER

PLATE, SEE UL REFERENCES

PLATE

DESIGN CONFIGURATION A & E INC.

A CARL LOCATION, AN INSTITUTE OF RESTRICTION OF AN INCIDENT OF AN

SPECIAL CONDITIONS: PLATE FRAMING

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ASSEMBLY APPLICATIONS



TYPICAL FLOOR SYSTEM - SQUASH BLOCK @ EACH SIDE OF FLOOR JOIST

STEPPED CONDITION - I-JOIST FLOOR JOISTS

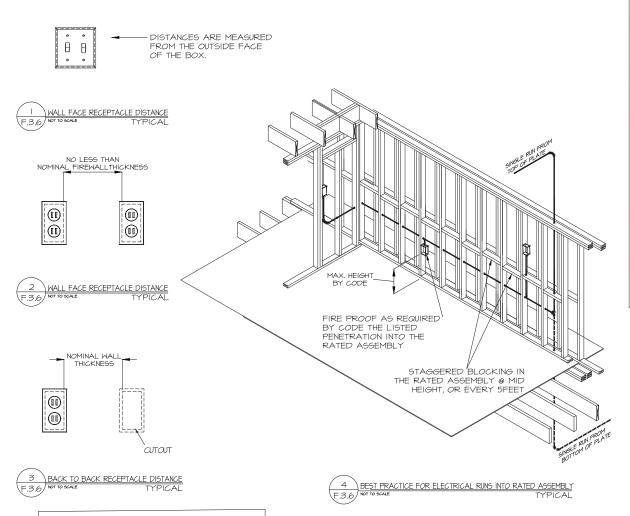
NOT TO SCALE

F.3.5

NOT TO SCALE

NOT TO SCALE

RATED ASSEMBLY ELECTRICAL PENETRATIONS



NOTE:

THE MINIMUM ALLOWED DISTANCE BETWEEN ONE

POWER BOX TO ANOTHER POWER BOX IN A

UL370 FIRE RESISTANT WALL IS 9 %

PER THE IRC:

R302.4.2 MEMBRANE PENETRATIONS. MEMBRANE PENETRATIONS SHALL COMPLY WITH <u>SECTION R302.4.1</u> WHERE WALLS ARE REQUIRED TO HAVE A FIRE-RESISTANCE RATING, RECESSED FIXTURES SHALL BE INSTALLED SO THAT THE REQUIRED FIRE-RESISTANCE RATING WILL NOT BE REDUCED.

EXCEPTIONS:

I. MEMBRANE PENETRATIONS OF MAXIMUM 2-HOUR FIRE-RESISTANCE-RATED WALLS AND PARTITIONS BY STEEL ELECTRICAL BOXES THAT DO NOT EXCEED 16 SQUARE INCHES (O.O.103 MTS) IN AREA PROVIDED THE AGGREGATE AREA OF THE 2-HOUR (O.0103 MT5) IN AREA PROVIDED THE AGGREGATE AREA OF THE OPENINGS THROUGH THE MEMBRANE DOES NOT EXCEED 100 SQUARE INCHES (0.0645 MT5) IN ANY 100 SQUARE FEET (4.24 M) OF WALL AREA. THE ANNULAR SPACE BETWEEN THE WALL MEMBRANE AND THE BOX SHALL NOT EXCEED 1/8 INCH (3.1 MM), SUCH BOXES ON OPPOSITE SIDES OF THE WALL SHALL BE SEPARATED BY ONE OF THE FOLLOWING:

11. BY A HORIZONTAL DISTANCE OF NOT LESS THAN 24

- I.I. BY A HORIZONTAL DISTANCE OF NOT LESS THAN 24 INCHES (610 MM) WHERE THE WALL OR PARTITION IS CONSTRUCTED WITH INDIVIDUAL NON-COMMUNICATING STUD CAVITIES;

 I.2. BY A HORIZONTAL DISTANCE OF NOT LESS THAN THE DEPTH OF THE WALL CAVITY HEN THE WALL CAVITY IS FILLED WITH CELLULOSE LOOSE-FILL, ROCKWOOL OR SLAG MINERAL WOOL INSULATION;

