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## EVALUATION REPORT

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### COCOON THERMAL AND SOUND INSULATION PRODUCTS

U.S. GREENFIBER, L.L.C.  
370 PALM ISLAND, S.E.  
CLEARWATER, FLORIDA 33767

#### 1.0 SUBJECT

Cocoon Thermal and Sound Insulation Products.

#### 2.0 DESCRIPTION

##### 2.1 General:

Cocoon thermal and sound insulation products consist of a uniform low-density mixture of cellulosic fibers and fire-retardant chemicals, designed for installation on or within floors, floor-ceiling or roof-ceiling assemblies, attics, crawl spaces, walls and partitions. The insulation is recognized for use as interior finish, thermal resistance, sound insulation, fire-blocking and fire-resistive construction under the 1997 *Uniform Building Code*™ (UBC), the 2000 *International Building Code*® (IBC) and the 2000 *International Residential Code*™ (IRC), as noted in this report.

##### 2.2 Materials:

**2.2.1 Cocoon Spray-applied Insulation:** Cocoon spray-applied insulation is used for exposed application as an interior finish on new or existing steel, wood, gypsum wallboard, aluminum, masonry or concrete substrates; for concealed application within walls and partitions; or for exposed application on horizontal or sloped attic floors. Cocoon spray-applied insulation is installed on or within walls and partitions at a density of between 2.2 and 2.6 pounds per cubic foot (35.2 and 41.6 kg/m<sup>3</sup>) and is installed on attic floors at a density of between 1.3 and 2.0 pounds per cubic foot (20.8 and 32.0 kg/m<sup>3</sup>). The products are spray-applied with water to activate the dry adhesive in the fire-retardant-treated cellulose fibers. Cocoon spray-applied insulation has a Class I flame-spread classification (flame-spread rating of 25 or less) and a smoke-developed rating of 50 or less when tested in accordance with UBC Standard 8-1 for compliance with the UBC (ASTM E 84-98 for compliance with the IBC and IRC).

**2.2.2 Cocoon Loose-fill Insulation:** Cocoon loose-fill insulation is blown into concealed spaces of walls, partitions, or roof-ceiling or floor-ceiling assemblies; or is exposed on horizontal or sloped attic floors. Cocoon loose-fill insulation is installed in enclosed spaces at a density of 2.6 pounds per cubic foot (41.6 kg/m<sup>3</sup>), and is installed on exposed surfaces at a density of between 1.3 and 2.0 pounds per cubic foot (20.8 and 32.0 kg/m<sup>3</sup>).

**2.2.3 Gypsum Wallboard:** Gypsum wallboard must comply with ASTM C 36-92 for compliance with the UBC (ASTM C 36-97 for compliance with the IBC and IRC).

##### 2.3 Installation:

**2.3.1 General:** Application must be performed by contractors certified by U.S. Greenfiber, L.L.C., and must be in

accordance with ASTM C 1015, with the U.S. Greenfiber, L.L.C., installation instructions, and with this report. When placed adjacent to recessed light fixtures, metal chimneys or other heat-producing elements, a permanent barrier is necessary to maintain a 3-inch (76 mm) clearance between the item and the insulation, unless the recessed light fixture is identified by the letters "IC" and is listed for direct contact with cellulosic insulation or the heat producing element is listed for zero clearance to combustibles. The insulation must not be placed in areas where the temperature exceeds 194°F (90°C). The building official may require an approved vapor retarder to be installed in accordance with Section R322.1 of the IRC and Section 1403.3 of the IBC. Attic vents must not be blocked by the application of the Cocoon insulation.

**2.3.2 Cocoon Spray-applied Insulation:** The insulation is sprayed into its final position using a pneumatic device. A fine water mist is mixed with the insulation as it passes through a specially designed nozzle that activates a dry adhesive component in the insulation.

All surfaces that are to receive spray-applied insulation material must be clean, dry and free from dust, grease, oil, rust and other agents tending to reduce bonding qualities. Before enclosing in walls, the insulation must dry for a minimum of 24 hours and the moisture content must be 25 percent or lower. Cocoon spray-applied insulation may be applied to sloped attic floors, regardless of slope.

**2.3.3 Cocoon Loose-fill Insulation:** Cocoon loose-fill insulation is installed into its final position using a pneumatic device. The insulation may be applied to sloped attic floors, provided the slope does not exceed 5:12 (41.66% slope).

##### 2.4 Thermal Properties:

Density and thermal characteristics of the Cocoon loose-fill and spray-applied insulations are given in Table 1.

##### 2.5 Fire Blocking:

Cocoon insulations are permitted as fire blocking under Section 708.2.1, Item 1, of the UBC and Section 716.2.1 of the IBC, and are permitted to be used as alternates to the fire blocking in Section R602.8, Item 1, of the IRC.

