**Scope**

Install insulation without misalignments, compressions, gaps, or voids along the thermal envelope of the house.

All ceiling, wall, floor, and slab insulation should achieve Grade I level insulation installation criteria as defined by the Residential Energy Services Network (RESNET).

See the Compliance Tab for related codes and standards requirements, and criteria to meet national programs such as DOE's Zero Energy Ready Home program, ENERGY STAR Certified Homes, and Indoor airPLUS.
Gaps, voids, and compressions that cause the insulation to lose contact with the surface it is intended to insulate can cause cold spots in walls, ceilings, and floors. These cold spots may encourage the formation of condensation in the wall cavity, floors, or ceilings.

The Residential Energy Services Network (RESNET) grades insulation installation quality in its Home Energy Rating System Standards, with Grade 1 being the best installation (RESNET 2013).

Grade 1 Installation requires that insulation material should uniformly fill wall cavities, filling each cavity from side to side and top to bottom, without substantial gaps or voids around obstructions. Batt insulation should be cut to fit around any wiring or piping installed in the wall cavities.

Blown insulation, such as loose fiberglass, cellulose, or mineral wool fibers, flows easily around obstructions, such as wiring and piping, to provide complete coverage in the cavities. To install blown insulation, the open cavities are first covered with a netting that is stapled to the stud faces. A slit is cut in the netting in each cavity and the insulation is installed with a hose inserted through the slit. The installer can easily see where the insulation is going to ensure that each cavity is completely filled without voids.

Spray foam is another option that readily fills areas around obstructions in wall cavities, and it has the advantage of providing both air sealing and insulation. The foam completely fills the open wall cavities and is trimmed flush with the stud faces before installing dry wall. Spray foam insulation is made of petroleum, soy, or castor oil-based polyurethane and is available in open-cell, low-density products or closed-cell, high-density products. Both insulate and air seal; high-density products can also provide a vapor barrier. Another option is sprayed-on cellulose or mineral wool that is mixed with adhesive and water then sprayed into the open cavities and allowed to dry before drywalling.

Additional information about insulation, including descriptions of the many types of insulation available, their R-values, applications and advantages and disadvantages of each kind, and installation guidance can be found in the Building America Best Practices Series Volume 17: Insulation, A Guide for Contractors to Share with Homeowners.

How to Install Insulation to RESNET-Defined Grade 1

1. Install insulation without misalignments, compressions, gaps, or voids in all wall cavities along the thermal barrier of the house. Figure 1 shows proper installation of batt insulation without gaps or voids. Figure 2 shows incorrect installation; the insulation was not cut to fit around wiring so the insulation will not be in full contact with the drywall along the length of the wall cavities.
2. Install wall insulation so that it is enclosed on all six sides in each wall cavity. It should completely fill the wall cavities as shown with the blown fiberglass insulation in Figure 3, the blown cellulose in Figure 4, and the spray foam in Figure 5. It should be in substantial contact with the sheathing material on at least one side (interior or exterior) of the cavity.
1. Blown fiberglass insulation fills netted wall cavities and flows easily around wiring and other obstructions to provide a uniform insulating layer without gaps or voids.

2. Blown cellulose insulation completely fills the netted wall and ceiling cavities and flows easily around wiring and other obstructions to provide a uniform insulating layer without gaps or voids.