



Energy Efficiency: Wall Insulation

(General)

The Importance of Insulation?

- Wall insulation increases energy efficiency by trapping heat inside during the winter and keeping warm summer air out during the summer.
- Proper insulation will reduce your family's environmental impact, save money on monthly utilities and increase home comfort.
- The largest energy requirement in your home is consumed by heating equipment. To get the most out of your heating equipment, ensure as little heat as possible escapes your walls.
- 20% of a home's heat is lost through walls, meaning they provide a significant area of opportunity to reduce heat loss in your home.



Typical Interior Wall Insulation Materials

Types of Blown In Loose Fill

As the name implies, this fluffy fibrous material is blown into a space with special machinery. It can be installed by hand but will be labour intensive and unevenly distributed.

Things You Should Know

- Allows for customizable depth or R Value
- Works best for attics with existing undamaged insulation that requires additional thermal resistance.
- One of the least labour intensive processes

Fiberglass

- 2.2 - 2.7 R-Value per inch
- Light in weight
- Affordable option
- Non-combustible
- Moisture does not change its effectiveness
- Settles more than other materials, will require a thicker layer.



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Cellulose

- 3.0 - 3.8 R-Value per inch
- Most common blow-in insulation material.
- Made of post consumer paper fibers. Treated for fire resistance.
- Most susceptible to developing mold or rotting.



wikipedia.org

Mineral Wool

- 3.0 - 3.3 R-Value per inch
- Provides fire resistance. Made of fibers from rock or recycled slag from furnaces.
- More costly option



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Types of Spray Foam

Closed Cell

- 4.9 to 7.1 R-Value per inch
- Ability to resist water
- Can be applied in low temperatures (-15°)
- Allows less water vapour through than open cell



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Open Cell

- 3.5 – 3.6 R-Value per inch
- Provides air sealing
- Mold resistant
- Inexpensive
- Sound resistant

Types of Batts

Batts can be used on the interior or exterior of home. A fluffy, flexible insulation that comes in rolls in various thicknesses. Typically 16-24 inches in order to fit between most studs or joists. Option to buy with or without vapour barrier paper attached to it.

Things You Should Know

- Can be used for attics or wall insulation.
- Is available with it's own vapour barrier attached
- Will require some measuring and cutting to fit into stud and joist spaces, around inset light fixtures and wires.

**“20%
of a home’s
heat is lost
through
walls...”**

Fiberglass

- 2.9 - 4.3 R-Value per inch
- Inexpensive and commonly used.
- Moistures does not affect its effectiveness
- Can cause irritability to lungs and skin. Best to wear long sleeves, gloves, facemask and eye protection.

Cellulose

- 3.7 - 3.8 R-Value per inch
- Made of recycled paper. Treated for fire resistance
- Less common than fiberglass
- Won't irritate your lungs or skin

Mineral Wool

- 3.0 - 3.3 R-Value per inch
- High density
- Provides fire resistance. Made of fibers from rock or recycled slag from furnaces.

Typical Exterior Wall Insulation Material

Rigid Styrofoam

This is typically used on the exterior of a home, including foundation insulation, as it is not resistant to water damage.

- 3.6 - 4.2 R-Value per inch
- Installed under siding



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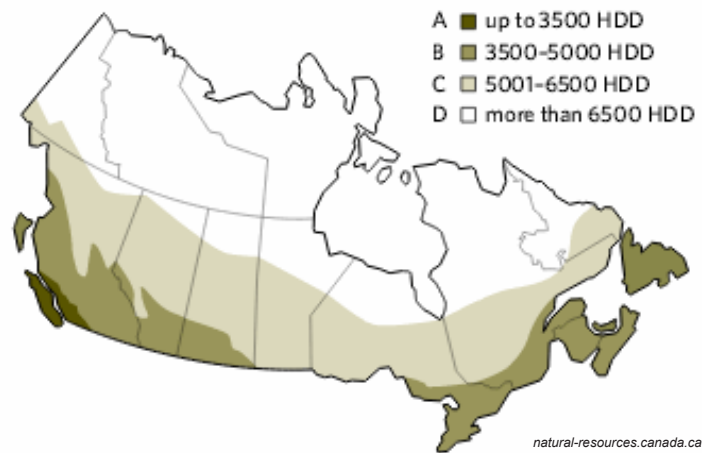
Old Insulation

- Homes built prior to the 1940's were rarely insulated, and if your home was built after this point the insulation may have settled or deteriorated due to dampness and time.
- Some homes may have newspapers, wood shavings etc instead of traditional insulation and those materials can remain as long as they are dry but you may want to add an additional layer of modern insulation.
- Home's built before 1990 often used a material called Vermiculite, which may contain asbestos. If you see grainy, lightweight, loose-looking insulation with shiny flecks, it could contain asbestos. Extra precautions should be taken, call a professional to inspect it and have it professionally removed.

What is an R-Value?

- An R-value or "thermal resistance" is a measurement based on its ability to slow or resist the flow of heat through it. A higher number indicates a higher insulation value.
- An R-value is determined by the properties of a type of material, such as its conductive properties, density and thickness.
- When determining R-values of a wall or attic, it is important to note that they can be added together.
 - ◆ If there are multiple layers of materials it is important to take note of each layer's R-value and add them together to calculate a total thermal resistance.
 - ◆ For example a home's walls could have vinyl siding with foam board insulation (a rigid, firm block of fibreglass), with additional loose and fluffy "blow-in" material on top. Add the R-value numbers of both of these to get the true R-value of your walls.

Use the map and the chart below to determine the recommended R-value in your region.



Note: The HDD are Heating Degree Days determine how much heating a home in each region typically requires.

