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The New ACI 301-20


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 Portland Cement Association

1916-2016
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Discussion

- Goal of Specifications
- ACI Standards and Codes
- Defaults
- Introduction to ACI 301-20
- How to Reference ACI 301

ACI 301-20, Specifications for Concrete Construction

Goal of Specifications


- Clear
- Single interpretation
- List only mandatory requirements
- Be written so that it cannot be misunderstood



ACI 301-20, Specifications for Concrete Construction

Bad Specifications

- Confusing
- Non-Mandatory
- Too Prescriptive



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ACI 301-20, Specifications for Concrete Construction

Industry Guide Documents

ACI 201.2R-16

ACI Committee Reports, Guides, Standard Practices, and Commentaries are intended for guidance in planning, designing, executing, and inspecting construction. This document is intended for the use of individuals who are competent to evaluate the significance and limitations of its content and recommendations and who will accept responsibility for the application of the information it contains. ACI disclaims any and all responsibility for the stated principles. The Institute shall not be liable for any loss or damage arising there from.

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.



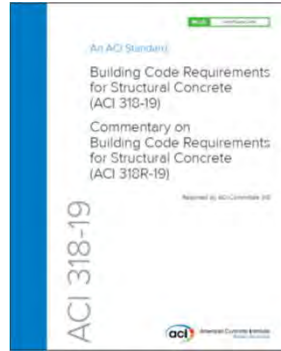
ACI 301-20, Specifications for Concrete Construction

Do You Know Your Defaults?

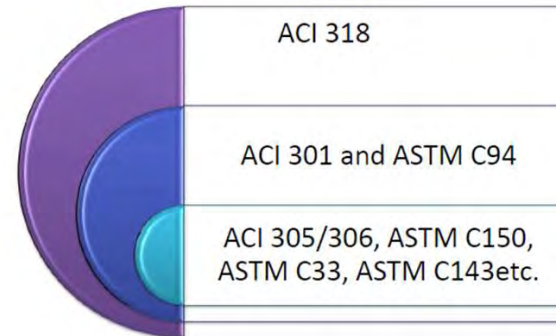
US Standards:

- ACI 318- *Building Code Requirements for Structural Concrete*
- ACI 301- *Standard Specification for Structural Concrete*
- ACI 311.6 - *Specification for Ready Mixed Concrete Testing Services*
- ACI 117- *Specifications for Tolerances for Concrete Construction*
- ASTM C94- *Standard Specification for Ready-Mixed Concrete*

Written to Comply with ACI 318-19, CH 26



Codes and Standards Umbrella



Evolution of ACI 301



Quest for Perfection

- ACI 301-xx



Consensus



301 Family



Introducing the New ACI 301-20



MasterFormat

- Reference specification that is written to Construction Specifications Institute (CSI) Three Part Format:
 - General
 - Products
 - Execution



Legal Document

Body of the Specification (53 pages)

- The Body of the Specification
- Gives direction to the Contractor

Checklists

Direction to the Specifier (Back pages 53-69)

- Mandatory Requirements Checklist
- Optional Requirements Checklist

Main Body

- Section 1—General requirements
- Section 2—Formwork and formwork accessories
- Section 3—Reinforcement and reinforcement supports
- Section 4—Concrete mixtures
- Section 5—Handling, placing, and constructing

Optional Sections- When Applicable

- Section 6—Architectural concrete
- Section 7—Lightweight concrete
- Section 8—Mass concrete
- Section 9—Post-tensioned concrete
- Section 10—Shrinkage-compensating concrete
for interior slabs
- Section 11—Industrial floor slabs
- Section 12—Tilt-up construction
- Section 13—Precast structural concrete
- Section 14—Precast architectural concrete

Mandatory Requirements Checklist

F4. The Mandatory Requirements Checklist indicates Work requirements regarding specific qualities, procedures, materials, and performance criteria that are not defined in ACI Specification 301-20.

The Specifier must include these requirements in the Project Specification.

Mandatory Requirements Checklist

- **Trigger language- 'specified in Contract Documents'**
 - Items requires the Specifier to take action
 - f'c*
 - aggregate size*
 - tolerance of mesh reinforcement*
 - Designate specialty sections scope
 - ie: What portions of project are architectural concrete , mass concrete, or post-tensioned.*

Optional Requirements Checklist

F5. The Optional Requirements Checklist identifies Specifier choices and alternatives. The Checklist identifies the Sections, Parts, and Articles of the ACI Reference Specification 301-20 and the action required or available to the Specifier.

The Specifier should review each of the items in the Checklist and make adjustments to the needs of a particular project by including those selected alternatives as mandatory requirements in the Project Specification.