Cocoon insulations may be placed in new or existing 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 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 stud space, and the plugs are removed. The existing insulation is cut and pushed away to form a minimum-16-inch-deep (406 mm) space. Cocoon spray-applied or loose-fill insulation, as applicable, is then installed into the open space, filling the full 16-inch (406 mm) (or greater) depth and contacting all surfaces. After installation has been completed, the plugs are replaced and the wall covering is repaired.

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When there is no insulation in the wall or partition, Cocoon spray-applied insulation must fill the stud space to a minimum depth of 16 inches (406 mm). When the walls or partitions have existing insulation in the spaces between the studs, installation is as noted for the loose-fill insulation.

## 2.6 Sound-rated Wall Assemblies:

The following wall assemblies have a Sound Transmission Class (STC) of 50 or greater:

**2.6.1 Double Wood Stud Wall:** The double wood stud wall assembly incorporates nominal 2-by-4 wood studs on a nominal 2-by-6 wood plate. The studs on each side of the wall are spaced at 16 inches (406 mm) on center and are staggered from the studs on the opposite side. One layer of  $5/8$ -inch-thick (15.9 mm) Type X gypsum wallboard is attached to the studs on both sides of the wall with minimum  $1\frac{5}{8}$ -inch-long (41.3 mm) Type W screws, spaced at 8 inches (203 mm) on center. The stud cavities are filled with Cocoon spray-applied insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

**2.6.2 Wood Stud Wall:** The assembly consists of nominal 2-by-4 wood studs, spaced at 16 inches (406 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm) Type X gypsum wallboard is attached to the studs on one face of the wall with minimum- $1\frac{5}{8}$ -inch-long (41.3 mm) Type W screws spaced at 8 inches (203 mm) on center. On the opposite face of the wall, minimum No. 25 gage resilient channels, spaced at 24 inches (610 mm) on center, are attached horizontally to the studs with minimum- $1\frac{5}{8}$ -inch-long (41.3 mm) Type W screws. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to the resilient channels with minimum-1-inch-long (25.4 mm) Type S screws. The cavities are filled with Cocoon spray-applied insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

**2.6.3 Steel Stud Wall, Assembly 1:** Number 25 gage [0.018 inch (0.46 mm)] steel studs,  $3\frac{5}{8}$  inches (92 mm) deep, complying with the code, are spaced at 24 inches (610 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to both faces of the studs with minimum-1-inch-long (25.4 mm) Type S screws spaced at 12 inches (305 mm) on center. The stud cavities are filled with Cocoon spray-applied insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

**2.6.4 Steel Stud Wall, Assembly 2:** Number 25 gage [0.018 inch (0.46 mm)] steel studs,  $3\frac{5}{8}$  inches (92 mm) deep, complying with the code, are spaced at 24 inches (610 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to one face of the studs with minimum-1-inch-long (25.4 mm) Type S screws spaced at 12 inches (305 mm) on center. On the opposite face, minimum No. 25 gage resilient channels, spaced at 24 inches (610 mm) on center, are attached horizontally to the studs with screws of sufficient length to penetrate the studs a minimum of  $1/4$  inch (6.4 mm). A double layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to the resilient channels. The base layer is attached to the resilient channels with screws spaced at 24 inches (610 mm) on center. The face layer is attached to the resilient channels with screws spaced at 12 inches (305 mm) on center. Screws must have sufficient length to penetrate the studs a minimum of  $1/4$  inch (6.4 mm). The stud cavities are filled with Cocoon spray-applied insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

**2.6.5 Steel Stud Wall:** Number 25 gage [0.018 inch (0.46 mm)], 2.5-inch-deep (63.5 mm) steel studs are spaced at 16 inches (406 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to both faces of the wall with minimum-1-inch-long (25.4 mm) Type S screws spaced at 12 inches (305 mm) on center. The stud cavities are

filled with Cocoon insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

**2.6.6 Double Wood Stud Wall:** The wall assembly consists of two nominal 2-by-4 wood stud walls spaced 1 inch (25.4 mm) apart. Studs are spaced at 16 inches (406 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to both faces of the wall with  $1\frac{5}{8}$ -inch-long (41.3 mm) Type W screws spaced at 8 inches (203 mm) on center. The cavity of the wall assembly is filled with Cocoon insulation. Wallboard joints and screw heads must be taped and sealed with joint compound.

## 2.7 Fire-resistive Construction:

**2.7.1 Fire-resistive Wall Assemblies:** Cocoon spray-applied insulation is permitted to be installed in stud cavities of fire-resistive wood or steel stud assemblies incorporating gypsum wallboard or gypsum sheathing described in Table 7-B of the UBC and Table 719.1(2) of the IBC without affecting the hourly rating. Time assigned for additional protection of wood-stud walls is 15 minutes when calculating fire resistance in accordance with Section 7.724 of UBC Standard 7-7 or with Section 720.6 of the IBC.

