The New ACI 301-20

Presented by:
Michelle L. Wilson, FACI
Director, Concrete Knowledge
Portland Cement Association

Goal of Specifications
• Clear
• Single interpretation
• List only mandatory requirements
• Be written so that it cannot be misunderstood

Bad Specifications
• Confusing
• Non-Mandatory
• Too Prescriptive

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

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

Evolution of ACI 301

Quest for Perfection
• ACI 301-xx
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

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
Section 2-
Formwork and Formwork Accessories
• Design and Construction
• Movement Joints and Waterstops
• LDE Optional or Mandated by Jurisdiction
• Tolerances- ACI 117-10

Section 3-
Reinforcement and Reinforcement Supports
• Materials, Fabrication, and Placement
• WWR
• Tolerances- ACI 117-10

Zinc-Coated (Galvanized) Reinforcing Bars
• 318-19 bars in accordance with ASTM A767/A767M
• Lesser thickness permitted in accordance ASTM A1094/A1094M

Section 4-
Concrete Mixtures
• Materials, Mixture Proportioning, Production, and Delivery
• Specify $f'$
• Exposure Class
• Durability Requirements
Self-Consolidating Concrete

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

Minimum Cementitious Requirements

<table>
<thead>
<tr>
<th>Nominal maximum size of aggregate, in.</th>
<th>Minimum cementitious material content, lb/ft³</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1/2</td>
<td>100</td>
</tr>
<tr>
<td>1</td>
<td>100</td>
</tr>
<tr>
<td>3/4</td>
<td>100</td>
</tr>
<tr>
<td>3/8</td>
<td>100</td>
</tr>
</tbody>
</table>

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

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
Curing by Ponding
- Temperature of Ponding Water Must be at Least ≥ 50°F
- Not More than 35°F Cooler Than Surface Contact Temperature

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

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

Adhesive Anchor Requirements
- Horizontally or Upwardly Inclined Holes
- 21 Day Old Concrete
- Installed by ACI Certified Adhesive Anchor Installers
Section 6- Architectural Concrete

- Mandatory Preconstruction Conference
- Mock Ups
- Technical Specialists

Formwork for Architectural Concrete

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

Section 7- Lightweight Concrete

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

Section 8- Mass Concrete

- Thermal Control Plan
- Maximum Temperature and Temperature Difference
- DEF
Thermal Control Plan
• Cementitious Material Restrictions Removed
• Allows Changes to Materials Without Updates

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

Section 9- Post-Tensioned Concrete
• Structural Design of PT
• LDE

Section 10- Shrinkage-Compensating Concrete for Interior Slabs
• Cementitious Materials- ASTM C845
• Reinforcement Requirements
• Isolation Joints
• Expansion Test Results- ASTM C878
Section 11- Industrial Floor Slabs
• Drying Shrinkage Test Results- ASTM C157

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

Section 12- Tilt-up Construction
• Mock Ups
  • 2 Panels, at least 4 ft x 8 ft
  • Lifting and Bracing Design Drawings

Smooth Panel Finishes
• SPF-2 Finish Required
• Visibility of Panels
• Repair Scope and Method
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

Michelle L. Wilson
Director, Concrete Knowledge
mwilson@cement.org
www.cement.org