New Title- Define Scope

ACI 301-16xx

Specifications for **Structural Concrete Construction**

An ACI Standard

Reported by ACI Committee 301



Section 1- General Requirements, Definitions and Tolerances

- Scope
- Definitions
- References- ACI, ASTM, Other Industry Documents
- Testing



Definitions

- New definitions included for clarity.
- Definitions of specialty concrete applications were removed.
- A/E's must designate portions of work meeting special applications such as architectural concrete or mass concrete.



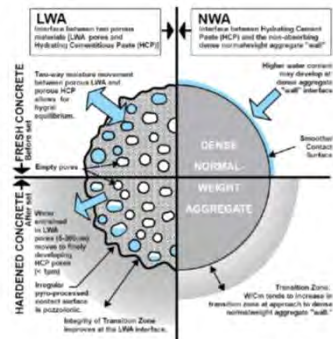
Preconstruction Conference

- Optional Checklist
- Review
 - Project Requirements
 - Acceptance Criteria
 - Responsibilities



Internal Curing

- ASTM C1761



Shotcrete

- ACI 506.2
- ACI 318-19



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Section 2- Formwork and Formwork Accessories

- Design and Construction
- Movement Joints and Waterstops
- LDE Optional or Mandated by Jurisdiction
- Tolerances- ACI 117-10



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Section 3- Reinforcement and Reinforcement Supports

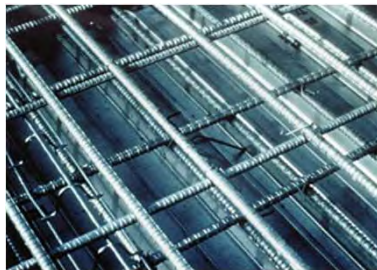
- Materials, Fabrication, and Placement
- WWR
- Tolerances- ACI 117-10



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Zinc-Coated (Galvanized) Reinforcing Bars

- 318-19 bars in accordance with ASTM A767/A767M
- Lesser thickness permitted in accordance ASTM A1094/A1094M



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Section 4- Concrete Mixtures

- Materials, Mixture Proportioning, Production, and Delivery
- Specify f'_c
- Exposure Class
- Durability Requirements



Self-Consolidating Concrete

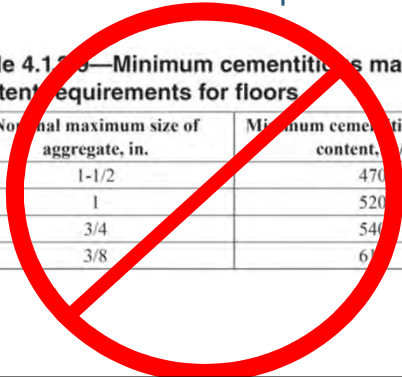
- Requirements for Slump Flow
- Passing Ability- ASTM C1621
- Static Segregation- ASTM C1610



Minimum Cementitious Requirements

Table 4.1.1.3—Minimum cementitious material content requirements for floors

Nominal maximum size of aggregate, in.	Minimum cementitious material content, lb/yd ³
1-1/2	470
1	520
3/4	540
3/8	600



Prequalification of Aggregates

- ASTM C33
- Alkali Aggregate Reactivity- ASR and ACR
 - ASTM C1293
 - ASTM C1567
 - ASTM C1260
 - ASTM C1778



New Materials

- Recycled Aggregates are permitted (ASTM C33) if documentation is provided suitable to A/E.
- Mineral Fillers conforming to ASTM C1797



Modulus of Elasticity

- Test Data
- 318-19



Durability Exposure Classifications

- Sulfate Exposure Categories
- Chloride limits

Table 4.2.2.6(b)—Requirements for Exposure Category S: sulfate exposure

Exposure class	Maximum w/c ^a	Minimum f' _c , psi	Required cementitious materials ^b —types			Calcium chloride admixture
			ASTM C150/C150M	ASTM C955/C955M	ASTM C157/C157M	
S0	NA	2500	NA	NA	NA	No restriction
S1	0.50	4000	IP ^c	Types with (HS) designation	MS	No restriction
S2	0.47	4500	V ^d	Types with (HS) designation	HS	Not permitted
S3	Option 1 0.45	4500	V plus pozzolan or slag cement ^e	Types with (HS) designation plus pozzolan or slag cement ^e	HS plus pozzolan or slag cement ^e	Not permitted
			Option 2 0.40	7000	V ^d	Types with (HS) designation

Table 4.2.2.6(b)1—Requirements for establishing suitability of cementitious materials combinations exposed to water-soluble sulfate

Exposure class	Maximum expansion when tested in accordance with ASTM C1012/C1012M, percent		
	At 6 months	At 12 months	At 18 months
S1	0.10	NA	NA
S2	0.05	0.10*	NA
S3	Option 1	NA	NA
	Option 2	0.05	0.10*

