Cathedral Ceiling Applications

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Cathedral ceilings have gained in popularity as architects and designers use this detail to add character to a home. A ceiling is designated as cathedral when the thermal barrier (insulation) and the pressure barrier (drywall) affixed to the underside of the roof rafters are parallel to a pitched roof. Cathedral assemblies have historically been vented since traditional thinking has been that a vent space was needed to alleviate heat gain. Studies have shown, however, that excess heat and moisture gain on a roof assembly is far more a function of roof color than the presence or absence of cavity ventilation.

Unvented cathedral ceilings were judged to provide better thermal performance and better moisture control by an international group of building scientists and contractors at the ASHRAE/DOE sponsored 'Thermal Envelopes Conference' held in Clearwater, Florida in December, 2001. In the Oak Ridge National Laboratory publication 'Moisture Control Handbook', under the heading "Should Cathedral Ceilings be Ventilated?," the answer was, "Not if that space is tightly packed with insulation."

Insulated cathedral ceilings are rafter cavities which fully encapsulate the thermal insulation on 6 sides. In vented cathedral ceilings, GreenFiber Stabilized Insulation or GreenFiber Loose-Fill Insulation is Dry Dense-Packed to a minimum density of 3.5 lb.ft^3 (56.1 kg/m3). In unvented cathedral ceilings, GreenFiber Stabilized Insulation or GreenFiber Loose-Fill Insulation is Dry Dense-Packed over an air impermeable insulation as prescribed per IRC 2009 Section R806.4. The thickness of the air impermeable insulation is determined per Climate Zone.

The decision whether to include venting or not in this application needs to be made by the specifier, architect, or engineer of record, taking into account climate conditions, site specific issues and assembly design. This document is not meant to imply that this assembly type, whether vented or unvented, can be used without due consideration of these and other pertinent issues. As noted above, in addition to the Code prescriptive path, the Code allows an alternate performance path, if it can be proven to the local Code body that the design choice will achieve the intended Code standard. Modeling programs such as WUFI (a hygrothermal modeling program) can be used to verify that the proposed performance path will work.

The typical installation method for Dry Dense-Packing cathedral ceilings is to staple a non-woven netting to the cathedral rafters. A hole is then cut in the netting near the ridge and a 2 1/2" or 3" hose is inserted the length of the cavity. Insulation is blown into the netted cavity to a minimum density of 3.5 pcf. At this density, there will not be any settling of the material. In hot, dry climate zones where unvented cavities can be totally filled with cellulose insulation, the insulation will always be in full contact with the roof sheathing, typically OSB. This helps avert the underside of the sheathing from becoming a condensing surface should there ever be any moisture vapor intrusion into the cavity.

Control of air infiltration into cathedral cavities is very important. Therefore, particular attention needs to be paid to air sealing of any unvented cathedral ceiling assembly. Interior humidity should not be allowed to infiltrate the cavities and outside moisture laden air should not be allowed entry through the eaves and rafter ends. The use of the Dry Dense-Pack approach is not recommended for spaces which have high indoor humidity such as indoor pools. These applications demand a level of construction design and detail that can be difficult to meet in practice.

Equipment and Material Requirements for Cathedral Ceiling Applications (These guidelines are different from those for cathedralized unvented attic applications. Please refer to GreenFiber's instructions for those product applications.)

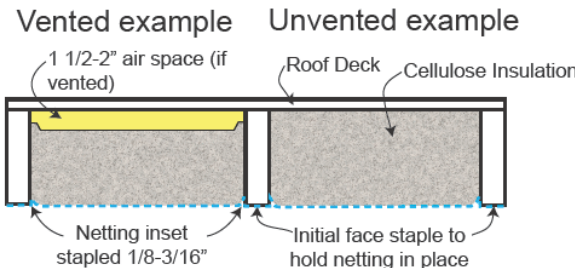
1. Hanes Insulweb™ brand netting
2. Air compressor with two or four air lines
3. Pneumatic staple guns with 1/4" staples
4. Ladder or scaffolding
5. Utility knives
6. GreenFiber INS515LD, INS735, INS745, INS765LD, or INS770LD

Installation Precautions

The installer must be familiar with cellulose insulation blowing equipment and techniques. Avoid installing netting or insulation in contact with non-UL rated electrical systems or non-insulated wiring. All lighting installed in the cathedral ceiling must be UL rated "IC" with air tight rated cans. Care must be taken during insulation installation to ensure the complete filling of the cavity around any lighting or other penetrations in the cavity, such as stereo speakers. Various other local, state and federal codes, rules and guidelines may apply.

