

## COMMON MISCONCEPTIONS REGARDING ICFs AND CURRENT ENERGY CODES

### OVERVIEW

There are common misconceptions regarding ICFs and the current energy codes. While many people involved in the home design, construction and inspection process are familiar with the R-value requirements of a cavity wall, most do not understand that different standards apply to ICFs.

### WALL TYPES

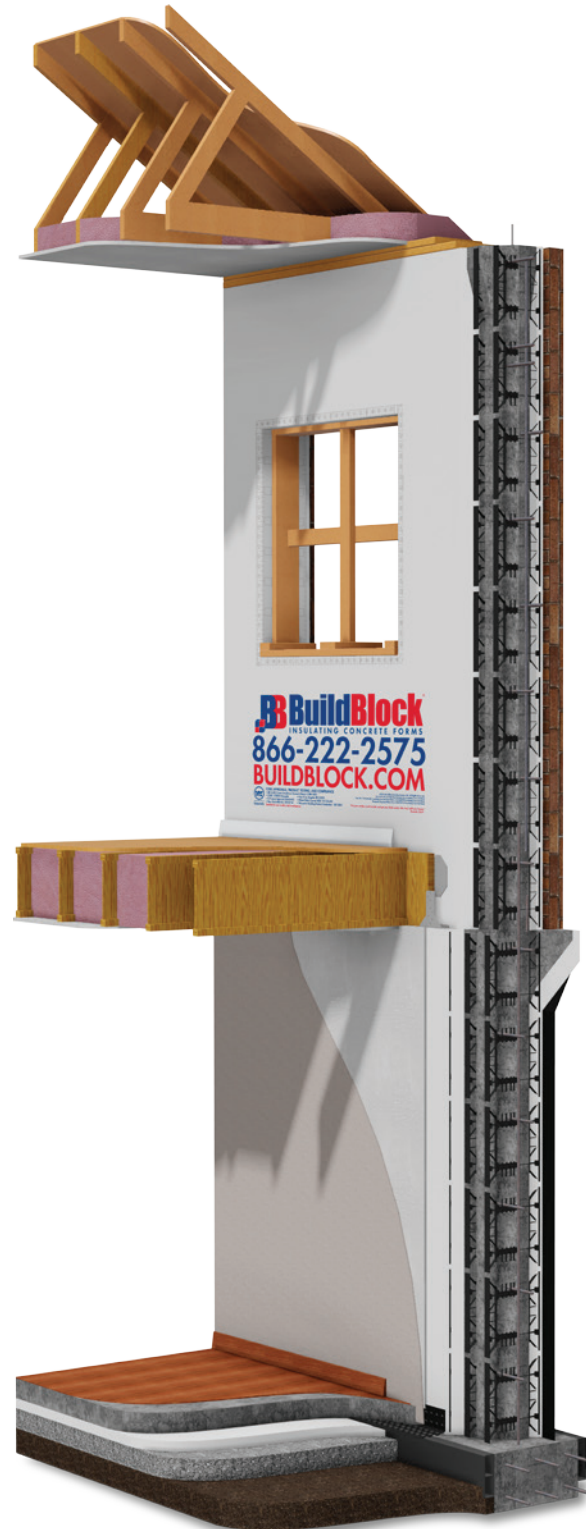
Cavity walls are usually wood or steel framed with insulation between framing members for the outside walls. Most single family structures in the United States are built this way. Cavity walls may meet local and national building codes, but lack the performance and resilience when compared with ICF mass walls.

The International Energy Conservation Code (IECC) defines mass walls as walls made of concrete block, concrete, insulated concrete form, masonry cavity, brick, earth, adobe and solid timber or logs. The insulation must be at least 50% on the exterior or integral to the wall to count. Links to the ICC building codes are at the end of this document.

ICFs are Mass Walls, and are listed as such in IECC Section R402.2.5 Mass Walls. This status causes much confusion when reading the current energy code requirements. Mass Walls are governed under a separate set of guidelines from cavity walls, because of significant differences in how their insulation performs.

