Spray-Applied
Glass Fiber Insulation

www.monoglass.com

Spray-Applied Glass Fiber Insulation

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AIA Continuing Education Provider

Learning Units: 1 AIA LU/HSW

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Learning Objectives

1. Explain how spray-applied glass fiber insulation components offer health benefits for building occupants.

2. Discuss the thermal, acoustic, and air quality performance provided by spray-applied glass fiber and identify situations where this product adds value to a project.

3. Define possible LEED credits and environmental credentials of both glass fiber and binder.

4. Compare the benefits of spray-applied glass fiber against other product applications on the market, including benefits and considerations in installation, safety, and fire ratings and compliance.

Spray-Applied Glass Fiber Insulation

- Made up of two components: inorganic white glass fiber and a nontoxic adhesive binder
- Can be sprayed to a depth of 5 inches on overhead surfaces and 7 inches on vertical surfaces
- Offers a thermal resistance of R-4 per inch

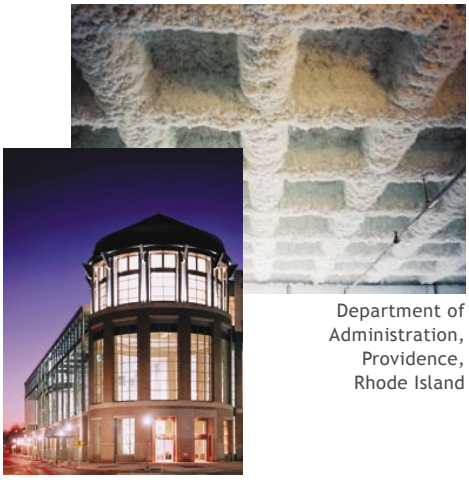
With an R-value of R-4 per inch, installations of R-20 / 5 inches overhead or R-28 / 7 inches on vertical surfaces can be applied quickly and easily in one pass without costly, slow layering or mechanical support.

It combines soft glass fibers and polymer adhesive to create a noncombustible, nontoxic insulation that can be quickly spray applied to virtually any surface or configuration.

It is applied by trained applicators using approved equipment, ensuring quality control and consistency.

Spray-Applied Glass Fiber Insulation

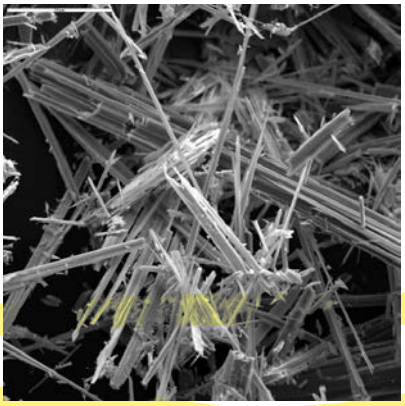
- Thermal and acoustic insulation material designed for use in a wide variety of applications
- State of Rhode Island Convention center

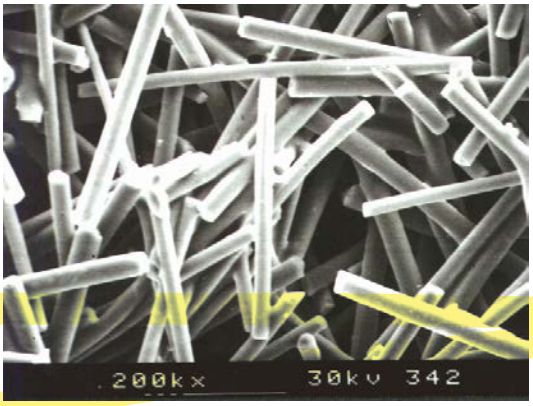


Department of Administration, Providence, Rhode Island

Shown is an example of a waffle ceiling configuration showing the conformity to unique ceiling shapes.

Benefits: A Word About Health





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Spray-applied glass fiber combines soft glass fibers and polymer adhesive to create a noncombustible, noncorrosive, nontoxic insulation that can be quickly spray applied to virtually any surface or configuration.

