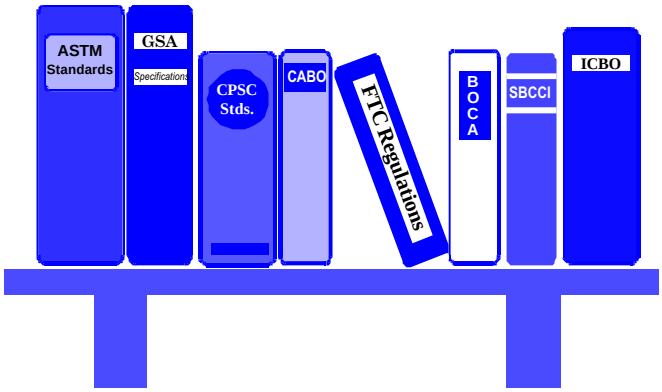
CIMA Technical Bulletin #1

Cellulose insulation:

codes, regulations, and specifications



A comprehensive body of federal regulations, government and private procurement specifications, building code requirements, and effective, time-proven voluntary industry standards makes cellulose insulation a building material you can buy, specify, and install with confidence.

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Cellulose building thermal insulation is a recycled product made from recovered newsprint, the largest single component of the residential waste stream in most communities.

Dry loose-fill cellulose insulation is installed in attics and walls with pneumatic blowing machines. Existing walls may be insulated by blowing insulation in through access holes. The holes may be at the top, bottom, and either inside or outside the building. A variery of methods are used to insulate new walls with dry cellulose. Techniques include using jigs or forms to fill open face cavities prior to installation of sheetrock. Various types of permanent retainers are also used in walls, crawl spaces, or cathedral ceilings.

Cellulose insulation spray-applied in wet form is a self-supporting material. It relies on water, adhesive, or a combination of both to build bond strength to a substrate and within itself. Spray-on products may be used in wall cavities (fully open and dried before covering) or on other suitable exposed wall or overhead surfaces.

Confusion over standards

Architects, specifiers, inspectors, contractors, buyers, and occasionally even manufacturers are sometimes unsure about the laws, regulations, specifications, and standards that apply to cellulose building insulation.

Cellulose insulation has grown in acceptance since it was first identified generically in General Services Administration Standard HH-I-515. It has been exposed to a broad range of construction, environmental, and various code requirements that called for more elaboration and definition of physical properties. These requirements have been identified and met in the following federal regulations, federal procurement specifications, and industry standards.

16 CFR Part 1209 (The CPSC Safety Standard)

16 CFR Part 460 (The FTC R-Value Rule)

ASTM C-739 (Standard Specification for Cellulosic Fiber [Wood-Base] Loose-Fill Thermal insulation)

ASTM C-1149 (Standard Specification for Self-Supported Spray Applied Cellulosic Thermal/Acoustical Insulation)

HH-I-515E (The General Services Administration purchasing specification for loose-fill cellulose insulation requires ASTM C-739 conformance.)

The states of California and Minnesota have their own insulation regulations which are based on the ASTM Standards and, in the case of cellulose insulation, on the CPSC standard. Of course, the insulation requirements of all building codes also apply to cellulose.

Standards, specifications, and test methods that are not currently applicable to cellulose insulation include:

The Two-Foot Tunnel Test (Not used for over 10 years, when it was determined to be inadequate.)

The Basket Test (Not used for over 10 years, when it was determined to be inadequate.)

ASTM E-84 (The tunnel flame spread test is no longer used to assess the surface burning characteristics of loose-fill cellulose insulation. In the 1970s it was replaced in ASTM C-739 and the CPSC standard by the radiant panel test [ASTM E-970], which is regarded as more appropriate for loose-fill insulation. The E-84 flame spread test applies only to cellulose fiber when used as a spray-applied self-supporting material where the surface remains exposed in a vertical or overhead mode.)

"Good enough" isn't good enough!

The minimum legal requirement for cellulose insulation is the CPSC standard, which covers four product attributes, critical radiant flux, smoldering combustion, corrosiveness, and settled density.