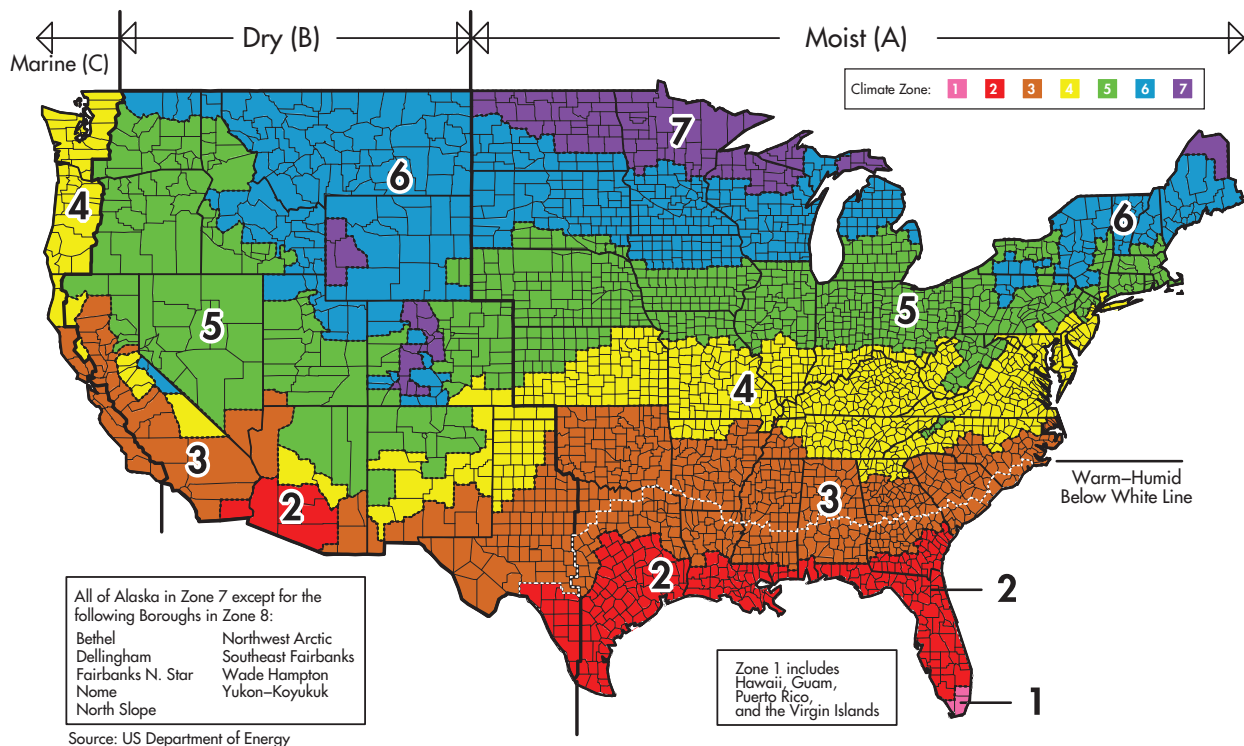
Cavity wall insulation, characterized by traditional wood or metal framing, is designed to resist the transfer of heat through air movement in the wall. The amount of energy required to change air temperature is much less than in a mass wall.

The mass of a mass wall takes a greater amount of energy (heat) to change the temperature of its material. The simplest example of this is after a hot summer's day, the sidewalks and streets still radiate heat even at night. Even though it is cooler at night, the mass of the concrete is slow to cool and release its heat.



Poured concrete wall with framed cavity wall below grade.

## International Energy Conservation Code (IECC) Climate Regions



Adding insulation to a mass wall on both sides, prevents the energy from reaching the mass wall and changing its temperature during solar heating cycles. ICFs are the best example of this advantage because they are also nearly air tight. Mass walls are allowed to factor in this increased efficiency by requiring less insulation overall. This results in walls that typically outperform cavity walls with equal amounts of insulation.