Spray-applied glass fiber bonds easily to:

- Concrete
- Steel
- Fireproofing products
- Wood
- Gypsum
- Rigid fiberglass and plastic insulations
- Most painted surfaces

Benefits

- Can be applied to any surface configuration
- Excellent product for hard-to-reach, hard-to-insulate locations
- Bonds easily to many materials

Spray applied glass fiber provides:

- High thermal value
- Excellent noise reduction
- Noncombustible
- Nontoxic
- Permanent
- Quickly installed
- Competitively priced
- Inorganic
- 53% post-consumer recycled content
- 5% pre-consumer recycled content
- No support for mold growth

Benefits

- Benign, can be left exposed in public areas
- White in color with high light reflectance of 85%
- Rated for return air plenum spaces – ASTM E859
- Complies with CDHP/EHLB Version 1.1, 2010 for Indoor Air Quality
- Complies with California Department of Public Health CDPH/EHLB/Standard Method Version 1.2, 2017 for Indoor Air Quality for Schools and Offices

Excellent in hard-to-reach, hard-to-insulate areas and does not require expensive framing. Can be tinted using optional tints, or painted with non-bridging latex or dryfall paintsto match architectural finishes, making it useful for theaters, restaurants, and night clubs for sound-control and thermal applications.

Thermal Resistance

- R=4 (ft^2hr F°)/BTU inch
- RSI=28.12 (mK)/W
- As tested to ASTM C-518

These are the test standards and results for thermal insulation.

Thermal Control: Horizontal Surfaces

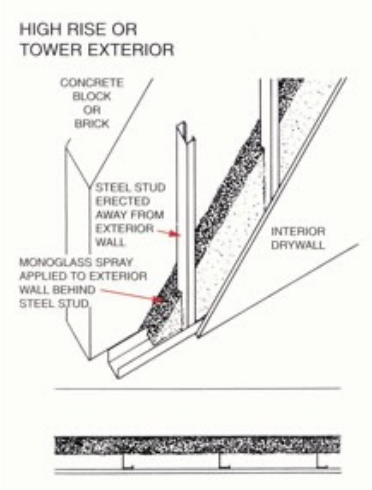
- Cold floors eliminated
- A/C spaces kept cool
- 5 inches/R-20 installed in one pass
- Up to 5 inches installed overhead without mechanical support

In commercial or residential buildings, cold floors are eliminated with spray-applied glass fiber without adding combustible elements to the structure. In warm climates, spray-applied glass fiber applied below air-conditioned spaces will help reduce building cooling time and costs.

Overhead applications of 5 inches/R-20 can be installed in one pass with no mechanical support. With the addition of mechanical support, up to 10 inches / R-40 can be installed overhead.

Thermal Control: Vertical Surfaces

- Ensures higher internal surface temperatures
- Minimizes cold radiation
- High R-value reduces thermal shock in precast and metal buildings
- Up to 7 inches installed on vertical surfaces without mechanical support



Spray-applied glass fiber has an exceptionally high thermal value creating savings in both heating and cooling costs by reducing fuel and power consumption. Spray-applied glass fiber ensures higher internal surface temperatures within a building and minimizes "cold radiation," increasing individual comfort and shortening the time required for the artificial heating or cooling of the building.

As a result of the high R-value, thermal shock in the structure is reduced, particularly in pre-cast concrete and metal buildings.

Benefits and Properties

Acoustic Control

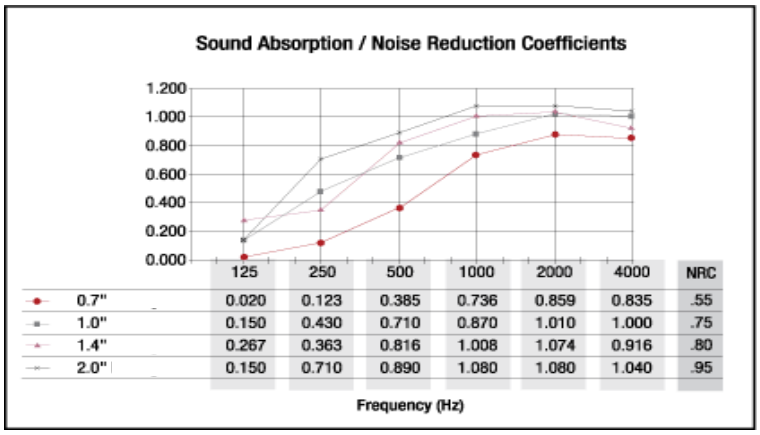
- Low compressive strength glass fibers have excellent noise reduction coefficients
- Reduces structure-borne noise
- Pneumatically applied, adhering to any surface configuration