 I.3. BY SOLID FIRE BLOCKING IN ACCORDANCE WITH IRC
- SECTION R3@2.II; I.4. BY PROTECTING BOTH BOXES WITH LISTED PUTTY PADS;
- 1.5. BY OTHER LISTED MATERIALS AND METHODS.
- MEMBRANE PENETRATIONS BY LISTED ELECTRICAL BOXES OF ANY MATERIALS PROVIDED THE BOXES HAVE BEEN TESTED FOR USE IN FIRE-RESISTANCE-RATED ASSEMBLIES AND ARE INSTALLED IN ACCORDANCE HITH THE INSTRUCTIONS INCLUDED IN THE LISTING. THE ANNULAR SPACE BETWEEN THE WALL MEMBRANE AND THE BOX SHALL NOT EXCEED 1/8 INCH (3.1 MM) INLESS
 LISTED OTHERWISE. SUCH BOXES ON OPPOSITE SIDES OF THE
 WALL SHALL BE SEPARATED BY ONE OF THE FOLLOWING:
 2.1. BY THE HORIZONTAL DISTANCE SPECIFIED IN THE LISTING
 OF THE ELECTRICAL BOXES;
 2.2. BY SOLID FIREBLOCKING IN ACCORDANCE WITH IRC
 SECTION R3921.

 - 2.2. BT SOLID FIREDLOCKING IN ACCORDANCE SECTION R302.II.
 2.3. BY PROTECTING BOTH BOXES WITH LISTED PUTTY PADS; OR
 2.4. BY OTHER LISTED MATERIALS AND METHODS.
- THE ANNULAR SPACE CREATED BY THE PENETRATION OF A FIRE SPRINKLER PROVIDED IT IS COVERED BY A METAL ESCUTCHEON PLATE.

IF ANSI AIIT, I APPLIES PER LOCAL JURISDICTION:

CABO/ANSI AIILI 1992 FOR ACCESSIBILITY, SECTION 425-3 (EXCEPTION) STATES: ELECTRICAL AND COMMUNICATION SYSTEM RECEPTACLES ON WALLES SHALL BE MOUNTED IS INCHES ABOVE THE FLOOR UNLESS THE USE OF SPECIAL EQUIPMENT REQUIRES LOCATION AT A DIFFERENT POSITION. THE ANSI STANDARD IS REFERENCED IN THE 1931_UBC_SECTION_1012.

|CC/ANS| AIT. | 1998 FOR ACCESSIBILITY, CHAPTER 3 - BUILDING BLOCKS, SECTION 308 REACH RANGES, 308.3 SIDE REACH:

3083.1 WOBSTRUCTED. WHERE A CLEAR FLOOR OR GROUND SPACE ALLOWS A PARALLEL APPROACH TO AN ELEMENT AND THE SIDE REACH IS UNOBSTRUCTED, THE HIGH SIDE REACH SHALL BE 46 NCHES (1220 MM) MAXIMUM AND THE LOW SIDE REACH SHALL BE 15 INCHES (380 MM) MINIMUM ABOVE THE FLOOR OR GROUND.

THE PENETRATION AREA SUM OF ALL THE OUTLETS, SWITCHES OR ELECTRICAL FIXTURES INTO THE FIRE RESISTANT RATED WALL MUST NOT EXCEED 100 SQUARE INCHES PER 100 SQUARE FEET OF FIRE RESISTANT RATED WALL. THESE PENETRATIONS MUST BE BY LISTED, UL OR OTHER, APPROVED ELECTRICAL COMPONENTS.

EXAMPLE:
ONE SINGLE RECEPTACLE BOX = 8.4 SQ. INCHES
TOTAL PER 100 SQ. FT. OF WALL= II SINGLE RECEPTACLE
BOXES

ONE DUPLEX RECEPTACLE BOX = 15 SQ., INCHES TOTAL PER 100 SQ. FT. OF WALL= 6 DUPLEX BOXES

PROVIDED THAT THE SPACING REQUIREMENTS, CODE AND LISTING ARE MET.

