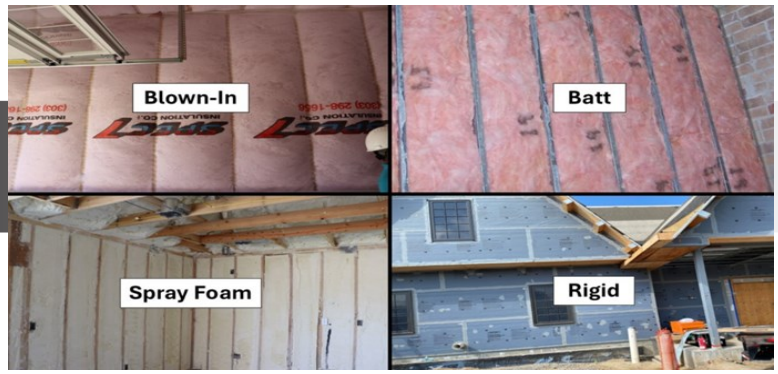
Xcel Energy®

Energy Code Support Program



Types of Insulation

Purpose: To identify the different types of insulation, installation methods, uses and thermal resistance.

Introduction: A material and/or technique to reduce the transfer of heat and sound. A critical component for multiple code requirements. Including the building thermal envelope, sound attenuation, fire-resistant construction, and vapor retarder assembly. Assists in maintaining comfortable indoor temperatures and reducing energy consumption for heating and cooling.

Types of Insulation:

- ***Fiberglass:*** Man made fiber, can also be called fibrous wool or glass wool. Made from molten glass spun or blown into thin flexible fibers,
- ***Cellulose:*** A wood or paper-based product blown or injected into a space.
- ***Spray Foam:*** Combination of 2 liquid components polyol resin and isocyanate.
- ***Mineral Wool:*** Like fiberglass, made from rock or slag, offers some fire resistance.
- ***Loose-fill:*** Rock wool or slag wool.
- ***Rigid Foam Boards:*** Expanded polystyrene (EPS), Extruded polystyrene (XPS), Polyisocyanurate (Polyiso,ISO)

Installation Methods:

- Cavity
- Blown-in
- Blanket
- Continuous

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Batt Insulation

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Fiberglass Batt:

- Pre-cut flat pieces or rolls
- Made of glass fibers that uses a binder with it
- Faced or un-faced
- Designed to slide into cavities between studs
- May be included in a fire-rated assembly
- Generally installed in:
  - Attics
  - Crawlspaces
  - Walls (above and below grade)
  - Ceilings

R-Value Average between 2.2 and 3.5 per inch

Stone Wool Batt:

- Pre-cut flat pieces or rolls
- Made of basalt rock and recycled slag
- Designed to slide into cavities between studs
- May be included in a fire-rated assembly
- May be used with metal buildings

R-Value Average between 3.8 and 4.3 per inch

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Blown-In Insulation

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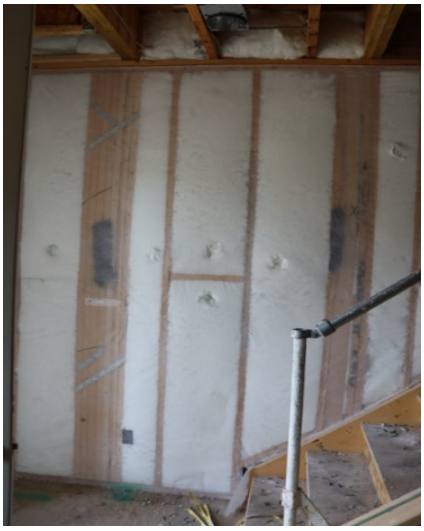
Blown-In Cellulose:



- Made of cellulose-based plant source
  - Wood
  - Newspaper
  - Cardboard
  - Other material
- This material is susceptible to mold and mildew.
- The material can weigh more, so structural integrity will need to be ensured.
- Blown through a hose, allows tight spaces to be filled to ensure a continuous thermal envelope.

R-Value Average between 3.2 and 3.8 per inch

Fiberglass Blow-In (loose fill):

- Blown through a hose, allows tight spaces to be filled to ensure a continuous thermal envelope.
- Loose fill of tiny fibers of glass woven together
- May be part of a fire rated assembly
- Generally installed in:
  - Attics
  - Walls
  - Ceilings

R-Value Average between 2.2 and 3.5 per inch

Spray Foam Insulation

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Open Cell (low-density):

- >50% open cells, can shrink
- Can be an air barrier @ 4.5” thickness
- Requires ignition or thermal barrier

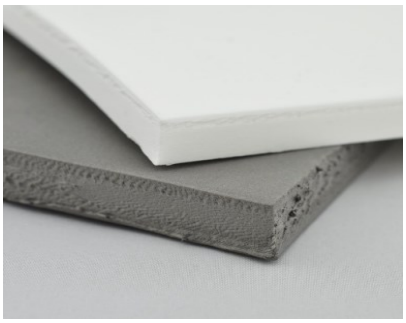
R-Value Average between 3.5 and 4.2 per inch

Closed Cell (mid-density):

- From foam plastic
- More rigid
- Air barrier @ 1.5” thickness
- Requires ignition or thermal barrier

R-Value Average between 6.0 and 7.0 per inch

Closed Cell (high-density):



- Often installed above roof deck

R-Value Average between 6.5 and 7 per inch

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Rigid Board Insulation

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EPS (Expanded Foam):

- Light weight made up of expanded beads.
- Can be utilized as part of the continuous insulation requirements

R-Value Average between 3.4 and 3.9 per inch

XPS (Extruded Foam):

- Made of various plastic resins and additives that expand into a shape.
- Can be utilized as an air barrier and continuous installation
- Often used for slab edge and under slab insulation

R-Value Average 4.7 per inch

Polyisocyanurate (Polyiso):

- Thermoset plastic in foam
- Can be considered an air barrier and continuous
- Mostly found above roof deck

R-Value Average between 5 and 7.2 per inch

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Rigid Board Insulation

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Fiberglass Rigid Board:

- Generally 4X8 foot panels
- Ranges in thickness from ¼” to 2”
- Installed in cavity
- Often installed over sheathing or pre-cast concrete, using fasteners, adhesives or a combination of both

R-Value Average 4.2 per inch

Stone Wool Rigid Board:

- Installed as continuous insulation
- Made of basalt rock and recycled slag
- May be part of a fire rated assembly
- Generally installed in:
  - Roofs
  - Walls (above and below grade)

R-Value Average 3.8 - 4.3 per inch

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Other Types of Insulation

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Denim

- Made from recycled jeans and other denim items

R-Value Average between 3.0 and 4.0 per inch

Sheep/Lambs Wool

- Made from sheared wool of sheet that is too course for textiles

R-Value Average between 3.5 and 3.8 per inch

Hemp

- Made from fibers of hemp plant that is processed and combined with a binder

R-Value Average of 3.5 per inch

Mushroom (mycelium)

- Made from root structure of fungi (mycelium) and combined with agricultural waste materials

R-Value Average of 3.0 per inch

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