Sound-Control Solutions

Sound control in the environment has become absolutely necessary in a complex society, be it where we work, live, or play. Cotton-like spray-applied glass fiber is noncombustible and exceeds older, inefficient, nonpermanent systems without increasing construction costs.

NRC

- NRC is 0.95 at 2 inches and 0.75 at 1 inch



	125	250	500	1000	2000	4000	NRC
0.7"	0.020	0.123	0.385	0.736	0.859	0.835	.55
1.0"	0.150	0.430	0.710	0.870	1.010	1.000	.75
1.4"	0.267	0.363	0.816	1.008	1.074	0.916	.80
2.0"	0.150	0.710	0.890	1.080	1.080	1.040	.95

Noise Reduction Coefficient (NRC)

Spray-applied glass fiber provides solutions for sound-attenuation control within a confined space, such as auditoriums, gymnasiums, factories, and schools. A material's ability to absorb sound energy is expressed as a single-number index, referred to as a Noise Reduction Coefficient or NRC. Spray applied glass fiber produces high NRC ratings, as shown in the graph above.

Sound Transmission Class (STC)

Spray-applied glass fiber provides solutions for sound levels between spaces, such as between suites in multiple tenancy buildings, condominiums, townhouses, and office buildings. When sprayed to a thickness of 1.46 inches (37mm) and tested to ASTM E-90-85, spray applied glass fiber insulation can increase the STC value of an assembly by 5.

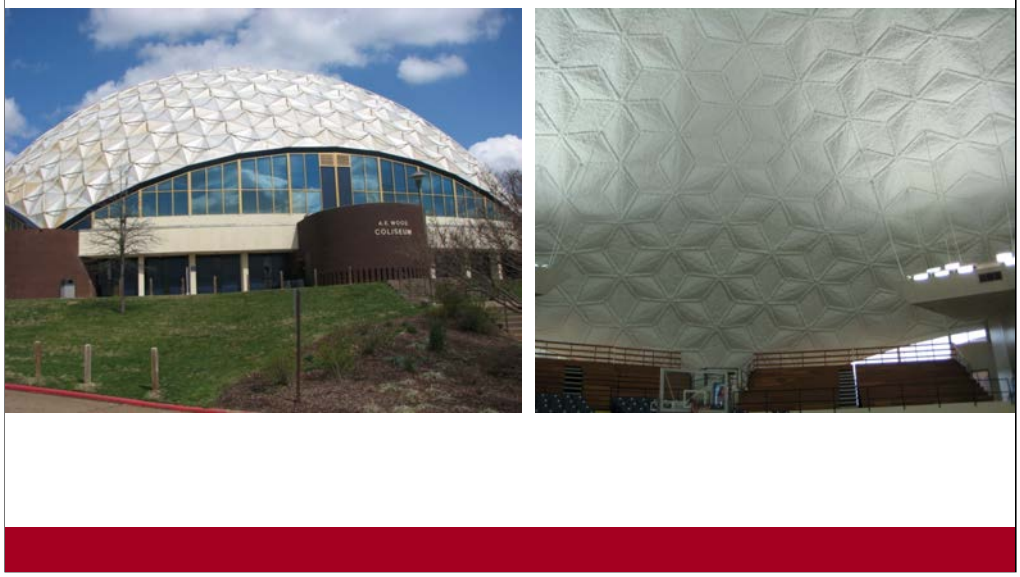
In addition to having high STC and NRC ratings, spray-applied glass fiber is pneumatically applied, which helps seal cracks and holes in drywall, fills voids normally left by batt insulations, and seal around plumbing and electrical outlets to prevent sound 'leaks.'

