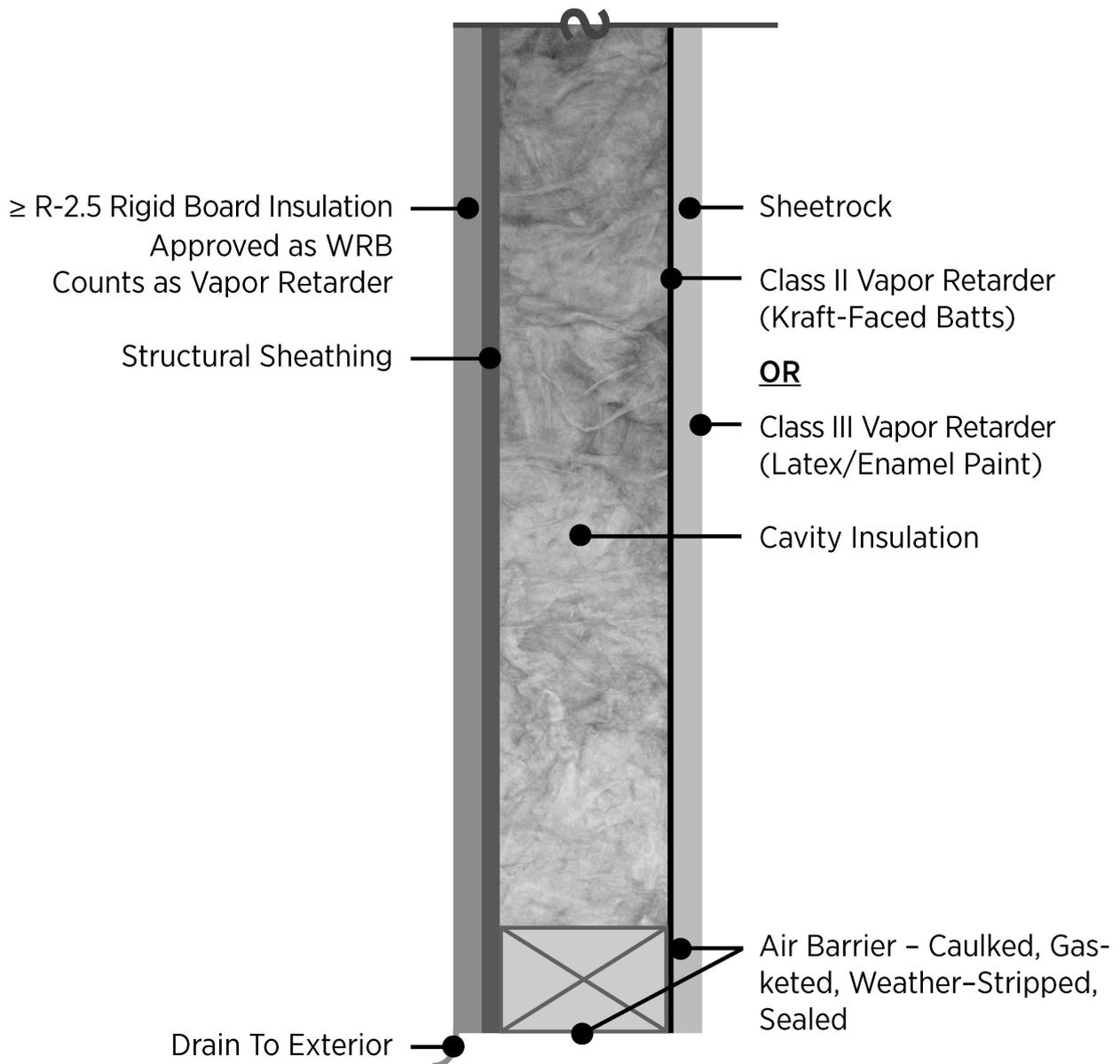


## **Code-compliant 2X4 Walls for Zones Marine 4-8 - Code Notes**

[2009 IECC and 2009 IRC]

### **Background**



## 2"X4" WALL SYSTEM W/RIGID BOARD AS WRB

Using 2"X4" studs in an exterior wall just got more challenging for Zones Marine 4 through 8. The 2009 IRC and IECC do not permit trade-offs for installing high-efficiency HVAC equipment--installing a 90%+ furnace as a trade-off for 2"X4" stud walls with R-13 insulation. The more permanent building insulation and sealing features now take precedence. However, there still remain optional strategies allowing 2"X4" exterior stud walls.

