NAIMA CANADA
REPRESENTING MINERAL FIBRE INSULATION MANUFACTURERS

SUPPLEMENTAL
CLIMATE NETWORK LANARK: NEIGHBOURHOOD CLIMATE RETROFIT CONCIERGE
May 2026 - Andy Cockburn – Technical Advisor (volunteer)

BASEMENT INSULATION STRATEGIES for EXISTING BUILDINGS

Summary Review:
This document provides suggestions and strategies for improving insulation and air tightness in existing buildings, specifically in the BASEMENT area. Within this document, you'll learn about the following:

- Basic building science and contractor roles
- Basement foundation types
- Insulation and airtight strategies appropriate to basement types
- Things that may change in your newly treated space

DISCLAIMER: ALWAYS consult with professionals before beginning any work that alters your building envelope, structure or mechanical systems (plumbing, HVAC, electrical). This summary is offered for **informational purposes only**. It does not purport to be an exhaustive recommendation for completing construction and renovation / retrofit work.
ALWAYS consult with professionals who follow provincial or territorial work site safety laws, manufacturer's installation guidelines and your local building regulations. Don't take chances with your health and safety!

If you have questions about **rebate and incentive programs** that may apply to your basement insulation renovation / retrofit, please contact:

- **Sadie Brule** – Senior Project Coordinator, Climate Network Lanark, email: sadie@climatenetworklanark.ca
- **Rachel Everett-Fry** – Project Coordinator, Climate Network Lanark, email: rachel@climatenetworklanark.ca

CLIMATE NETWORK LANARK

COMMON SENSE WARNINGS

Before you start buying materials or putting shovels in the ground to improve your basement, there are some very important things to consider:

- **HIRE A PROFESSIONAL!** Changing the comfort conditions of your building is **not** a do-it-yourself operation. It will cost you more, take longer and possibly cause injuries or expensive damage to your home. There are hazardous materials and systems that can seriously hurt or potentially kill you, especially in older buildings. Don't take chances with your safety or the safety of others in your home. Hire a professional.

- **PLAN EVERYTHING ON PAPER!** It is much less expensive to make changes and correct mistakes with a pencil and eraser than it is with concrete and lumber. Make a solid plan, share it with your professional help, revise and edit before ANY work is started.

- **SITE AND MATERIAL HAZARDS MUST BE IDENTIFIED AND CORRECTED BEFORE WORK BEGINS!!** There may be pipes, electricity or gas lines buried in your yard that you don't know about – they need to be located and marked. There may be asbestos, vermiculite, lead pipes or other hazards in your home that must be remediated (removed). Bring in a professional who can inspect your home and identify these hazards.

- **GET AN ENERGY ASSESSMENT!** As part of your planning process, bring in an ENERGY ADVISOR to test and measure the energy performance of your building. Establishing a baseline for how well (or how poorly) your house is performing will give you a place to start.

- **DEAL WITH WATER LEAKS and PESTS BEFORE ADDING LAYERS!** Water infiltration and critters means that there are holes somewhere in the basement. Holes mean that heat, air and moisture can get in and out of your building. Deal with these problems before doing any insulating!

- **SERIOUSLY…HIRE A PROFESSIONAL!** Don't take chances with your biggest investment. A professional contractor can help you determine the best approach, help you sort through your renovation budget, and work MUCH faster than you can. They are also going to work to a contract, have insurance and be responsible for completing the project correctly.

1 BASICS OF BUILDING SCIENCE & CONTRACTOR ROLES

When a building is closed in, or separated from the outside, the layers that protect us from the weather and keep our homes comfortable are called the "**building envelope**".