Spray-applied glass fiber produces excellent NRCs, as tested to ASTM C-423-77, ISO 354:

- 17 mm/0.7" = 0.55
- 25 mm/1" = 0.75
- 35 mm/1.4" = 0.85
- 50 mm/2" = 0.95

The low-compressive-strength glass fibers in spray-applied glass fiber produce excellent noise reduction coefficients. This capability reduces airborne noise transmitted through the structure from external sources and provides superb absorption of internal airborne sound.

Acoustic Control:
A.E. Woods Coliseum, Mississippi College



The A.E. Woods Coliseum pictured above is an excellent example of where spray applied glass fiber insulation can be used on substrates that would otherwise be very difficult to insulate.

The spray applied insulation is used here primarily for it's high Noise Reduction Coefficients (NRC), improving acoustics within the coliseum which is used for college sporting events and performances.

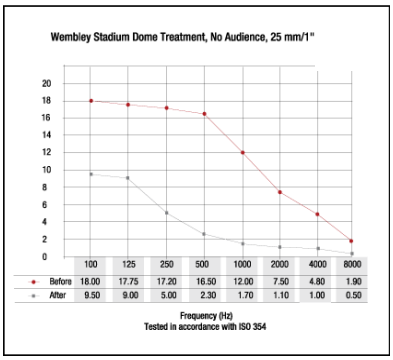
Acoustic Control

- Superb absorption of airborne sound
- Can be tinted using several standard colors or painted with an appropriate acoustic paint with minimal effect on the NRC or STC ratings

Bridge Studios
Black Application

Noise Reduction

- Stadium treated with 1-inch spray-on glass fiber insulation
- Reverberation times with zero occupancy dropped by about 60 percent
- 35 millimeters adds an STC of 5 to an assembly



Project Profile: Wembley Indoor Sport Stadium

Noise reverberation time can be greatly reduced with a minimal application of spray-applied glass fiber, as demonstrated at the Wembley Indoor Sport Stadium in Johannesburg, South Africa.

Treated with only 1 inch of spray-applied glass fiber, the graph (above) depicts the reverberation times with 0 percent occupancy measured before and after treatment. This shows a considerable reduction in reverberation time over the entire frequency range, which resulted in major improvements in speech intelligibility.

Before treatment, speech conversations more than 6.5 feet (2 meters) was very difficult. After treatment, even with the hall empty (no audience), conversation can now be conducted without any special effort.

Fire Safety

- Inorganic and naturally noncombustible
- No additional chemicals required to control flammability
- Class 1 rated per ASTM E-84
- UL approved over fireproofing

St. Luke's Hospital
Houston, Texas

Dual purpose: fire safety and acoustic enhancement.

Spray-applied glass fiber:

- is inorganic, noncombustible, and will not provide any assistance to the buildup of fire.
- is rated a Class 1 Building Material per ASTM E-84.
- can be safely installed over fireproofing materials without affecting fire ratings.
- is permanently noncombustible and does not require occasional reapplication of chemicals to maintain its flame-spread properties, unlike some spray materials.
- is approved for use in multistory, multi-tenancy, and high-population-density structures.
- complies with or exceeds applicable building codes.

The surface burning characteristics of spray-applied glass fiber are:

- Flame spread = 0
- Smoke developed = 0
- As tested to ASTM E-84

Spray-applied glass fiber is a noncombustible building product. As tested to ASTM E-136-82, CAN 4-S114-87, and IMO 1182-1990, as per part 1 of the FTP code.

Because it is made from glass, spray-applied glass fiber is naturally a noncombustible material. Spray-applied glass fiber does not require the addition of chemicals to control flammability, as all cellulose-based insulations do. Furthermore, spray-applied glass fiber will never need to have such chemicals reapplied, reducing long-term costs and ensuring long-term product safety.

Spray-applied glass fiber is rated as a Class 1 Building Material and meets the requirements for noncombustible building materials.

Fire Safety

- Approved for use in multistory, multi-tenancy buildings
- Tested for fire gas toxicity and complies with New York State Uniform Fire Prevention and Building Code, Article 15, Part 1120
- State of California Bureau of Home Furnishings approved
  - UL approved for use over fireproofing materials

Oceania Residential Development
Brooklyn, New York

Because spray-applied glass fiber is inorganic and noncombustible, it is approved for use in multistory, multi-tenancy, and high-density structures.

