DO CONCRETE MASONRY WALLS REQUIRE CONTINUOUS INSULATION? NO!

Simplifying Concrete Masonry

Today's high-performance building market is driven by increasingly stringent energy codes and a growing demand for greater building efficiency, sustainability, and affordability — meaning understanding continuous insulation and where to get for answers is more critical than ever.

IN THIS SIMPLIFYING MASONRY SERIES, WE'LL ADDRESS WHAT CODE ALLOWS AND WHY USING CMU IN WALLS CAN ACHIEVE HIGH ENERGY PERFORMANCE RATINGS BETTER THAN WOOD FRAMED WALLS.

International Energy Conservation Code (IECC) allows five different methods to show compliance with minimum building efficiency requirements. It's important to note that four of five don't require continuous insulation.

- ✔ ASHRAE 90.1
- ✔ COMCheck (trade-off or system performance)
- ✔ Whole building energy analysis
- ✔ Prescriptive U-Factor method
- ✔ Prescriptive R-Factor method

While the prescriptive method is the easiest to apply it is often confused as the only path to compliance. The prescriptive method has a multitude of specific requirements which can be limited and **increase total building costs.**

BUILDING ENVELOPE BENEFITS WITH CMU:

- **Lower Insulation Costs –** IECC permits CMU to have less insulation than frame wall systems to meet the energy requirements.
- **Decreases Thermal Mass Loads –** CMU can require 18% – 70% less insulation than similar frame buildings while still providing an equivalent level of energy efficient performance.
- **Higher Thermal Mass Factor –** high-density material with high thermal mass increases its ability to absorb and store heat energy. While less dense materials like wood have low thermal mass.
- **Reduces Building Temperature Fluctuations –** absorbing the warmth during the day and release it steadily during the night prevents energy loss and could lower heating and cooling bills by 50%.
- **Design Flexibility –** obtain extremely high-performance ratings from mass wall systems with the ability to adjust the size, shape and density of the material.

CLIMATE ZONE	1		2		3		4 EXCEPT MARINE		5 AND MARINE 4	
	All other	Group R	All other	Group R	All other	Group R	All other	Group R	All other	Group R
Roofs										
Insulation entirely above deck	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-20ci	R-25ci	R-25ci	R-25ci	R-25ci
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-38	R-49
Walls, Above Grade										
Mass[2]	R-5.7ci	R-5.7ci	R-5.7ci	R-7.6ci	R-7.6ci	R-9.5ci	R-9.5ci	R-11.4ci	R-11.4ci	R-13.3ci
Metal building	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-6.5ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci	R-13 + R-13ci
Metal framed	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci	R-13 + R-7.5ci
Wood framed and other	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-3.8ci or R-20	R-13 + R-7.5ci or R-20 + R-3.8ci

Prescriptive requirements for building envelope elements are listed in table format, with requirements listed separately for each element and climate zone, as shown in Table 1 below. This table is often the sources of the misconception that these elements must have continuous insulation in order to comply

Notes: ci=continuous insulation. R-5.7ci is allowed to be substituted with CMU that complies with ASTM C90, ungrouted or partially grouted at a spacing no less than 32 in. o.c. vertically and 48 in. o.c. horizontally, with ungrouted cores filled with insulation.

Using this prescriptive table, the requirements for individual elements are independent of each other. IECC Table C402.2 is also misinterpreted as not permitting insulation within the hollow cells of a single wythe concrete masonry assembly for energy compliance. Although CMU with integral insulation cannot comply under the Table C402.2 requirement for continuous insulation because the webs of the masonry units interrupt the insulation, the IECC provides an additional prescriptive option in Table C402.1.2 based on the overall U-Factor of the wall assembly. (The U-Factor is the inverse of R-Value, i.e. U = 1/R and R = 1/U).

For compliance with IECC Table C402.1.2(below), the U-Factor of the wall assembly must meet the prescriptive U-Factor requirement instead of the insulation meeting the prescriptive R-Value of IECC Table C402.2. For example, the mass wall U-Factor requirement for Chicago (Climate Zone 5) is U0.078, which corresponds to an R-Value of 12.8. As long as the wall as a whole (not the insulation alone) meets the U0.078/R12.8 requirement, the wall complies with the IECC in Climate Zone 5. Although not as flexible as the trade-off or whole building analysis compliance options, the prescriptive U-Factor option of the IECC often provides additional flexibility over the prescriptive R-Value approach.

Climate Zone:	1	2	3	4	5	6	7	8
U-Factor requirement	0.142	0.142	0.110	0.104	0.078	0.078	0.061	0.061
Corresponding overall wall R-Value	7.0	7.0	9.1	9.6	12.8	12.8	16.4	16.4

ADDITIONAL REFERENCES:

International Energy Conservation Code (IECC), International Code Council, www.iccsafe.org. NCMA TEK 6-1C, "R-Values of Multi-Wythe Concrete Masonry Walls", National Concrete Masonry Association, www.ncma.org. NCMA TEK 6-2C, "R-Values and U-Factors of Single Wythe Concrete Masonry Walls", National Concrete Masonry Association, www.ncma.org. NCMA FAQ 13-14, 2014, "What options are available for complying with the International Energy Conservation Code?", National Concrete Masonry Association, www.ncma.org. "Thermal Catalog of Concrete Masonry Assemblies, 2nd Edition", National Concrete Masonry Association, www.ncma.org.