Cellulose Insulation Manufacturers Association

TECHNICAL BULLETIN

STANDARD PRACTICES FOR INSTALLATION OF CELLULOSE INSULATION IN THE UNITED STATES

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1. Introduction

Cellulose building thermal insulation is made from up to 85% recycled paper and cardboard—higher than almost any other commonly used building material. Other elements in cellulose insulation include chemicals like boric acid, which is used in cellulose insulation as a flame retardant and to repel insects but found in everything from agricultural to medical products.

Cellulose insulation is the lowest embodied carbon building material commercially available. It is also the only widely accessible form of insulation that stores carbon in the product itself.[1] Our insulation gets installed in homes that see immediate effects on thermal performance and home energy costs. This ultimately benefits all homeowners who use cellulose insulation, ranging from new construction to existing buildings (commonly referred to as retrofit applications). Homeowners may be eligible for weatherization programs and other opportunities to receive tax incentives by insulating their homes with cellulose. Other benefits of cellulose insulation include sound control, fire protection, and its unique hygroscopic properties. When properly installed, it can function well for decades.

Members of the Cellulose Insulation Manufacturers Association (CIMA) have developed these installation guidelines to cover the recommended methods of installing cellulose insulation for both new construction and retrofit applications.

These guidelines are intended for the installation of cellulose insulation manufactured in accordance with federal regulations for either thermal applications and/or acoustical applications. Purchasing cellulose insulation from a CIMA Producer Member located in the United States means your insulation has met these standards.

All new construction installation must consider the International Energy Conservation Code (IECC) and other building code requirements as specified by your state and local jurisdictions.

2. Definitions

APPLIED THICKNESS: the average thickness of insulation provided immediately after installation. For certain applications, it may be 5-12% greater than settled thickness. The terms "blown" and "installed thickness" are also used.

BACKER BOARD: a rigid, non-vapor barrier forming material such as rock lath, treated cardboard, plywood, etc. which is used to cover the open side of an existing wall and forms a cavity which may be filled with loose-fill insulation. It must have sufficient strength to withstand the pressure developed when filling the cavity.

[1] Builders for Climate Action - Low-Rise Buildings as a Climate Change Solution. https://www.buildersforclimateaction.org/

BLOCKING: any material used to divide the area to be insulated from an area that is to be left free from insulation (such as soffit areas).

DENSE-PACK: application technique to apply cellulose insulation to enclosed cavities such as walls, floors, or ceiling, where cellulose insulation is pneumatically injected to pack the cavity full.

DESIGN DENSITY: the mass-per-unit-volume at which the product attains the states thermal resistance. For attic applications, it represents the final density achieved once settlement has occurred; also known as "settled density" or "coverage density."

ENCLOSED CEILING CAVITIES: ceiling area (joists) covered on both top and bottom.

FILL TUBE: a tube or nozzle that enables a cavity to be filled through a single-entry hole.

INTERNAL WETTING SYSTEM: a tube that varies in length and diameter with internal mounted spray tips, mounted in-line with the blowing hose near the blowing machine, and pressure regulator whose purpose is to inject a metered mist of water into the product air stream of a blowing machine. Water for an internal wetting system is normally supplied by a standard water source, garden hose, or a pump system attached to a water tank.

OVERFILL: insulation sprayed beyond the stud face to insure a totally filled cavity after scrubbing.

OVERSPRAY: that portion of material from a spray pattern not filling or adhering to intended substrates.

R-VALUE: the ability of insulation material to resist heat flow.

SETTLED THICKNESS: the average thickness that the manufacturer declares will provide the corresponding thermal resistance listed in the coverage chart on the product package. The terms "declared" or "design density" are also used.

SIDEWALL: an exterior vertical wall (that is heated on the interior side).

SPRAY NOZZLE: a tube with a liquid atomizing unit attached to intermix fibers and liquid. These nozzles can have various numbers and configurations of spray tips.

STABILIZED CELLULOSE: a cellulosic insulation product treated to resist settling. Stabilized cellulose is defined as a cellulosic insulation that settles by no more than 5%.

WALL SCRUBBER: a tool with a rotating brush that grooms the insulation flush to the face of the studs.

3. Applicable Standards

A. ASTM Standards

- C168 Standard Definition of Terms Relating to Thermal Insulating Materials
- C739 Standard Specification for Cellulosic Fiber (Wood Base) Loose-Fill Thermal Insulation
- C755 Standard Recommended Practice for Selection of Vapor Barriers for Thermal Insulation
- C1015 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation
- C1149 Standard Specification for Self-Supported Spray Applied Cellulosic Thermal/ Acoustical Insulation
- E241 Standard Recommended Practice for Increase Durability of Building Constructions Against Water Damage

B. Federal Regulations

- 16 CFR Part 1209 Consumer Products Safety Commission Interim Safety Standard for Cellulose Insulation
- 16 CFR Part 460 FTC Trade Regulation Rule, Labeling and Advertising of Home Insulation

4. Standard Loose-Fill Insulation

This recommended practice covers the application of cellulosic loose-fill thermal insulation in attics, sidewall cavities, and between floors of single and multi-family dwellings by means of pneumatic equipment and by pouring in place in attics.

