Residential New Construction Continuous Insulation Reference

Efficiency Vermont

All insulated assemblies carry some risk of condensation that could lead to mold or structural damage. Keep the following guidelines in mind when designing your wall system:

- Keep water out, but design to allow a wall to dry if moisture gets in. At least one side of the wall should have high vapor permeability so that moisture in the wall can dry out in that direction. The best wall designs may be vapor permeable on both sides, with a vapor retarder somewhere in the middle. Vented siding promotes drying and is generally a good idea with any wall assembly.

- Know the vapor permeability (measured in perms) of every material in your assembly. This helps you identify the vapor control layer and avoid a double-vapor-barrier assembly (a vapor barrier "sandwich") that can prevent drying. Paint, insulation, sheathing, and dedicated vapor retarders all can slow vapor diffusion (see table below). Exercise caution with polyethylene, which prevents moisture movement.

- Vermont code requires a Class I or II vapor retarder on the interior side of framed walls, with some exceptions. Class III vapor retarders are allowed in certain cases, such as R-11.25 insulated sheathing over a 2x6 wall with cavity fill insulation.

- Placing a minimum of 50% of the insulation value to the exterior of the structural sheathing is widely considered a conservative best practice for avoiding condensation.

- "Smart" vapor retarders change permeability based on relative humidity / moisture content; they are more vapor permeable with higher moisture, more easily allowing a wall to dry. Smart vapor retarders can be a good choice where a wall assembly is at risk from reduced ability to dry with a conventional vapor retarder.

Some of the assemblies on the next page are less susceptible to condensation. Your Efficiency Vermont Energy Consultant is available to help you with safe wall design and material selection.

Vapor retarder classes:

Class I Vapor Retarder, a.k.a. Vapor Barrier	0.1 perm or less	Vapor impermeable	Rubber membrane, sheet polyethylene (0.1 perm), glass, foils
Class II Vapor Retarder	0.1 – 1.0 perm	Vapor semi-impermeable	Oil-based paint, Kraft-faced batt (1.0 perm), vinyl wall coverings, stucco
Class III Vapor Retarder	1.0 – 10 perm	Vapor semi-permeable	Plywood, OSB, EPS, XPS, most latex paints, heavy asphalt-impregnated building paper
Vapor open	> 10 perm	Vapor permeable	Unpainted gypsum board, unfaced fiberglass, cellulose, "housewraps" (Tyvek: 58 perm)[1]

(for reference 1 perm = 1 grain of water vapor per hour, per square foot, per inch of mercury)

[1] Housewrap is usually not installed well enough to be an air barrier, though the plywood or OSB beneath it is, so even if not useful for slowing water vapor the wrap can still be useful to control liquid water.

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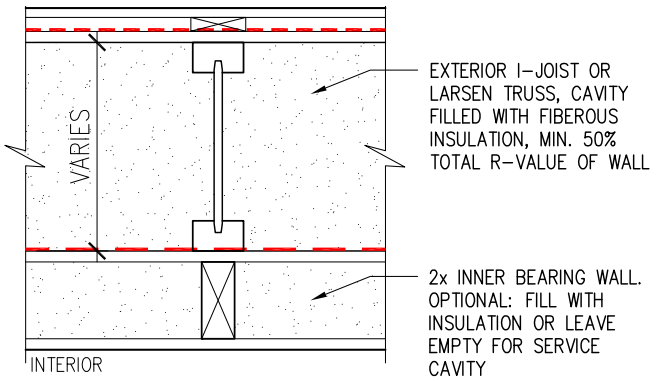
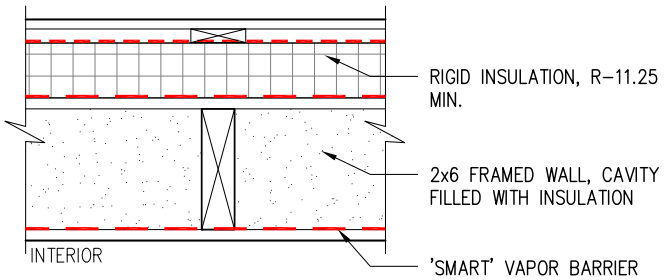
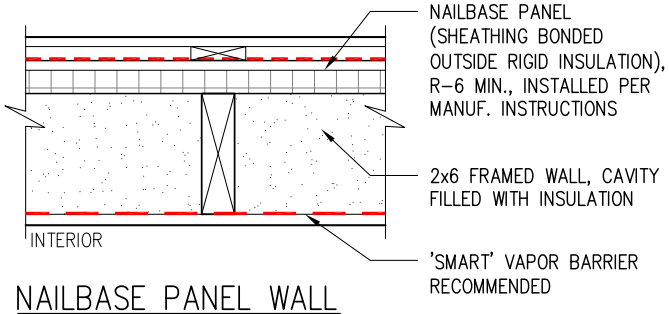