- DETAILS VI PENETRATIONS SPECIAL CONDITIONS MEMBRANE

PERMIT

O



DESIGN CONFIGURATION

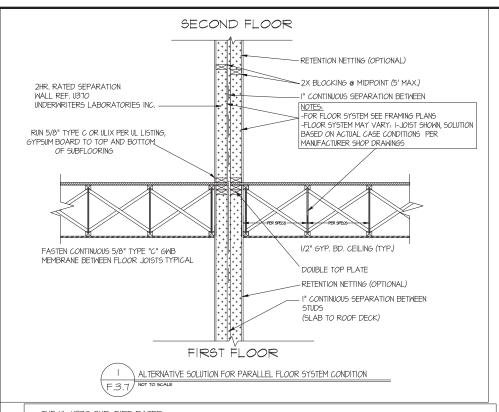
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CONDITIONS POWER BOXES

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FIRE SEPARATION RATED WA

UL - U370 & U377 ASSEMBLY APPLICATION

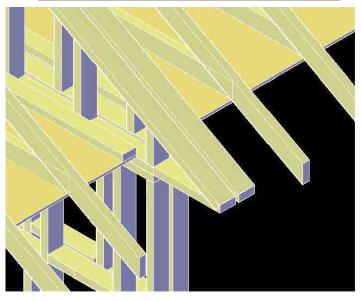


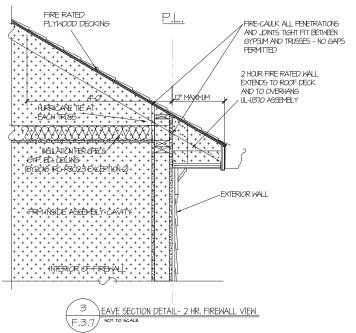
THE UL-U370 2HR, FIRE RATED SEPARATION WALL HAS TO EXTEND INTO THE EAVE AREA AS SHOWN:

- I) THE UL-U370 FIRE RATED SEPARATION WALL HAS TO BE FLUSH WITH THE BOTTOM OF THE FIRE RATED MATERIAL DECK, WETHER PLYWOOD OR SHEET ROCK.
- THE GREENFIBER FRM FIRE RATED 2) MATERIAL EXTENDS INTO THE EAVE CAVITY CONTINUING THE ASSEMBLY AND SEALING ALL THE FRAMING GENERATED CAVITY, CREATING IN EFFECT A CONTINUOUS MEMBRANE, BOTH OF STUD FRAMING COMPONENTS AND FRM BLOWN-IN CELLULOSE: FROM SIDE TO SIDE AND FROM THE TOP OF THE SLAB TO THE BOTTOM OF THE ROOF DECK OF THE BUILDING.
- 3) A TRIANGULAR SOFFITED EAVE IS SHOWN IN THE DETAIL FOR CLARITY, BUT ABBREVIATED EAVES, SHED ROOF EAVES, EXPOSED EAVES AND BOXED END EAVES FOLLOW THE SAME CONCEPT OF EXTENDING THE ASSEMBLY INTO THE CAVITY.
- 4) FIRE PROOFING, BY I.C.C. RES. CODE EXTENDS 48 INCHES ON BOTH SIDES OF THE PROPERTY LINE CONTINUOUSLY.