Spray-applied glass fiber has been tested for fire gas toxicity, as per the University of Pittsburgh Protocol. Under the fire conditions simulated, spray-applied glass fiber produced a maximum of 3.5 percent concentration of carbon dioxide (CO_2) and 0.30 percent carbon monoxide (CO).

As a result, spray-applied glass fiber complies with strict requirements of The New York State Uniform Fire Prevention and Building Code, Article 15, Part 1120 and is listed as an approved product.

Over Fireproofing

- Can be installed over fireproofing materials, UL approved over Monokote and CAFCO
- Structural fireproofing and spray-applied glass fiber insulation combine to achieve fire ratings, thermal value, and acoustic control

Glass fiber insulation sprayed over cementitious fireproofing materials

Effective Combination

Spray-applied glass fiber is approved for use over fireproofing materials because it is noncombustible and will not affect the fire ratings of the fireproofing materials it is applied to. Because it is sprayed right over the fireproofing, it helps solve normally difficult design problems, such as how to insulate the underside of corrugated steel decking.

Structural fireproofing and spray-applied glass fiber thermal/acoustic insulation combine to achieve required fire ratings, thermal values, and acoustic properties on steel or concrete structures.

First Application: Structural steel and concrete beams are sprayed with cementitious fireproofing material to provide fire-resistance ratings.

Second Application: Spray-applied glass fiber is applied over cured fireproofing to achieve thermal and acoustic requirements, bonding easily and permanently to the fireproofing material beneath.

Environmental Credentials

- Glass fiber is made from post-consumer recycled glass and recycled manufacturing glass
- Total recycled content between 53 percent post-consumer and 5 percent pre-consumer
- Binder has trace VOC emissions 1.74g/l undiluted

BuildingGreen

GreenSpec, LEED, and Recycled Content

- Spray-applied glass fiber insulation is made from a combination of post consumer recycled glass and recycled manufacturing glass. The total volume of post consumer material is not less than 53 percent. When this is combined with the recycled manufacturing waste content, the total recycled content of spray-applied glass fiber insulation is not less than 58 percent.
- Spray-applied glass fiber insulation has been installed in educational facilities, community centers, and hospitals as well as a variety of other locations where environmental responsibility and product safety are of high concern.

What makes spray applied glass fiber insulation green?

- The high R-value of spray-applied glass fiber insulation is in itself part of the reason spray-applied glass fiber insulation is considered a green product. By virtue of being a good thermal insulator, spray-applied glass fiber insulation reduces the amount of fossil fuels required to heat a building, thereby reducing the amount of greenhouse gasses that are put into the atmosphere. In addition to this, the heating costs for the building are reduced.
- As an inorganic, naturally noncombustible material, spray-applied glass fiber insulation needs no additional chemicals to reduce flammability.
- Spray-applied glass fiber insulation does not support the growth of mold/fungus, eliminating the need for chemical fungicides.
- As a white product with high light reflectance, spray-applied glass fiber insulation reduces the amount of energy required to light an area. The high light reflectance also provides a safer environment at night.
- The PVA (polyvinyl acetate) binder used in the spray applied glass fiber insulation application has only trace VOC emissions. When applied, the amount of potential VOC emissions are approximately 0.000053 percent by weight.

Environmental Credentials

- Virgin material for glass is sand.
- Sand is harvested within 200 miles of the plant

Virgin material (in life-cycle costing) is sand.

LEED Credits

- For Current LEED Points Manufacturers should be updated to LEED BD + C v 4.0 and 4.1 for Contributions.
- We recommend checking each Manufacturer's website for their most current information.