A. Preliminary Inspection

An inspection of the building should be made prior to installation. Special consideration should be given to the following areas:

- Holes in ceilings or sidewalls that would allow the insulation to escape should be sealed.
- Weak areas of interior walls that may not be able to withstand pressure during the filling operation should be reinforced or filled using less pressure.
- Walls with alterations, such as built-in bookshelves and cabinets, which may create isolated cavities, will require special entry holes.
- Wall cavities which are used as air ducts for heating or air conditioning systems must not be filled with insulation.
- Openings in heating or air conditioning air systems in insulated areas must have blocking placed around them, but not restricting air flow.
- Wall cavities which open into basements or crawl spaces must be sealed.

- The external siding of existing buildings should be inspected for paint peeling or other evidence of moisture problems. Insulation alone may not solve such problems and other remedial actions may be necessary.

B. Preparation

New Construction

- Where individual vents are used in the soffit, the rafter space immediately in front of and on either side of the vent should be provided with an air chute (see Figures 1A and 1B below). Other spaces should be completely blocked.
- Where a continuous strip vent is used in the soffit, an air chute should be provided every third rafter space with the other spaces completely blocked (see Figures 1A and 1B below).
- Small cavities around door and window frames should be insulated prior to the installation of the interior covering. The material should not be forced into the cavity so tightly that frames are distorted.
- Insulating the corners of attics in buildings with hip roofs may require special nozzles or placement tools.
- Alternately, corners can be insulated with suitable insulation before the drywall or plasterboard is installed. Any other areas inaccessible after the interior finish is installed must be handled in like manner.

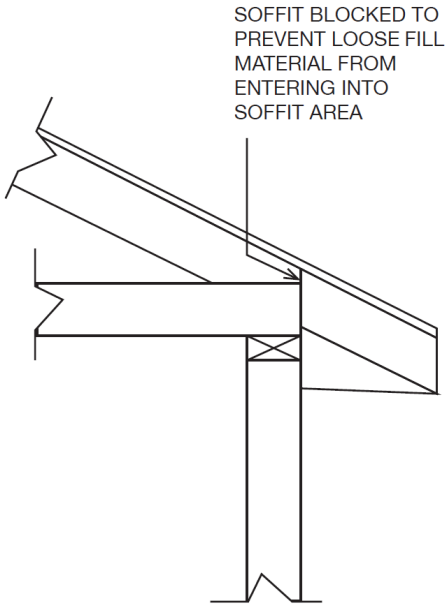

Figure 1A

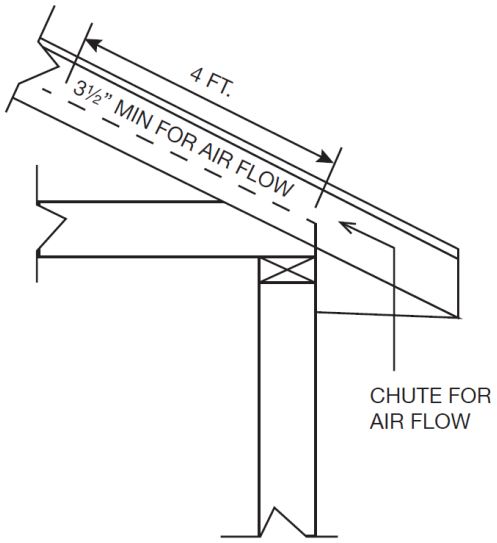

Figure 1B

Existing Structures

In joist areas, where soffit vents are installed, the opening from the attic into the soffit area may be blocked by batt-type insulation between and at the ends of the joists (see Figure 2). Insulation

should not completely fill the space between ceiling and roof. There should be a one inch (2.54 cm) opening next to the roof for ventilation from the soffit area, or a chute may be installed per Figure 1B.