EXTENSION OF THE FIREWALL INTO THE OVERHANG @ THE PROPERTY LINE

OVERHANG AND EAVE CONDITION





SPECIAL CONDITIONS - DETAILS VII Ω EAVE OVERHANG AND

PERMIT

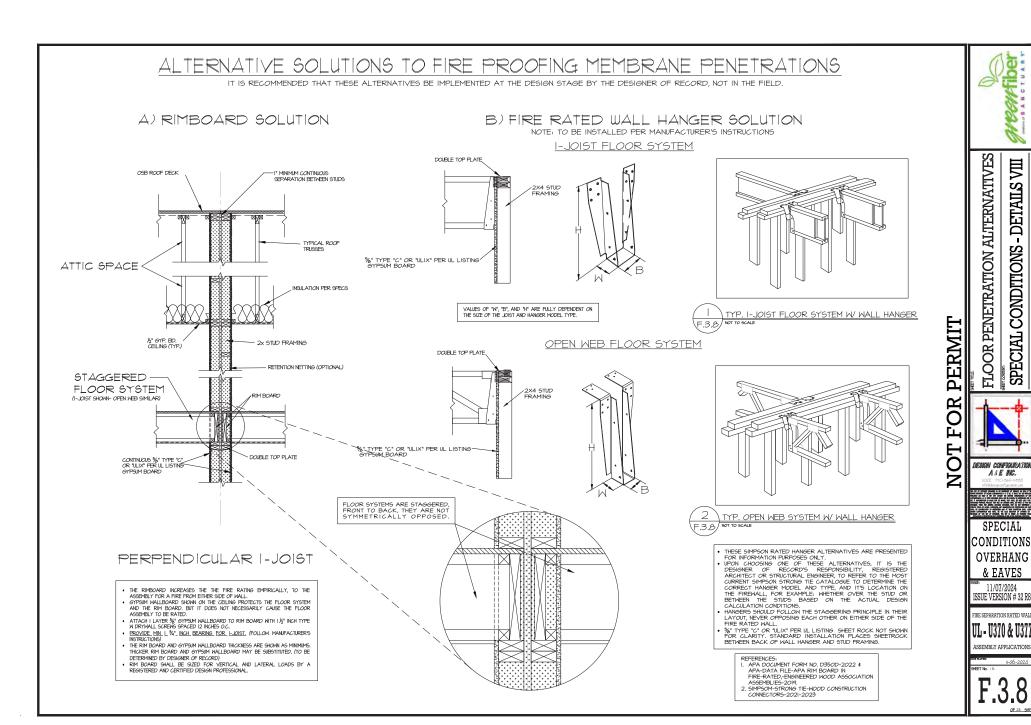
