



CEILING AND ROOF INSULATION



Hot air rises. In the winter your building needs heat and some of that heat is escaping through the roof. In fact, some of the most significant air leaks are hidden in the ceiling and roof of a building. This escaped heat causes an increase in energy use and utility costs, and could affect the comfort of building occupants as they experience varying temperatures. Adding insulation can lower energy use and costs, making your building more energy efficient. It helps maintain consistent temperatures, which increases occupant comfort and reduces heating and cooling costs.

Details



R-Value

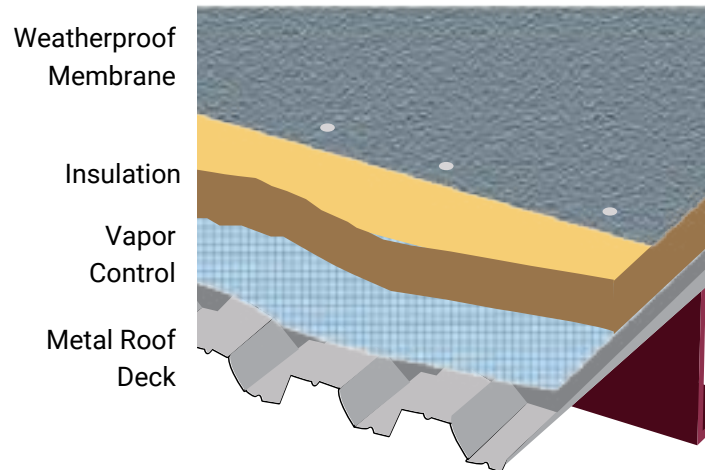
Considering the local climate, energy codes have been developed to detail requirements for materials and techniques when building or repairing a structure. Correct insulation must be set to seal the building against air leakage and moisture migration. Nevada is mainly in climate zone 5, with the southern tip spilling into climate zone 3.

Insulation levels are specified by R-value. A higher R-value means a better ability to resist heat transfer from the inside out. Typical business spaces in Nevada require R-19 to R-38 for ceilings, higher for those with attics. For metal buildings, R-5 thermal blocks are required, plus two layers of insulation using R-19 and R-11 linear system.



Requirements

As of July 1, 2019, the 2018 International Energy Conservation Code (IECC) was adopted as the minimum standard in some areas of Nevada. However, the IECC will be used as the basis for determining code requirements when the building is permitted. COMcheck-Web is an online tool for architects, designers and builders to confirm if new business buildings, additions or modifications meet the IECC and ASHRAE Standard 90.1 requirements. The tool can be accessed at energycode.pnl.gov/COMcheckWeb.



Adding insulation to ceilings, floors and outer walls produces energy savings between 13% and 35%, depending on the size of the building (NAIMA.org).



Types of Business and Industrial Insulation

Fiberglass: Thermal and acoustical insulation products made from inorganic glass fibers.

Rock wool (mineral wool): Man-made material formed from natural minerals and metals.

Wood fiber: Composed of organic materials (wood, cane or vegetable fibers) mixed with fillers and binders.

Cellulose: Composed of mostly recycled paper products.

Polyisocyanurate: A foam plastic insulating core seated between felt, glass or foil facers.

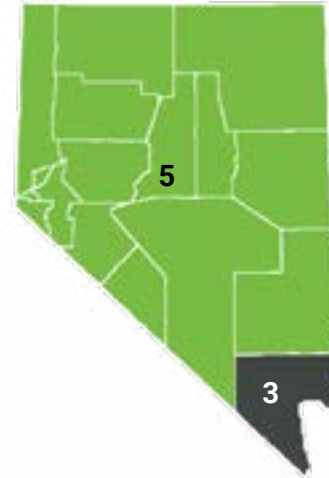
Polystyrene: A thermoplastic, typically found in foam board, using small beads.

Polyurethane: Foam insulation in both closed- and open-cell formulas.

Plastic fiber: Composed of mainly recycled plastic milk bottles.

Cellular glass: Composed of crushed glass combined with a foaming agent.

