

COCOON™ CELLULOSE INSULATION AND THE SYSTEMS APPROACH TO BUILDING DESIGN



SIMPLY SMARTER INSULATION®

SEAMLESS PROTECTION AND HIGHER R-VALUE FOR MAXIMUM INSULATING PERFORMANCE



ACHIEVE FULL INSULATING POTENTIAL WITH THE SYSTEMS APPROACH TO DESIGN AND INSTALLATION



You can cost-effectively enhance the quality of your next project simply by insulating with Cocoon™ cellulose insulation. Made from a high-quality engineered paper fiber ("cellulose"), Cocoon is designed to conserve energy and improve insulation performance in a wide range of climatic conditions.

Cocoon insulation may be used in walls and attics of residential or commercial structures, as well as cathedral or flat ceilings, crawl spaces, basements, and as insulation under floors. There are no slope restrictions with Cocoon stabilized insulation.

HIGH R-VALUE AND SEAMLESS PROTECTION

Cocoon insulation's density gives it a high R-value per inch, and it maintains that R-value even under extreme conditions. Cocoon insulation completely fills most voids, forming a tight, seamless insulation seal around irregular objects such as wiring, plumbing and framing materials in attics and walls. Cocoon insulation may be added over fiberglass in attics of existing structures to increase R-value and to improve the thermal resistance of the existing insulation.

ADVANCED WALL SPRAY SYSTEM

The unique Cocoon Wall Spray system uses minimal moisture, which permits installation of drywall within 24 hours of application. The product is self-supporting and does not need veneer to hold it in place. And it adheres to any typical wood, metal, gypsum board or concrete sheathing surface.

Cocoon Stabilized Insulation Spray Applied Application Coverage Chart		
R-Value at 75°F Mean Temperature	Minimum Thickness	Minimum Weight Per Square Foot
To Obtain an Insulation Resistance (R) of (inches)	Installed Insulation Should Not Be Less Than: (Inches)	Wt./Sq. Ft. of Installed Insulation Shouldn't Be Less Than: (Lbs.)
R-50	13.5	1.705
R-38	10.3	1.210
R-30	8.1	.897
R-19	5.1	.497
R-13	3.5	.299
Sidewalls (Wall Spray)		
R-13 (2 x 4)	3.5	.758
R-20 (2 x 6)	5.5	1.192

FIRE, MOLD, INSECTS AND SOUND CONTROL

Cocoon insulation meets flame resistance specifications set by all federal, state and local building authorities. The same boron-based chemicals that are so effective as fire retardants in Cocoon insulation are also natural fungicides that protect against mold, mildew and other microbes. Cocoon Pest Control Formula insulation contains higher concentrations of the boron chemicals which repel pests such as termites, cockroaches, ants and silverfish. In addition, Cocoon insulation is highly effective at reducing airborne sound transmission as well as inside noise from plumbing and other sources.

SAFE FOR THE BUILDING AND THE ENVIRONMENT

Cocoon insulation does not irritate normal skin. Although Cocoon insulation is only classified as a nuisance dust, wearing a dust mask during installation is recommended. And because it is made from 100% recycled newspaper and other waste paper products, Cocoon insulation is environmentally friendly, significantly reducing landfill waste and reducing energy needs for the lifetime of the structure.

WE GUARANTEE IT

Cocoon insulation is tested by certified laboratories to assure that it meets stringent performance standards and meets or exceeds national building code requirements. GreenFiber offers a written limited lifetime warranty to meet the strongest industry standards as well as those set by the federal government. This warranty includes the permanence of the chemical fire retardant treatment.

LIMITATIONS

GreenFiber recommends installation according to ASTM C-1015. Cocoon insulation should not be installed in areas where temperatures exceed 194°F, or in areas of excessive or continuous moisture. Spaces to be insulated must be prepared so as to keep insulation material from coming in direct contact with heat sources such as light fixtures, stove pipes, chimneys, etc., which are not rated for zero clearance from combustibles. Proper venting and moisture control will improve the effectiveness of any thermal insulation. Questions about appropriate installation of Cocoon insulation may be directed to a representative at 888-592-7684.