DESIGN CONFIGURATION

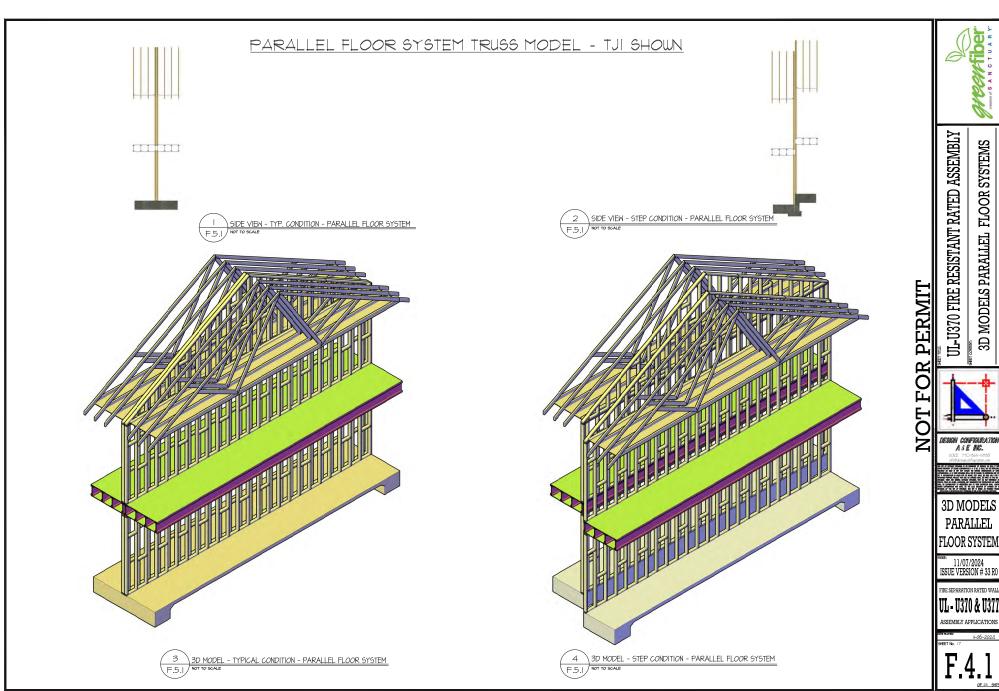
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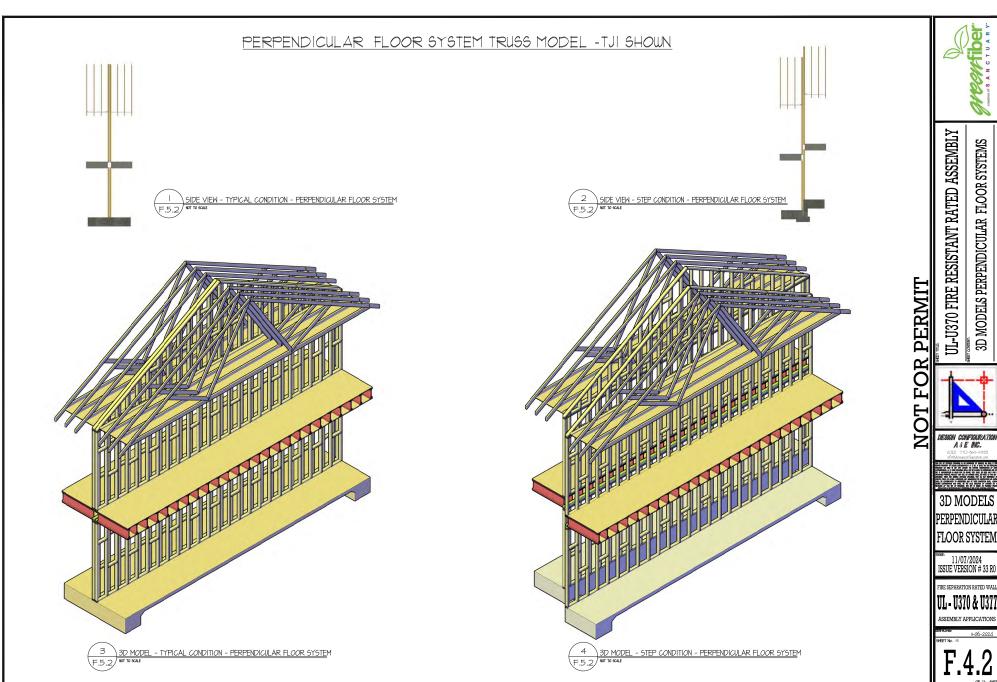
CONDITIONS: **OVERHANG** & EAVES