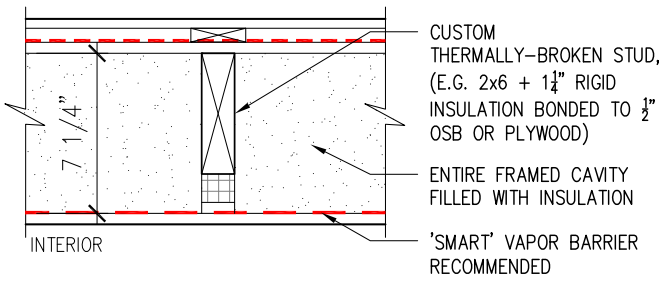
ARTIC / TJI / LARSEN TRUSS WALL



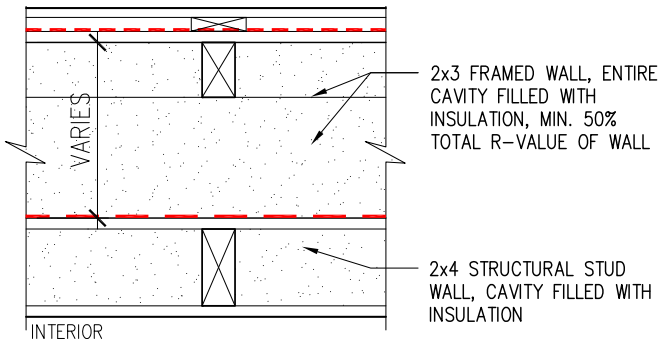
EXTERIOR RIGID INSULATION



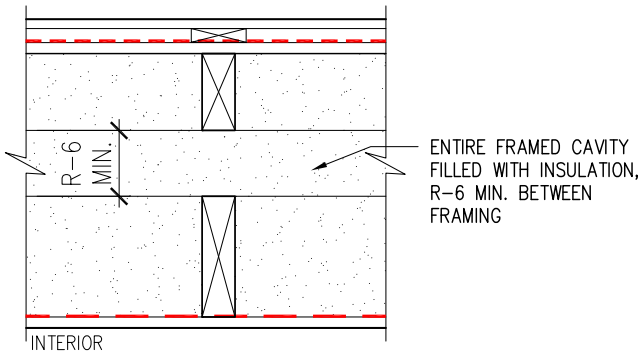
NAILBASE PANEL WALL



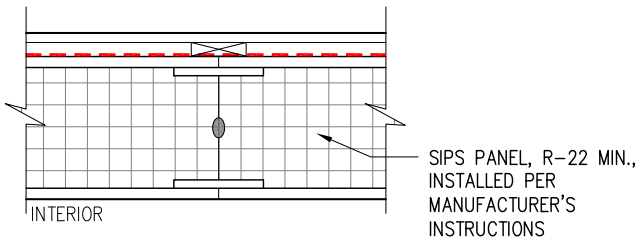
THERMALLY–BROKEN 2x6/2x8 WALL



BUILDING SCIENCE DOUBLE WALL

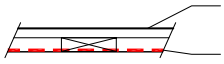


DOUBLE STUD WALL



STRUCTURAL INSUALTED PANEL

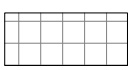
KEY NOTES:



VENTILATED RAINSCREEN (RECOMMENDED)/ SIDING

WEATHER RESISTIVE BARRIER AND/OR SHEATHING, (RECOMMENDED: VAPOR OPEN TO ALLOW DRYING)

AIR AND VAPOR CONTROL LAYER ('SMART'/ VARIABLE PERMEABILITY MEMBRANE OR SHEATHING WITH JOINTS SEALED OR FINISHED DRYWALL WITH ALL JOINTS SEALED AND VAPOR BARRIER COATING)



RIGID INSULATION (EPS, XPS, POLYISO, ROCKWOOL BOARD)

FIBEROUS INSULATION (CELLULOSE, FIBERGLASS, ROCKWOOL BATTS)