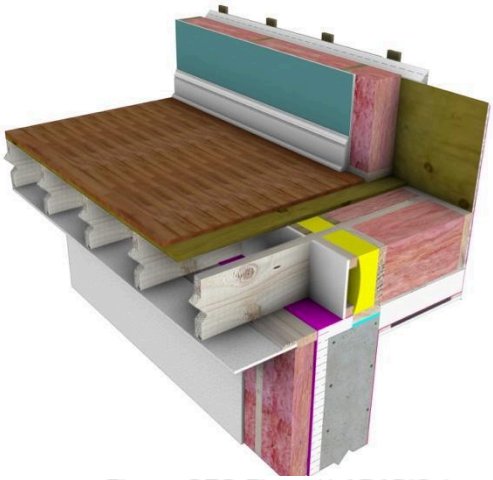


*Figure SEQ Figure * ARABIC 1 Projecting or "cantilevered" floor system*

This collection of layers includes:

- **Structure** – wood, metal, concrete
- **Control layers** – insulation, air barriers, moisture and vapour barriers
- **Openings and Finishes** – windows and doors, trim, roofing, siding

The '**control layers'** in your building envelope are managing three very important elements:

HEAT – AIR – MOISTURE

When we talk about '**building science'**, we're talking about the **PHYSICS** of heat, air and moisture in a building – how heat, air and moisture move, and how we use control layers and mechanicals to manage those elements for the best comfort in our homes.

While most control layers in a building envelope have no moving parts, they must work in tandem with the **systems** in a home that provide warmth and cooling, fresh air, water and electricity. Those systems are called **MECHANICALS**.

Mechanical systems in a building include the following:

- **Heating and cooling equipment** – furnaces, heat pumps, baseboard heaters, radiant heating and boilers, portable and central A/C units, wood stoves,
- **Ventilation equipment** – combustion air supply, fresh air and exhaust equipment (HRV or ERV – Heat Recovery Ventilator, Energy Recovery Ventilator).
- **Water Supply and Hot Water Heating** – supply and drainwater pipes, hot water heaters (electric, fuel fired), sump pumps and water softeners
- **Electrical** – wires, panels, outlets, switches, appliances and devices

KEY TAKEAWAY: BUILDING SCIENCE IS THE MANAGEMENT OF HEAT, AIR AND MOISTURE

CONTRACTOR ROLES

Professionals in construction and renovation are called **CONTRACTORS**, because they create contracts with their clients that describe an agreement to complete work.

A **contract** for construction or renovation work is a **LEGAL DOCUMENT** that outlines when work will start and end, what work will be done, when payments are due and what will happen if something changes or happens unexpectedly.

A **GENERAL CONTRACTOR** is a professional who can complete construction or renovation jobs from start to finish, handling all aspects of a job. They will work with clients, architects, engineers, municipal officials and other contractors to take a project through to completion, controlling the scheduling of payments, equipment, material deliveries and phases of the job. A general contractor may have one job or many jobs on the go at the same time, with teams of workers on each site.

Contractors who focus only on one or two specific layers or installations are called **SPECIALISTS** or **SUB-CONTRACTORS**. They will work to complete parts of a job for a general contractor.

Specialists that take care of **building envelope layers** may include the following:

- **Insulation Technicians and installers** – Fibre loose fill and batts, dense packed loose fill, rigid boards, blow-in attic insulation. These installers may also handle installing barrier materials for airtightness and vapour management.
- **Spray Foam Technicians** – Low (open cell) and high (closed cell) density expanding spray foam insulations. NOTE: This installation requires specialized training for proper application!
- **Drywall installers** – Gypsum drywall installers are often tasked with installing insulation.
- **Barrier installers –** Roll-type fabric and plastic barriers, peel and stick membranes, atomized spray air barrier enhancement
- **Window and Door installers** – Opening units are installed and sealed to become part of the building envelope, with tapes, sealants and low expansion (open cell) spray foam.