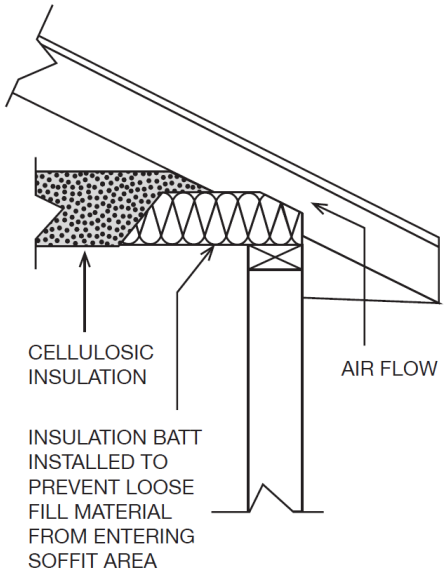

Figure 2

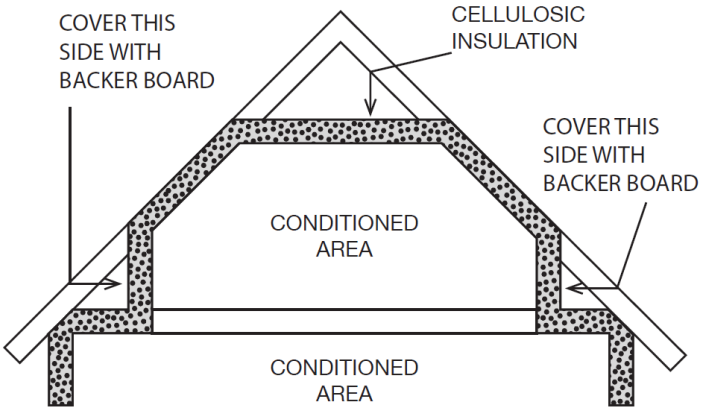

Figure 3

New and Existing Structures

- Blocking should be placed around access to the attic to prevent insulation from falling out.
- Blocking should be placed around recessed light or heating fixtures, chimneys, and flues. Clearance between heat-producing elements and combustible construction should follow applicable codes.
- Blocking should be permanently placed so as to keep insulation a minimum of 3" away from all sides of recessed lighting fixtures and other heat-producing devices.
- The open area above recessed lighting fixtures and other heat-producing devices should not be insulated per the National Electrical Code.
- Cabinet bulkheads, stairway wells and wall cavities which open into the attic should be covered by backer board to support the insulation.
- The open side of any wall between a heated and unheated area should be covered by backer board to form a cavity to retain loose-fill material (see Figure 3).

C. Coverage Requirements

When installing insulation, care should be taken not to exceed the square foot coverage shown on the label. The labeled thickness is the minimum thickness required for a given R-value. The initial installed thickness in ceiling applications will exceed the settled thickness shown on the

coverage chart. The bag count and weight-per-square-foot requirements of the coverage chart must be followed to provide the specified R-value at settled density.

D. Application Procedures

Ceiling Areas

- Accessible ceilings: when installing insulation by pneumatic means, it is important that the application machine be set as recommended by the machine manufacturer.
- Markers such as attic rulers should be placed wherever possible to indicate proper installation thickness. The more markers in place, the easier it will be to provide a consistent application.
- Machine air settings should be set low at the outset and then adjusted once application begins. Material flow should be like water from a hose, falling between 4-6' (1.5–2 m) from the end of the hose or nozzle. Start at the perimeter and work back towards the attic access. Material can be applied more evenly to the outer edge of the attic by using a rigid extension tube, which is removed when working in the center of the attic.
- The application hose should be held parallel with the ceiling joists whenever possible (or practical) at a height of 2-3' (0.6-0.9 m). This ensures the trajectory of applied material does not contribute to excessive compaction of the product. Aiming too high or too low results in increased or variable density (and decreased or inconsistent coverage).
- Obstructions such as cross-framing may require the hose to be kept much closer to the surface to direct material underneath. Product should be blown on both sides of such obstructions in order to eliminate potential voids. Only where space limitations make it necessary should the stream of material be deflected by hand.
- Enclosed ceiling cavities: installations of this type must be made by pneumatic means. Insert a fill tube into each cavity and withdraw it as the cavity is completely filled. The air setting on the machine should be set as recommended by the machine manufacturer for sidewall application. Coverage will be proportional to that shown on the manufacturer's coverage chart under sidewalls, depending on the cavity size.

Sidewalls (Existing Buildings)

- Installation into sidewall cavities must be made by pneumatic means. When dense packing sidewalls, many of the manufacturers, building code inspectors, and contractors are recommended to use a blowing machine that can be calibrated to achieve a minimum 3.25 p.s.i. line pressure to achieve the minimum required density of fiber to prevent settling. Many machine manufactures will provide pressure gauges on machine or hand-held pressure gauges for this purpose. After fill holes are drilled, all cavities should be checked for fire blocks or other obstructions with an electrician's fish tape or similar tool. A mathematical check should be made in the first few stud spaces to assure that the proper amount of insulation is being installed per the manufacturer's coverage chart.
- Filling through external siding in applications of this type, the following procedure is recommended.

