

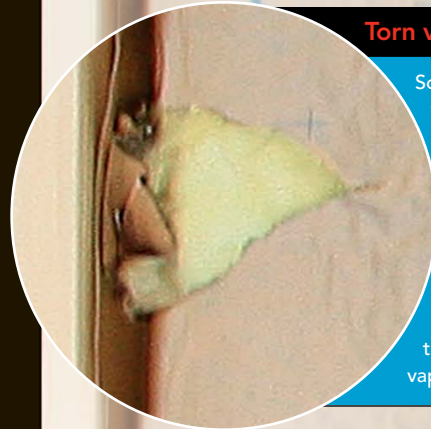
## Fiberglass-batt insulation

**A**n architect recently described the 2x6, fiberglass-batt-filled walls in his new home as performing at R-19—presumably because he used R-19 batts. The statement is a reminder that lots of builders and architects—even after all the research and testing that has been done—still don't understand the material.

On pp. 76-81 of this issue, Nathan Good writes about a home he designed on the Oregon coast. Acknowledging the difficulty of installing fiberglass batts well, he sought alternative insulation methods to maximize performance.

So what is wrong with that architect's "R-19" wall? Simply put, it doesn't perform to R-19. Common mistakes (right) compromise its performance, and the way batts perform after installation is vastly different from what you might expect just by reading the label (far right). To determine if fiberglass-batt insulation is right for your next project, you need to understand how it works.

*Rob Yagid is an associate editor.*



### Torn vapor retarder

Some installers mishandle the batts and rip their vapor-retarder facing. Don't worry about small tears, but if there are large holes in the facing, repair them with housewrap tape before hanging the drywall to restore the integrity of the vapor retarder.

### Sloppy utility detail

Batts should be cut precisely so that they fit snugly around electrical boxes, and they should be split and fitted around wires and pipes so that the fiberglass is not compressed, which would reduce its R-value.



### Compression

Batt compression diminishes rated R-values. Most R-19 batts (R-3.04 per in.) are 6¼ in. thick. When the batt is compressed into a 5½-in.-deep stud cavity, the overall R-value decreases to R-18. The R-value per inch increases to R-3.27, but the overall R-value is what really matters. Stuffing a batt into place or pinching it behind obstructions reduces its overall R-value even more.



## LABELED VS. REAL-WORLD PERFORMANCE

R-19-labeled batts don't create R-19 walls. Studies at Oak Ridge National Laboratory show how conventionally framed 2x6 walls filled with standard, low-density R-19-labeled fiberglass batts actually perform (graph below).

Installation has a significant effect on insulation performance, but so does the very nature of wood-framed structures, something that's often forgotten.

### BATTS ARE EASY TO INSTALL INCORRECTLY

The Residential Energy Services Network (RESNET) has created a three-grade criteria for assessing the quality of new insulation installed in homes getting a home energy rating. The ideal installation is rated as Grade I, which demands the following:

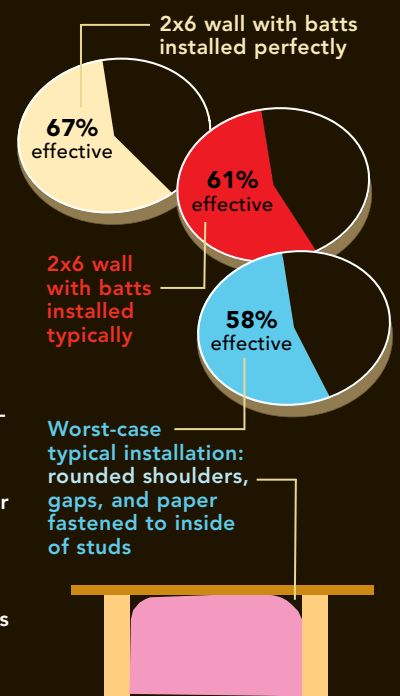
- Batts must be installed according to the manufacturer's directions.
- Each stud bay must be filled completely with minimal gaps or compression around obstructions. No more than 2% of the insulated area can be compressed, and there can be no areas of missing insulation.
- The insulation must be cut or split so that it fits snugly around electrical wires or plumbing running through the stud bay.
- The insulation must be in full, uniform contact with either the exterior or the interior sheathing. With a putty knife, you can push a batt so that it fits tightly into the back corners of the stud bay, eliminating rounded shoulders.
- The insulation must be installed to full rated thickness, allowing for the 2% compression. If insulation is uniformly compressed, the lower resulting R-value must be taken into account.
- Each insulated stud bay must be enclosed on all six sides, though there are certain exceptions for floors, ceilings, and rim joists.

### REAL R-VALUES ARE LOWER THAN LABELED R-VALUES

While it's difficult to install fiberglass insulation perfectly, batts will perform at their rated R-value if used correctly. However, cavity insulation is only part of the equation when it comes to a wall's true performance.

The Oak Ridge National Laboratory study looked at whole-wall R-values, which take into account flaws in batt installation and the variety of structural elements that make up approximately 25% of the wall, such as studs, headers, and sill plates. The findings show that a 2x6 wall insulated with R-19 fiberglass batts that have been installed perfectly actually performs at an R-value (12.8) that's more than 30% lower than what the labeled R-value suggests.

The thermal bridging that so drastically reduces whole-wall R-values is most simply and effectively handled with the application of exterior rigid foam. Thermal bridging also can be reduced by designing and building with OVE (optimum-value engineering) framing, which reduces the amount of framing in wall and roof assemblies.



### Incorrect fastening

Batts with vapor-retarder facings should be stapled to the face of the studs. Otherwise the batts become overly compressed along their edge, which reduces their overall R-value further.

### Gaps

Gaps between framing and batts can lead to energy losses and comfort and durability issues due to condensation that forms in the wall when warm air comes into contact with cold, exposed surfaces.

A fiberglass batt will perform best if it's installed in an airtight cavity and if it's in full, uniform contact with the interior or exterior sheathing, as well as the studs and top and bottom plates.