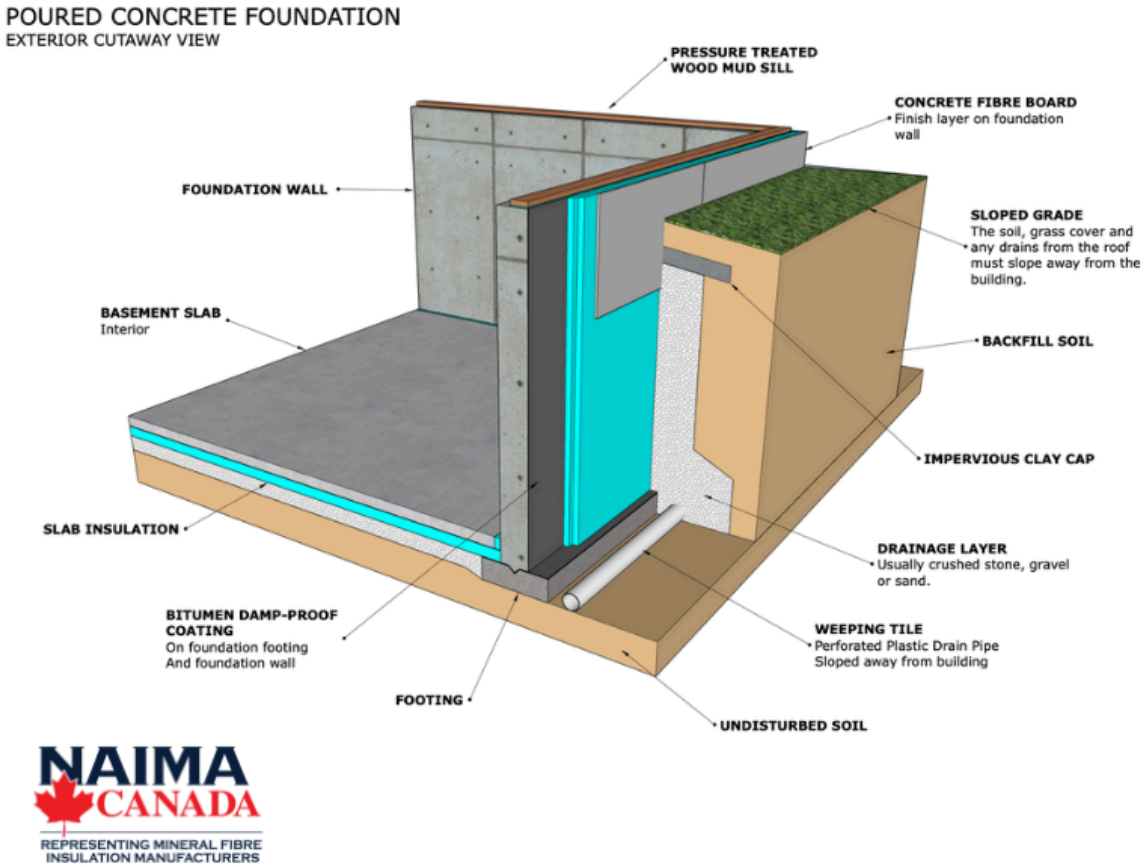
ALL contractors are required to have **insurance** for their work, and many will have requirements for **trade certification** – especially contractors who work with plumbing, electrical and HVAC systems.

KEY TAKEAWAY: HIRE PROFESSIONALS AND ALWAYS WORK TO A CONTRACT!

The lowest part of a building is called a **FOUNDATION**, and it provides solid connection to the ground and a base for floors, walls and roof assemblies.

In our cold climate, our foundations need to be protected from the freeze-thaw cycle that happens through fall, winter and spring. The way that most homes handle dealing with freeze-thaw is by having a **BASEMENT**.

There are many types of foundations and basements we use in Canada, including the following:



POURED CONCRETE basements are most common for modern construction. The main parts and materials used for this type are:

- Concrete that is poured or pumped from a special mixer truck
- **Footings** for walls and posts to transfer loads to the ground
- Steel reinforcement bars (**re-bar**)
- Insulation and water-resistant membranes
- Drainage layers like crushed stone and perforated weeping tile pipe.