- Drill holes 5/8" to 2" (1.59 to 5.08 cm) in diameter, depending on the siding, in each wall cavity. The vertical distance between the holes and top or bottom plate should not exceed 2' (.62 m) and the vertical distance between holes should not exceed 5' (1.52 m).
- Homes with shingle or lapped siding should have the holes drilled as near the shadow line as possible. Homes with brick veneer should have holes 5/8" to 3/4" (1.59 to 1.9 cm) in diameter drilled in the mortar joints. All holes should be filled with suitable plugs (see Figure 4).

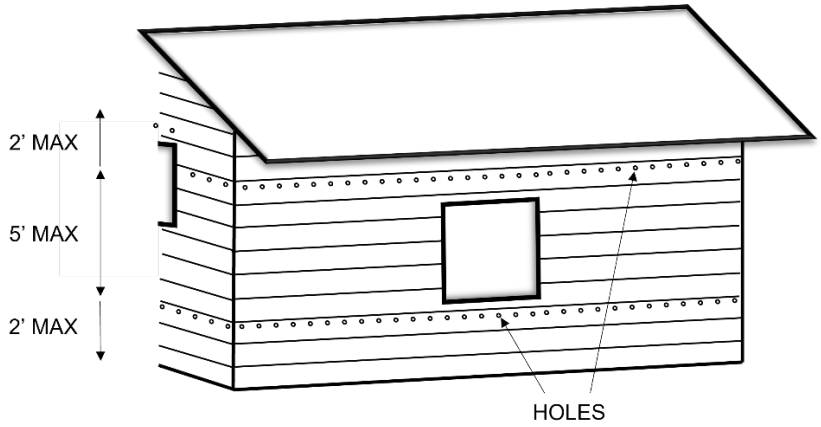

Figure 4

- Filling with fill tube in some applications is desirable. When using this method, only one entry hole per cavity is necessary. The fill tube should be inserted far enough to reach within 18" (45.72 cm) of the plate farthest from the point of entry. Fill tube size will depend upon the size of hole which can be drilled (see Figures 5A and 5B for alternate points of entry for the fill tube).

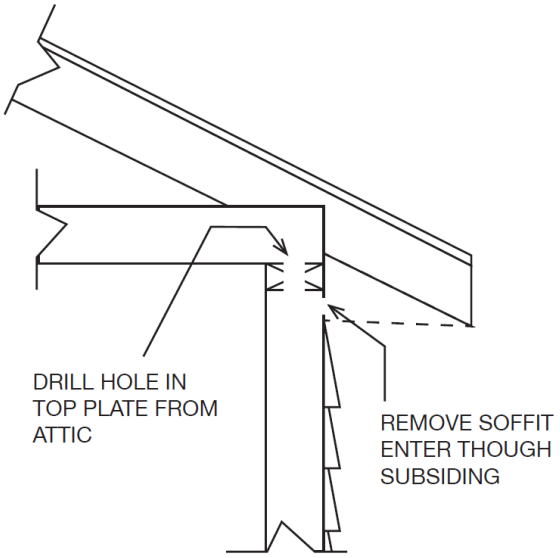

Figure 5A

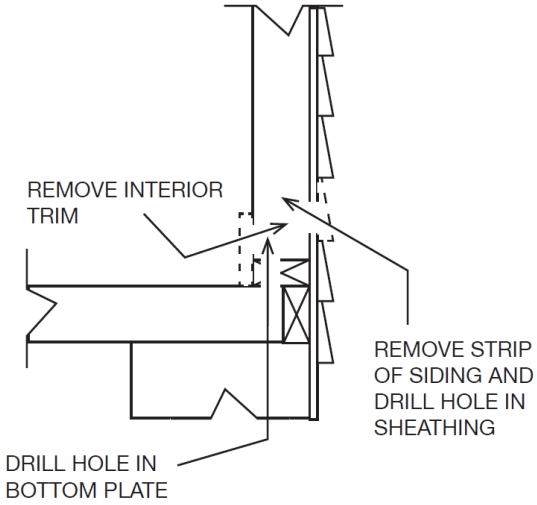

Figure 5B

Sidewalls (New Construction)

- The same installation techniques used with existing walls are occasionally employed in new construction, however insulation is usually installed in new walls before the walls are closed using spray or dry application techniques.
- The insulation is sprayed into the wall cavities from inside the building. Many application systems are proprietary and are designed for use with specific products. Manufacturer's instructions regarding application equipment and its use should be followed explicitly, as should the manufacturer's instructions on the amount of liquid to be added during application. All pipes, ducts, conduits, wiring, and outlets should be installed in the wall before the insulation is applied. Windows and areas from which insulation is to be excluded, such as electrical boxes, should be masked.
- After application, the insulation is made even with the stud faces by a stud scrubber. The wall can be closed shortly after installation of the insulation, however vapor retardant material, such as some types of paint and vinyl wallcoverings, should not be applied to the inner surface of the wall until the insulation has reached moisture equilibrium. Most authorities agree that vapor retarders of any type should not be used with spray-applied cellulose. This recommendation may conflict with some building codes, but knowledgeable code officials understand the special nature of spray-on cellulose and normally grant exceptions when the material is used.
- Various types of permanent retainer systems are used to install dry cellulose insulation in new walls. All systems are proprietary, and the manufacturers provide detailed instructions and often special training programs for their use. All systems require pneumatic installation and compression of the material to sufficient density to prevent settlement. The Insulation Contractors Association of America recommends a density of

1.5 times nominal settled density for sidewall installations. Some manufacturers recommend an installed density of at least 3.5 PCF in sidewalls.