**2.7.2 Two-hour Fire-resistive Limited Load-bearing Double Wood Stud Wall Assembly:** The assembly consists of two rows of nominal 2-by-4, No. 2 Douglas fir wood studs spaced at 16 inches (406 mm) on center, on separate 2-by-4 plates placed 1 inch (25.4 mm) apart. See Figure 1. Studs in one row are staggered 8 inches (203 mm) from studs in the other row. Horizontal blocking is installed between studs at a height of 60 inches (1524 mm). Each side of the assembly is covered with  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard attached to framing with  $1\frac{7}{8}$ -inch-long (47.6 mm) wallboard nails spaced at 8 inches (203 mm) on center. Prior to covering, Cocoon spray-applied insulation is sprayed into the 8-inch (203 mm) space between the interior and exterior face, at a nominal density of 2.6 pounds per cubic foot (41.6 kg/m<sup>3</sup>), and screeded off smooth with the surface of the studs. Wallboard joints and nail heads are taped and covered with joint compound. Nail heads are covered with two coats of compound. The maximum wall height is 10 feet (3048 mm). Allowable bearing loads cannot exceed the following, whichever is most restrictive:

- 1,200 pounds (5338 N) per 2-by-4 stud.
- Design stress of  $0.78 F_c$  as set forth in Sections 3.6 and 3.7 of the NDS\* as referenced in Section 2316 of the UBC and amended in Item 15, Section 2316.1, of the UBC, and as referenced in Section 2306.1 of the IBC.
- Design stress up to 47.5 percent of the  $F_c$  or  $F_{c\perp}$  permitted for the stud species and grade.

**2.7.3 One-hour Fire-resistive Nonload-bearing Steel Stud Partition:** The assembly consists of No. 25 gage [0.018 inch (0.46 mm)],  $2\frac{1}{2}$ -inch- or  $3\frac{5}{8}$ -inch-deep (63.5 mm or 92 mm) or  $2\frac{1}{2}$ -inch-deep (63.5 mm) steel studs spaced at 24 inches (610 mm) on center. One layer of  $5/8$ -inch-thick (15.9 mm), Type X gypsum wallboard is attached to both sides of the studs with  $1\frac{5}{8}$ -inch-long (92 mm) Type S screws spaced at 12 inches (203 mm) on center. The stud cavities are filled with Cocoon spray-applied insulation. Wallboard joints and screws must be taped and sealed with joint compound. See Figure 2.

**2.7.4 Membrane Penetrations:** Outlet boxes on opposite sides of the wall shall be separated by a horizontal distance not less than the depth of the studs when the wall cavity is filled with Cocoon insulations.

## 2.8 Identification:

All bags are identified with the product name, the manufacturer's name, the address of the manufacturing plant and the date of manufacture, and the ICBO ES evaluation report number (ER-2833). Additionally, all bags bear a label with information required by CPSC 16 CFR, Parts 1209 and 1404.

\*ANSI/NFPA NDS 91, National Design Specification for Wood Construction of the American Forest and Paper Association, Revised 1991 Edition, and the Supplement to the 1991 Edition National Design Specification (UBC); ANSI/AF&PA NDS-97 Wood Construction and Supplement (IBC and IRC).

**3.0 EVIDENCE SUBMITTED**

Installation instructions and reports of tests in accordance with CPSC 16 CFR, Parts 1209 and 1404; ASTM Standards E 518-91, E 90-83 and E 413-73 (1980); small-scale fire-resistance comparison tests of fire blocking; and UBC Standards 7-1 (ASTM E 119) and 8-1 (ASTM E 84).

**4.0 FINDINGS**

That the Cocoon thermal and sound insulation products described in this report comply with the 1997 *Uniform Building Code*<sup>™</sup>, the 2000 *International Building Code*<sup>®</sup>, and the 2000 *International Residential Code*<sup>™</sup>, subject to the following conditions:

- 4.1 The insulation is applied as set forth in this report and the manufacturer’s instructions.
- 4.2 The insulation is permitted in fire-resistive wall assemblies described in Section 2.7 of this report.

- 4.3 The insulation is permitted to be used in noncombustible construction without affecting the non-combustible recognition.
- 4.4 The installer provides to the building official a signed and dated statement describing the insulation installed, and including thickness; coverage area; R-value; and number of bags used, or pounds installed.
- 4.5 Cocoon Thermal and Sound Insulation products are manufactured by U.S.GreenFiber, L.L.C., at their manufacturing plants located in Phoenix, Arizona; Sacramento, California; Tampa, Florida; Lithia Springs, Georgia; Norfolk, Nebraska; Charlotte, North Carolina; Delphos, Ohio; Portland, Oregon; Waco, Texas; and Elkwood, Virginia.