### Prescriptive Compliance Approach

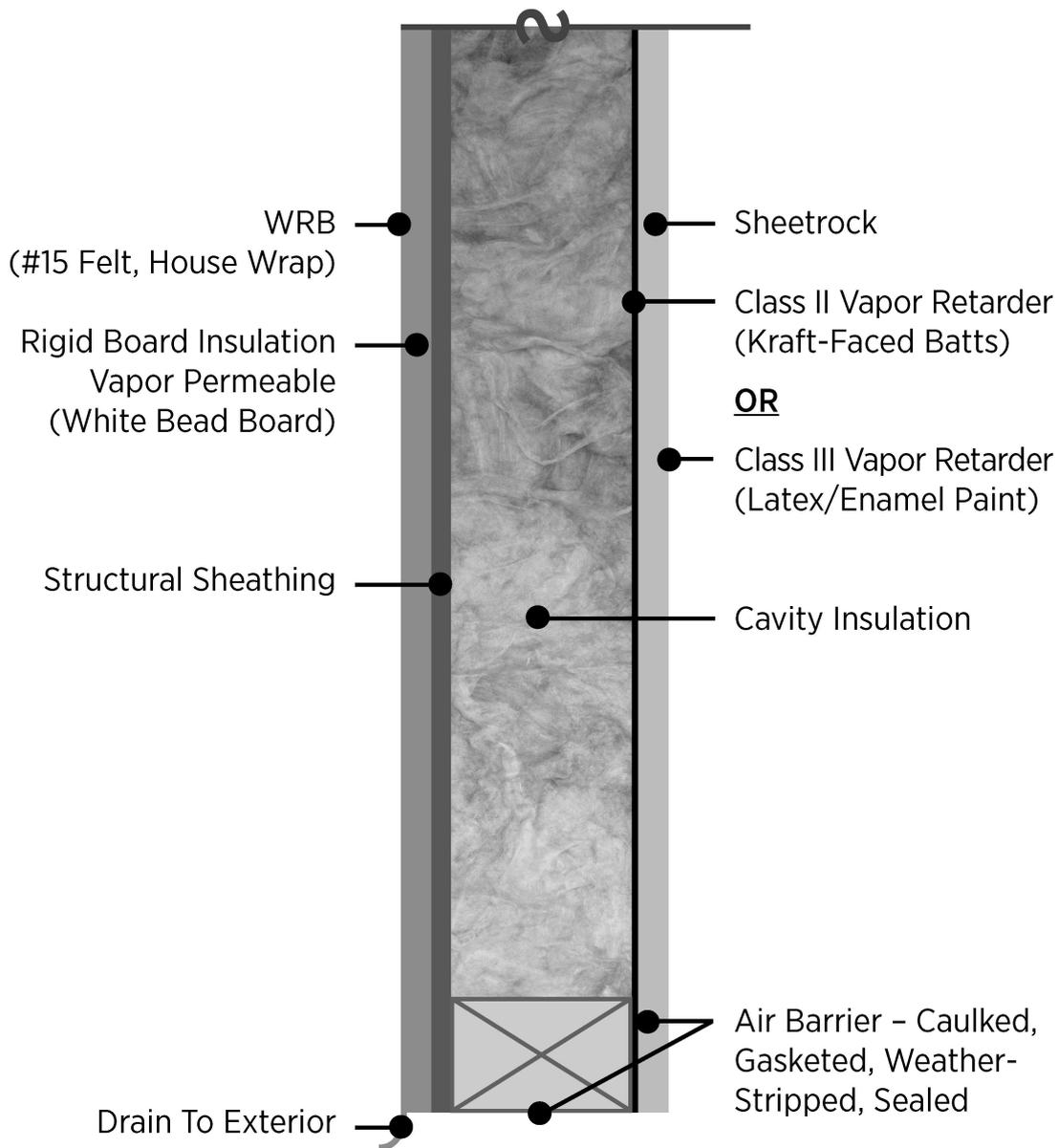
#### Insulation Requirements

IECC Section 402.1.1 and Table 402.1.1 establish insulation and fenestration requirements by component,



