## INSULATION

The energy code specifies minimum insulation levels based on local climate. Check with local building officials for applicable rules. The amount of insulation will depend on a balance of several variables, including the building layout, initial cost savings on HVAC systems, ongoing energy-cost savings, and the comfort level desired for a particular climate. **Figure 7-12** lists the R-values for various types of insulation.

### Insulation Details

When adding insulation, focus first on adding insulation to under-insulated areas, such as rim joists and headers.

*For more information: "Getting the Most for Your Insulation Dollar," JLC 10/96*

**Rim joist.** The best way to add sufficient insulation and seal against air leakage is to address this at the framing stage by offsetting the rim joist to allow space for foam insulation (**Figure 7-13, page 136**). In cold climates, additional insulation should be installed in this cavity.

Just as important as the insulation, the sill and rim joist should be sealed against air leakage, as shown in **Figure 7-14, page 137.**

*"Wet-Spray Cellulose Insulation," JLC 8/94*

Headers can typically only be insulated at the framing stage. **Figure 7-15 (page 137)** shows two ways to provide adequate insulation over windows and doors.

*"Fiberglass vs. Cellulose: Making the Choice," JLC 9/95*

### Installing Insulation

Thermal bridging by framing members, voids in the insulation, or thermal bypasses from air leakage can reduce the effectiveness of insulation. To maximize insulation value, omit unnecessary framing members, as shown in **Figures 7-16** and **7-17, page 138.**

*Insulation calculator: http://www.ornl.gov/sci/roofs+walls/calculators*

Insulation performs best when it is continuous and uniform. Carefully fit insulation to cavities without creating voids, particularly around electrical and plumbing and in narrow cavities (**Figures 7-18, 7-19,** and **7-20, page 139**).

### Limiting Rooftop Solar Gain

In hot climates, solar gain through the roof is a significant part of the total cooling load. To limit rooftop solar gain, use reflective roofing or an under-roof radiant barrier (**Figure 7-21, page 140**).

Applying radiant barrier foil beneath the roof plane or spraying low-e paint on the underside of roof sheathing can save 8% to 12% in annual cooling costs in a hot climate.

## VAPOR RETARDERS

Vapor diffusion is the slowest method of moisture movement through a building assembly. However, this does not necessarily mean that the vapor retarder (designed to slow down diffusion) is unimportant. A misapplied vapor retarder can trap moisture and reduce the drying potential of a wall assembly. If the drying potential of a building assembly is slower than the wetting potential, mold and rot are likely to grow.

Walls must be designed to dry to at least one side — to the interior or to the exterior. When placing vapor barriers, follow these guidelines:

- In any climate, wall assemblies can be designed with a vapor retarder on the exterior or on the interior wall face, but not both.
- Walls with exterior vapor retarders should be allowed to dry to the interior, with vapor-permeable materials on the interior face (**Figure 7-22, page 142**).
- Walls with interior vapor retarders should have vapor-

*text continued on page 141*