

TOOLBASE™ TECHSPECS

Alternative Insulation Materials

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TECH @ A GLANCE

BENEFITS (+) / DRAWBACKS (-)

- + **AFFORDABILITY:** Faster installation can result in lower labor costs
- + **ENERGY EFFICIENCY:** Can have higher insulating value than fiberglass batts; spray foam insulation performs air sealing in addition to insulation; sprayed insulation provides simple method for completely filling wall cavities, including areas around plumbing and electrical penetrations
- + **ENVIRONMENTAL PERFORMANCE:** Can have high recycled content or use natural materials
- + **MARKETABILITY:** Many systems, e.g., blown-in cellulose, especially effective for retrofits; allow homeowner and builder to avoid costly and disruptive process of opening walls during renovations
- **COST:** Most systems more costly than conventional fiberglass batts due to higher material costs; spray insulation requires special equipment and training; usually performed by specialized trade contractor
- **ADAPTABILITY:** Insulation that entirely fills wall cavity makes snaking wires or pipes difficult after wall is complete; makes remodeling difficult

INITIAL COST

Cost is typically comparable or higher than fiberglass batts. In attics, blown-in insulation usually costs less than batt insulation.

OPERATIONAL COST

Can reduce energy costs through enhanced energy efficiency and air sealing, depending on the product and application.

CODE ACCEPTANCE

Section R314 of the 2003 International Residential Code (IRC) covers foam plastic insulation. Section R316 addresses other types of

insulation. Section R318 specifies that vapor barriers must be used on the warm-in-winter side of wall cavities for counties listed in Table N1101.2—however, spray foam products typically serve as a vapor and thermal barrier. All products must meet ASTM standards for fire and thermal resistance. Foam insulation must be covered with a fire-resistant covering, such as gypsum board.

RESULTS FROM THE FIELD

PATH Field Evaluations have examined the cost and complexity of switching to sprayed cellulose insulation from fiberglass batt insulation.

WARRANTY

Varies widely by manufacturer.

MAKING THE SWITCH

Insulation contractors need specialized equipment for sprayed insulation products, and some manufacturers require the trade contractor to be trained and certified. In some cases, this may require a builder to find a new insulation contractor. Some site preparation may be necessary before blowing insulation into wall cavities.



THE BASICS

There are numerous alternatives to fiberglass batts for insulating wood- or steel-framed homes.

Non-Fiberglass Batts include cotton and wool batts and rock (and slag) wool batts or boards. Cotton is made of recycled materials; sheep's wool is a natural product; and rock wool is moisture, fire, and sound-resistant. Cotton and wool are treated for fire, mold, and vermin resistance, whereas rock and slag wool are naturally resistant. Cotton and wool batt insulation R-values and installation methods are similar to fiberglass batts. Rock wool, due to its relatively high density, has higher acoustical absorption and a slightly higher R-value of 13.5 for a 2x4 stud cavity, than fiberglass batt insulation. Because each product is unfaced, a separate vapor barrier must be installed, if one is required by code.

Sprayed Foam insulation is a foam product that, when sprayed into wall cavities, expands to fill the cavity and provide insulation. Because foam completely fills wall cavities, it can also greatly reduce air infiltration through cavities and air circulation within cavities. Sprayed foam insulation may eliminate the need for a vapor barrier, but check with your local building department.

A layer of foam can be combined with other types of insulation in wall cavities to achieve air sealing and energy efficiency at a reduced cost. For example, a company in Pennsylvania sprays a one-inch layer of

DOLLARS AND SENSE

Approximate installed costs for various insulation products follow. Costs will vary according to local product availability and material cost, labor rates, and thickness of insulation.

Fiberglass Batt Insulation: \$0.70 per s.f. (R-19)

Cotton Batt Insulation: \$1.20 per s.f. (R-19)

Sheep's Wool: \$2.40 per s.f. (R-19)

Blown Insulation (attic): \$0.50 per square foot (R-38)

Insulation Blown or Foamed through a Membrane: \$1.40 per s.f. (R-19)

Cellulose Wall-Spray: \$1.20 per s.f. (R-19)

Spray Foam (1" flash coat with R-19 batt): \$1.60 per s.f.

Spray Foam Insulation: \$1.25 to \$2.25 per s.f. (R-19)

Cementitious Foam through a Membrane: \$1.45 to \$2.45 per s.f. for an R-19 wall (a 2x6 wall filled with cementitious foam is R-21.5 and would cost about 10% more)

THE BASICS *continued*

closed-cell foam into cavities and finishes with fiberglass batt insulation.

Sprayed Fiber insulation is a sprayed insulation system (cellulose, fiberglass, or mineral wool) that is blown into wall cavities via a specialized blowing machine. Fibers are typically mixed with some water and/or an adhesive substance to help material stay in place after drying. The main benefit of sprayed fiber insulation is the ease of completely filling a wall cavity with insulation. The fibers must dry to a manufacturer-specified moisture content (typically less than 19%) before cavity is enclosed; allow at least 24 hours for the material to dry. More time may be required depending on climate and season. Waste material can be fully recycled.

Insulation Blown through a Membrane involves fiber or foam being blown into a wall cavity through a membrane that is applied to the wall studs. With fiber insulation, the product that is blown in is dry. Because insulation is blown in, insulation can completely fill wall cavity around wires, electrical outlets, and other obstructions. The main benefit of the system is its ability to completely fill the cavity, its relatively mess-free installation, and its neat finished appearance. The main drawback is a higher cost and the added step of applying the membrane. The high-density insulation has a slightly higher R-value than conventional batts—up to R-14 for a 2x4 wood wall.