based on the climate zone specified in Chapter 3, for prescriptive compliance with the residential energy code. The table specifically accommodates 2"x4" studs in wood frame walls in Zones Marine 4 through 6 by footnote "h" which allows compliance by R-13 cavity insulation layered with R-5 insulative sheathing. The following prescriptive compliance approaches for 2"x4" stud frame exterior walls are allowed in the code.

- For Zones Marine 4, 5, and 6, the IECC and the IRC require R-20 or "13+5" wood frame walls. The "13+5" means R-13 stud cavity insulation plus R-5 insulating sheathing (see below)
- For Zones 7 and 8, the IECC requires R-21 wood frame walls (stud cavity insulation plus insulating sheathing)



## 2"X4" WALL SYSTEM W/VAPOR PERMEABLE, RIGID BOARD AND WRB

One of the properties typically associated with insulative sheathing is its high R-value per inch; rigid foam board is a good example. Different cell configurations, films, and other added features give the products specific characteristics that may allow the product to meet your needs for more than one function. However, one characteristic may be perfect for one application and totally unacceptable for another. Read the product data, carefully select the product for your application, and follow the manufacturer's installation instructions.

### *Vapor Retarder Requirements*

The IRC requires a Class I or II vapor retarder on the interior side of frame walls in Zones Marine 4 through 8,



with the following exceptions.

- For Zone Marine 4, a Class III vapor retarder (latex or enamel paint) is permitted if R-2.5 or higher insulated sheathing is used
- For Zone 5, a Class III vapor retarder is permitted if R-5 or higher sheathing is used
- For Zone 6, a Class III vapor retarder is permitted if R-7.5 or higher sheathing is used
- For Zones 7 and 8, a Class III vapor retarder is permitted if R-10 or higher sheathing is used
- Walls in cold climates can dry to the inside when the vapor retarder on the interior side of the frame wall has a higher perm rating (greater vapor diffusion) than the materials on the exterior side of the wall; select and apply products based upon manufacturer's data and installation instructions.

#### *Water-Resistive Barrier (WRB)*

For Zones Marine 4 through 8, the IRC requires exterior walls shall provide the building with a weather-resistant exterior wall envelope. This water-resistive barrier (WRB) can be one layer of No. 15 asphalt felt or other approved material (e.g., insulating sheathing approved as a WRB, house wraps) applied over studs or sheathing of all exterior walls. A properly installed and sealed closed-cell foam board sheathing typically is rated for use as a WRB, eliminating the expense of a dedicated water-resistive barrier product. WRB- approved products can be identified in the International Code Council-Evaluation Service (ICC-ES) Evaluation Reports ([www.icc-es.org](http://www.icc-es.org)). Concrete or masonry walls designed in accordance with Chapter 6 and flashed according to Section R703.7 or 703.8 are excepted.

#### *Air Sealing*

For Zones Marine 4 through 8, the air barrier should be the innermost surfaces--the interior wall, ceiling, floor, etc. The building thermal envelope shall be durably sealed to limit infiltration. All joints, seams, penetrations and other sources of infiltration shall be caulked, gasketed, weatherstripped, or otherwise sealed with an air barrier material, suitable film or solid material. Air tightness and insulation installation shall be demonstrated to comply with either a blower door test option--after rough in and after installation of penetrations of the building envelope for utilities, plumbing, electrical, ventilation, and combustion appliances option--or a visual inspection option--field inspection and verification of the air barrier and insulation.

