

Slab Thickness Tolerances

Position Statement #9

Most project specifications, including ACI 301-99, “Specifications for Structural Concrete,” reference ACI 117-90, “Standard Specifications for Tolerances for Concrete Construction and Materials.” This document allows the same thickness tolerance—+3/8 in. (+10 mm) and -1/4 in. (-6 mm)—for both slabs on ground and elevated slabs 12 in. (300 mm) thick or less. These tolerances give owners, engineers, and architects false expectations because no measured and reported slabs have ever met these criteria.

An article by Armand Gustaferro (“Are Thickness Tolerances for Concrete Floors on Grade Realistic?” *Concrete Construction*, April 1989) gives slab thickness data from seven projects representing more than 2000 cores. On these projects, the standard deviation for measured slab-on-ground thickness varied from 0.47 to 0.90 in. (11.9 to 22.8 mm). In a later interview, Eldon Tipping, a floor consultant for Structural Services, Inc., and Armand Gustaferro indicate that the ACI 117-90 tolerances for slabs-on-ground thickness are “not reasonable” and “ridiculous” (“Slab Thickness Tolerances: Are They Realistic?” *Concrete Construction*, June 2000).

“Specified Tolerances versus As-Built Data” (*Concrete International*, May 2002) reports that the average standard deviation for elevated slab thickness is 0.46 in. (11.6 mm) based on 3454 measurements. In developing the load and resistance factors for ACI 318, “Building Code Requirements for Structural Concrete,” the slab thickness standard deviation was considered to be 0.47 in. A standard deviation of about 1/2 in. (13 mm) means that about 68% of a floor will

have a thickness within $\pm 1/2$ in. of the average thickness. And if the average thickness is exactly equal to the specified thickness, about 30% of the floor will be thinner than the -1/4 in. (-6 mm) tolerance allows. If a slab-on-ground specification requires a *minimum* thickness, the contractor will need to place a slab with an average thickness about 1-1/2 in. (38 mm) (three standard deviation units) greater than the minimum. This will significantly increase the owner’s cost.

Slab thickness variations don’t usually lead to strength problems. For slabs on ground, a decrease in slab thickness is often compensated for by higher in-place concrete strengths and subgrade *k*-values than those used in the design. For elevated slabs, the use of reinforcement, and the higher than designed-for concrete strength offset strength concerns related to slightly thinner slabs.

Based on current practice, ASCC contractors provide a slab thickness that meets ACI 117-90 tolerances for 50% or more of the slab area. If slab thickness tolerances are critical, contact your ASCC concrete contractor for a discussion of techniques and pricing that can meet your expectations.

If you have any questions, contact your ASCC concrete contractor or the ASCC Technical Hotline at (800) 331-0668.



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