CONCRETE BLOCK basements are built using pre-made concrete masonry units (CMUs) that are normally about

12” long by 8” tall by 8 to 10” thick. They are stacked on top of each other and held together with **mortar**.

Because concrete blocks are hollow in the centre, they are sometimes filled with poured concrete to add strength. This is called **CORE FILLING**.

Steel re-bar is used in concrete block basement foundations, laid horizontally between block ‘courses’ and vertically in core filled walls.

Modern foundations will support **FLOOR SYSTEMS** that will act like platforms in the structure of a building. The materials used for floor systems connected to basements include wood framing, air sealing gaskets, insulation and membranes to separate wood parts from concrete (preventing moisture migration).

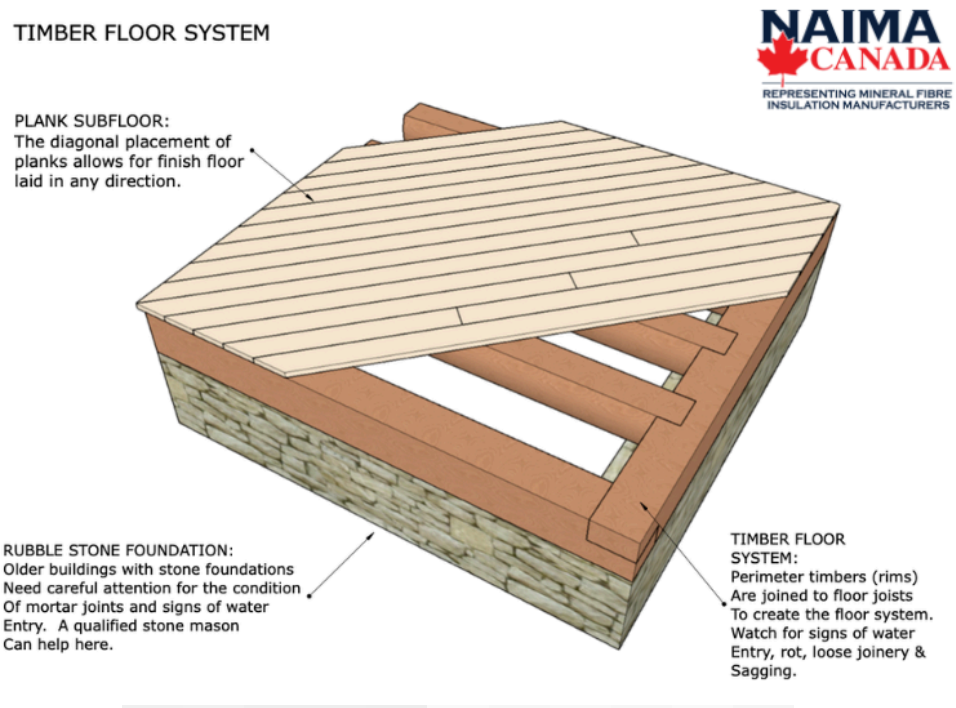
*Figure SEQ Figure * ARABIC 4*
Concrete block foundation wall

STONE AND BRICK MASONRY foundations were used historically until the early 20th century. This type of basement is often called a **CELLAR**. Before basements were used for utilities and living space, cellars were mainly a connection to the ground and not much else.

This type of basement foundation may see settling, cracks and water infiltration due to extended aging and movement of the ground around the building.

Both stone and brick masonry construction will need maintenance, especially to repair and replace mortar joints. This is called **RE-POINTING** and requires the help from a **MASON**. Having a masonry wall repointed can help with air and water leakage, as well as keeping the structure solid for many years.

Some cellars may still have dirt floors, along with **wood timber floor systems and wood posts**…and maybe some well-established critter nests.