RESULTS FROM THE FIELD

This technology has been evaluated by other builders in real-world building projects – learn from their experiences. For more information on these Technologies in Practice, visit www.toolbase.org.

Denver, Colorado, Oakwood Homes (2002 PATH Field Evaluation)

- Production builder switched from using high-density fiberglass batt insulation to blown cellulose in walls and attics
- Installed cost of R-13 blown cellulose wall insulation was competitive with R-15 high density fiberglass batts and no special design changes were necessary
- Site preparation slightly different -- windows covered with plastic; house swept to avoid foreign matter from getting vacuumed into blowing machine; small inaccessible areas filled with fiberglass batt insulation; lightweight fabric installed on concrete wall to hold insulation in place
- Installation involved three workers: one to operate blowing machine, one to scrape excess from wall cavities, one to vacuum excess for reuse
- Installed product filled cavities completely and had a tidy appearance. The installation was simple and fast, and wall cavities were enclosed after 48 hours of drying time
- Based on blower door testing, product reduced air leakage over fiberglass batt wall.

Elkton, Maryland, Dunrite Construction (PATH Case Study)

- Small builder switched to cellulose insulation for wall cavities and attics
- Cellulose insulation proved highly cost-effective for attic applications
- Cellulose insulation cost 25% more than fiberglass batt insulation for 2x4 walls in a two-story home
- Ladder blocking used to create space for insulation at interior wall partitions; insulation flowed easily behind blocking
- Installation started with crews taping over outlet boxes and other areas that needed to remain clear
- Certain unshathed partitions, such as wall separating living space from an unheated garage, needed to have a netting material stapled onto framing to provide adhesion surface for insulation
- Correct moisture-adhesion balance helped cellulose retain its shape as mist evaporated, and resisted settling that could have led to loss of long-term insulation performance
- Special roller device, powered by a variable-speed drill, used to remove overspray and to lightly compact insulation into cavities; process created a smooth, plumb surface



FOOD FOR THOUGHT

This section provides some things to think about before switching to this building technology – make sure it's the right choice for you.

- Alternative insulation products are suitable for any climate and house type. The best product for the application depends on local product availability, availability of knowledgeable contractors, cost, and personal preference.
- Most spray insulation is ideally suited to attics and new construction. However, many products are suitable for retrofit situations, as well. For example, blown insulation is an excellent solution for insulating wall cavities in an occupied home.
- The variety of insulation alternatives can be overwhelming. Talk with other builders and your insulation contractor about the pros and cons of various insulation products.

MAKING THE SWITCH

What training, tools, and home design changes are required to switch from your current building practices to using this technology?

- **Consult the local codes.** Find out if vapor barriers are required with your chosen insulation system.
- **Review your home designs.** Look for opportunities in your home design to improve performance by using a material with a higher R-value. Assess whether 2x6 walls can be replaced by 2x4 walls with advanced insulation, and make design changes, if necessary.
- **Find a trade contractor.** Check with your insulation contractor regarding the insulation products they are capable of installing. Contractors who are not familiar with the products may need to be trained and certified, and need to buy new equipment. Typically, manufacturers can direct you to insulation contractors in your area that use a particular product, if you need to find a new trade contractor.
- **Tools.** Most of the insulation alternatives outlined require expensive and specialized equipment. In most cases, builders should seek a trained and certified installation professional, rather than purchase the equipment.
- **Work with your other trade contractors.** Notify plumbing, home automation, and electrical contractors of the insulation you plan to use. In the case of electrical contractors, they will need to specify recessed lighting products that are appropriate for direct insulation contact.



DEFINITIONS

Mineral Wool Insulation

(Also called Rock or Slag Wool)

Fibrous insulation made by blowing a powerful jet of air or steam through melted slag or rock.

Blowing Density

Amount of insulation, per unit volume, blown into a wall cavity. Follow manufacturer requirements for density of insulation in order to achieve rated R-value.



TECH CHECK

Below is a checklist of steps to follow in order to implement this technology in each of your projects.

- Work with your insulation installer or distributor to select the product that is right for your application.** Review the framing plan to ensure proper flow of blow insulation, particularly at interior wall partitions.
- Follow manufacturer installation instructions,** and for spray products, follow instructions for blowing density and amount of insulation.
- If using a wet-spray insulation, **allow adequate drying time before enclosing wall cavity.** Drying time will vary depending on the amount of moisture in the product and ambient conditions.
- Be sure contractor follows safety precautions** for any spray insulation product, including using breathing masks or filters, using contained rooms, and posting signs, if necessary.
- Let customers know about insulation products you use.** This can be very helpful in the event that renovations or upgrades are necessary in the future. It can also be a selling point if the home is sold.

TIP: *If you are using an alternative insulation that improves the energy performance of your homes, be sure to tell your customers about it. "If you don't point it out to customers, you are giving it away," says Vernon McKown, president of sales for Ideal Homes (Norman, OK).*



The Partnership for Advancing Technology in Housing (PATH) is dedicated to accelerating the development and use of technologies that radically improve the quality, durability, energy efficiency, and affordability of America's housing. Managed by HUD, the PATH partnership includes the homebuilding, manufacturing, insurance and financial industries, and Federal agencies concerned with housing.

PATH addresses barriers to innovation, provides information on advanced building technologies, and advances housing technology research; making affordable, quality American homes a reality.

For more information on the PATH program, visit www.pathnet.org.

Tech Specs are Prepared for PATH by the NAHB Research Center.

RESOURCES

ToolBase Services

Information on this building technology and many others brought to you by PATH and the building scientists at the NAHB Research Center.

www.toolbase.org

U.S. DOE Insulation Fact Sheet

www.ornl.gov/sci/roofs+walls/insulation/ins_01.html

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