

ACI 301—Specifications for Structural Concrete for Buildings

A reference standard good for both specifier and contractor

ACI 301 is a reference standard which the engineer or architect may make applicable to any building project by citing it in the project specifications. He supplements it as needed by designating or specifying individual project requirements.

How ACI 301 is used

As its introduction explains, ACI 301 is incorporated into project specifications by reference. For example, the contract requirements might read: “Concrete work shall conform to all requirements of ACI 301-72 (Revised 1981), Specifications for Structural Concrete for Buildings.” If some part of ACI 301 is not appropriate, the specifier can state any desired exceptions.

So that the standard is not confused with an earlier standard or an earlier revision, the year the standard was adopted and the last year it was revised must be included when referencing it. ACI 301 was adopted as a standard by the American Concrete Institute in May 1972 and most recently revised in May 1981.

Supplementary requirements briefly added

OTHER ACI REFERENCE SPECIFICATIONS

ACI 301 is a specification for structural concrete in buildings. It focuses on basic cast-in-place work and does not deal with specialty concretes. Some other reference specifications available from ACI include the following:

- 503.1-79 Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-component Epoxy Adhesive
- 503.2-79 Bonding Plastic Concrete to Hardened Concrete with a Multi-component Epoxy Adhesive
- 503.3-79 Producing a Skid-resistant Surface on Concrete by the Use of a Multi-component Epoxy System
- 503.4-79 Repairing Concrete with Epoxy Mortars
- 336.1-79 End Bearing Drilled Piers
- 346-81 Cast-in-place Nonreinforced Concrete Pipe
- 506.2-77 Materials, Proportioning, and Application of Shotcrete
- 531.1-76 Concrete Masonry Construction

For more information, contact the American Concrete Institute, Box 19150, Detroit, Michigan 48219.

ACI 301 is not complete in itself, though. The requirements that vary from project to project must be specified. A list of such requirements is presented at the beginning of ACI 301. Two of these requirements must be specified for all projects:

- the strength of the concrete for each portion of the structure
- the types and grades of reinforcing steel

Other supplemental requirements are designated only when they apply. Some examples are: the test age of concrete if other than 28 days; the admixtures that are required or prohibited; the types and strengths of prestressing steel; and when reshoring is required or permitted.

It takes the specifier only about three pages to state the mandatory supplementary requirements—concrete strength and type of reinforcement—plus those supplementary requirements that pertain to the specific project. The list of supplementary items at the beginning of ACI 301 serves as a checklist; each item is keyed to section numbers in the text.

Notes help contractor

At the end of each chapter are notes pointing out any items which require approval of the architect-engineer or other specifying authority. Items such as construction joints not shown on the drawings, proprietary patching agents, or heavy-duty toppings are among those called out. It is virtually impossible to overlook these sensitive points. They can be found by quick inspection at the end of the chapters instead of having to scan the entire document.

What ACI 301 covers

This 36-page reference standard is divided into 18 chapters (see box). Each chapter is further divided into sections and subsections. Decimal numbering makes for easy reference and shows the relationship of topics.

Why reference ACI 301?

The requirements of ACI 301 are standard specifications, developed through a consensus process and approved by a group of industry professionals. If followed correctly, these specifications will produce quality construction. With repeated use, they become familiar, not frightening. The contractor comes to know what the

SUBJECTS COVERED IN AACI 301 CHAPTERS

1–GENERAL: Defines certain words used in ACI 301 and lists ASTM and other standards cited in ACI 301.

2–MATERIALS FOR CONCRETE: References ASTM standards for materials and tells how materials should be stored.

3–PROPORTIONING: Three methods based on (1) trial mixes, (2) past field test data, and (3) a chart indicating maximum water-cement ratio, and slump are specified. Chart classifies concrete floors by use and gives minimum strength and maximum slump for each.

4–FORMWORK: Design and installation of formwork: preparation of form surfaces; removal of forms; and reshoring. Chart lists tolerances for various formed surfaces.