Climate Zones



REFERENCE: energycode.pnl.gov/EnergyCodeReqs/?state=Nevada

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Type	Insulation Materials	Where Applicable	Installation Method(s)	Advantages
Blanket: batts and rolls	<ul style="list-style-type: none"> • Fiberglass • Mineral (rock or slag) wool • Plastic fibers • Natural fibers 	<ul style="list-style-type: none"> • Unfinished walls, including foundation walls • Floors and ceilings 	Fitted between studs, joists and beams.	Suited for standard stud and joist spacing that is relatively free from obstructions. Relatively inexpensive.
Foam board or rigid foam	<ul style="list-style-type: none"> • Polystyrene • Polyisocyanurate • Polyurethane 	<ul style="list-style-type: none"> • Unfinished walls, including foundation walls • Floors and ceilings • Unvented low-slope roofs 	<ul style="list-style-type: none"> • Interior applications: Must be covered with ½-inch gypsum board or other building-code approved material for fire safety. • Exterior applications: Must be covered with weatherproof facing. 	High insulating value for relatively little thickness. Can block thermal short circuits when installed continuously over frames or joists.
Loose-fill and blown-in	<ul style="list-style-type: none"> • Cellulose • Fiberglass • Mineral (rock or slag) wool 	<ul style="list-style-type: none"> • Enclosed existing wall or open new wall cavities • Unfinished attic floors • Other hard-to-reach places 	Blown into place using special equipment; sometimes poured in.	Good for adding insulation to existing finished areas, irregularly shaped areas and around obstructions.
Reflective system	<ul style="list-style-type: none"> • Foil-faced kraft paper, plastic film, polyethylene bubbles or cardboard 	Unfinished walls, ceilings and floors	Foils, films or papers fitted between wood-frame studs, joists, rafters and beams.	Suitable for framing at standard spacing. Bubble-form suitable if framing is irregular or if obstructions are present. Most effective at preventing downward heat flow, effectiveness depends on spacing.
Sprayed foam and foamed-in-place	<ul style="list-style-type: none"> • Cementitious • Phenolic • Polyisocyanurate • Polyurethane 	<ul style="list-style-type: none"> • Enclosed existing wall • Open new wall cavities • Unfinished attic floors 	Applied using small spray containers or in larger quantities as a pressure sprayed (foamed-in-place) product.	Good for adding insulation to existing finished areas, irregularly shaped areas and around obstructions.
Structural insulated panels (SIPs)	<ul style="list-style-type: none"> • Foam board or liquid foam insulation core • Straw core insulation 	Unfinished walls, ceilings, floors and roofs for new construction	Construction workers fit SIPs together to form walls and roof.	SIP-built structures provide superior and uniform insulation compared to more traditional construction methods; they also take less time to build.



ANSI/ASHRAE/IESNA Standard 90.1-2010 Building Envelope Compliance Documentation

Mandatory Provisions Checklist includes:

Install insulation materials in accordance with manufacturer's recommendations, ensuring it achieves rated R-value of insulation. An exception exists for metal building roofs or metal building walls.

- Don't use loose-fill insulation in attic roof spaces when the slope of the ceiling is more than three in twelve.
- Use baffling in attic eave vents to deflect incoming air above the surface of the insulation.
- Install insulation in a permanent manner in substantial contact with the inside surface.
- Ensure batt insulation installed in floor cavities is supported in a permanent manner by supports no greater than 24 inches on center.
- Don't install roof insulation over a suspended ceiling with removable ceiling panels.
- Cover exterior insulation with a protective material to prevent damage.
- Ensure insulation is protected in attics and mechanical rooms where access is needed.
- Make sure foundation vents don't interfere with the insulation.
- Ensure that insulation materials in ground contact have a water absorption rate no greater than 0.3%.
- Ensure recessed lighting fixtures, HVAC and other equipment in ceilings don't affect the insulation thickness unless:
 - The recessed area is less than 1%.
 - The entire roof, wall or floor is covered with insulation to the full depth required.
 - The effects of reduced insulation are included in calculations using an area's weighted averages.

REFERENCE: bookstore.ashrae.biz/90UM/Building-Envelope-Compliance-Forms.pdf

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