Material and Resources (MR) Credits

Credit: Building Product Disclosure and Optimization – Sourcing of Raw Materials (v4.1)

Option 2- Leadership Extraction Practices (1 POINT)

Spray-on Insulation contains the following recycled contents:

Post-consumer Recycled Content: 53%

Pre-consumer Recycled Content: 5%

Energy and Atmosphere (EA) Credits

Credit: Minimum Energy Performance and Optimize Energy Performance (v4.1)

Option 1- Whole Building Energy Simulation (1-18 POINTS; 1-16 POINTS FOR SCHOOLS; 1-20 POINTS FOR HEALTHCARE) OR **Option 2**- Prescriptive Compliance: ASHRAE Advanced Energy Design Guide (1-6 POINTS)

Spray-On Insulation can be utilized to meet the mandatory provisions of ANSI/ASHRAE/IESNA Standard 90.1-2016 for thermal insulation and has an R-value of 4.00 per inch.

Indoor Environmental Quality (IEQ) Credits

Credit: Low-Emitting Materials (v4.1)

Option 1- Product Category Calculations OR **Option 2**- Budget Calculation Method (1-3 POINTS)

Spray-on Insulation has a general emissions evaluation that passes the California Department of Public Health Standard Method (CDPH Std. Mtd.) v1.1-2010. Our range of TVOC after 336 hours is 0.5 mg/m3 or less, under the school classroom and private office exposure scenarios. This product falls under the Insulation Category under the low-emitting materials credit. **CDPH v1.1-2010 compliant**

Credit: Thermal Comfort

Option 1- ASHRAE Standard 55-2010 (1 POINT)

The thermal comfort design of Spray-On Insulation is compliant with the ASHRAE Standard 55-2010 and has an R-value of 4.00 per inch.

Credit: Acoustic Performance (v4.1)
Option 1- Speech Privacy, Sound Isolation, and Background Noise (1 POINT)

Spray-On Insulation has an NRC of .75 at 1 inch and an NRC of .95 at 2 inches and would contribute to an STC rating in conjunction with the other components of the building envelope.

Mold Control

- Inorganic product that does not support fungal growth
- No growth medium for mold
- Rated zero mold growth per ASTM G-21 and MIL STD 810F

Perfect for use in high-humidity areas, such as swimming pools

Spray-applied glass fiber is an inorganic product that will not support fungal growth as tested to ASTM G-21 and MIL STD 810F. The threat of contamination of indoor air quality by mold and fungus is becoming a major issue and a major source of litigation in the United States, especially in public buildings.

Unfortunately, mold has become a substantial problem in almost all areas of building construction. When a product is being chosen, the specification writer must have confidence that the product utilized will not support mold growth at any time during the life of the building. The health of the people using a building as well as liability considerations must be taken into account for the projected life span of any new project.

Spray- applied glass fiber helps eliminate mold concerns. How are we able to achieve this?

- For mold to grow, there needs to be a food source. Organic, paper-based products provide an abundant source of food. The only way for these products to reduce the risk of mold is through the addition of chemicals, which over time may lose their effectiveness.
- As a fiberglass-based product, spray-applied glass fiber is inorganic and therefore incapable of supporting mold growth. Simply put, the mold has no food source. There is no need for the addition of any chemical products to retard mold growth. Therefore, there is never a need to reapply any chemicals in order to maintain mold resistance.
- Spray-applied glass fiber provides peace of mind with the knowledge that as an inorganic compound, it will not support mold growth.

Color

- Standard color is white
- Color can be changed by adding manufacturers' tints directly to the bonding adhesive
- Can be painted with conventional latex, oil, or dry-fall paints with no effect to thermal values and minimal reduction of acoustic values

Spray-applied glass fiber bonding adhesives can be tinted using tints designed for use with the bonding adhesive, allowing tinted finishes to be achieved without spray painting or dyeing. Tinted finishes are an excellent choice for any application that requires controlled lighting and acoustics.

Limitations

- Adhesive must be kept from freezing prior to and during application
- Cannot be washed without the application of a protective coating
- Cannot be applied or cured when ambient and substrate temperatures are below 34 degrees Fahrenheit

Liquid bonding adhesive must be kept from freezing.

Spray-applied glass fiber cannot be applied when ambient and substrate temperatures are below 34 degrees Fahrenheit during the application and until the product is completely dry to the substrate. Adequate dry heat and ventilation must be supplied at lower temperatures.