5–REINFORCEMENT: Concrete cover over reinforcement; overlap of wire fabric reinforcement; supporting and fastening reinforcement; and tolerances in fabrication rebar placement. ASTM specifications are referenced.

6–JOINTS AND EMBEDDED ITEMS: Location and construction of joints; methods for bonding joints; types of expansion joint filler. Requirements for waterstops and placing embedded items.

7–PRODUCTION OF CONCRETE: Requirements for batching and mixing, for producing lightweight concrete, and for adding admixtures and mix water. Cites ASTM standards for ready mixed concrete and for concrete produced by on-site volumetric batching and continuous mixing.

8–PLACING: Method of vibration, limits on placing temperature and preparation of joints for bonding. Gives requirements for truck mixers, belt conveyors, chutes, and pumping equipment.

9–REPAIR OF SURFACE DEFECTS: How to prepare the surface and mix grout and patching compound.

10–FINISHING OF FORMED SURFACES: Methods for as-cast finishes and rubbed finishes such as grout cleaned or cork floated.

11–SLABS: Construction of two-course slabs and how to do the following finishes: scratched, floated, troweled, broom or belt, dry shake, exposed aggregate, and non-slip.

12–CURING AND PROTECTION: How and how long to cure. Protective measures against wind and hot or cold temperatures.

13– ARCHITECTURAL CONCRETE: Location of joints and form ties; form deflections allowed; and the requirements for proportioning mixes, patching surfaces, and forming architectural finishes.

14–MASSIVE CONCRETE: Material, proportioning, placing, curing and protection requirements.

15–PRESTRESSED CONCRETE: Definition of prestressing terms; requirements for tendons, anchorages, couplings, sheathing, and grout. Methods for placing and protecting tendons, applying prestressing force, and grouting.

16–TESTING: Which tests must be made and how often to make them. Who makes tests, and who pays for them.

17–EVALUATION AND ACCEPTANCE OF CONCRETE: Variation allowed in concrete test strengths; use of in-place testing, especially core tests.

18–ACCEPTANCE OF STRUCTURE: Dimensional tolerance and appearance necessary. Conditions which might impair the strength of a structure.

standard says. He does not have to wade through the entire concrete specification to avoid surprises.

Referencing ACI 301 saves the specifier time in writing the project specifications. The contractor can become familiar with the standard in advance and also save time. As long as ACI 301 is not rewritten or retyped, the contractor can assume he knows the performance level required and read only the supplemental requirements and those parts he needs to review. On the other hand, if the complete standard were entered into a word processor and neatly printed out in the contract docu-

ments, the bidder would still have to reread the material closely to be certain no changes were made—by accident or intention. ACI 301 thus saves time for both the specifier and the contractor, particularly when incorporated by reference.

Copying the standard is not necessary anyway. Section 1.6 of ACI 301 requires the contractor to keep at least one copy of the *ACI Field Reference Manual, SP-15 (81)*, in his field office at all times. The field manual contains ACI 301 and other selected ACI and ASTM references. Published by the American Concrete Institute,

the manual costs \$21.50 to ACI members and \$28.50 to nonmembers. ACI also makes copies of ACI 301 suitable for binding into project specifications.

How ACI 301 relates to the ACI 318 Building Code

Unfortunately some specifiers incorporate ACI 318 by reference, instead of using ACI 301. This is not good practice. ACI 318, "Building Code Requirements for Reinforced Concrete," is written so it may be adopted by reference in a general building code. It is intended as public law, not a specification.

Though compatible and consistent with ACI 318, ACI 301 is different. While ACI 318 presents minimum requirements for public safety, ACI 301 presents above-minimum construction requirements. Following ACI 318 guarantees safe design, not good construction. Specifiers should therefore reference 301, not 318. Referencing 318 may tend to make the contractor responsible for design questions which should be handled by the architect-engineer.

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