This report is subject to re-examination in one year.

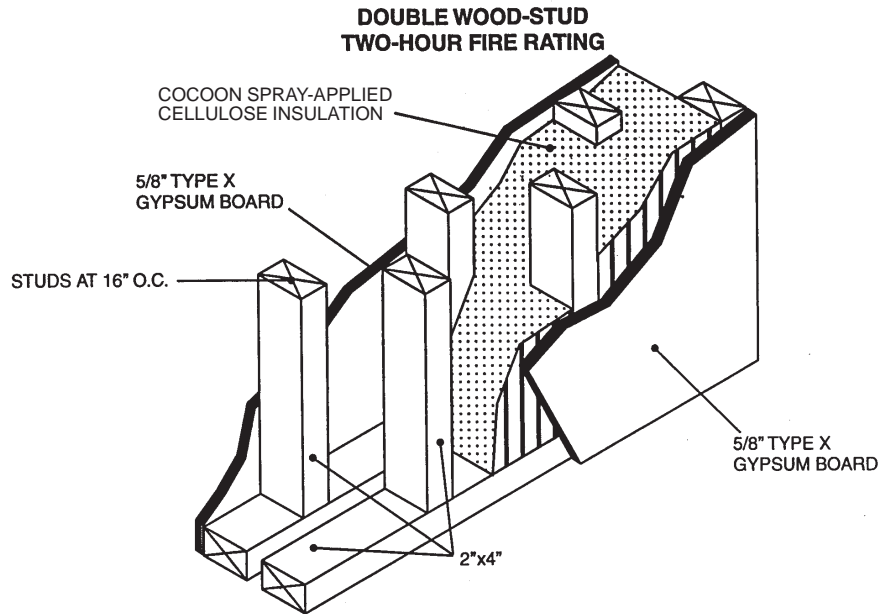
**TABLE 1—THERMAL PROPERTIES OF COCOON INSULATION**

INSULATION TYPE	NOMINAL DENSITY (pcf)	THERMAL CONDUCTIVITY k-VALUE (Btu-in./hr. · sq.ft. · °F)	R-VALUE (per inch of thickness)
Cocoon Spray-applied <sup>1</sup> :			
- Walls	2.60	0.270	3.7
- Ceilings	1.60	0.270	3.7
Cocoon Loose-fill <sup>2</sup> :			
- Walls	2.60	0.270	3.7
- Ceilings	1.60	0.270	3.7

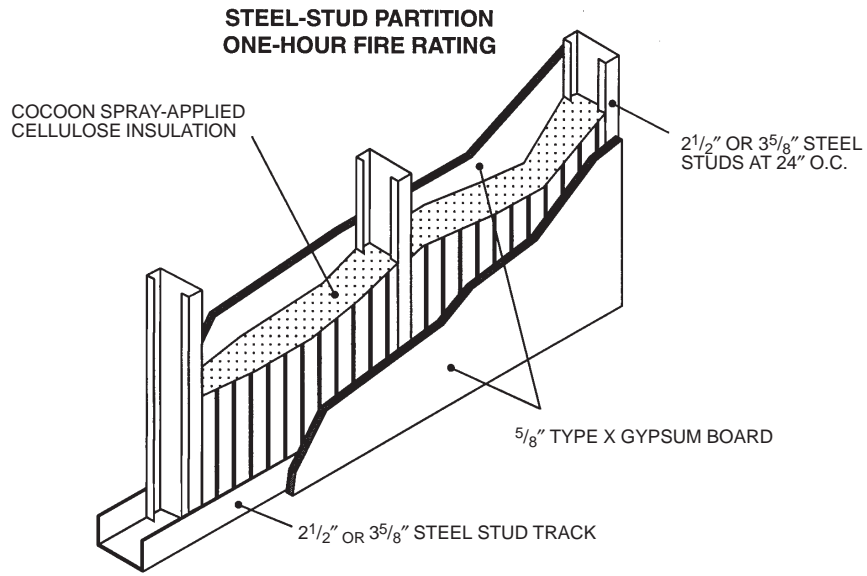
For SI: 1 pcf = 16.018 kg/m<sup>3</sup>, 1 Btu-in./hr.-sq.ft.-°F = 0.1442 W/m · k, 1 inch = 25.4 mm.

<sup>1</sup>Water is field-mixed with the dry insulation fibers at the nozzle of the spray equipment.

<sup>2</sup>Densities noted in the table are the settled densities.



**FIGURE 1**



**FIGURE 2**