

Northern Fundamentals

REMOTE Walls



Easily meet current AHFC wall standards

3 year return on investment

Eliminate moisture issues

“By placing the heat, air, and moisture control layers to the exterior of the structure, the REMOTE wall system creates the perfect assembly for constructing durable, efficient, and affordable structures for all the severe climates of Alaska.”

- Marquam George, University of Alaska Southeast



COLD CLIMATE HOUSING RESEARCH CENTER
CCHRC

“The single most important thing to manage when building a house in a cold climate is moisture.”

- Jack Hébert, President & CEO, CCHRC

The Problem

As we all know, building a home in a cold climate presents special challenges. For decades “warm climate” construction methods have also been the norm in the North. While buildings are less expensive to construct using these methods, they can have much shorter life spans due to their many potential failure points – they’re expensive to heat, feel cold in the winter, and are less durable.

Moisture infiltration is one of the biggest problems faced by builders in cold climates. Humid indoor air can migrate into the building’s wall assembly during the winter months and condense on any framing members with a temperature below the dew point. Left unchecked, this moisture can cause mold and rot in the framing members. Ultimately this can add up to a multitude of human health and building structural problems.

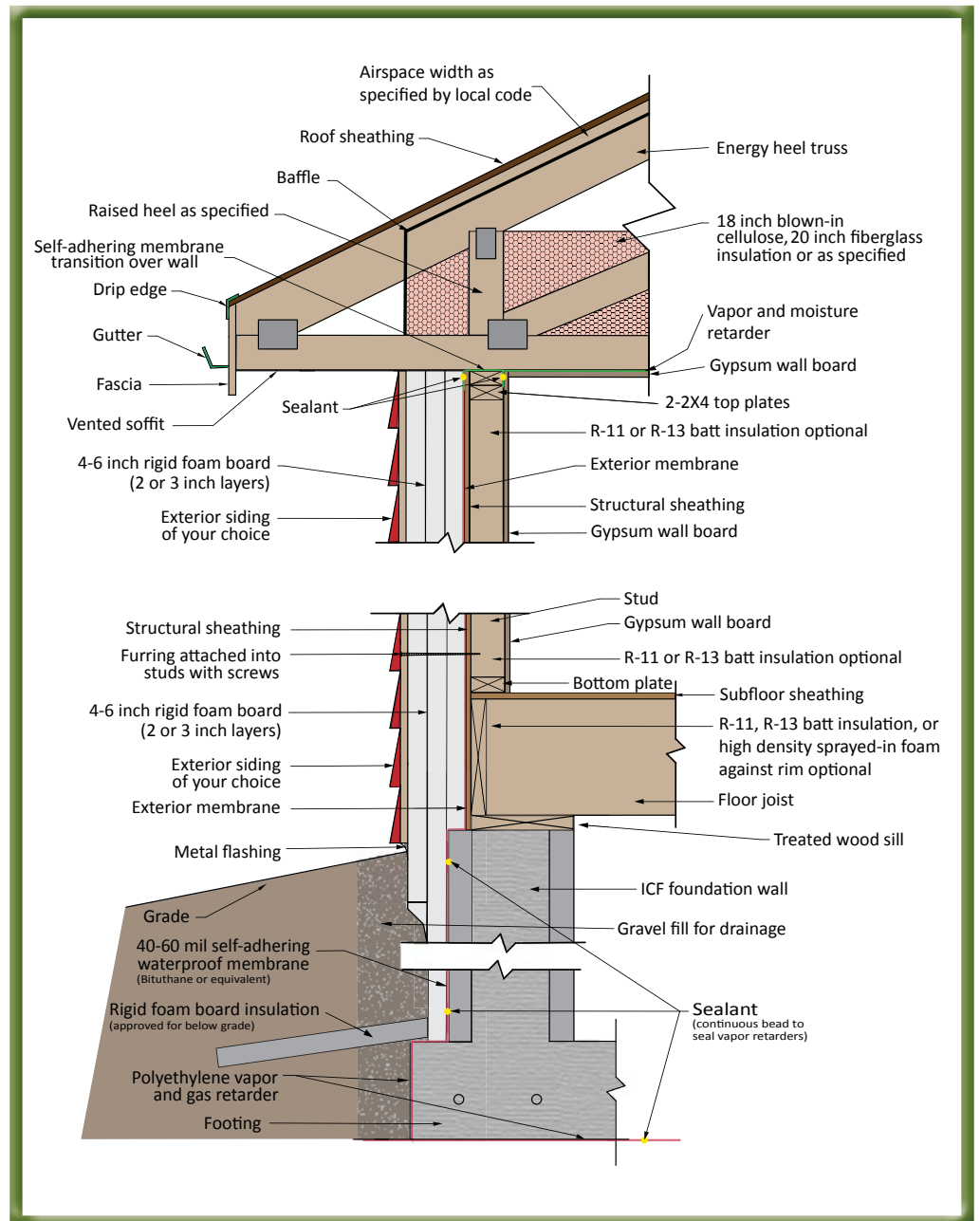
The key to a long-lasting and economical home in a harsh environment? Super insulation, moisture control, and an air-handling system.