Area of House	Zone A	Zone B	Zone C	Zone D
Walls	R 22	R 24	R 27	R 40

Energy Savings

The following is an estimated payback calculation of a wall insulation upgrade in Fort Chipewyan, Alberta which lies in Canada's Zone D. Natural Resources Canada recommends R-40 in northern Canada. This can be achieved by making sure your wall insulation is R-21 and then adding 4" rigid foam board to the exterior of the home under the siding, or 6-7" of polyurethane spray foam. The work is best done in the summer by professional contractors.

Example A

A Northern climate home with 2x6' walls with existing R-20 fiberglass batt insulation, replaced with R-40 insulation, could save up to \$1200/year and reduce greenhouse gas emissions by up to 2900 kilograms of carbon dioxide equivalent per year.

Energy Savings (cont.)

Example B

In comparison, a home in a Northern climate with 2x4 walls with existing R-12 fiberglass batt insulation, replaced with R-40 insulation, could save up to \$2800/year and reduce greenhouse gas emissions by up to 6500 kilograms of carbon dioxide equivalent per year!

Determining If You Need to Upgrade your Insulation

A homeowner can determine what type of existing wall insulation is in their home by completing the following:

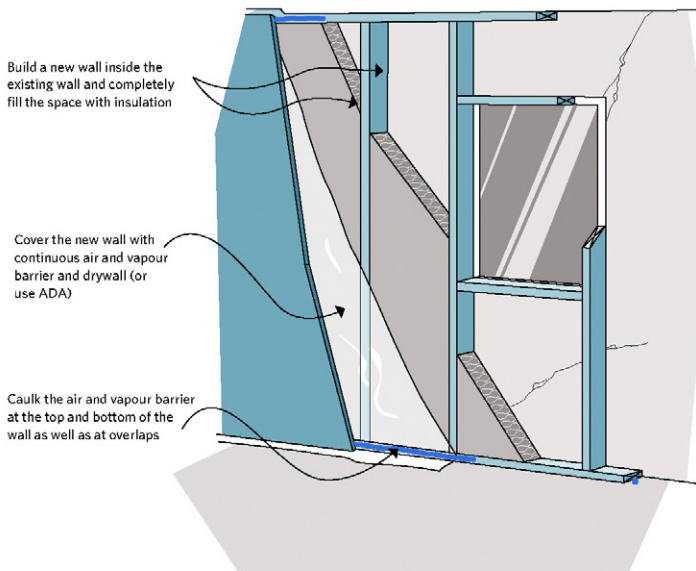
- Using a tape measure, go to an exterior door opening and measure the wall's thickness.
- Subtract the width of the total drywall (typically a sheet of 1/2" dry wall on the interior and around the same depth for sheathing on the exterior side). This gives you the approximate depth of your insulation. You can now use this number to determine what R-value you would want to end up with.
- Remove any outlet cover or plumbing inspection hatch on an exterior wall to see if there is insulation and what kind.
- To find the R-value of the existing insulation, multiply the number of inches of insulation by the R-value for your particular type of insulation.

For example, if you find that the wall contains fiberglass batt, you can look up it's R-Value which is around 2.5 per inch. You then measure the wall and come up with 8 inches for the insulation depth in the wall. All you need to do is multiply $2.5 \times 8 =$ Total R-value of 20 for this particular wall.

Installation Information

What To Expect When Adding Installation

Installation of wall insulation on an existing home is more difficult than adding or replacing attic insulation. Before beginning to add insulation, both exterior and interior insulation will require all gaps and cracks to be sealed.



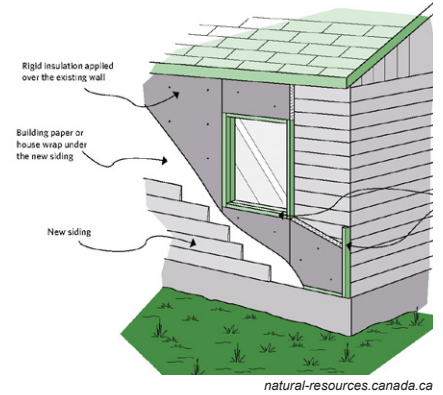
Exterior Installation

Save time and money by taking advantage of a siding replacement project. Since the siding will be removed, it is easy to install new insulation at the same time.

If your home has shallow walls you may consider making them thicker to add more insulation. By expanding a 2x4 wall to a 2x6 wall you will be able to add significant R-value. This is common in smaller homes where square footage is limited to begin with and adding wall depth inside is not practical.

This work is typically done during summer and will not affect your home life as the contractors will be working outside the home. A contractor will:

- Remove exterior siding
- Remove old weather barrier and sheathing
- Fix any defects or issues that have been revealed
- Install air sealing such as caulking
- Install an insulation that is suitable for exterior insulation, such as styrofoam rigid boards
- Install sheathing
- Install new weather barrier
- Install new siding or reattach original siding



Interior Installation

Replacing or adding interior wall insulation will interrupt your daily life much more and is generally not done unless a major home renovation is already planned. The home will be noisy and dusty while removing the interior drywall and old insulation.

Drywall, studs, wiring, receptacles, switch boxes and vapour barrier are all obstacles you will need to work around. Some of these obstacles can be avoided with blow-in or spray foam insulation as only a small section of the wall needs to be cut away but can still be difficult to achieve an even distribution of insulation.

When installing Batt insulation, the process will be similar to the exterior application. A contractor will:

- Remove drywall
- Remove vapour barrier
- Remove any moldy or damaged insulation
- Fix any defects or issues that have been revealed
- Install air sealing such as caulking
- Install an insulation that is suitable for interior insulation, such as batt or spray-foam
- Install new vapour barrier
- Install new drywall and paint