FLOATING and FROST PROTECTED SLAB foundations are a modern type of foundation that doesn't required a deep hole but instead sits on top of the ground. This kind of foundation requires careful attention to the size, shape and reinforcement of the slab.

An important thing to consider…
Slab foundations use MUCH less concrete than full-basement foundations. The manufacture and use of concrete is an energy and emissions intense material process – using less of it can help to reduce greenhouse gas emissions.

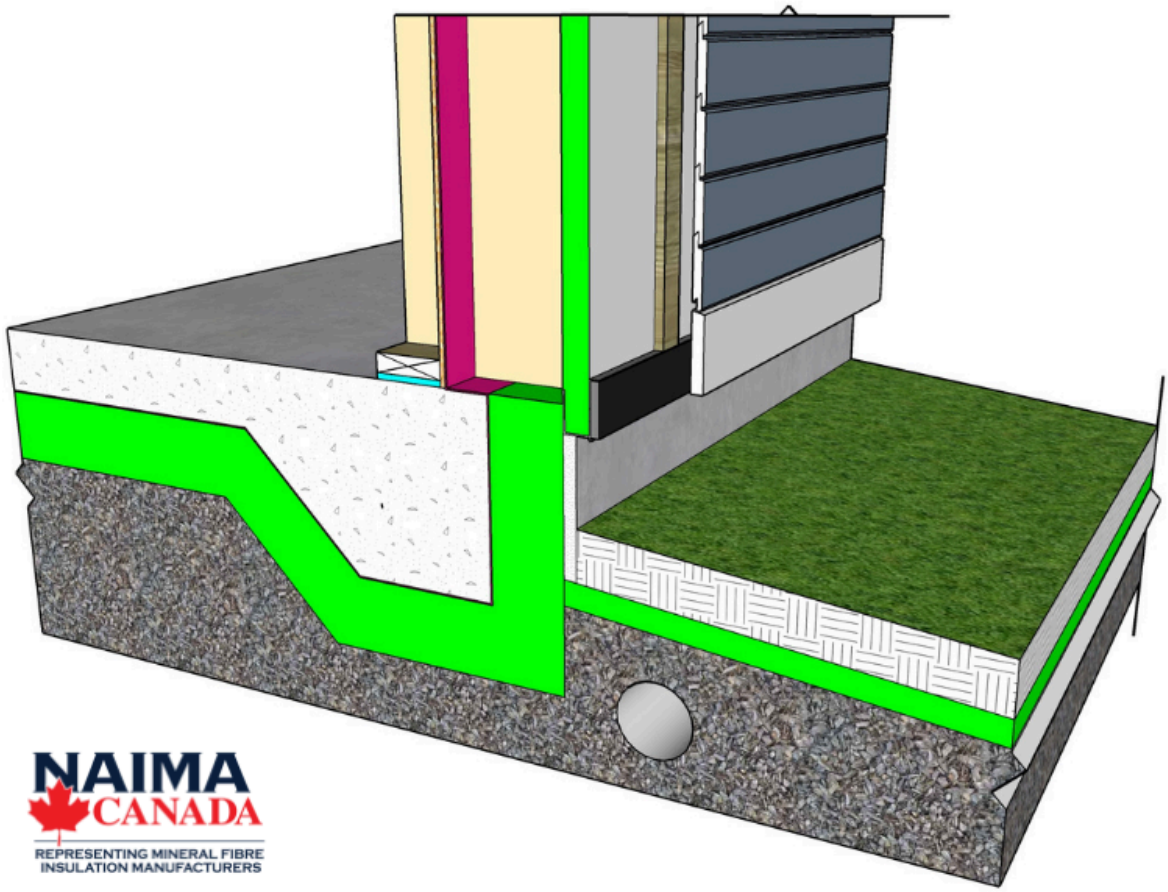


Figure 8 Frost protected and super insulated slab foundation and wall system

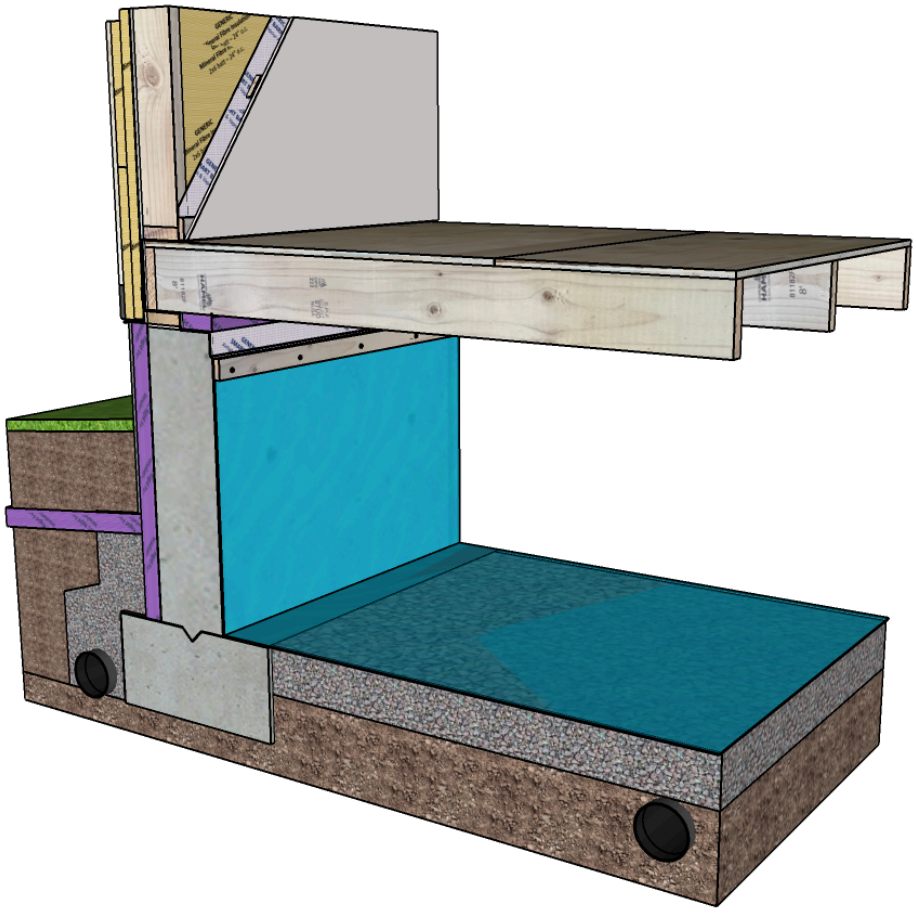
A floating slab foundation may or may not have insulation under and around the concrete. This may mean that the slab incurs a lot of heat loss. Modern building code requires that slabs must have insulation underneath and along the perimeter.

