



# Energy Efficiency: Foundation Wall Insulation

(General)

## Why Upgrade Your Foundation Wall Insulation?

When you think about home heat loss, basements do not usually come to mind. However, 20% of a home's heat can be lost that way. The ground is a poor insulator, cracks in foundation are common and many foundations have no insulation at all.

Poor basement insulation can lead to increased energy bills, heating system wear and tear as well as dampness. Dampness and leaks can cause mould, health concerns, as well as damage to the foundation, interior walls and flooring.

## Typical Foundation Situations

### Existing Concrete Foundation

- can be insulated from the interior or exterior.

### New Concrete Foundation

- can also be insulated from the interior or exterior, however it is best to wait at least a year to insulate as the concrete must be dried.

### Brick or Stone Foundation

- should be insulated from the exterior in order to reduce dampness, however some can be added to the interior.

### Preserved Wood Foundation

- will be insulated during construction from the exterior or from the interior.

## Before You Upgrade

- Any dampness or leakage in a basement must be fixed before upgrades take place.
  - Repair all cracks in the foundation wall.
  - Redirect water from the home by redirecting or extending downspouts.
  - Re-slope the grade away from the house.
- Find out what the recommended R-value is in your region.
- Find out what type of basement you have so you know if interior or exterior insulation is best.
- If installing exterior insulation, make sure that a drainage system is installed at the base of the foundation.

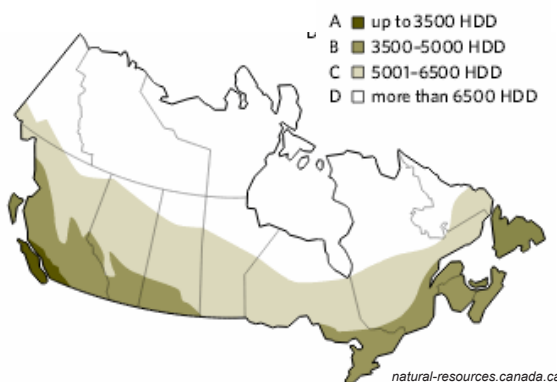
## What is an R-value?

- 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 means it will retain heat better.
- An R-value is determined by the properties of a type of material, such as its density, thickness and how easily it allows heat to travel through it.
- When determining R-values of a foundation wall, it is important to remember they can be added together.
  - Look at each layer's R-value and add them together to calculate a total R-value.
  - For example, a home's concrete foundation wall may have foam board insulation (a rigid, firm block of fiberglass). The true R-value of your walls would be the insulation and the concrete's R-values added together.

## What R-value Do You Need?

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

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



Heating degree-days (HDD) are a measure of heating demand based on the difference between the average daily outdoor temperature and 18°C. In other words, how many days you can expect to need your heating system running. Each zone experiences a similar number of heating degree-days.

House Component	Zone A	Zone B	Zone C	Zone D
Basement Walls	R 19	R 19	R 24	R 25



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## Cost Savings Case Study

Interior basement wall insulation upgrades provide low upfront cost when compared to exterior. The following is an estimated payback calculation of a basement insulation upgrade in Fort Chipewyan, Alberta which lies in Canada's Zone D. Natural Resources Canada recommends R-25 in northern Canada.

Many basements and crawl spaces are not drywalled, so insulation is easily added.

Upgrading basement wall insulation to achieve R-25 when easily accessed, by adding 1" to 3" extruded polystyrene foam board and drywall. Foam board must be covered for fire protection. Work can be done year-round.

