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DO CONCRETE MASONRY WALLS REQUIRE CONTINUOUS INSULATION?

No. This is a common misconception. Although one particular compliance path (2021 IECC Table C402.1.3) requires insulation to be continuous, there are several other options in the International Energy Conservation Code (IECC) that do not require continuous insulation. The following discussion references specific sections and requirements of the 2021 IECC[1], but applies equally to other editions of the IECC as well. The IECC allows three different methods to be used to show compliance with minimum energy efficiency requirements: prescriptive, trade-off or system performance, and total building energy analysis. A project need only comply with one of these methods, not all three.

Of the 3 compliance methods, the prescriptive method is the easiest to apply and perhaps the best recognized. 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. Table 1 shows that in Chicago (Climate Zone 5), a flat roofed building (other than Group R) must have R30 continuous insulation and masonry walls (listed as 'Mass') must have R11.4 continuous insulation to comply with this table. This table is often the source of the misconception that these elements must have continuous insulation in order to comply with the IECC.

Using this prescriptive table, the requirements for individual elements are independent of each other. In Climate Zone 5, if the mass wall has R14 insulation and the

roof has R20, the building cannot comply prescriptively based on R-values. Hence, although using the prescriptive tables is very straightforward, it is also very limiting in terms of design flexibility.

IECC Table C402.1.3 is also misinterpreted as not permitting insulation within the hollow cells of a single-wythe concrete masonry assembly for energy compliance. Although concrete masonry with integral insulation cannot comply under the Table C402.1.3 requirement for continuous insulation because the webs of the masonry units interrupt the insulation, the IECC provides an additional prescriptive option in Table C402.1.4 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 C402.1.4, 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 C402.1.3. 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 requirements, 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.

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Table 1—Excerpt from 2021 IECC Table C402.1.3 Showing Prescriptive Wall and Roof R-Value Requirements¹

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-25ci	R-25ci	R-25ci	R-25ci	R-25ci	R-30ci	R-30ci	R-30ci	R-30ci
Attic and other	R-38	R-38	R-38	R-38	R-38	R-38	R-49	R-49	R-49	R-49
WALLS, ABOVE GRADE										
Mass ²	R-5.7ci ²	R-5.7ci ²	R-5.7ci ²	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-14ci	R-13 + R-14ci	R-13 + R-14ci
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-10ci
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-7.5CI OR R-20	R-13 + R-7.5ci or R-20 + R-3.8ci
Notes:										
1. ci = continuous insulation										
2. R-5.7ci is allowed to be substituted with concrete block walls complying 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.										

Table 2—Excerpt from 2021 IECC Table C402.1.4 Showing Prescriptive Mass Wall U-Factor Requirements by Climate Zone for Buildings Other than Group R

CLIMATE ZONE	1	2	3	4	5	6	7	8
U-Factor requirement	0.151	0.151	0.123	0.104	0.090	0.080	0.071	0.037
Corresponding overall wall R-Value	6.6	6.6	8.1	9.6	11.1	12.5	14.3	27

Additional discussion on thermal efficiency and code compliance options for concrete masonry construction is provided in References 2-5.

REFERENCES

1. 2021 International Energy Conservation Code (IECC), International Code Council, www.iccsafe.org.
2. “R-Values of Multi-Wythe Concrete Masonry Walls”, CMHA TEK 06-01C, Concrete Masonry & Hardscapes Association, masonryandhardscapes.org, 2013.
3. “R-Values and U-Factors of Single Wythe Concrete Masonry Walls”, CMHA TEK 06-02C, Concrete Masonry & Hardscapes Association, masonryandhardscapes.org, 2013.
4. “Thermal Catalog of Concrete Masonry Assemblies, 2nd Edition”, CMHA CMU-MAN-004-12, Concrete Masonry & Hardscapes Association, masonryandhardscapes.org, 2012.
5. “What options are available for complying with the International Energy Conservation Code?”, CMHA CMU-FAQ-009-14, Concrete Masonry & Hardscapes Association, masonryandhardscapes.org, 2014.

ABOUT CMHA

The Concrete Masonry & Hardscapes Association (CMHA) represents a unification of the Interlocking Concrete Pavement Institute (ICPI) and National Concrete Masonry Association (NCMA). CMHA is a trade association representing US and Canadian producers and suppliers in the concrete masonry and hardscape industry, as well as contractors of interlocking concrete pavement and segmental retaining walls. CMHA is the authority for segmental concrete products and systems, which are the best value and preferred choice for resilient pavement, structures, and living spaces. CMHA is dedicated to the advancement of these building systems through research, promotion, education, and the development of manufacturing guides, design codes and resources, testing standards, and construction practices.

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