Limitations

- Must be protected from direct contact with water
- On wall applications below 8 feet, application should be protected
- Will not offer a complete air or vapor barrier
- Not a fire-rated product

Spray-applied glass fiber should be kept dry during shipping and storage prior to installation.

Spray-applied glass fiber is a fiber product and as such will not offer a complete air or vapor barrier.

Competitive Advantages Over Spray Cellulose

- Higher R-value per inch: 4.0 versus 3.85
- No chemical additives required to obtain noncombustibility
- No chemical additives required to prevent mold growth
- Can be applied thicker and faster, reducing costs

Competitive Considerations: Closed-Cell Foam

- Foam has higher R-value (R-6 per inch)
- Sprayed fiberglass can be applied thicker, thereby achieving a higher R-value overall
- Foam has much higher flame and smoke ratings and typically cannot be left exposed
- Foam has a high VOC content

Competitive Considerations: Water-Based Foam

- Fiberglass has a higher R-value per inch: 4.0 versus 3.8
- Sprayed fiberglass can be applied thicker, thereby achieving a higher R-value overall
- Foam has much higher flame and smoke ratings and typically cannot be left exposed
- Foam does provide an air barrier when installed in the appropriate application

Installation: Fiber

- Fiberglass insulation and adhesive are combined at spray gun during application
- Bales of glass fiber are broken up in applicator machine then forced pneumatically through spray nozzle

Spray machine

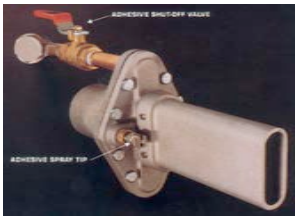
Spray-applied glass fiber is applied pneumatically. The two components that make up spray-applied glass fiber insulation are combined at the spray gun during application.

The glass fiber is shipped in 30-pound bales that are loaded into the hopper of the fiber spray machine.

The bale of glass fiber is broken up by the paddles and beater bars in the machine and forced pneumatically through a 2½-inch hose to the spray nozzle.

Installation: Adhesive

- Mixed with water on-site
- Adhesive wets fiber as it is passed through nozzle



Spray-applied glass fiber is applied by trained applicators using approved equipment, ensuring quality control and consistency.

The adhesive is shipped in 5-gallon pails. They are mixed with water at a ratio of eight parts water to one part adhesive thereby making up a 45 gallons of adhesive mixture.

The adhesive is pumped through a hose to the spray nozzle, which has a total of two jets, one on either side. As the fiber is forced out the center of the nozzle, it is wet with adhesive on its way to the intended substrate.

Installation: Scheduling

- When to schedule installation

Ideally, the product should be applied before pipes and other obstructions are in place. If there too many obstructions, it may become impossible to spray.

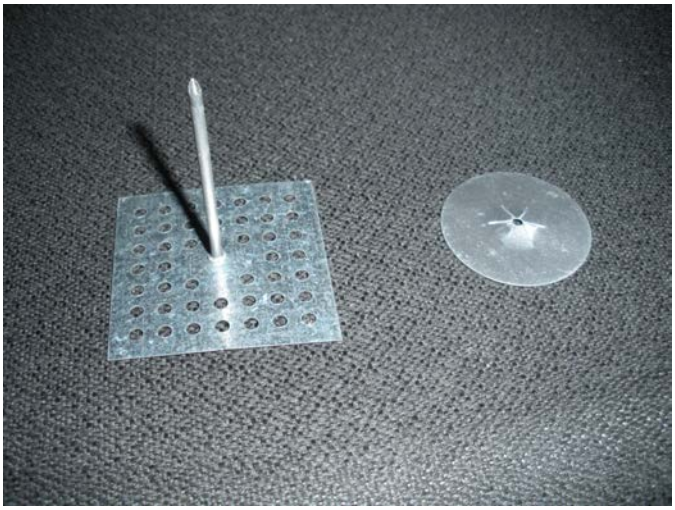
Installation: Surface Preparation

Surfaces should not look like the photo in this slide. They must be clean and free of dirt, grease, debris etc. Failure to have a clean surface will prevent a good bond. If the surface cannot be cleaned a primer may be used.