- Dry cellulose insulation can be installed in new walls using temporary retainers that are clamped in place to create a closed cavity. Insulation is blown into the temporary cavity at sufficient density to keep it in place when the retainer is removed. An installed density of 3.5 to 4.0 PCF may be necessary.

E. Vapor Retarders

New Construction

- Many building scientists question prescriptive use of vapor retarders, however some building codes continue to require a vapor retarder on the warm side of insulated walls. Most cellulose manufacturers recommend against use of vapor retarders in walls insulated with spray-applied cellulose. CIMA is not aware of any endemic problems resulting from this practice.
- A vapor retarder is not required under attic insulation when the attic is adequately ventilated. A vapor retarder must be used when the cold side of a ceiling cannot be ventilated (see Section 4F for Ventilation).
- A ground surface vapor retarder such as plastic film is recommended when there is a crawl space beneath the floor (see Section 4F for Ventilation).

Existing Buildings

- Most cellulose producers regard vapor retarders as unnecessary with dense-pack cellulose under most conditions in the United States. Check your local building codes to see if an air barrier and/or vapor barrier is required.
- A ground surface vapor retarder, such as plastic film, is recommended when there is a crawl space beneath the floor. (See Section 4F for Ventilation).

F. Ventilation

- In vented attics without vapor retarders, standard practice is to provide one square foot (.093 m^2) of net vent area for each 150 square feet (13.94 m^2) of ceiling area.
- In vented attics with vapor retarders, standard practice is to provide one square foot (.0903 m^2) of net vent area for each 300 square feet (27.87 m^2) of attic floor area.
- When using a combination of roof and eave vents and no ceiling vapor barrier, there should be one square foot (.093 m^2) of net vent area for each 300 square feet (27.87 m^2) of ceiling area. Vents should be installed with 50% of the total area in the eaves and 50% of the total area in the roof near the peak.

G. Precautions and Limitations

- Heaters and recessed light fixtures must not be covered by the insulation unless the fixture has an insulation contact (IC) rating. Local and national codes must be followed where applicable. A minimum of 3" (7.62 cm) of air space must be maintained between fixtures and the blocking.

- Cold air returns and combustion air intakes for hot air furnaces must not be blocked or insulation be installed in a manner which would allow it to be drawn into the system.
- Insulation must not contact chimneys or flues. A minimum of 3" (7.62 cm) of air space must be maintained with blocking used to retain the insulation.
- The homeowner should be advised that in tightly constructed homes or when insulating existing homes which have fuel fired heating systems within the living area or basement, an air duct must be installed between the furnace room and a well ventilated outside area to provide combustion air. A local heating contractor should be contacted for proper duct size and installation.
- The homeowner should be advised that the relative humidity within the living area should be kept below 40% R.H. when outside temperatures fall below 32° F (0° C).
- Cellulose insulation is not recommended for use in sidewalls below grade or for filling the cavities of masonry walls.
- This insulation is to be used in temperatures ranging -50° to 180° F (-45.6° to 82.2° C).
- The installer must wear appropriate respiratory protective equipment.

5. Sprayed Cellulosic Wall Cavity Insulation

This recommended practice covers the application of sprayed cellulosic wall cavity insulation (SCWCI) into wood/steel framed cavities of single and multi-family dwellings. When installing SCWCI materials, it is essential that the guidelines of the manufacturer are followed. In addition, this guide is not intended to supersede local, state, or federal codes.

This guide assumes that the installer possesses a good working knowledge of the applicable codes and regulations, safety practices, tools, equipment, and methods necessary for the proper installation of SCWCI materials. It also assumes that the installer understands the fundamentals of residential construction that affect the installation of insulation materials.

A. Preliminary Inspection

An inspection of the building should be made prior to installation. Special consideration should be given to the following areas:

- All voids around windows and doors should be sealed to stop air infiltration. Various materials such as foam backer rod or urethane spray foam are available for this purpose.
- Seal all vertical plumbing and electrical penetrations through both top and bottom plates of all walls.
- Cover finished areas including windows, doors, fireplaces, etc. It is faster to protect finish surfaces than to clean them later. Two or four mil polyethylene sheeting works well.
- Cover electrical boxes and other necessary openings until the spraying is completed.
- If recycling the SCWCI, a clean floor is absolutely essential before starting to spray. Objects such as nails, wood, wire, etc. could damage the machine. Sweep these from the floor before starting to spray the SCWCI.