Modern buildings consist of thousands of components that shape large functional interrelated systems. When all the components of these systems work together, the results are dramatic: maximum safety, durability, comfort and efficiency throughout the structure.

That's the systems approach to building design. And it is the approach that can help you achieve superior thermal performance and insulation value with Cocoon™ cellulose insulation.

ZERO TOLERANCE INSTALLATION

Insulation plays a crucial role in the building envelope system. It is important that insulation be in direct contact with the air barrier. The air barrier is the plane commonly made of drywall that separates the conditioned area of a building from the unconditioned area. Adherence to these "zero tolerance" guidelines will produce an effective thermal boundary:

No Gaps

Gaps commonly occur in the thermal boundary when insulation covers too short or too narrow an area for a stud cavity.

No Voids

Holes in the thermal boundary allow unwanted heat gain during the summer and heat loss during the winter. Typical problem areas are knee walls, stairs on exterior walls, vaulted ceilings, tubs or tub and shower stalls, and utility shafts.

No Compression

Insulation achieves its full R-value only when it is allowed to remain at its full thickness.

No Misalignment

Misalignment occurs when there is a separation between the insulation and the air barrier. This space allows air to circulate inside or through the cavity resulting in a decrease in insulation performance.

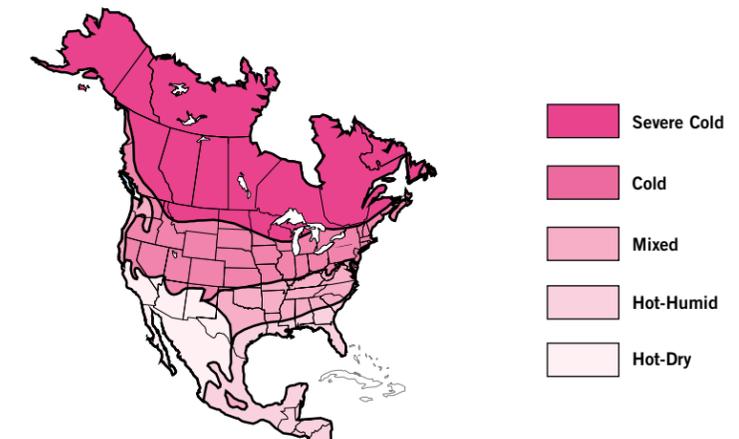
No Wind Intrusion

In attics, wind can enter the insulation through soffit vents and reduce R-value. Therefore, wind baffles properly installed prior to insulating can prevent wind intrusion.

ADDITIONAL FACTORS

To preserve the integrity of the building envelope, the system

Climate Zones Covered by Building Science



Varying climates demand differing insulation strategies. Building Science Corporation provides guides to building in specific regions. Visit www.buildingscience.com

must deter moisture infiltration. The need, selection and placement of a vapor retarder varies according to climate and building conditions.

Completely filling cavities such as cathedral ceilings, vaulted ceilings and flat roofs with Cocoon insulation is recommended in some climates. These ceiling assemblies should be unvented and carefully sealed to control the amount of moisture vapor transported into the cavities.