CRAWLSPACE and PIER FOUNDATIONS might be classified between a slab and a full basement. This type of foundation may only have enough space to crawl around on your hands and knees, hence the name 'crawlspace'. You can find many foundations that have crawlspaces AND full basement together.

A house that sits on concrete **posts** and wood **beams**, or **PIERS**, may be open to the outside along the perimeter and may have dirt or crushed stone underneath. Sometimes in this type of foundation, the floor system is insulated and air sealed from below, with free air flow on all sides. You can often find this type of foundation on cottages and buildings that are seated on

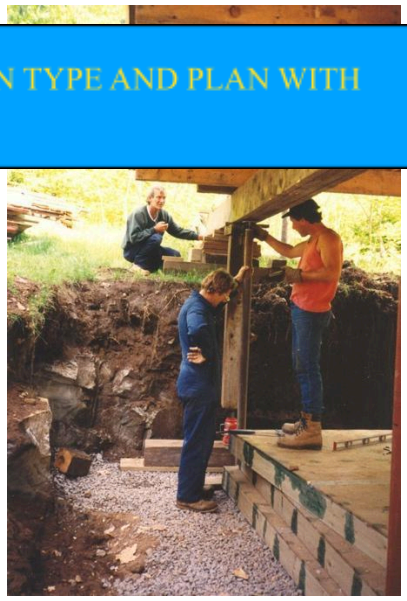
hills. Special note: this arrangement can be challenging to manage heat loss, air tightness and moisture.