B. Required Equipment

The insulation shall be applied with spray application machines, spray nozzle, and other necessary equipment suitable for the material being installed.

- A semi-spiral hose should be used. This hose allows the material to tumble and stay in the air stream. A 2 1/2" or 3" hose can be used, however if you use 3" hose you need to reduce to 2 1/2" to attach the spray nozzle.
- A pump capable of 200 to 300 psi at a flow rate sufficient to dampen the fibers as required by the insulation manufacturer.
- Nozzles should be 2" to 3" to facilitate good volume of material. The control of fiber to water ratio must be consistent. The liquid pressure line must be rated to handle the pressures that the pump is delivering.
- A wall scrubber should be used for cleaning down walls. The cavity must be sprayed beyond the stud surface. Wall scrubbing is recommended to be done from the floor upward, in which case the scrubber head should be spinning upward against the wall cavity. Downward scrubbing may cause sags. After wall scrubbing, there should be no voids. Refer to the manufacturer or supplier for recommendations on safe and correct use of the wall scrubber.
- Large commercial vacuums may be used to aid in the recycling process (see Section 5E). Some machines have vacuum systems attached that blend the recycled cellulose with new bags of cellulose, otherwise vacuum systems may be added to machines.
- Other items include water tank, shovels, brooms, trash cans (for recycle), and staple gun and poly.

C. Equipment Setup

- The blower machine may be mounted in a truck or trailer to be positioned at the job site as close to a door as practicable to make recycling easier and increase production. An alternative is to take the machine into the building in a central location.
- The pump, hoses, and water tank need to be protected from freezing. Electrical outlets may require ground fault protection per local regulations.
- At the job site pull the hose to the farthest point you must insulate. Make the hose no longer than necessary (100' minimum) having as few bends as possible. Next, pull the water line out along the insulation hose.
- Connect the blower hose to the nozzle loosely, for easier direction of the nozzle. When going from room to room, the hose will turn. When it does, the nozzle must be adjusted on the hose. Tape the water pressure hose to the blower hose just behind the nozzle to keep the nozzle attached, while allowing removal of the nozzle by disconnecting the pressure hose from the nozzle and simply sliding the nozzle out of the blower hose.
- Adjust the blower machine and pump according to manufacturer's recommendations. Also refer to the manufacturer's recommendations for the correct pressure settings for the nozzle in use; specific recommendations from the thermal insulation manufacturer must be followed. Liquid flow tests may be made periodically to verify a proper liquid-to-

fiber ratio. This can be done by measuring the amount of water sprayed into a bucket during a period of one minute and comparing to the fiber feed rate.

D. Spraying Techniques

- Start at the bottom of the cavity.
    - Use a 45-degree downward angle for about 2 or 3 passes. Then within 4 or5 passes, gradually shift to a slightly downward angle (about 5 to 10 degrees). Retain that angle until about 12" from the top of the cavity. Gradually start shifting the angle upward so that the underside of the top plate can get a film of moisture before completing the top. On the last 4" of the top of the cavity, with a slightly faster pass, angle at about 45 degrees to complete to top. Do not overfill at the top.
    - That same angle procedure should be used to properly seal the underside of windows, blocking and the underside of electrical boxes. Spray behind electrical boxes before spraying the cavity to ensure there is a good seal behind the boxes.
    - The angle of spray is an absolutely essential part of spraying and must become a habit. A downward angle of approximately 5 to 10 degrees and about 3' to 4' away from the wall gives a layering effect. Nozzle tips should be slightly angled up to condition the wall sheathing to assist in cellulose adherence.
    - Care should be taken to protect the nozzles from damage. Periodically the tips should be replaced as they wear and change the spray pattern. As the nozzle moves from one side to the other, angle the nozzle sideways and maintain 5 to 10 degrees down, spraying into the existing insulation.
    - Nearing the top of the wall, keep the nozzle angled down. To fill the very top, under the plate, turn the nozzle angle up and step in a little closer to pack the insulation against and into the top of the cavity. After the top portion is almost full, step back and level out the nozzle to finish the cavity. Be careful not to overfill the top portion of the wall cavity. The cavities under windows, soffits, etc. must be treated the same as the top plate.
- Filling the cavity to the proper thickness comes with experience. The nozzle should be centered to the cavity (not the person). A very even pass will assure a smooth surface on the face of the stud. The smoother the surface, the less overspray will be needed, and that will make less recycle on the floor. Angles are critical to give a firm buildup in the cavity and alleviate voids. A smooth and steady movement of the nozzle will also help to decrease the amount of over spray. Many new applicators have problems with fall off. There are three principles to know about fall off.
    - The thicker the wall, the more weight is pulling on the sprayed insulation. Therefore, it is very important to know the fiber-to-water ratio and keep it consistent. The thicker the walls, the more important this becomes.
    - The wider the distance between studs, the less surface area the sprayed material has to attach itself. 16" OC (on center) is much more forgiving than 24" OC stud spacing. Framing with 2x8, 24" OC can be successfully sprayed.