The CPSC standard adequately addresses safety issues, but safety -- important as it is -- is only one factor in insulation performance. The standard for loose-fill cellulose insulation accepted by the insulation industry is ASTM C-739, which provides tests for R-value, odor, moisture vapor sorption, and fungi resistance, as well as critical radiant flux, smoldering combustion, corrosiveness, and settled density, the attributes covered by CPSC standard.

In addition to omitting four material characteristics that are not safety-related, the CPSC standard has not been amended since 1978. Accordingly, it does not reflect changes that have occurred since then. Most notable of these changes is widespread use of compressive packaging. To compensate for this, ASTM C-739 added a pre-blow step to the settled density test procedure to more closely reflect actual installation procedures. Other than this 16 CFR Part 1209 and C-739 are essentially identical in the test procedures for their four common material characteristics.

In 1990 the Federal Trade Commission endorsed the ASTM methodology by amending the R-Value Rule (16 CFR Part 460) to remove references to the CPSC procedure and specify that enforcement will be based on the C-739 procedure.

In specification HH-I-515E the General Services Administration replaceddetailed testing and product attribute descriptions that were contained in the preceeding "D" specification with references to ASTM C-739. Military construction specifications, including those published by the Defense Logistics Agency and The Naval Facilities Engineering Command (NAVFAC) *NAVFAC Guide Specification NFGS 07216*., reference ASTM C-739.

Although there is not necessarily considered to be a

consistent direct relationship, cellulose insulation conforming to ASTM C-739 would also be expected to:

- Meet the requirements of 16 CFR Part 1209
- Qualify as Class I material under ASTM E-84.

Cellulose insulation manufacturers are entitled to claim compliance with 16 CFR Part 1209 on the basis of compliance with ASTM C-739 and C-1149. This authority is clearly stated in 16 CFR Part 1209.33(b), which says, in part: "A reasonable testing program may include either the tests prescribed by the standard, or any other reasonable test procedures." Since the C-739 procedures are obviously "reasonable," cellulose that complies with C-739 is by definition in compliance with 16 CFR Part 1209, unless CPSC proves it isn't. It's doubtful CPSC would question any cellulose producer that can document C-739 compliance.

Building codes are required by the Consumer Products Safety Act to follow the CPSC standard. Thus, cellulose insulation conforming with the federal standard is approved for installation in any code jurisdiction.

Spray-applied cellulose

Cellulose insulation formulated and labeled as self-supporting, spray-applied material is legally required to conform with the CPSC safety standard for loose-fill cellulose. The CPSC procedures assure the safety of this type of cellulose insulation, but do not address all the important characteristics of the material as installed. ASTM C-1149 is a more appropriate material standard.

Although many of the tests described in C-1149 differ from those in C-739 and the similar CPSC 16 CFR Part 1209 procedures, manufacturers are justified in claiming CPSC compliance on the basis of the C-1149 methodology since the tests described in C-1149 are "reasonable test procedures."

ASTM C-1149 covers 10 material attributes: Density, thermal resistance, surface burning characteristics, adhesive/cohesive strength, smoldering combustion, fungi resistance, corrosion, moisture vapor absorption, odor, and flame resistance permanency. Material installed using liquid adhesive (Type I) also has substrate deflection and air erosion characteristic requirements. Obviously, under C-1149 spray-applied material is tested in the sprayed state.

Spray-applied cellulose installed in closed walls and in attics is approved for use in every code jurisdiction on the basis of conformance with the CPSC standard. Exposed spray-applied cellulose insulation may be subject to the interior finish requirements of the building codes. Cellulose insulation conforming with ASTM C-1149 qualifies as a Class I or Class A interior finish as defined by all model building codes.

Stabilized cellulose

A relatively new form of cellulose is used in typically loose-fill applications, but is generally considered to be a spray product. This material is sometimes referred to as "stabilized cellulose," although that term remains unofficial. It uses adhesive, which is activated by a small amount of water, to limit settling. It's normally used in attics, but may also be installed in walls, if it meets the performance requirements defined for Type II material by ASTM C-1149.