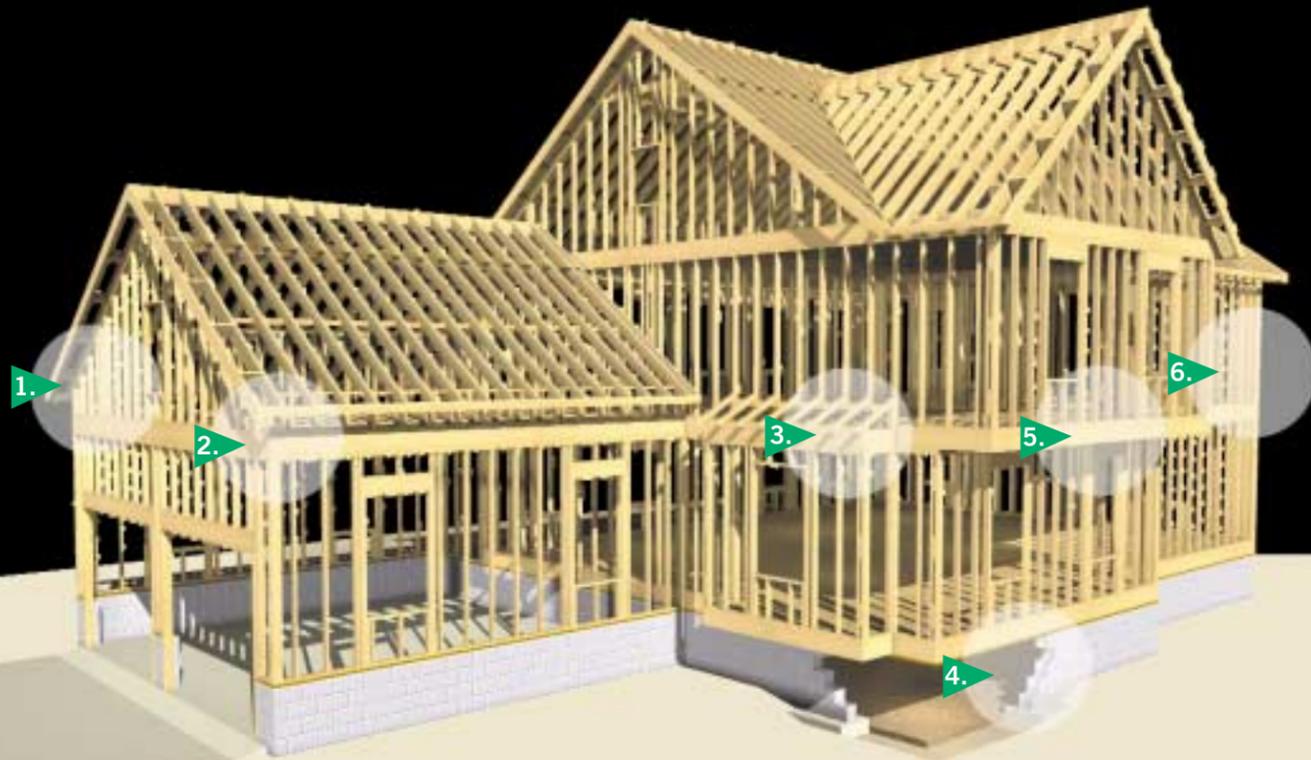
For these and other details, visit www.buildingscience.com

ENGINEERED FOR LIFE

Engineered for Life™ is a home-certification program that promotes design and construction based on proven building science techniques. To learn more about Engineered for Life, visit www.us-gf.com

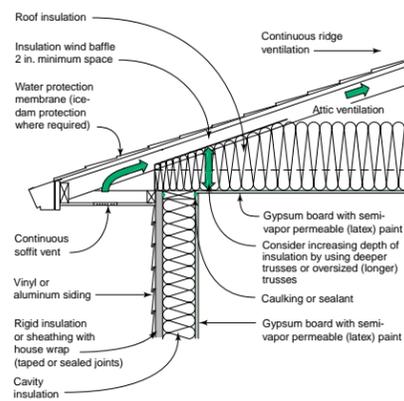
INSTALL COCOON™ CELLULOSE INSULATION FOR EFFECTIVE INSULATION THROUGHOUT YOUR STRUCTURE.

The building envelope plays many roles in the proper function of the entire structure. It serves as the thermal barrier and the air pressure barrier of the building. The systems approach to design and construction ensures that Cocoon™ cellulose insulation will perform to meet a wide range of structural demands.

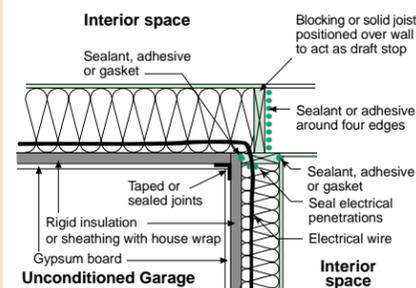


Construction and workmanship are critical to building envelope performance. The examples below illustrate effective installation techniques for addressing varying conditions, from foundation to attic.