The best way to treat a crawl space or pier foundation is by creating a sealed and insulated perimeter wall, making it sort of like a full basement.



PRESERVED WOOD BASEMENT FOUNDATIONS are not the most common type you'll see in Canada, but they have been around since the 1970's. Instead of concrete or masonry, the structure is built with chemically treated wood that is resistant to pests and rot. One advantage to this type of basement foundation is that it can be insulated and air sealed the same as regular wood framed walls.

KEY TAKEAWAY: KNOW YOUR FOUNDATION TYPE AND PLAN WITH PROFESSIONALS!



BASEMENT FOUNDATION INSULATION STRATEGIES

Insulating an existing basement or slab foundation is challenging, sometimes expensive and potentially disruptive. BUT…almost any kind of foundation can be improved for insulation, airtightness and moisture management.

Illustrations adapted from ISO 12575-1:2012, Figures 1-3. Legend corresponds to insulation applications identified in the above table.

Figure 1: Examples of vertical edge and ground insulation in foundations

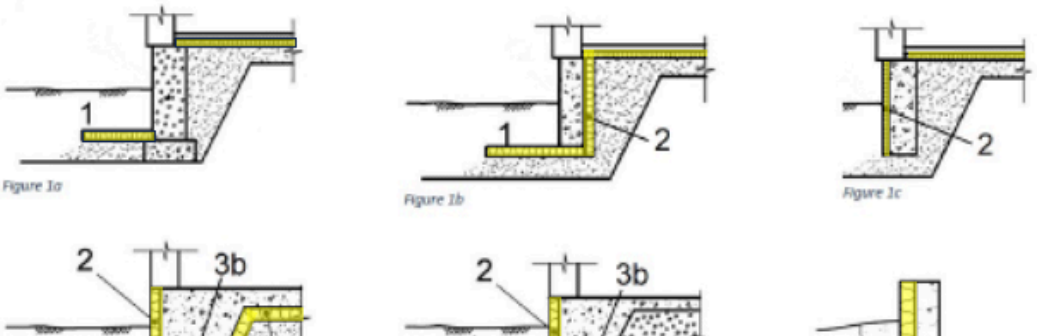


Figure 1a

Figure 1b

Figure 1c

IMPORTANT THINGS TO KEEP IN MIND…

- **Water is your enemy!** A basement or slab that has water problems must NOT be insulated until the water leakage is found and corrected. Water entering the basement or slab may lead to material degradation (rot) or mould.
- **Don't put materials against concrete or masonry that could be damaged by water or moisture vapour!** Fibre insulation, wood, drywall and even some metals should NOT have direct contact with concrete, stone or brick. Ensure there is some kind of separator or moisture resistant material (i.e. rigid foam board insulation)
- **Air leakage can carry moisture!** Basements can be air leaky, especially around the perimeter where floors meet foundation support. Always include air sealing in your basement improvement plans!

STRATEGIES BY TYPE OF BASEMENT / FOUNDATION

FOUNDATION TYPE	INSULATION / AIR SEALING STRATEGY*
Poured concrete and concrete block	● **Interior application** – extruded polystyrene (XPS) insulation against concrete wall, stand-off 2x4 wall inside of foam w/ cavity insulation, vapour barrier and drywall ● **Exterior application** – fluid applied or peel-and-stick water resistant membrane, insulation appropriate for below ground (foam plastic, high density mineral fibre), drainage layer (crushed stone, dimple mat) ● **NOTE**: For both interior and exterior applications, the perimeter area of the floor system (called the HEADER) must be insulated and air sealed to the same extent as exterior walls.