Like all cellulose insulation products, stabilized cellulose must conform with the CPSC safety standard. ASTM is currently developing a material standard for stabilized cellulose. Until this standard is approved and published the safety of stabilized cellulose is assured by conformance with the requirements of CPSC. The requirements for Type III material defined by ASTM C-1149 cover some attributes of stabilized cellulose. Specifiers may wish to require conformance with this standard.

Installation standards & practices

Loose-fill cellulose insulation, like all loose-fill insulation, should be installed in accordance with ASTM Standard C-1015, *Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation*.

In wall applications standard practice is to compact loose-fill cellulose to a density that will prevent settling. While this is a matter of some controversy most authorities recommend a density of at least 3.0 pcf for cellulose insulation in walls. Materials with high nominal settled densities (2.0 pcf and higher) should be installed at 3.5 pcf. Research has confirmed that settling is virtually nil with any cellulose insulation at densities of 3.5 pcf, or higher. Compacting cellulose insulation may produce a very slight reduction of R-value.

Specifiers do not need to compensate for settling in attics since federal law (the CPSC standard and the FTC R-Value Rule) requires R-value and coverage data to be stated at settled density. Open blow cellulose installations do lose R-value as the material settles, however such installations provide "bonus R-value" until they reach settled density

Specifiers, installers, and buyers need to understand that the "minimum thickness" column on cellulose coverage charts represents settled thickness, if the chart has only one thickness column.

This is not done to confuse or mislead. It results from the fact that there is no accepted procedure for determining blown thickness that has been proven to correlate with the amount of material, by weight, required to yield the desired R-value. ASTM is working on an appropriate procedure. Some manufacturers provide initial installed thickness recommendations, but this is only a guideline to aid installers. The bag count and weight columns are the "official" coverage statements.

Installation of spray-applied cellulose is covered by CIMA Technical Bulletin #3, "Standard Practice for the

Installation of Sprayed Cellulosic Wall Cavity Insulation."

This publication describes installation procedures that have been found to be generally suitable for cellulose wall cavity spray installation, but the instructions of the manufacturer should be followed.

All manufacturers and independent authorities agree that material with low moisture permeability, such as a vapor retarder and foil or vinyl wallcovering, should not be installed on both sides of the insulation until the material has totally dried.

Drying time depends on several factors, primarily temperature and humidity. Some electronic moisture meters can be used to determine when spray-applied cellulose is dry. Not all meters will give accurate readings however, because the fire retardants are electrolytes. Those using electronic meters should be sure the device is suitable for cellulose insulation.

Many aspects of building design, including assemblies incorporating thermal insulation, are still more “art” than “science.” After all code and specification requirements are satisfied, the performance of an insulation system is determined by the technical expertise of the insulation manufacturer, the professional knowledge of the specifier, and the skill and experience of the installer.

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The performance story

The *natural* superiority of cellulose

Higher R-per-inch values than most comparable mineral fiber materials.

Tightens buildings against air infiltration much better than mineral fiber materials. (Colorado University found cellulose at least 36 percent better than fiber glass in tightening buildings.)

Not subject to convective heat loss, which has been shown to reduce the actual R-value of comparable mineral fiber materials from 20 to 40 percent in cold weather. (Oak Ridge National Laboratory measured actual values as low as R-12 at nine degrees F for an “R-19” fiber glass installation. Oak Ridge found no R-value erosion with cellulose.)

"R" for "R" requires much less energy to produce than mineral fiber materials, which are made in gas-fired furnaces.

Productively recycles the largest single component of the residential waste stream.

Rationalizes use of resources by putting trees cut to produce an ephemeral product to long-term use as energy-conservation material.

Overall, insulates homes better. (Colorado University reported cellulose performs 26 percent better than fiber glass in temperate climates and as much as 38 percent better in cold climates.)

Cellulose. . . .it’s simply better insulation