  - The angle of the nozzle and the velocity of the material are the two most important factors to reduce falloff. The sprayed insulation must hit the substrate and stay. This can only be achieved with the proper angle. If the angle is not correct, the material will tend to deflect or slide off the studs and substrate. This can be mastered with practice and training.
- In all cases it is important to maintain a consistent ratio of dry to recycle material.
- Variables such as climate, depth of insulation, and initial moisture content affect the rate of drying. The manufacturer's recommended drying times shall be followed accordingly.

E. Recycling

- When recycling overspray and overfill material, all of the insulation is used, therefore there is very little waste. This also reduces the need for disposing of the excess material. When recycling, the material must be mixed uniformly, or problems are likely to occur. If mixed improperly, the wall cavity insulation may be too wet, causing inconsistent flow leading to instability, thus causing insulation to fall out of the wall cavity.
- Carefully adjust moisture or fiber volume when the recycling method begins. The recycled material adds moisture mixed with the dry product. Adjusting the water pressure or changing spray tips will help maintain the same moisture percentage throughout the job.
- When a recycle machine is used with a dry machine, the slide-gate on each machine will determine how much material will be feeding into the hose. Adjusting the slide-gate of each machine as necessary, along with tip size on the nozzles, and water pressure and air pressure, will determine the result of the application.

F. Cold Weather Spraying

SCWCI can be applied successfully in freezing conditions. Always consult the manufacturer for recommendations on spraying in severe climates and conditions.

G. Special Areas

- SCWCI is excellent for sound control. It can be used in walls between rooms and other areas that require sound control. Consult the manufacturer for the recommendations of the type of sound control that is needed for each configuration.
- When spraying sound walls, normally there is no backing. Drywall on one side would be a good backing. Most builders do not want to bring drywall installers in to only do one side of sound walls. Netting can be used on one side. It must be installed very tightly and stapled every 2". After spraying the sound walls, netting should be installed on the other side of the wall to protect against damage from drywall stockers and others that may accidently hit it. The netting of the 2nd side should also be very tight, however, stapling can be every 12".
- Cellulose insulation has been tested and found to meet code requirements for fire stopping around steel through penetrations in fire rated walls. It is approved as a fire block in the International Building Code and the International Residential Code. ICC codes allow an additional 15 minutes in a nominal 2x4 wall for calculated fire resistance ratings.

Cellulose insulation is a key component of several proprietary two-hour fire wall designs. Consult manufacturers' technical bulletins for details.

H. Vapor Retarders

Consult local and state building codes about the use of vapor retarders in your region.

I. Precautions and Limitations

- Heaters and non-IC-rated (insulation contact) recessed light fixtures must not be covered by the insulation. Local and federal codes should be followed. It is recommended that a minimum of 3" of air space be maintained between any fixture and the blocking.
- Cold air returns and combustion air intakes for hot air furnaces must not be blocked or the insulation should not be installed in a manner which would allow it to be drawn into the system.
- Insulation should not be allowed to contact chimneys or flues. A minimum of 3" of air space should be maintained with blocking used to retain the insulation.
- This insulation is not recommended for filling the cavities of concrete block walls.
- Consult the manufacturer about using SCWCI below grade or ground level because of moisture considerations.
- This insulation is to be used in the temperatures range of -50° F to 194° F.
- It is recommended that the installer wear a N95 or equivalent dust mask and eye protection.

6. Stabilized Cellulosic Thermal Insulation

This recommended practice covers the application of stabilized cellulosic thermal insulation in open or closed attic spaces, regardless of slope. Stabilized cellulosic thermal insulation is produced with the addition of an adhesive to loose-fill cellulosic insulation. The adhesive may be added to the insulation at the time of manufacture and, if necessary, activated by the addition of a mist of water when installed, or the adhesive may be added to the insulation at the time of installation. When installing stabilized cellulosic thermal insulation materials, it is essential that the guidelines of the manufacturer are followed. In addition, this guide is not intended to supersede local, state, or federal codes.

This guide assumes that the installer possesses a good working knowledge of the applicable codes and regulations, safety practices, tools, equipment, and methods necessary for the proper installation of stabilized cellulosic thermal insulation materials. It also assumes that the installer understands the fundamentals of residential construction that affect the installation of insulation materials.

