



# A Laser Scanning Interlaboratory Study on Selected ACI 117 Tolerance Compliance Verification

*Keywords: Laser scan, concrete tolerance, precision*

## **Highlights**

- The study is backed up by the American Concrete Institute (ACI) and the American Society of Concrete Contractors (ASCC)
- Study follows ASTM E691-23 standard and data/results will be published in Concrete International Magazine with credits to the participants and the associated companies
- An inclusive event to exchange experiences on laser scanning for selected ACI tolerances with industry leaders and improve your workflow

## **Objective**

- **Previous Study:** In 2018, there was a laser scan study to determine target coordinates from scanner organized by the American Society of Concrete Contractors (ASCC). Eight parties participated in that study at a job site in Walnut Creek, CA, USA. One of the conclusions based on all the data collected from that study was that it is appropriate to use a laser scanner for specification compliance when measuring a vertical tolerance of 5/8 in. or more and a horizontal tolerance of 1 in. or more. With the 3 best participants' data, the vertical tolerance to be verified with the scanner can be as low as about 1/4 in., and horizontal tolerance can be as low as 1/2 in. following best practices.
- **Objective 1:** Revisit a similar procedure after six years with the hardware advancing and collect data for a precision statement following ASTM E691-23
- **Objective 2:** Data from this study will be applied to a few selected ACI 117-10 tolerances (listed below) with the consideration of the human interpretation of the data (i.e. when an operator checks a slab edge with a 1/2 in. chamfer from the point cloud, he or she might not be able to extract the actual edge of the slab when there is not a set-up position close to the edge, thus the result will lead to a false reading. Another example is that some operators use sophisticated software to generate “best fit” linework to idealize the edge that does not reflect the true edge, etc.)

## **Participants**

10 qualified candidates (single or multiple individuals from each party) from different geographic regions

## **Location**

A job site in the San Francisco Bay Area, CA, USA with recently poured elevated slab and vertical concrete elements.

## **Time**

Two days on a weekend (Saturday and Sunday) in July, 2024

## **Selected applicable ACI 117-10 (reapproved 2015) tolerances**

- 4.1 Deviation from Plumb
- 4.2 Deviation from location
- 4.4 Deviation from elevation

## **ASTM standard**

ASTM E691-23 Standard Practice for Conducting an Interlaboratory Study to Determine the Precision of a Test Method

## **Study Outline (test day)**

**Step 1:** Mark the test areas (10 points on slab edges, bottom of columns/walls, top of columns/walls, openings, example as shown on the photo below);

**Step 2:** Provide four survey controls (grid intersection points and elevations) surveyed from a total station;

**Step 3:** A total station will be used as baseline measurements on these 10 spots;

**Step 4:** A CAD file will be provided as the design location and elevation (shared the same coordinate as the survey controls provided on-site) for participants to decide the concrete element deviation from the design (plumb, location, or elevation) on the 10 test spots;

**Step 5:** All 10 participants will be given 1-2 hours to capture the required testing areas and controls (reproducibility requirement);

**Step 6:** Each participant will perform scans twice on the same testing areas (time slot will be Saturday morning, Saturday afternoon, Sunday morning, and Sunday afternoon) (repeatability minimum requirement);

**Step 7:** All participants are required to report results on an Excel data sheet template (to be developed) within 10 days after the study.