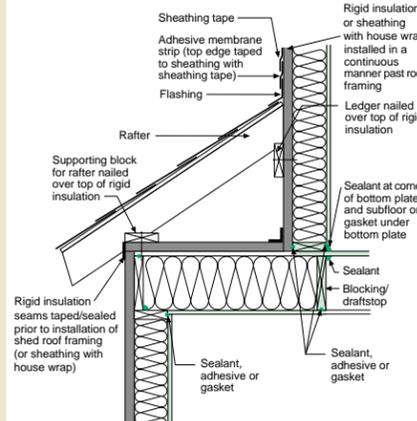
1. BAFFLE INSULATION



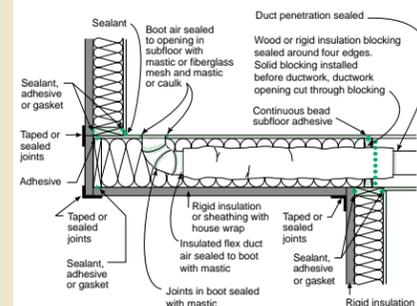
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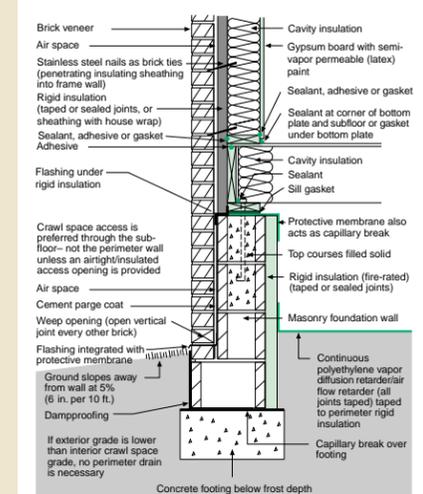
3. SET-BACK ROOF



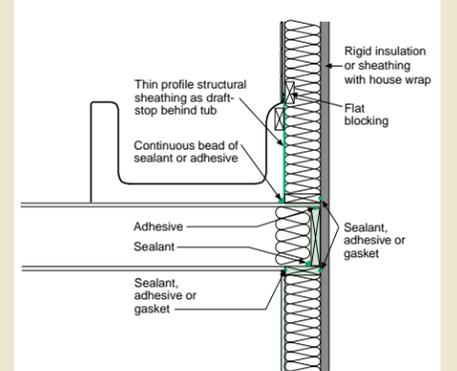
4. CANTILEVERED FLOOR AND DUCTS



5. INTERNALLY INSULATED CRAWL SPACE



6. TUB FRAMING



IMPROVE SOUND CONTROL AND FIRE SAFETY WITH COCOON™ CELLULOSE INSULATION



SOUND

What is STC?

Sound Transmission Class (STC) is a numerical rating in decibels (dB's) 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. For other sources such as machinery, many music systems, and transportation noises, accurate STC assessment requires a detailed frequency band analysis.

Materials

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.

The mass or weight of an assembly's membrane also contributes to sound control. For example, added sheets of gypsum board absorb more sound, and a cement block wall absorbs more sound than an empty 2 x 8 frame wall. Likewise materials with higher density and airflow resistance are better at reducing sound transmission. Table 1 lists typical airflow resistivity values for the most common absorptive materials. Airflow resistance was measured according to ASTM C522-87, and airflow resistivity is the result of dividing by unit thickness. (NRC Consortium, 1995)

Table 1

Airflow Resistivity of Common Absorptive Materials			
Absorptive Material	Thickness (inches)	Density (pounds per ft ³)	Resistivity (mks rays/m)
Glass Fiber	3.5	0.76	4,800
Rockwool	3.5	2.04	12,700
Cellulose	3.5	3.08	33,000

Table 2 may be used as a guide in estimating the STC of an insulated wall from the contribution of various elements. If an empty 2" x 4" wood stud wall had an STC rating of 35, for example, adding 3 1/2" Cocoon™ cellulose insulation would raise the STC to 40.