A. Preliminary Inspection

An inspection of the building should be made prior to installation. Special consideration should be given to the following areas:

- Seal all vertical penetrations where plumbing or electrical service is located in all interior and exterior wall top plates.
- Install protective blocking around recessed lighting fixtures or other heat producing devices in accordance with ASTM C1015.
- Cover open electrical boxes to protect them from filling with sprayed cellulose. Remove the covering after the installation is completed (duct tape is a quick and easy covering).
- Ensure that proper attic ventilation has been provided.

B. Equipment

- The fiber blowing machine should be capable of generating sufficient air volume to move the activated stabilized cellulose through the desired size and length of hose. The selected machine should also be capable of adjustments to the product/air volume needed to move the desired amount of material. Operate the fiber-blowing machine in accordance with the manufacturer's instructions.
- An internal wetting system is needed to meter a mist of water into the product air stream as a control to the fiber-to-water ratio. The water can be supplied by means of a pump or hose bib connection with a typical garden hose.
- If a pump is used, it normally should be capable of 200-300 psig with a flow rate to meet the manufacturer's recommended add-on rate (depending on the desired rate of installation, an approximate flow rate of 2 gallons per minute is sufficient). Since a sufficient amount of water is usually supplied at 140-170 psig, the pump will not be overworked and will remain serviceable for a long time. Diaphragm pumps have been found to be the best because they are durable and supply a constant pressure. Consult the material manufacturer for pump type and size needed for application.
- The type, diameter and length of hose will affect the water mist distribution within the product. An air stream in a semi-spiral hose has been found to promote sufficient mixing of the water mist and dry product. A semi-spiral hose allows the material to tumble and stay in the air stream. Smooth bore hose, as compared to semi-spiral hose, does not promote as much mixing action. Generally, a minimum of 75' to 100' of blowing hose is required.
- All connecting water lines must be rated to handle the pressure generated by the pump or the hose bib connection.

C. Equipment Setup

- Upon arriving at the job site, pull the hose to the farthest point to be insulated. The hose length used should be no longer than necessary with as few bends as possible. The more bends there are in the hose, the slower the air stream will be which can cause plugging or blocking in the hose. Next, attach the water line to the water supply. In cold weather take the proper precautions to avoid the water supply or water supply lines freezing.

- Adjust the blowing machine and internal wetting system to deliver the proper fiber-to-water ratio according to the manufacturer's recommendations. The proper fiber-to-water ratio ensures that the manufacturer's recommended coverage can be achieved. Separate time trials and weighing scales can be used to determine if the proper ratio of water mist and dry product is being delivered. One technique is to determine the flow rate for each separately before allowing the combined mixture of product and water mist to be conveyed by the air stream.
    - The first step of this technique is to determine and adjust the flow rate for dry product for the desired output rate.
    - The second step is to determine and adjust the water mist flow rate to achieve the manufacturer's recommended water add-on ratio based on the intended dry product flow rate.
    - The third and final step is to combine both dry material and water mist for the desired output.
- Most manufacturers suggest the installation ratio between water and dry stabilized cellulose thermal insulation is less than 20%. For example, during installation, approximately 6 pounds of water (approximately 3 quarts) should be added to a 30lb bag of dry stabilized thermal insulation with the internal wetting system.
- Placing 25' of hose that is 25-30% larger in diameter than the hose immediately after the internal wetting system can reduce fiber build up due to product-flow variations.

D. Spraying Techniques

- The hose position during application is an essential part of installing stabilized cellulosic insulation. Adjust the hose position so that the insulation is blown even across the floor of the open area.
- Spray to the minimum depth that is recommended by the manufacturer to achieve the desired installed R-Value. Additionally, ensure that the correct amount of stabilized material has been installed in the required area. This is often accomplished by counting the number of bags required per the manufacturer's coverage chart.
- Note: Only use the manufacturer's recommended ratio of material-to-water. Material-to-water ratios different than those recommended by the manufacturer can result in less coverage than stated.
- Periodically disconnect the hose after the internal wetting system and clean out any buildup of wet material.
- Excess material not removed from the blowing equipment or hose after installation is complete can hinder or block product flow for the next installation.

E. Precautions

- Unless IC-rated (insulation contact), heaters and recessed light fixtures or other heat producing devices must not be covered by the insulation. Local and federal codes should be followed. ASTM C1015 recommends that a minimum of 3" of air space be maintained between a heat source and blocking (unless rated differently) of any type of insulation.
- Cold air returns and combustion air intakes for hot air furnaces must not be blocked by insulation.
- Insulation should not be allowed to contact chimneys or flues.

7. Manufacturer's Certification Statement

It is strongly recommended that all contractors provide their customers with a completed manufacturer's certification statement. The purpose of this document is to provide the customer with a permanent record of the materials used and the work performed and is often required to validate product warranties and seek tax credits.

For more information on cellulose insulation, visit
www.cellulose.org