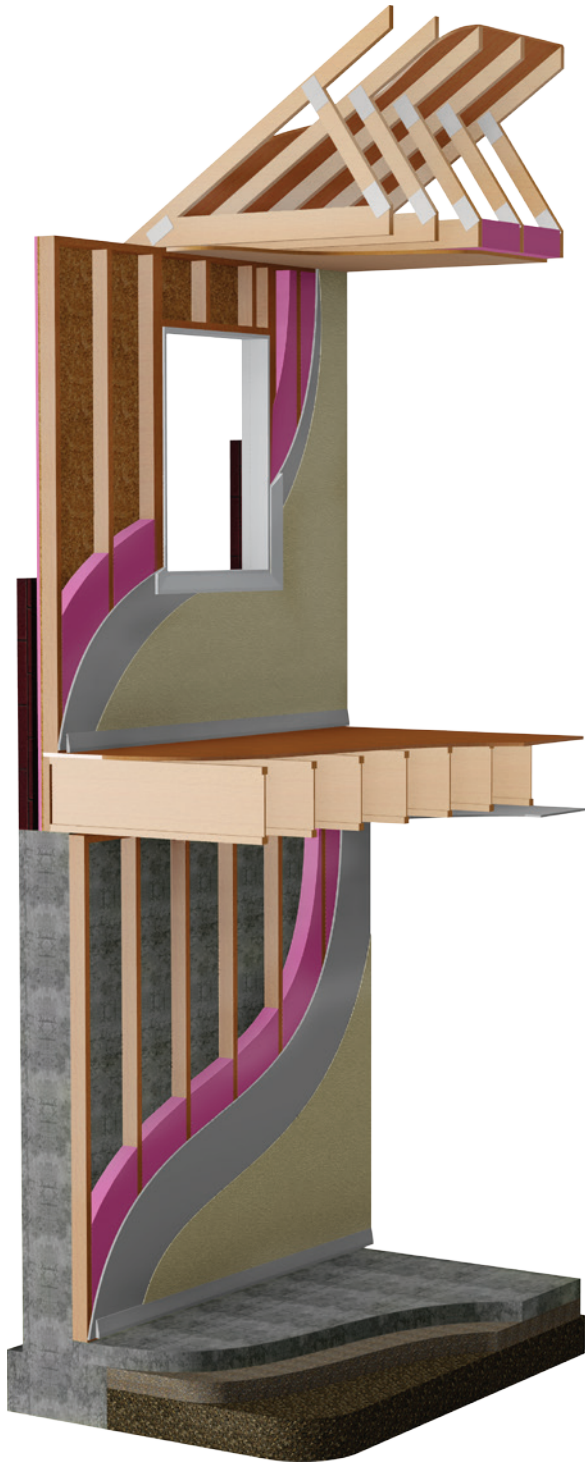
In Climate Zone 3, a wood frame wall requires an R-20 value for cavity insulation, or R13+5, indicating an R-13 cavity insulation and R-5 continuous insulation. Mass walls are required to have R-8 Continuous Insulation on either the interior or the exterior of the wall or R-13 Cavity Insulation on the interior (CMU wall with a framed cavity and wall cavity insulation). ICFs provides a combined R-22 across both panels; R-11 on both the interior and exterior of the wall. This far surpasses the code requirements. Even in Climate Zones 7 and 8, the combined R-value (R-22) exceeds the R-19 requirement.

### PENETRATIONS

Some concerns have been raised about the loss of R-Value at penetrations and areas where the foam has been removed. Often spray foam is used to refill any voids after installing wiring, plumbing, or other wall penetrations. Electrical boxes and other permanent cut-outs are generally such small areas compared to the entire area of the wall they do not affect overall insulation values.

ICFs are nearly air tight, and other than penetrations which should be completely sealed with proper exterior and interior finishes, there is no air movement through the wall itself. Note window and door openings do not apply as they will allow some air movement into and out of a structure.

ICFs meet the requirements of Climate Zones 1-3 and Zone 4 except marine, with a single panel. Concerns over a small area of foam removed in the interior for installation of mechanical, electrical, or plumbing systems is of little consequence. If a significant amount of foam is removed it should be replaced either with spray foam or foam sheathing



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and then rasped flush with the rest of the wall before the final finish is applied.

The 2015 IECC, Table R402.4.1.1 lists installation requirements dealing with common items found on many if not all homes. Electrical/Phone Boxes on Exterior Walls do not have any additional requirements given for insulation.

The air barrier requirement is fully met by the solid concrete core of the ICF as well as EPS foam is a Class 2 Vapor Retarder, and likewise requires no additional air barrier.

## REFERENCES

Commercial Climate Zone Map

[premiumaccess.iccsafe.org/document/code/244/3947967](http://premiumaccess.iccsafe.org/document/code/244/3947967)

Commercial Insulation Requirements (Table R402.1.3)

[premiumaccess.iccsafe.org/document/code/244/3950882](http://premiumaccess.iccsafe.org/document/code/244/3950882)

Residential Climate Zone Map

[premiumaccess.iccsafe.org/document/code/244/3958139](http://premiumaccess.iccsafe.org/document/code/244/3958139)

Residential Insulation Requirements (Table R402.1.2)

[premiumaccess.iccsafe.org/document/code/244/3965918](http://premiumaccess.iccsafe.org/document/code/244/3965918)