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**Guide to Formed Concrete
Surfaces**

Reported by ACI Committee 347



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Guide to Formed Concrete Surfaces

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The primary goal of the construction team is to produce as-cast concrete surfaces that meet project specifications and expectations. Although various descriptions, interpretations, and methods exist to achieve an as-cast concrete surface, no unified definitions of different concrete surfaces exist.

This document defines four quality levels of formed concrete surfaces and provides methods to achieve and evaluate them. These quality levels are identified by three surface finish categories: 1) form facing; 2) concrete surface void ratio; and 3) characteristics of form-facing materials. The basic procedures for classification are defined using tables derived from recommendations of the German Concrete Association (DBV) (Merkblatt Sichtbeton Deutscher Beton- und Bautechnik-Verein e.V. 2004).

This guide assists the project owner, design team, contractor, formwork and concrete suppliers, and all other parties in reaching a more specific understanding of how to produce a more clearly defined as-cast concrete surface. All other parties should understand the procedures, processes, and costs for producing defined surfaces of formed concrete. The guide also discusses all phases of construction relating to concrete surfaces from planning, description of work, and construction through acceptance of a concrete surface.

This guide can be used by both specifier (architect/licensed design professional) and contractor as a supplemental tool for defining, specifying, and evaluating concrete surfaces and offers guidance to the development of concrete surface specifications and expecta-

tions. Please refer to ACI 308.1P-12 for information regarding post-construction treatment of formed concrete surfaces.

This guide also describes an entire process for comprehensive use, including the creation of a concrete surface team and its defined roles and responsibilities in the construction process.

Keywords: color uniformity; exposed to view; form facing; job-built formwork; makeup; offsets; panelized formwork; reference area; surface finish; surface void ratio; texture; tolerances.

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Reference to this document shall not be made in contract documents. If items found in this document are desired by the Architect/Engineer to be a part of the contract documents, they shall be restated in mandatory language for incorporation by the Architect/Engineer.

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CHAPTER 1—INTRODUCTION

The scope of this guide is to solve a lack of uniformity in the appearance criteria of concrete surfaces, provide definitions for the various levels of formed concrete surfaces, and give objective evaluations of them.

Although there are various reference sources for constructing and evaluating concrete surfaces, none exist that offer a comprehensive guidance and understanding to its production and evaluation. Several ACI and ASCC documents, however, do provide partial guidance:

1) ACI 347-04 provides terms for classes of formed concrete surfaces, discusses irregularities in formed surfaces, and gives general guidance for the use of formwork for concrete;

2) ACI 309R-05 provides terms about visible effects of consolidation on formed concrete surfaces, why they occur, and how to avoid them;

3) ACI 303R-12 discusses architectural concrete, applications, and details of production including formwork, release agents, repair, and economics;

4) ACI 301-10 specifies concrete surfaces (Section 5.3.3.3);

5) The ASCC Education and Training Committee (1999) guide uses samples of concrete surfaces to illustrate appearance expectations.

These references, which exclude uniform appearance criteria or a process for evaluating formed concrete surfaces, make it difficult to achieve a wide range of expectations.

The ultimate authority on a project is the contract document. The contract document is a guide for the:

- a) Designer to specify the desired surface finish;
- b) Owner to understand what the final product will approximately look like;
- c) Contractor to select facing materials, concrete mixture, release agents, and construction methods to achieve the specified surface finish.

CHAPTER 2—DEFINITIONS

ACI provides a comprehensive list of definitions through an online resource, “ACI Concrete Terminology,” <http://www.concrete.org/Tools/ConcreteTerminology.aspx>. Definitions provided herein complement that source.

area exposed to view—portion of structure that can be observed by the public during normal use.

blushing—slight pink or rose color on concrete surface.

flatness—deviation of a surface from a plane.

form facing—the form material that comes in direct contact with the concrete.

gap—space between abutting edges of the form-facing materials measured on the plane of the form surface.

mockup—a sample of a component of the building as specified in the contract documents that is used to establish the expected surface finish.

reference area—a significantly large area of a completed concrete surface serving as a basis of comparison for the acceptance of a surface category or value at a specified location of a given project.

surface void ratio—the ratio of the total surface void area to the total concrete surface area after stripping with no subsequent surface treatment.

CHAPTER 3—FORMED CONCRETE SURFACE DESCRIPTIONS**3.1—General**

Tables 3.1a through 3.1d define the various measurable properties pertaining to formed concrete surface texture, surface void ratio, color, flatness, and joints. Four concrete surface categories (CSCs) are defined in Table 3.1a. CSC1 has the lowest classifications and CSC4 the highest for a finished surface. The individual constituents used to define each CSC are further described in Table 3.1b. The classification for form-facing materials is described in Table 3.1c. The surface void ratio is defined and categorized according to net pore area in Table 3.1d.

Concrete surface levels are specified for individual parts of the structure to reflect the owner’s needs, desires, and budget. Possible examples include:

- a) Basement walls: CSC1;
- b) Industrial structures: CSC1 or CSC2;
- c) Electrical and mechanical rooms: CSC1 or CSC2;
- d) Stairwells: CSC1, CSC2, or CSC3;
- e) Commercial building exteriors: CSC3;
- f) High-end commercial building exteriors: CSC3 or CSC4;
- g) Religious structures or museums: CSC3 or CSC4;
- h) Monumental or landmark structures: CSC4.

These examples are only provided to illustrate the various classifications of concrete surfaces and are not recommendations of the committee.

Concrete surface finish schedules should be designated as part of the contract documents in drawings or by designations on exterior/interior views of the structure.