The Solution

The REMOTE Wall System (Residential Exterior Membrane Outside-insulation TEchnique) is a superior alternative to standard frame construction. It prevents moisture problems, is cost effective, and provides the homeowner with a super-insulated, energy efficient home.

In a REMOTE wall, the vapor barrier is applied to the outside, on the sheathing, not on the inside, behind the sheetrock. In addition, in cold, dry regions like Fairbanks, two thirds of the wall’s insulating value consists of rigid foam board that is attached on the walls exterior, while the remaining third is fiberglass batt or insulation placed in the interior stud bays in the usual manner.

Why? Because this method moves the dew point outside the vapor barrier and warm side wall cavities, keeping the framing members dry, and effectively creating a super-insulated structure in the process. Foundation and roof work is straightforward; cantilevers are easy to seal and insulate.



The Big Picture

- *Uses standard materials*
- *Can be framed to code minimums*
- *No need for an interior vapor barrier*
- *Eliminates moisture issues*
- *Exterior insulation eliminates heat loss through studs*
- *Complete and heat the shell before mechanical subs are needed*
- *Easy installation of freeze-protected plumbing, ducting, and electrical systems on interior walls*
- *Easily meets current AHFC energy standards for Interior Alaska*
- *Can easily be covered in stucco or conventional siding types*

For the Homeowner

- *Major aspect of a healthy home*
- *Two-to-five year payback in energy savings on the initial investment in materials*
- *Longer lasting home*
- *Less expensive to offer custom exterior details like bay windows*
- *A higher AHFC energy rating means a lower mortgage interest rate*
- *Makes qualifying for the current Alaska statewide \$7500 5 Star Plus home rebate easily attainable*

How to build it

Foundation

Apply the vapor barrier to the exterior sheathing, lapping over the foundation waterproofing membrane to ensure a continuous seal. Depending on what thickness insulation is installed to the exterior walls and foundation, different flashings will be required. This detail is best addressed before construction begins.

Wall Framing

The REMOTE system is framed conventionally and can be built with 2x4 framing. The deeper 2x6 cavity is no longer needed to hold as much of the wall insulation. With this in mind, there are several things to consider when choosing stud widths:

- Framing and stud spacing must meet code standards, or an engineer's specifications
- If the exterior wall will be used as a chase, a 2x6 stud

bay can accommodate larger ducts and mechanical systems – without compromising structural integrity

- Longer screws are used to attach exterior furring and need to be kept clear of wiring and plumbing running through the stud cavity.

Windows, Doors, and Decks

Window and door framing extends the full thickness of the wall, unless stucco is used. Typically a Bituthene-type adhesive membrane is wrapped around the extended jambs and over the wall membrane. Jambs that extend flush to the outside face of the furring allow for solid attachment of doors and flanged windows.

In maritime climates where wind driven rain is a primary concern, windows are attached directly to the sheathing and flashed conventionally, to maintain a continuous drainage plane on the wall. Jamb extensions that expand the thickness of the foam are added once the windows have been installed. This insures that any water that finds its way behind the foam will have a direct drainage path downwards with minimal interruptions.

Areas where decks, shed roofs, and other framing need to be securely attached to the exterior walls, should be located in advance. Build blocking up to the finished thickness of the foam to minimize the surface area where cold can conduct directly through to the interior framing. The blocking is bolted to rim joists or framing, providing the attachment points for ledger boards that carry any exterior structures.