#### *HVAC Equipment Efficiency*

No requirement

### **Performance Compliance Approach**

The 2009 IECC Chapter 4 Section 405--Simulated Performance Alternative--provides the ability to "trade-off" lower levels of insulation in the building envelope for increased levels of efficiency in other areas of the building. This approach can be used to demonstrate compliance using 2"x4" stud walls in a house and trading off the lower efficiency with increased efficiencies in glazing, reduced air leakage in the building envelope or reduced leakage in the duct system. For example, a home being designed for construction in Climate Zone 5 using 2"x4" walls with R-13 insulation can take credit for reducing the air leakage in the house down from the required 7 ACH 50 to an air leakage value that will offset the energy use of the reduced wall insulation. Under this example, the building envelope would need to be tested to ensure that it did not exceed the air leakage rate modeled in performance software. Documentation would need to be provided to the jurisdiction demonstrating that the envelope met the requirements. Also, ventilation may need to be added to the house based on the targeted air leakage rate

### **Application**

As an alternative, foam-in-place polyurethane or other foamed-in or blown-in cavity fill strategies may achieve Frame Wall assemblies with U-factors equal to or lower than the Table 402.1.3 Frame Wall Equivalent values. However, a continuous layer of foam insulating sheathing reduces thermal bridging through the studs and maintains temperatures sufficiently high to avoid condensation on the stud and in the stud cavity. Resources are better managed; a properly installed and sealed closed-cell foam board sheathing typically is rated for use as a WRB, eliminating the expense of a dedicated water-resistive barrier product.



## Plan Review

Ensure the drawings detail the layering of exterior wall insulation materials, the individual and total R-value of insulating materials comprising the wall building thermal envelope, and the presence of the water-resistive barrier.

## Field Inspection (2009 IRC)

Verify the proper installation of the layering of insulation materials comprising the exterior wall building thermal envelope and the location of the water-resistive barrier.

## Code Citations\*

The 2009 IECC requires residential buildings shall comply with specific mandatory provisions (Sections 401, 402.4, 402.5, and 403.1, 403.2.2, 403.2.3, and 403.3 through 403.9) and either prescriptive (Sections 402.1 through 402.3, 403.2.1, and 404.1) or performance (Section 405) provisions. (2009 IECC Chapter 4 Section 401).

The 2009 IRC (International Residential Code for One- and Two-family Dwellings) establishes minimum requirements that apply to the construction of detached one- and two-family dwellings or townhouses. Chapter 6 Section R601.3 (with exceptions) requires Class I (sheet polyethylene or unperforated aluminum foil) or Class II (Kraft-faced fiberglass batts) vapor retarders on the interior side of frame walls in Zones 5,6,7,8 and Marine 4. Table R601.3.1 provides conditions permitting Class III (Latex or enamel paint) vapor retarders. Chapter 7 Section R703.2 requires an approved water-resistive barrier be applied over studs or sheathing of all exterior walls.

Wood frame wall insulation must meet the minimum requirements of the 2009 IECC Table 402.1.1 based on the climate zone specified in Chapter 3. For Zones Marine 4, 5 and 6, prescriptive compliance can be "13+5" meaning R-13 cavity insulation plus R-5 insulated sheathing. Specific construction strategies may permit R-2 as the insulating sheathing (2009 IECC Table 402.1.1 footnote h.) Zones 7 and 8 prescribe R-21. (2009 IECC Chapter 4 Section 402.1.1).

The 2009 IRC Part IV Chapter 11 Section N1101.2 states compliance shall be demonstrated by either meeting the requirements of the IECC or meeting the requirements of IRC Chapter 11.

## More Information

[Foam Board Insulation](#)

[Moisture Control in Walls](#)

[Vapor Barriers or Vapor Diffusion Retarders](#)

[Weather-Resistive Barriers](#)

## References

\*Copyright, 2009, [International Code Council](#), Inc. Falls Church, Virginia. 2009 International Residential Code for One- and Two-Family Dwellings. Reproduced with permission. All rights reserved.



\*Copyright, 2009, [International Code Council](#), Inc. Falls Church, Virginia. 2009 International Energy Conservation Code. Reproduced with permission. All rights reserved.

Figure source: [www.ductsinside.org](http://www.ductsinside.org)