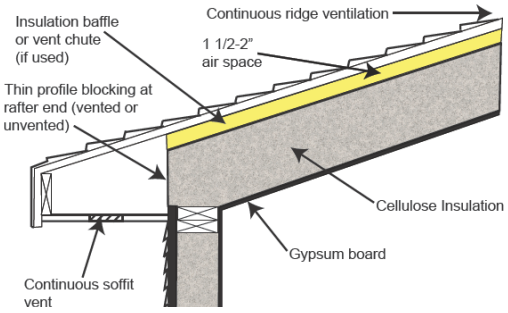
GreenFiber's Material Data Safety Sheet (MSDS) requires the use of safety eyewear when installing this product. The insulation contractor is responsible for managing housekeeping and engineering controls below nuisance dust levels. Follow all OSHA guidelines for safety requirements including 29 CFR-1926.501 Duty to Have Fall Protection. Various other local, state and federal rules and guidelines may apply.

Procedure for Installing Netting in Attic Rafters



1. Pre-cut netting sheets to manageable size relative to the area to be covered, if necessary.

2. Be sure the rafter ends are blocked correctly with an air sealed barrier to prevent insulation from being installed into the eaves. This detail needs to be completed before netting and insulation installation. Please consult the architect or engineer of record to ensure the proper detail and construction technique is followed. If venting is used, install prior to netting which must be continuous from eave to ridge. If the application is unvented, there should not be any opening at the ridge or rafter end.



3. Netting installation is a two-step procedure. First, affix the netting to the rafter edges and peak, creating a square or rectangular stapled sheet, which is also stapled to the rafters across the netting face. Second, inset staple the netting to the sides of the wood framing around all four edges of the cavities to be insulated. It is important to inset staple to increase tension in the netting to prevent the netting from bowing out beyond the rafter surfaces.

Bowed netting can lead to difficulty in applying drywall to the ceiling after insulation is installed.

4. Taking a straight, factory netting edge, the crew may either start stapling across the peak or down the eave, stretching the netting tight along the stapled edge.

5. Beginning in one corner adjacent to the stapled edge, continue stapling out from the corner, increasing the stapled area in a triangular fashion. Face staple the netting to the rafters as installation progresses. Be sure to pull the loose ends tight to maintain a taut sheet in all netting directions. Staple spacing in the first step should be at least 2-3 staples per linear foot. The remaining loose netting is then stapled to the rafter edges while maintaining a taut sheet across the area.

6. The result should be a tight square or rectangular sheet, stapled on all four sides with at least 2-3 staples per linear foot to hold the netting in place. This includes face stapling the netting to the rafters, as well as the perimeter of the sheet.

7. When using multiple netting sheets that adjoin each other, overlap the sheets by at least one foot to prevent insulation from blowing out of the cavity.

8. Inset staple 1/8"-3/16" in from the framing face around all four edges of every cavity to prevent netting bow as previously indicated. The netting is then ready for insulation application. All inset stapling should be performed with 15-20 staples per linear foot.

Insulation Installation Instructions

1. Set the feed gate on the blowing machine opening at approximately 60% to 70%. The air setting should be set at 70% to 100%. The settings will vary depending on machine type.

2. One to three feet from the roof peak, cut a slit large enough to insert the blowing hose in the netting. Insert the three inch blowing hose behind the netting and slide the hose down the netted cavity to the eave and begin Dry Dense-Packing the insulation.

3. Begin filling cavity; do not allow the material flow to back the hose up the cavity on its own. Create some resistance in order to ensure full cavity density. Slowly retract the hose in order to avoid clogging the hose. Ensure that the Dry Dense-Packing at the ridge is complete to avoid the potential for settling.

4. The time to fill a cavity will depend on the machine being used, the material flow and air settings. The material should not clog the hose during this process. If the hose does clog, clean out the hose and close down the feed gate by 10% or increase the air flow until clogging does not occur.

5. Make sure the netting is stretched tight over the entire cavity. Patch the hose entry hole with duct tape.

6. Move on to the next cavity and repeat this process throughout the entire ceiling area.

Product Usage Estimates for Cathedral Ceiling Applications

See chart below for GreenFiber estimates on the amount of product needed. These estimates are subject to variation depending on the actual cavity volume of the installation, the operator skill level, blowing machine condition and settings, and other variables. As such, these are only guidelines, and are not to be construed as a coverage chart, or as a definitive calculation of product usage. The R-value used in these calculations is 3.70 per inch, tested at a 4" representative height per ASTM standards.

Stud Dimensions	Stud Height	Total R-value @ 3.7/inch	Ft^2 covered @ 3.5 pcf
2 X 10	9.125"	33.8	11.3
2 X 12	11.125"	41.2	9.2

Helpful Tips for Application

1. For quick measurements without using a tape measure, count the number of sheets of plywood from the eave to the peak. Multiply this number by four– the width of a sheet of plywood. This will give the distance from the eave to the peak.

2. Make all of the standard cuts on the floor before stapling any netting.

3. Pull the blowing hose into the attic area as the attic is being blown. Secure the hose to a ceiling joist to relieve the hose weight.

The following list of equipment and supplies can be ordered from Spray Insulation Components at 1-800-210-1311.

1. Hanes netting, 9' width rolls

2. Josef Kihlberg pneumatic staple guns:
   a. Model JK670 for 1/4" staples
   b. Model JK680 for 5/16" staples

3. Staples-10,000 per box, 10 boxes per case, 1/4" or 5/16"

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