Installation: Existing Building

Extra care must be taken when installing in locations with mechanical equipment in place. Protection must be used for any area that overspray could affect.

Installation: Higher R-Values



With the additional of mechanical support, higher R-Value installations can be achieved. This involves using insulation stick pins and clips, as shown above, along with mesh, to support the spray applied glass fiber. This is used when overhead applications greater than 5 inches overhead, or 7 inches on vertical surfaces are required.

With the use of mechanical support, installations of R-40 / 10 inches can be achieved.

Installation: Video

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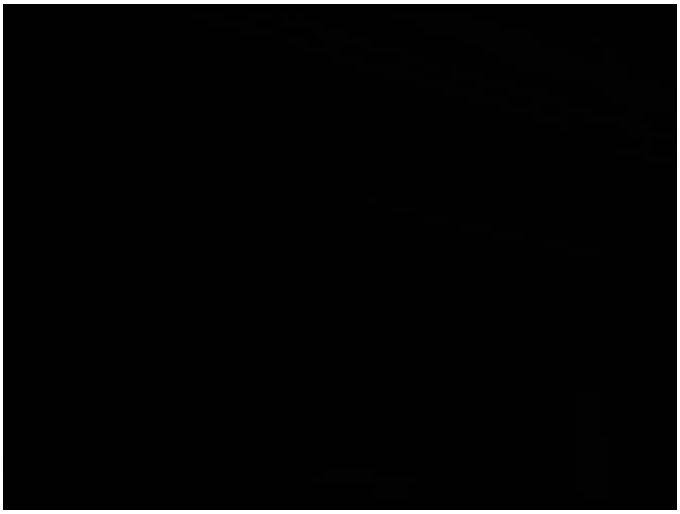
Installation: Cleanup



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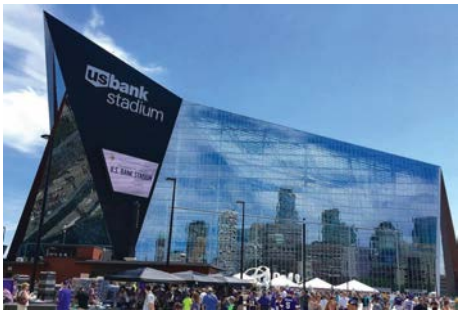
Applications: Parking Garages

- Underside of slab insulation separates unconditioned parking area from conditioned space above

Insulating the underside of the slab in the shape of the building footprint, thus insulating the conditioned space above from the unconditioned parking deck below.

Applications: Stadiums

- Thermal insulation for underside of private boxes or mezzanines
- Thermal insulation for underside of seating areas
- Acoustical insulation for ceilings (ex: TV booth)



- Thermal insulation for the underside of the seating area.
- Thermal insulation for the underside of private boxes or suspended mezzanines.
- Acoustical insulation for ceilings.

Applications: Airports

- Sprayed to underside of suspended slabs below passenger terminals to thermally insulate passenger area above
- Applied to ceilings in passenger areas for noise control

Typically sprayed to the underside of suspended slabs with occupied passenger terminals above and baggage handling below.

Applications: Soffits

- Typically covered with cladding

Offers an easy solution to areas where non-spray applications have a difficult time being applied.

Applications: Restaurants

- Black application for acoustics

Offers an easy solution to areas where non-spray applications have a difficult time being applied.

Applications: Soffits

- Sprayed to the underside of soffits or overhangs

Science World, Vancouver,
British Columbia

Applications: Acoustic Control

- Provides superb absorption of internal airborne sound

Adhering to any surface configuration, spray products easily resolve difficult application issues.

Summary

- R-value of 4.0 per inch
- NRC of 0.95 at 2 inches
- Noncombustible with no additives
- Class 1 building material
- Will not support mold growth

Summary

- Inorganic
- Up to 58 percent recycled content; will contribute LEED points to the project
- More cost-effective than other spray alternatives
- Licensed applicators throughout North America and worldwide

Thank you for attending!

This concludes the American Institute of Architects Continuing Education Systems Program.

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