Division 3 versus Division 9 Floor Flatness Tolerances

Position Statement #6

AMERICAN SOCIETY OF CONCRETE CONTRACTORS
Enhancing the Capabilities of Those Who Build with Concrete

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Division 3 specifications for concrete floor flatness typically include F_F requirements. The specifications also require that floor tolerance measurements be taken in accordance with ASTM E 1155-96, "Standard Test Method for Determining F_F Floor Flatness and F_L Floor Levelness Numbers." Thus, the F-number measurements for meeting Division 3 requirements incorporate the following:

- Point elevations measured at regular 12 in. (300 mm) intervals along each line;
- Measurement lines distributed uniformly across the test section;
- Minimum number of readings required for statistical approach;
- Measurement lines not within 2 ft (0.6 m) of any slab boundary, construction joint, isolation joint, block-out, penetration, or other similar discontinuity; and
- Flatness measured within 72 hrs. of concrete placement.

Division 9 specifications for concrete floors to receive a floor covering typically provide floor flatness requirements in terms of an allowable gap under an unleveled straightedge. There is no ASTM procedure for this measurement. Straightedge measurements for Division 9 incorporate the following:

- Continuous measurement at any gap under the straightedge;
- Indefinite number of straightedge locations on the floor;
- No minimum or maximum number of readings;
- Measurements typically made with the straightedge crossing construction joints or column block-outs, and near penetrations; and
- Measurements made just prior to floor covering installation, which can be from 4 to 18 months after concrete placement.

Division 3 and 9 floor flatness tolerances are obviously not compatible. There is only a rough correlation between F_F numbers and the gap under a straightedge. F-number measurements don't include flatness variations indicated by straightedges placed across construction joints and column block-outs. And floor flatness changes with time (due to curling) make it impossible to predict the flatness when floor coverings are installed, based on F_F measurements made soon after concrete placement.

Despite this incompatibility of tolerance-measuring methods, some specifiers believe concrete contractors should be responsible for taking corrective action when Division 9 floor flatness requirements aren't met. To further complicate this issue, concrete contractors seldom receive Division 9 specification requirements when bidding. The floor covering often isn't chosen—and Division 9 isn't written—until after the concrete contract is signed, and sometimes until after the concrete is placed.

Concrete contractors are responsible for meeting the requirements of Division 3 specifications for floor flatness. To reduce the effect of curling on floor flatness, ASCC contractors suggest that the engineer consider using 0.5% reinforcing steel (both ways) and placed within the top half of the slab. Whether reinforcing is used or not, ASCC, NWFA, FCICA, IMI, BAC, TCAA and NTCA suggest that the owner provide a bid allowance, established by the A/E and based on the floor covering requirements, for any necessary grinding and patching to close the gap between Division 3 tolerances and Division 9 tolerances. Providing an allowance enables the owner to compare floor covering bids on an equal basis. Any unused allowance money is returned to the owner.

If you have any questions, contact your ASCC concrete contractor, the ASCC Technical Hotline at (800) 331-0668, the NWFA at (800) 422-4556, FCICA at (248) 661-5015, IMI at (410) 280-1305, BAC at (202) 783-3788, TCAA at (816) 868-9300 or the NTCA at (601) 939-2071.

Update: Section 4.8.6 of ACI 117-10, "Specifications for Tolerances for Concrete Construction and Materials and Commentary," contains minimum sampling requirements for testing surface flatness evaluated by using a straightedge. ASTM E1155-96 (2008) supersedes ASTM E1155-96 but contains the same requirements.

(08-11 update replaces 04-09 revision)

This ASCC authored position statement has appeared in *Concrete International*, a publication of the American Concrete Institute, for information only. It is not an ACI consensus document, nor has it been endorsed by ACI.

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03-31-2022