Table 2

Approximate STC Contribution of Wall Elements	
Wall Element	Approximate Change in STC
3-1/2 inch Absorptive Material, Wood Studs	5
5-1/2 inch Absorptive Material, Wood Studs	7
3-1/2 inch Absorptive Material, Metal Studs	8
5-1/2 inch Absorptive Material, Metal Studs	10
1/2 or 5/8 inch Gypsum Board, per sheet	4
Stud Spacing 24 vs. 16 inch	4
Resilient Channel on 16 inch Centers, Wood Studs	10
Resilient Channel on 24 inch Centers, Wood Studs	12*
Wood Studs on 16 inch Centers	27
Metal Studs on 16 inch Centers	30
Staggered 2 x 4 Wood Studs on 6 inch Plate	37
Double Row of Wood Studs on Separate Plates	40

*This only applies when wood studs are on 16 inch centers

Detailing and Workmanship

Detailing and workmanship significantly affect sound control. For instance, flanking paths, inter-connecting ductwork, non-airtight edge joints, and inadequate door and window construction all degrade sound control performance. Performance is also compromised when sounds bypass absorptive material through gaps and voids; therefore, intimate contact between absorptive material, framing, and gypsum board should be maintained.

FIRE SAFETY

Cocoon Insulation Enhances Fire Resistance

Cocoon insulation can add significant fire resistance. Cocoon insulation will burn at a controlled rate of about one inch per five minutes, based on one- and two-hour ASTM E119 fire endurance tests on wood and steel-framed walls. Cocoon insulation can be added to any non-load bearing or load bearing wood or steel-framed wall assembly without reducing fire resistance. It can also be used as an alternative to traditional building code fireblocking measures. Fire rated walls filled with Cocoon insulation will meet building code provisions for adequate protection around non-combustible through penetrations.

Normally, membrane penetrations for such things as wall receptacles require a separation of at least 24" on opposite sides of a fire rated wall. However, if the wall is filled with Cocoon insulation, the horizontal separation need only be equal to the wall's thickness. GreenFiber has obtained approval from Underwriters Laboratories for the use of Cocoon insulation for many designs listed in their Fire Resistance Directory.

Wood Stud and Steel Stud Wall System

STC	Design Number STC Test	Fire Rating	Construction Description	Drawing	Thickness
66*	WP3820 RAL-TL98-5	2 Hr.	Double row 2 x 4 wood studs 16" o.c. with opposite studs staggered and cross braced at mid-height; double layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Load-Bearing)		10.5"
58	OP-15746-101913 RAL-TL98-5	2 Hr.	Double row 2 x 4 wood studs 16" o.c. with opposite studs staggered and cross braced at mid-height; single layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Limited Load-Bearing)		9.25"
52*	U342	2 Hr.	Double row 2 x 4 wood studs 16" o.c. and cross braced at mid-height; single layer 5/8" Type X gypsum board on inside and double layer outside each row; full cavity Cocoon insulation inside each row. (Load-Bearing)		11.75"
50*	WP4135	2 Hr.	Single 2 x 4 wood studs 24" o.c. and cross braced at mid-height; double layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Load-Bearing)		6.00"
51	WP3230 RAL-TL95-275	1 Hr.	Single 2 x 4 wood studs 16" o.c.; horizontal resilient channel on one side 24" o.c.; single layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Load-Bearing)		4.75"
52	WP3380 RAL-TL93-102	1 Hr.	2 x 4 wood studs 16" o.c. staggered 8" o.c. on 2 x 6" wood plates; single layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Load-Bearing)		6.75"
42/46*	WP3514/WP3510 RAL-TL95-274	1 Hr.	2 x 4 wood studs 16" or 24" o.c.; single layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Load-Bearing)		4.75"
65*	U419	3 Hr.	Single 25-gauge 6" steel studs 16" o.c.; three sheets 5/8" Type C gypsum board each side; full cavity Cocoon insulation. (Non-load bearing)		9"
58*	U412 WP1548	2 Hr.	Single 25-gauge 2-1/2" steel studs 24" o.c.; double layer 5/8" Type C gypsum board each side; full cavity Cocoon insulation. (Non-load bearing)		5"
58*	WP 1711	2 Hr.	Single 25-gauge 3-5/8" steel studs 24" o.c.; double layer 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (No-load bearing)		6.5"
50	WP1200 RAL-TL93-70W	1 Hr.	Single 25-gauge 3-5/8" steel studs 24" o.c.; single layer 5/8" Type X gypsum board each side; 1-1/2" Cocoon insulation. (Non-load bearing)		4.875"
50	OP-15746-105423 RAL-TL98-7	1 Hr.	Single 25-gauge 2-1/2" steel studs 24" o.c.; single sheet 5/8" Type X gypsum board each side; full cavity Cocoon insulation. (Non-load bearing)		3.75"

*STC estimated from similar data

Special Considerations

Fire rated floor/ceiling systems require special consideration if sound absorptive material such as Cocoon™ cellulose insulation is added to the plenum area. The weakest link in a floor system is the joist. The longer the joist member can be protected from fire, the longer it will carry its load. Adding sound absorptive material to the plenum of a floor/ceiling or attic/ceiling can cause the ceiling membrane to fall off prematurely due to excessive heat build-up.