^aThe maximum w/c limit does not apply to lightweight concrete.
^bAlternative combinations of cementitious materials of those listed in this table are acceptable if tested for sulfate resistance and meeting the criteria in Table 4.2.2.6(b)1.
^cFor sulfate exposure, other types of portland cement with trisulfate aluminum (C₃A) content up to 10 percent are acceptable if the w/c does not exceed 0.46.
^dOther suitable types of cement, such as Type III or Type I, are acceptable in Exposure Classes S1 or S2 if the C₃A content is less than 6 or 7 percent, respectively.
^eThe amount of the specific source of the pozzolan or slag cement to be used shall be at least the amount determined by test or service record to improve sulfate resistance when used in concrete containing Type V cement. Alternatively, the amount of the specific source of the pozzolan or slag used shall not be less than the amount tested in accordance with ASTM C1012/C1012M and meeting the requirements of Table 4.2.2.6(b)1.
^fType V cement is used as the sole cementitious material, the optional sulfate resistance requirement of 0.040 percent maximum expansion in ASTM C1012/C1012M is applicable.

*The 12-month expansion limit applies only if the measured expansion exceeds the 6-month maximum expansion limit.

Section 5- Handling, Placing, and Constructing

- Construction Requirements for cast-in Place Concrete
- Handling, Placing, Finishing, Curing
- Repair of Surface Defects



Cold Weather

- Temperature of Massive Metallic Embedded Items ≥ 10°F
- Contact Surface Temperature ≥ 32°F



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Curing by Ponding

- Temperature of Ponding Water Must be at Least $\geq 50^{\circ}\text{F}$
- Not More than 35°F Cooler Than Surface Contact Temperature



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High Strength Concrete

- Integrate HSC with Floor Systems
- Extend at Least 2 ft Past Face of Columns and Walls
- Achieve a Monolithic Mass



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Surface Finish Requirements

- SF-2 is Default Finish
- Exposed to View
- Finish requirements updated



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Adhesive Anchor Requirements

- Horizontally or Upwardly Inclined Holes
- 21 Day Old Concrete
- Installed by ACI Certified Adhesive Anchor Installers



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Section 6- Architectural Concrete

- Mandatory Preconstruction Conference
- Mock Ups
- Technical Specialists



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Formwork for Architectural Concrete

- Structurally Rated Plywood Bonded to Sanded Hardwood Veneer
- NonPorous Finished Surface



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Section 7- Lightweight Concrete

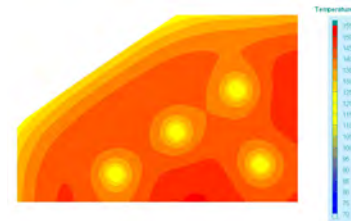
- Meet Equilibrium Density- ASTM C567
- Density Tolerances ± 4 lb/ft³



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Section 8- Mass Concrete

- Thermal Control Plan
- Maximum Temperature and Temperature Difference
- DEF



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Thermal Control Plan

- Cementitious Material Restrictions Removed
- Allows Changes to Materials Without Updates



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Section 9- Post-Tensioned Concrete

- Structural Design of PT
- LDE



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Encapsulated Tendons

- Non-Encapsulated Tendons Prohibited
 - Slabs on ground exposed to external sources of chlorides
 - Stressing pockets are subject to wetting or direct contact with soil
- Cutting of Tendons

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Section 10- Shrinkage-Compensating Concrete for Interior Slabs

- Cementitious Materials- ASTM C845
- Reinforcement Requirements
- Isolation Joints
- Expansion Test Results- ASTM C878

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Section 11- Industrial Floor Slabs

- Drying Shrinkage Test Results- ASTM C157



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Joint Fillers

- 100% Solids
- Shore A Hardness of at least 85%- ASTM D2240
- Elongation below 90%- ASTM D638



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Section 12- Tilt-up Construction

- Mock Ups
 - 2 Panels, at least 4 ft x 8 ft
- Lifting and Bracing Design Drawings



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Smooth Panel Finishes

- SPF-2 Finish Required
- Visibility of Panels
- Repair Scope and Method

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Sections 13 and 14- Precast Structural Concrete and Precast Architectural Concrete

- Aligned with PCI
- MNL-116 and MNL-117
 - Erector QC, Plant QC
 - Fabricators Qualifications



Fabricator Qualifications

- Alternative Certification Program from NPCA
 - Applicable to Structural Precast Products (non prestressed)

How to Reference ACI 301

- Work on (Project Title) shall conform to all requirements of ACI 301-20, "Specifications for Structural Concrete," published by the American Concrete Institute, Farmington Hills, Michigan, except as modified by these Contract Documents.

This is not sufficient!

Must also handle Mandatory Checklist and consider Optional Checklist within Contract Documents

Read ACI 301-20

- Avoid Confusion
- Know what's written
- Do you know your defaults?



Be Clear on Desired Outcome

Specifications should have the right “hoops” to jump through to get the performance required for service conditions.

Use ACI 301



Further Information

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