



Achieving Expected Thermal Performance Fiber Glass Batts in Flat Ceilings

Information from NAIMA

In this issue we examine the application of batts in horizontal ceilings and focus on recent testing.

Fiber glass batts and blankets are commonly used to insulate flat ceilings and attic areas in both new and existing buildings.

To satisfy the need for higher R-values in ceilings, fiber glass batts are available with insulation values up to R-30 and R-38. These batts are manufactured in full widths of 16" and 24" so they not only fill spaces between ceiling joists or bottom chords of trusses, but also extend above and close over most wood members. Because of their resiliency, they compress and fit between framing members where required. The installed performance of full-width ceiling batts has been tested and shown to achieve expected R-values.

Attic System Testing

Laboratory tests were conducted under controlled con-

ditions on a 14 x 20 foot attic section in one of the most sophisticated test chambers in the world. The chamber can simulate climatic conditions throughout the country. (See Figure 1, page 2.)

The attic assembly utilized 20 foot long trusses with 2 x 4 bottom chords spaced on 24" centers. Twenty-four inch wide batts of 12" thick R-38 insulation were installed. Each truss had six vertical support members penetrating the insulation area.

Six tests were conducted on the assembly with the temperature differential ranging from 50 to 75 degrees F on the inside to the attic. These conditions simulated most of the typical winter conditions for the lower 48 states. The mean test temperatures were all at 40 degrees F.

Two groups of three tests were run. The first group examined the R-38 batts as installed, including minor gaps caused by the truss support penetrations. The second set of tests examined the

impact of filling the gaps in the batts, caused by the truss supports, with insulation.

The Test Results for Full-Width Insulation

For each group of tests, the results were similar (within $\pm 1.5\%$). The ceiling system using full-width batts performed consistently over the range of conditions tested. The average ceiling system performance for the full-width batts as installed was R-41.

Calculations made using the common, one dimensional ASHRAE procedure at 40 degrees F mean predicted an R-43 for the test assembly. Although this approach is simple, it has been shown to be reasonably accurate for estimating system performance. The calculations modeled the specific config-

uration of the test attic including insulation, trusses, ceiling and air films. The test results showed that the batted ceiling had a system performance under these conditions that was very close to the R-43 expected by the ASHRAE procedure.

Measured Ceiling System Performance		
Mean Temp.	Full-width R-38 batts as installed (3 test average)	Full-width R-38 batts with truss gaps filled (3 test average)
40°F	R-41.0	R-41.6

The second group of tests indicated that, even when minor gaps present around truss support members were filled, their impact was small and did not greatly affect the overall

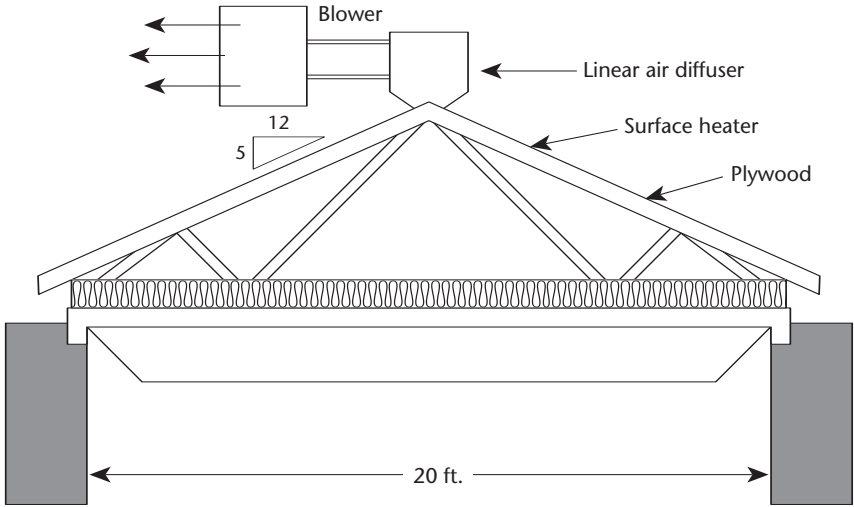
system performance of the ceiling. The average of the three tests showed a ceiling performance of R-41.6.

Narrow-Width Insulation

R-30 and -38 batts are also made for special narrow-width applications, such as in cathedral ceilings or floor cavities. These products, generally 15" or 23" wide, are intended for applications where the insulation fills only the space between framing members.

Although designed only for floors or cathedral ceilings, these narrow-width products have occasionally been misapplied in open attics. In these cases, the ceiling joists or truss bottom chords are not covered and remain exposed to the attic space.

