CONTRACTOR'S ALERT – 2020.06

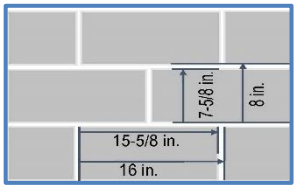
TOLERANCE COMPATIBILITY - CMU

Concrete Masonry Units (CMU) are produced by casting a cementitious material into a mold for a very short time to form the unit. Units are then cured and possibly modified for texture and appearance, such as a split-face or ground face unit. Even though the Quality Control is excellent, there are necessary manufacturing tolerances to allow for slight imperfections. ASTM C90, *Standard Specification for Loadbearing Concrete Masonry Units*, lists dimensional tolerances along with certain property requirements.

ASTM C90
6. Permissible Variation in Dimension
6.1 Standard Units—For standard units, no overall dimension (width, height, and length) shall differ by more than ± 1/8 in (3.2 mm) from the specified dimension.

Since structural masonry is intended to be installed on an 8 inch module with typical mortar joints of 3/8 inch, the specified dimensions of a (nominal) 8 inch wide by 8 inch tall masonry unit would be (WxHxL) 7-5/8 x 7-5/8 x 15-5/8 inches. Manufacturing tolerances allow for any of the actual dimensions to be 1/8 inch more or less than the specified dimension.

It is no coincidence that (2016) TMS 602 *Specification for Masonry Structures*, contains installation tolerances that complement manufacturing tolerances. This approach permits masonry walls to remain on an 8-inch module as depicted in the figure. For example, if the masonry unit is 1/16 in. longer than specified (15-11/16 in.), then ideally the mortar joint would be 1/16 in. short (5/16 in.). This approach also applies to height and width (applicable to wall corners and intersections).



(2016) TMS 602, *Specification for Masonry Structures*
3.3 F. *Site tolerances*—Erect masonry within the following tolerances from the specified dimensions.
1. Dimensional tolerances
b. Mortar joint thickness
bed joints between masonry courses .....± 1/8 in. (3.2 mm)
head joints.....- ¼ in. (6.4 mm), + 3/8 in. (9.5 mm)

Occasionally, project specifications will adjust the tolerances listed in TMS 602 without regard to the manufacturing tolerances. Perhaps the specification writer thinks that arbitrarily reducing allowable tolerances will improve quality, but it has the opposite result. If the mason cannot fully adjust the mortar joint dimension, then the height and/or length can easily deviate from the 8-inch module resulting in the story height or top of wall reaching the wrong elevation or end-of-wall dimension not matching the intended grid line.

The important thing to remember is that any masonry wall height or length, or opening location for a door or window, will always be 3/8 inch (1 mortar joint) less than a perfect 8-inch module. When dimensioning for a perfect 8-inch module, the mason can make the adjustment in the field of the wall by slightly adjusting the vertical and/or horizontal mortar joints to reach the intended elevation or dimension with full masonry units.

Specialty units may require different mortar joint dimensions and tolerances. Slump (Adobe textured) units may be manufactured so that a ½ inch bed joint is normal since the head joint will vary significantly due to the end slump. Split face units will have a random depth dimension due to the variation in unit split.


Slump Block


Split Face Block

6. Permissible Variation in Dimension (ASTM C90)
6.2.2 For split-faced units, all non-split overall dimensions shall differ by not more than ±1⁄8 in. (3.2 mm) from the specified standard dimensions.
6.2.3 For slump units, no overall height dimension shall differ by more than ±1⁄8 in. (3.2 mm) from the specified standard dimension.

Note: In order to lay masonry units in straight, level courses, bricklayers 'lay to a line' on one side of the wall. This method allows one side of the wall to follow a two-dimensional plane, where the opposite side of the wall may have slight, but permitted, dimensional irregularities. If the designer has concern on either side of the masonry wall, this should be communicated to the masonry contractor prior to the start of construction.

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