

## ***Can Contractors Meet These Requirements?***

### **ACI 347.3R-13 “Guide to Formed Concrete Surfaces”**

At the 2012 Annual Conference, a number of ASCC members heard a presentation by Rolf Spahr, principal author of ACI 347, “Guide to Formed Concrete Surfaces,” which was being balloted by the ACI Formwork Committee. The presentation was followed by a roundtable discussion at which many of the contractors in attendance expressed concerns about the Guide content. ACI 347.3R-13 was published in January 2014, but it appears that most of the ASCC members’ concerns and comments were not addressed.

The most troubling aspect of this document is that it is not based on U.S. concrete construction practices. As the ACI document states “The basic procedures for classification are defined using tables from recommendations of the German Concrete Association”. One of the requests from ASCC was to delay publication of this document until data from concrete construction in the U.S. could be collected and analyzed. Unfortunately, this did not happen. Thus, it is unclear whether the Guide recommendations are appropriate for, or can be met by, concrete contractors in the U.S.

There are other troubling aspects of this document, including four complex tables that describe up to four quality levels for surfaces assigned to four different surface finish categories.

Table 3.1a – Description of formed concrete surface categories (CSC1, CSC2, CSC3, CSC4)

Table 3.1b – Description of visible effects on as-cast formed surfaces

- Texture, panel-joint (T1, T2, T3, T4)
- Color uniformity (CU1, CU2, CU3)
- Surface irregularities (SI1, SI2, SI3, SI4)
- Construction and facing joints (CJ1, CJ2, CJ3, CJ4)

Table 3.1c – Form-facing categories (FC1, FC2, FC3)

Table 3.1d – Concrete surface void ratio (SVR) on as-cast formed surfaces (SVR1, SVR2, SVR3, SVR4)

Confused yet? To assess the impact of these quality requirements being included in a specification, consider how your typical formed concrete surface would compare with what ACI 347 considers to be “normal requirements”, a CSC2 quality level. A CSC2 is described as “concrete surfaces where visual appearance is of moderate importance.” Here are the requirements:

- Texture (T2)
  - ✓ Acceptable gaps in adjacent formwork components  $\leq 1/2$  in.
  - ✓ Acceptable depth of mortar loss  $\leq 3/8$  in.
  - ✓ Acceptable surface offsets of panel joints up to  $1/2$  in. (ACI 117-10, Section 4.8.3, Class C).
  - ✓ Allowable projections  $1/2$  in. from adjacent surface.
  - ✓ Form-facing material examples: Class BBOES plywood, MDO plywood.
  - ✓ Imprints of modular panel frames are acceptable.
- Surface void ratio (SVR2 or SVR1)
  - Void area of pores of surface occurring within a 24 x 24 in square**
    - ✓ Void area not to exceed 1.2 percent of test area; not more than  $6.9 \text{ in}^2$  of void
    - ✓ Maximum void size of  $3/4$  in.
    - ✓ Exclude voids less than or equal to  $3/32$  in.
    - ✓ Color uniformity (CU1)
    - ✓ Light and dark color variations are acceptable.
    - ✓ Color variations between adjacent placements and layer lines are acceptable.
    - ✓ Rust and dirt stains are acceptable.
- Surface irregularities (SI2)

- ✓ ACI 117-10, Section 4.8.3, Class C-Surface.
  - ✓ Maximum gradual deviation over a distance of 5 ft (152 cm), or abrupt deviation is 1/2 in.
  - ✓ Limit deflection of formwork structure to  $L/360$ .
  - ✓ ACI 117-10, Section 4.8.2 does not apply.
- Construction and facing joint (CJ2)
    - ✓ Acceptable offset of surfaces between two adjacent placements  $\leq 1/2$  in. (13 mm).
    - ✓ The use of chamfer strips or similar reveals are recommended at construction joints.
  - Form-facing category (FC1)
    - ✓ Holes, greater than 3/16 in. – plug or disk covers are acceptable
    - ✓ Holes, 3/16 in or less – acceptable
    - ✓ Vibrator burns – acceptable
    - ✓ Scratches/dents – acceptable
    - ✓ Concrete remnants – acceptable
    - ✓ Swelling of facing at fastener or tie holes – acceptable
    - ✓ Patching -- acceptable

ACI 347.3R indicates that these are the normal requirements that standard formwork and placement practices should yield without any special effort and at an average relative cost. How does your “normal” formed concrete surface compare to these requirements?

ASCC is proposing a research effort with the Construction Industry Management (CIM) schools to assess the impact of this ACI Guide and the measurement of formed concrete surfaces to determine the appropriateness of the German Concrete Association recommendations to U.S. concrete construction practices. Let us know what you think and if you would like to participate.