Figure 1 Environmental Chamber



When the uncovered ceiling framing is exposed to the attic, the overall performance of the ceiling system is substantially lessened. Though a laboratory test was not performed, an ASHRAE calculation of the R-38 test attic, assuming no coverage over the framing, yielded an overall R-30 at 75 degrees F mean. Clearly, the right material to use in the ceiling is full-width insulation. Narrow-width insulation should only be used for rafters with cathedral ceilings or floor cavities where the insulation fills only the space between wood members.

Calculated Ceiling System Performance

Mean Temp.	Full-Width R-38 batts	Narrow-width R-38 batts
75°F	R-38	R-30
40°F	R-43	R-34

Doing the Job Right

The performance of any insulation product is dependent not only on selecting the proper product but also on installing it correctly. Ceiling batts are easy to install but the installer should take a few precautions to ensure quality application for a flat ceiling:

- n Use full-width R-30 or R-38 batts. Never use narrow-width material since the framing members will not be covered. (See Figure 2.)
- n Install batts out over exterior wall top plates. Batt's assure thermal protection at eaves by preventing cold spots and potential moisture condensation.
- n With eave vents, leave at least one inch of clearance between the insulation and roof deck. Use baffles where needed. (See Figure 3.)
- n Make sure that the ends of insulation batts butt together snugly. This is easy to accomplish with resilient batt-type insulation.

Figure 2
Ceiling Installation

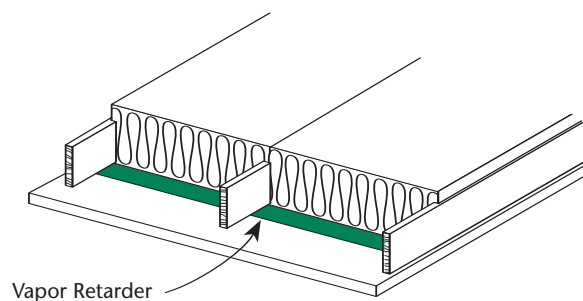
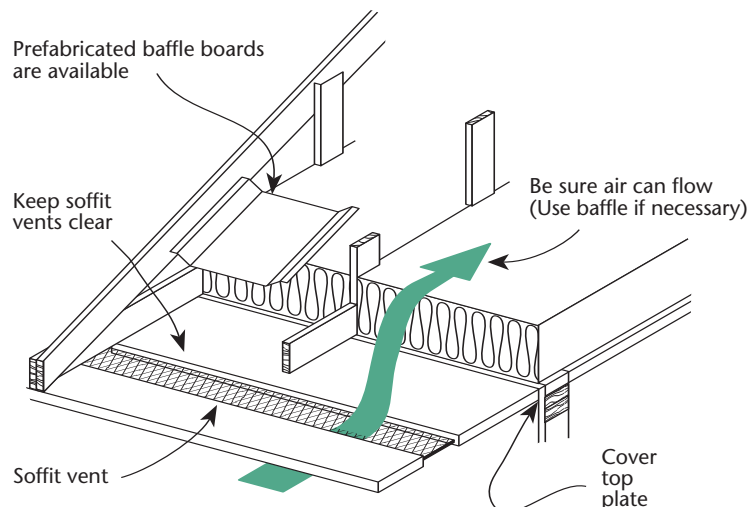


Figure 3
Soffit Venting



- n When installing from below, make sure that the batts are pulled down flush with the ceiling line.
- n Do not cover recessed light fixtures with insulation. Unless the fixture is IC rated, any insulation must be kept at least three inches away.
- n When using a faced product, install the vapor retarder down toward the living space. Standard facings must be covered by drywall, paneling or other appropriate interior finish.
- n Look for the NAHB Research Center label which insures the insula-

tion you have purchased will perform to the labeled R-value. (See Figure 4.)

Desired Performance

Both actual attic thermal research and ASHRAE calculations indicated that, to achieve expected thermal performance, open attic applications need standard, full-width batts which are designed to cover the ceiling joists or bottom chords of roof trusses. NAIMA recommends that full-width batts be used in all open attic applications. Narrow-width products should only be used for their intended applications, such as for cathedral ceilings or floor cavities.

Figure 4
NAHB Label



For More Information

NAIMA has published a variety of informational brochures on proper installation procedures and recommended insulation practices. For a complete listing of NAIMA publications, contact:

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ABOUT NAIMA

NAIMA is a trade association of North American manufacturers of fiber glass, rock wool, and slag wool insulation products. NAIMA's role is to promote energy efficiency and environmental preservation through the use of fiber glass, rock wool, and slag wool insulation products and to encourage safe production and use of these insulation products.

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