

Slab Thickness Tolerances

ASCC Position Statement #9

Most project specifications, including ACI 301-10, “Specifications for Structural Concrete,” reference ACI 117-10, “Standard Specifications for Tolerances for Concrete Construction and Materials.” ACI 117-10 has tolerances for both suspended slabs and slabs-on-ground. For suspended slabs, the thickness tolerance is minus 1/4 in.

“Specified Tolerances versus As-Built Data” (*Concrete International*, May 2002) reports that the average standard deviation for elevated slab thickness is 0.46 in., based on 3454 measurements. In developing the load and resistance factors for ACI 318, “Building Code Requirements for Structural Concrete,” the slab thickness tolerance was considered to be 0.47 in. A standard deviation of about 1/2 in. 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 minus-1/4-tolerance allowed. Small out-of-tolerance slab thickness variations don’t usually lead to strength problems for elevated slabs because the resistance factors used in strength design anticipate such variations. Further, the reinforcement used in elevated slabs and the higher than designed-for concrete strength can offset strength concerns related to slightly thinner slabs.

For slabs-on-ground, Section 4.5.4 of ACI 117-10 requires tolerances as follow:

Average of all samples -3/8 in.
Individual sample -3/4 in.

Where the minimum number of slab thickness samples, when taken, shall be four (4) for each 5000 ft² or part thereof. Section 4.5.4.5 states that when computing the average of all samples, samples with a thickness more than 3/4 in. above the specified thickness shall be assumed to have a thickness 3/4 in. more than the specified thickness.

Gustafarro showed that these tolerances don’t match up with as-built data (“Are Thickness Tolerances for Concrete Floors on Grade Realistic?” *Concrete Construction*, April 1989).

He reported floor thicknesses from seven projects represented by more than 2000 cores. Three of the floors had a 4-in. design thickness and the other four were designed for 6 in. thickness. The distributions for these seven floors showed that the average thicknesses were in agreement with the minus 3/8-in. tolerance in ACI 117-10, so that tolerance is appropriate. However, a large number of measured thicknesses were less than the minimum thickness (design minus 3/4 in.) allowed by ACI 117-10. A graphical representation of the thickness distributions based on Gustafarro’s data is found on page 62 of *Tolerances for Cast-in-Place Concrete Buildings*, by Suprenant and Malisch, published by ASCC in 2009. This graph clearly shows the discrepancy between ACI specified minimum thicknesses and as-built thicknesses.

Many slabs that don’t meet ACI 117-10 thickness tolerance requirements still perform well. This can be explained by assumption of conservative *k*-values for the subgrade support, concrete strengths exceeding the design values, and conservative design safety values. Based on current practices and an analysis of as-built data, designers are cautioned that specifying a nominal 4 in. slab thickness means the average will be about 3-5/8 in. with the lowest value at 2 1/2 in. If this is not acceptable, the specified slab thickness should be increased.

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

Notes: This Position Statement supersedes ASCC Position Statement No. 9 published in Concrete International in September 2003.

Tolerances for Cast-in-Place Concrete Buildings, by Suprenant and Malisch, can be purchased at www.asconline.org.



2025 S. Brentwood Blvd., Suite 105 ■ St. Louis, MO 63144
Telephone: 314-962-0210 ■ Website: www.asconline.org
Toll Free: 866-788-2722 ■ E-mail: ascc@asconline.org