	● **SAFETY NOTE**: Some insulation types for interior application must be covered with a fire-resistant layer after they are installed. Gypsum drywall is the most common fire block layer. ● **SMART THINKING**: Before using spray foam to cover broad surface areas think about the reversibility (removal) of the insulation OR what you might do in case of repairs or maintenance. Use spray foam effectively and sparingly.
Stone or brick masonry	● **Interior application** – Breathable, draining membrane against the masonry, extruded or expanded polystyrene against membrane, stand-off wall inside of foam w/ cavity insulation, vapour barrier and drywall. ● **Exterior application** – Breathable drainage membrane on masonry, XPS insulation applied vertically in a trench, minimum 24" below ground surface OR applied as a "skirt", minimum 10" below ground, angled away from the wall, minimum 24" wide. ● **NOTE**: For both interior and exterior applications, the perimeter area of the floor system (called the HEADER) must be insulated and air sealed to the same extent as exterior walls. ● **SAFETY NOTE**: Some insulation types for interior application must be covered with a fire-resistant layer after they are installed. Gypsum drywall is the most common fire block layer. ● **SMART THINKING**: Before using spray foam to cover broad surface areas think about the reversibility (removal) of the insulation OR what you might do in case of repairs or maintenance. Use spray foam effectively and sparingly.
Floating Slab	● **Exterior application** - fluid applied or peel-and-stick water resistant membrane against concrete, foam plastic insulation appropriate for below ground applied vertically against foundation perimeter AND as a "skirt" minimum 10" below ground, angled away from the foundation, minimum 24" wide, w/ drainage layer (crushed stone, gravel, sand)
Preserved Wood	● **Interior application:** Cavity insulation of any type ● **Exterior application:** Water proof membrane against wood foundation wall, foam plastic insulation appropriate for below ground, drainage layers (crushed stone, dimple mat) ● **NOTE**: For both interior and exterior applications, the perimeter area of the floor system (called the HEADER) must be insulated and air sealed to the same extent as exterior walls. ● **SAFETY NOTE**: Some insulation types for interior application must be covered with a fire-resistant layer after they are installed. Gypsum drywall is the most common fire block layer.

	• **SMART THINKING**: Before using spray foam to cover broad surface areas think about the reversibility (removal) of the insulation OR what you might do in case of repairs or maintenance. Use spray foam effectively and sparingly.

*ALL OF THE STRATEGIES AND CONTROL LAYERS LISTED HERE REQUIRE CORRECTLY INSTALLATION, PROPER SEQUENCING (WHAT GOES WHERE) AND CONSIDERATIONS FOR HEATING, COOLING AND VENTILATION. **ALWAYS HIRE A PROFESSIONAL TO HELP YOU SET TARGETS FOR COMFORT AND ENERGY PERFORMANCE.**

4 WHAT'S GOING TO CHANGE IN YOUR NEW, IMPROVED BASEMENT?

The first and best thing that could change in your basement space is that you'll feel more comfortable. You may also notice that you're not using as much energy to keep that space comfortable, which might also mean that you're saving a bit of money too.

Some things to watch out for…

- **Air Quality:** You may notice that you can smell new things because of the insulating and air sealing. Reduced air leakage means that the air in your building hangs around a bit longer. Make sure that you plan for MECHANICAL VENTILATION to keep your air fresh, at the right humidity and at a moderated temperature.
- **Noise Reduction:** Better insulation and air tightness can cut out sounds from outside and reduce noise from inside.
- **Moisture and Humidity:** If you notice condensation on basement windows or feel added humidity in the air, it may mean that your HVAC system needs adjusting to account for the new and better energy performance. Talk to your Energy Advisor or a certified HVAC technician.

KEY TAKEAWAY: WORK WITH A PROFESSIONAL TO REACH NEW COMFORT TARGETS!