

Building Energy Asset Score: Building Upgrade Guide¹

ENVELOPE

Roof Insulation

The applicability of roof insulation upgrades depends on roof construction type and presence of existing insulation. Basic recommendations based on type of roof and ceiling construction are given below. Detailed recommendations on the quantity of insulation suggested for different building types and climate zones are available in the ASHRAE Advanced Energy Design Guides: <https://www.energy.gov/eere/buildings/advanced-energy-design-guides>.

Asset Score Report Recommendation: Add Roof Insulation

Cost: \$ to \$\$ based on whether it is possible to add blow-in insulation or if re-roofing is required.

Roof type: Pitched Roof/Shingles/Shakes

Attic Ceiling: Based on your current insulation level and space availability, add sufficient insulation to obtain the minimum insulation level for your climate location. A higher insulation R-value improves the thermal performance of your roof, keeping the interior space cooler in summer and warmer in winter. In addition, adding higher insulation levels beyond the minimum codes requirements may increase the cost-effectiveness of the upgrade; however, there will be diminishing returns, and therefore cost should be weighed carefully against performance. If there is no existing insulation, consider a high insulation level such as R-30 or R-38. Roof insulation should extend to the exterior of the walls to minimize edge effects.

Suspended Ceiling: If there is a suspended ceiling, add insulation on top of the suspended ceiling. When suspended ceilings with removable ceiling tiles are used, the insulation performance is best when installed at the roof line.

Roof type: Flat, Built-up Roof

Add at least 1 inch (e.g., at least R-5 or R-10) of roof insulation and re-roof. A higher insulation R-value improves the thermal performance of your roof, but the cost-effectiveness of additional insulation should be evaluated. Insulation above the deck should be continuous rigid boards because no framing members are present that would introduce thermal bridges or short circuits to bypass the insulation. If two layers are used, the board edges should be staggered to reduce the potential for convection losses or thermal bridging. If an inverted or protected membrane roof system is used, at least one layer of insulation should be placed above the membrane and a maximum of one layer placed beneath the membrane.

¹ The complete Asset Score Building Upgrade Guide is available at:
https://buildingenergyscore.energy.gov/assets/energy_asset_score_recommendations_guide.pdf

Roof type: Metal Surfacing

Add insulation to interior surface, such as 2 to 4 inches of fiberglass or 1 to 2 inches of foam. Thermal blocks cannot be used when through-fastened in a roof that is screwed directly to the purlins because the blocks diminish the structural load-carrying capacity by “softening” the connection and restraint provided to the purlin by the roof.

For Climate Zones 1-3, recommended construction is a filled cavity with the first insulation layer perpendicular to and over the top of the purlins and the second layer of insulation parallel to and between the purlins.

For Climate Zones 4-7, recommended construction is a linear system with the first layer of insulation parallel to and between the purlins and the second layer of insulation perpendicular to and over the top of the purlins.

For Climate Zone 8, recommended construction is a linear system with the first and second layers of insulation parallel to and between the purlins and the third layer of insulation perpendicular to and over the top of the purlins.

Asset Score Report Recommendation: Implement a Cool Roof

Cost: \$ to \$\$ based on the ease of adding an additional reflecting layer to the existing roof.

Cool roofs are constructed with a material that reflects sunlight and emits thermal energy. In effect, the roof is “cooler” than conventional roofs, which reduces the amount of heat transferred into the building. Reducing the amount of heat transfer will also reduce the amount of mechanical cooling required in the building. This measure involves replacing the existing roof membrane with a cool roof membrane.