Vapor Barrier

Moisture control is one of the biggest problems builders encounter in cold climate wall construction. By moving the vapor barrier and most of the insulation to the exterior of the sheathing, the inside wall always stays warm enough that moisture has no surface upon which to condense. If there is a condensing event in the stud cavities, it can dry readily to the inside of the building.

Self-adhering, rubberized membranes such as Grace Bituthene are proven and tough, and have good self-sealing properties. DuPont Drain Wrap and 6-mil polyethylene were used as cost effective alternatives on the walls at the CCHRC facility and are also proving to be very effective. In wet climates however, where ongoing exposure to rain is an issue, the self-adhering membranes or drain wrap will provide the best protection against moisture infiltration from the outside.

Regardless of which membrane is used, the system must be continuous from foundation to ceiling; sealed at the joints; and installed with care. Whenever feasible, the membrane should be lapped over the top of the wall to allow for a continuous seal to the ceiling vapor barrier.

Insulation

“Insulation is the only investment in a home with instant and constant return on investment which will work every day in effectively reducing energy costs.”

- Thorsten Chlupp, REINA, LLC

The bulk of the R-value for the REMOTE wall system comes from rigid foam. Six inches of exterior foam is preferred for walls in extreme cold climates (e.g., Fairbanks, Alaska), and yields the best results. Four inches is considered the minimum allowable thickness to keep the framing from cooling enough for moisture to condense inside the wall.

By being applied in continuous layers from the foundation to the top of the walls, it eliminates cold air “bridging” from the outside to the framing members. Because the entire exterior wall surface is sealed and covered, this also solves the often challenging problem of sealing rim joist areas and cantilevered bays.

The foam can be attached by a variety of fasteners, depending on application and exterior finish. The best results come from staggering all layers and joints, including corners, to minimize leakage. Two-by-four sheets provide more controlled expansion, which may be a factor with stucco finishes. Expanded polystyrene foam, usually called “beadboard,” is most commonly used, has the highest perm rating, and is typically the most cost effective. XPS (extruded polystyrene) has been used with good results, too.

Both foam types work well below grade, as long as the manufacturer has rated it for ground contact.

Exterior Finishes

“The REMOTE system lends itself very well to all standard siding applications. It allows me to design a clean look and offer my clients a wide variety of finish choices.”

*- N. Claiborne (Clai) Porter, Jr., AIA, CGR,
NCP Design/Build Ltd.*

Attach furring using long screws that pass through the foam layers, sheathing, and into the studs for structural support. Either horizontal or vertical furring can be used, depending on the siding type and look desired. Avoid any exposed screw penetrations inside the wall cavity, since they may conduct cold and cause condensation, particularly if they extend through the entire wall assembly to the furring.

Keep in mind that some siding requires 16-inch maximum furring spacing to insure good attachment, and this will affect the initial stud layout.

Stucco can be installed directly over the foam. The manufacturer may recommend that the last layer of foam be glued on with a mortar type adhesive mix, rather than with screws and washers. Be sure to follow the stucco manufacturer's guidelines both for foam type and fastening methods.

Roof Systems

In cold climates, roof trusses should have an “energy heel” which allows enough depth for sufficient insulation directly over the exterior walls. The ceiling vapor barrier should extend down the walls far enough so that it can be positively sealed to the top of the wall – this makes the membrane virtually continuous from the ceiling to the foundation.

Mechanical Ventilation

A house built using the REMOTE system has a very tight air envelope and will require mechanical ventilation. A heat recovery ventilator (HRV) system, properly installed and balanced, is the best choice for a cold climate. The HRV provides a measured, evenly distributed, source of fresh air to the home and will recover much of the heat that would be lost with a simple fan system.

By the Numbers

Comparing the cost of insulating and heating a home built in Fairbanks, Alaska using “standard” construction and two REMOTE systems.

Chart shows additional materials cost over the “standard” construction and energy cost savings for the homeowner of a 1960 square feet, 2-story, 5-Star or 5-Star Plus based on AkWarm calculations.

	R-value	Energy Savings per year [†]	Additional Materials Cost	Payback Period [†]	10 Year Energy Savings [†]
R-25 batt, 2x6	25				
4" EPS II, R-11, 2x4	28	\$637.00	\$2611.03	4.1 Years	\$6,370.00
6" EPS II, R-11 batt, 2x4	37	\$814.40	\$3738.34	4.59 Years	\$8144.00

[†]Per year, based on \$5.00/gallon fuel oil.