waste stream. Cellulose insulation not only saves energy, it helps cities meet the growing waste disposal challenge.

- Since production of cellulose requires much less energy than mineral fiber insulation, which is made in gas-fired furnaces, and foam plastics, which are petrochemicals, the "embodied energy" in cellulose insulation is much lower per "R" of insulating value than other materials. Cellulose consumes less energy when it's made and saves more energy after it's installed.

If you're serious about saving money heating and cooling your home, about recycling and responsible use of resources, and about saving energy for our country the only insulation to seriously consider is cellulose.

Standards

Cellulose insulation is covered by the most comprehensive legal and voluntary standards of any insulation material. To be sold at all cellulose insulation must meet the requirements of Consumer Products Safety Commission Safety Standard 16 CFR Part 1209. Most cellulose producers adhere to the more comprehensive American Society for Testing and Materials standards C-739 for loose-fill cellulose, C-1149 for self-supporting spray-applied cellulose insulation, and C-149 for stabilized cellulose insulation. The Federal Trade Commission R-value Rule applies to a residential thermal insulation - assuring honesty and accuracy in coverage and R-value claims.

A number of qualified independent produce testing laboratories have cellulose insulation certification programs to assure contractors and consumers that the material they buy and install meets or exceeds government and industry standards.

The labels of Underwriters Laboratories, United States Testing Company, R & D Services are reliable indicators of safe, effective cellulose insulation that conforms with all federal and industry standards.

If you want insulation that's best for the nation's energy security, the environment, and your pocketbook, choose CELLULOSE!

Approved under all codes

Cellulose insulation is subject to the strict flammability and corrosiveness standards established by the Consumer Products Safety Commission. The BOCA National Building Code, the SBCCI Standard Building Code, the ICBO Uniform Building Code, the CABO One and Two Family Dwelling Code, and the new codes published by the International Code Council all contain cellulose insulation requirements that are consistent with the CPSC standard. The ICC codes also recognize the fire safety advantages of cellulose by permitting installation of electrical boxes on opposite sides of fire rated walls if the boxes are separated by as little as 3½ inches of cellulose insulation. In walls with fiber glass the required separation is 24 inches.

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Thermal Performance

Beyond R-Value

R-value is a measure of the ability of insulation materials to resist heat transfer. The higher the R-value, the greater the insulating value. R-value is a very accurate and reliable expression of how insulation materials perform in a laboratory apparatus. In the real world of buildings, thermal performance is a lot more complicated and R-value is only one of many factors in the actual performance. These factors include total R-value of all system components, air infiltration due to leakage through gaps in the system, air infiltration due to permeability of system materials, convective flow within insulated systems, thermal bridging across the building envelope, and the thermal mass of building components.

So how does one evaluate this? Wouldn't it be reasonable to simulate conditions closer to the structures we live in. Read on and find out what researchers discovered when this was done.

Maintaining R-Value

Two independent studies by the University of Illinois and Oak Ridge National Laboratory documented the long standing claim that cellulose insulation outperforms loose-fill fiberglass insulation because of it's higher density and lower air permeability.

These tests studied a range of cold attic temperature conditions rather than a single laboratory condition. At attic temperatures of 30°F the effective R-value loss for fiberglass started and reached 50% at 10°F. Loose-fill cellulose insulation tests by Oak Ridge in a Large Scale Climate Simulator found the effective R-value actually increased slightly to temperatures as low as -18°F. A simple solution to fixing the loose-fill fiberglass degradation is to add 2 to 3 inches of cellulose on top or use cellulose initially.

Energy shoot-out at the CU corral

In December 1989 and January 1990 the University of Colorado at Denver School of Architecture and Planning studied the energy conservation efficiency of two test buildings that differed only in the insulation systems that had been installed.

Building "A" was insulated with 5.5 inches of cellulose wall cavity spray in the walls and R-30 of loose fill cellulose in the ceiling.

Building "B" received R-19 unfaced fiberglass batts in the walls and R-30 kraft-faced batts in the ceiling.

Over the two month period a number of different tests and measurements were performed.

Here's what the CU Denver researchers learned.

- In spite of the fact that tests showed Building "B" was about 12% tighter than Building "A" in the uninsulated state, after insulation was installed Building "A" was far tighter than "B". Calculations showed that cellulose tightened the building 36% to 38% more than fiberglass.
- An overnight heat loss test revealed that after nine hours (midnight to 9 a.m.) the cellulose-insulated building was 7 degrees F warmer than the fiberglass building.
- Most significantly, after three weeks of monitoring the cellulose-insulated building has used 26.4% less energy to heat than the fiberglass building.

The CU researchers commented that the results suggest cellulose performs as much as 38% better than fiberglass. The performance advantage of cellulose in temperate climates appears to be about 26%, and the report projects that "this benefit would become more significant in more severe climates."

Fire Safety

All residential structures contain large amounts of wood. Cellulose insulation is the only wood-based building material that is always treated for fire retardancy. This makes cellulose insulation one of the safest materials used in home construction.

If a fire occurs, the dense structure of cellulose and its fire retardants slow its spread through the building by blocking flames and hot gases and restricting the availability of oxygen in insulated walls and ceilings.

AFT's cellulose insulation has been treated with fire retardants and has a Class 1 fire rating. Strict flammability standards of the Consumer Product Safety Commission must be met. AFT uses microprocessors / load cells to gravimetrically integrate the ratio of chemical to fiber to ensure a uniform and correct level of fire retardants. The borates added as fire retardants are less toxic than common table salt.

In several demonstration burns, buildings with cellulose have retained structural integrity significantly longer than buildings with other fiber materials. In one demonstration the ceiling of a fiberglass insulated building collapsed 22 minutes after ignition while the cellulose stayed in place for 70 minutes, an important margin of safety for building occupants.

The National Research Council Canada (NRCC) added scientific support to the fire safety benefits of cellulose insulation in a 1994 study. This study concluded that fiberglass reduced the fire resistance of insulated assemblies while cellulose insulation improved fire resistance 22% to 55%.

NRCC tested a cellulose insulated floor/ceiling assembly in 1995 and found it to have approximately 50% higher fire resistance than a fiberglass insulated assembly. The cellulose assembly resisted direct fire exposure about 30 minutes longer than the fiberglass test assembly.

A cellulose insulated wall tested in 1999 by Omega Point Laboratories was found to be up to 77% more fire resistance than an uninsulated wall.

As a result of this fire resistance, under some fire conditions, cellulose give building occupants more time to reach safety and fire fighters more time to save the structure.

Additional Benefits

Cellulose insulation benefits not covered by the University of Colorado study include:

- AFT's cellulose insulation is extremely effective in controlling sound transmission in walls, floors, and ceilings because of cellulose insulation's higher density and ability to fill the gaps and create a seamless wall cavity or ceiling. Noise is trapped by the same properties that provide superior resistance to air infiltration.
- Cellulose insulation contains more than 80% recycled material, primarily newsprint, one of the largest parts of the