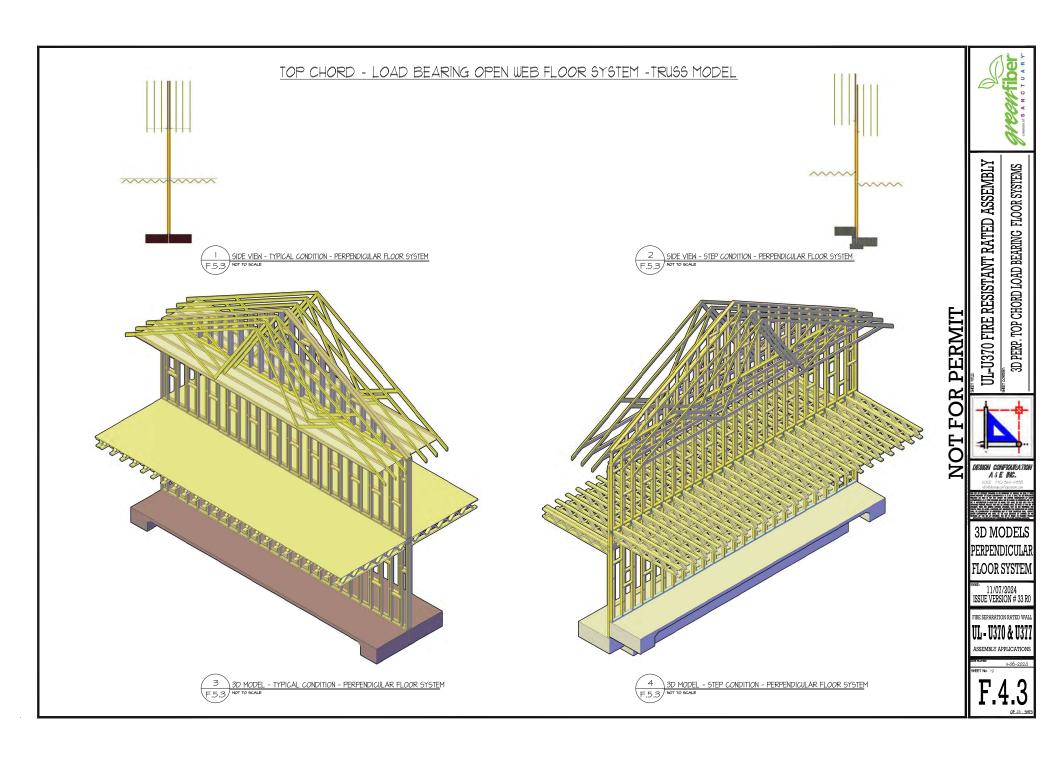
11/07/2024 ISSUE VERSION # 32 R8 FIRE SEPARATION RATED WA

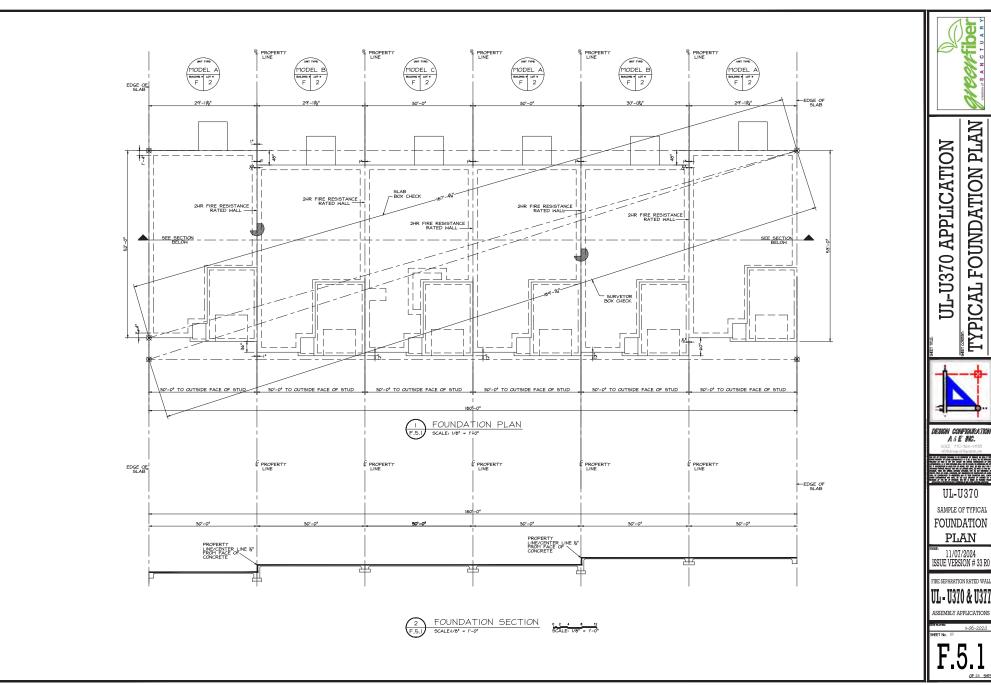
UL - U370 & U371 ASSEMBLY APPLICATIONS





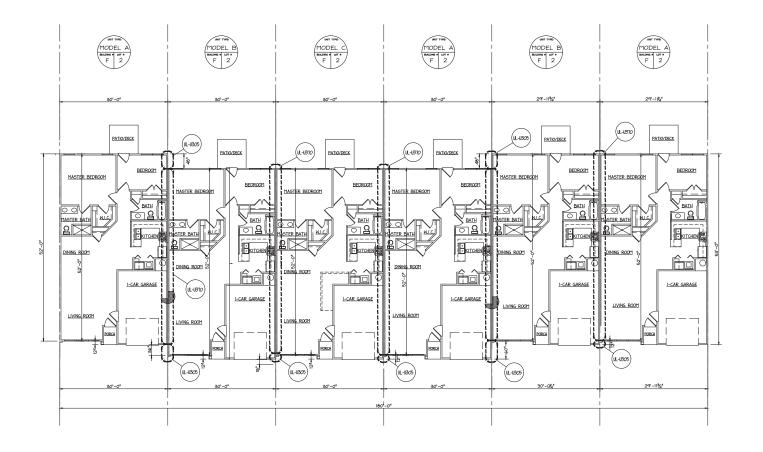








HORIZONTAL SEPARATION



NOTE.

BACH TOWNHOUSE HAS BEEN DESIGNED AS A SEPERATE BUILDING AND SHALL BE SEPERATED FROM ADJOINING TOWNHOUSES BY A 2-HOUR FIRE-RESISTANCE RATED HALL IN COMPLIANCE WITH SECTION R 321.2 OF THE INTERNATIONAL RESIDENTIAL CODE

FLOOR PLAN



UL-U370 APPLICATION TYPICAL FLOOR PLAN



A & E MG. VOICE 170-366-9528 vitotidesignantiquation.com

UL-U370 SAMPLE OF TYPICAL FLOOR PLAN

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FIRE SEPARATION RATED WALL

ASSEMBLY APPLICATIONS

I-06-2024

F.5.3