Current Situation	What You Can Do	Material + Labour (\$)	Energy Savings (\$/year)	GHG Savings* (kg CO <sub>2</sub> e/year)	Payback (years)
Basement walls with R-12 insulation	Add insulation to achieve R-25	\$8500 + \$8500	\$2,000	4,700	9
Basement walls with R-20 insulation	Add insulation to achieve R-25	\$2800 + \$4300	\$500	1,100	15

\*Green House Gas Savings (kilograms of carbon dioxide equivalent per year)

## Insulating from Exterior

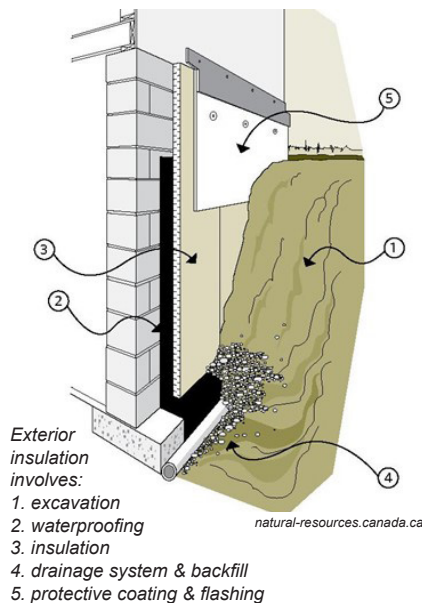
Short term pain will result in long term gain due to the expense. The most common material used to insulate foundation walls from the exterior is polystyrene board. Polyurethane and rigid mineral wool boards are also used.

### Pros

- Most effective - best comfort, maintenance savings and fuel savings.
- Since the outside tends to be simple flat walls, there is little interruption in the insulation wall making installation easier.
- It is easier to spot the source of any basement dampness, and correct it.
- No major disruption to people living in the house during construction since it is all outside.
- A concrete foundation is a thermal mass within the building which means it stores and slowly releases heat, resulting in slower, comfortable temperature changes.

### Cons

- Costs more up front.
- Excavating a trench around the exterior of a home can be difficult no matter the method. Fitting heavy machinery into tight spaces can be challenging and digging by hand can be time consuming and labour intensive.
- Temporary storage of dirt can be challenging.
- Must be done in Spring or Summer.
- Obstructions such as gardens, fences, driveways or steps will need to be removed and or replaced.
- Experts should be consulted when dealing with brick or stone foundations.



## Insulating from Interior

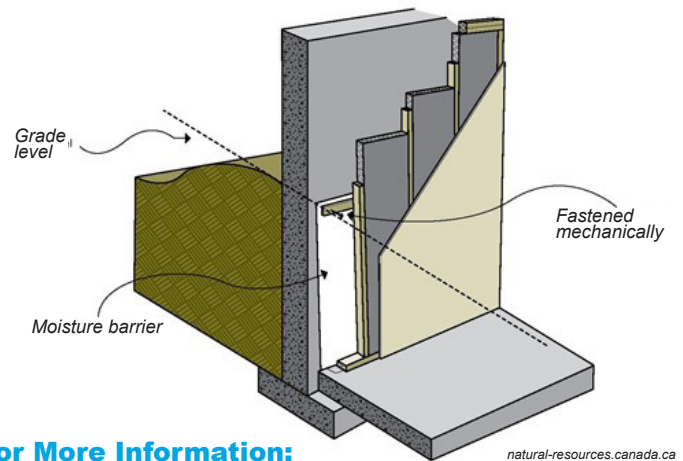
While exterior installation is more effective, sometimes for economic reasons the interior makes the most sense. Rigid board insulation is a popular option for interior insulation. The most common interior basement insulation materials include fibreglass loose fill, rigid board, batt and polyurethane spray. It is best to leave the installation of polyurethane spray to the professionals

### Pros

- Lower upfront cost.
- Less disruptive to driveway and yard.
- Can be done any time of year.
- Can be incorporated into a basement finishing project.

### Cons

- Cannot be done before taking corrective action for basement dampness or else insulation will rot.
- Cold exterior concrete will result in condensation. Interior insulation will hide any new dampness accumulation.
- Obstructions such as lighting, wires, plumbing etc will result in time consuming customization of new insulation.
- May be disruptive for people living in the house during construction.



## For More Information:

Keeping The Heat In - Section 6: Basement insulation: floors, walls and crawl spaces- Natural Resources Canada

<https://natural-resources.canada.ca/energy-efficiency/homes/make-your-home-more-energy-efficient/keeping-the-heat/section-6-basement-insulation-floors-walls-and-crawl-spaces/15639>