It is important to verify that adding sound absorptive material will not reduce the fire resistance of a floor/ceiling or attic/ceiling assembly which did not include it when originally tested. In some designs, insulation is listed as an option; however, be sure to note differences in ceiling attachment criteria, if any. Generally, building codes and other certification agencies require an additional layer of the same type ceiling membrane as was originally certified whenever sound absorptive material is added to the original design.

COCOON™ CELLULOSE INSULATION SPECIFICATIONS

SCOPE

This specification provides data pertinent to the pneumatic application of Cocoon™ cellulose insulation in attics and walls. Cocoon insulation provides outstanding resistance to heat flow for thermal applications, noise control for acoustical treatments, and fire control in walls and attics of residential and commercial construction.

MATERIALS

More than 80% of the content of Cocoon insulation is processed from recycled cellulose fibers which have been chemically treated for flame resistance. The additives will not irritate normal skin and will not adversely affect other building materials.

FUNCTIONS

Thermal performance

Cocoon insulation resists the flow of heat by trapping air within the cell wall of each fiber and between fibers, creating significant resistance to air movement. This natural ability to trap air provides Cocoon cellulose insulation with 22% more insulation effectiveness than the same R-Value of other low-density loose-fill fibrous insulating materials.

Sound Control

These same isolated air pockets and density also provide effective noise reduction in walls and between floors by effectively creating a customized batt at the job site.

MATERIAL CHARACTERISTICS

All cellulose insulation sold in the U.S. must conform to the CPSC standard 16 CFR Parts 1209 and 1404. In addition, Cocoon meets all of the test requirements of ASTM C-739 in the U.S. and CAN/ULC-S703 (formerly CAN/CGSB-51.60) in Canada.

The following properties were tested by Underwriters Laboratories (R-15890):

Density

The maximum density anticipated after long-term settling of dry attic applications was determined by the following specifications:

ASTM C-739	1.6lb/ft ³
CAN/ULC-S703	25.6kg/m ³

Thermal Resistance

The average thermal resistance per inch was determined by test method ASTM C-518 (4 in. thick):

ASTM C-379	3.70 (R-Value/in)
CAN/ULC-S703	25.65 (RSI – Value/M)

Surface Burning Characteristics

Two surface burning characteristics are evaluated. They are Critical Radiant Flux using test method ASTM E-970, and Flame Spread using ASTM E-84 or CAN/ULC-S102.2. Cocoon insulation meets or exceeds the specified requirements for each test as follows:

ASTM E-970	greater than	0.12 watts/cm
ASTM E-84	Flame spread	less than 25
	Smoke developed	less than 50
CAN/ULC-S102.2		less than 150

Moisture Vapor Sorption

This requirement assures that normal variations in relative humidity will not adversely affect thermal performance. Cocoon insulation meets the requirements of less than 15% for maximum weight gain under the specified test conditions.

Corrosiveness

When in contact with steel, copper, aluminum, or galvanized materials, Cocoon insulation was determined to be non-corrosive.

Other Properties Tested

Cocoon cellulose insulation passed these additional tests:
Odor Emission
Separation of Chemicals
Flame Spread Permanency
Fungi Resistance
Smolder Resistance

BUILDING CODES

Properly installed Cocoon insulation meets the requirements for thermal insulating materials set forth in CABO, BOCA, ICBO, SBCCI, IBC, IRC, IEC, Model Energy Code and the National Building Code of Canada. Cocoon insulation has achieved additional certifications for fire-rated assemblies, fire blocking, membrane penetrations and sound transmission. See ICBO Evaluation Report #ER-2833.

ACKNOWLEDGEMENT

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