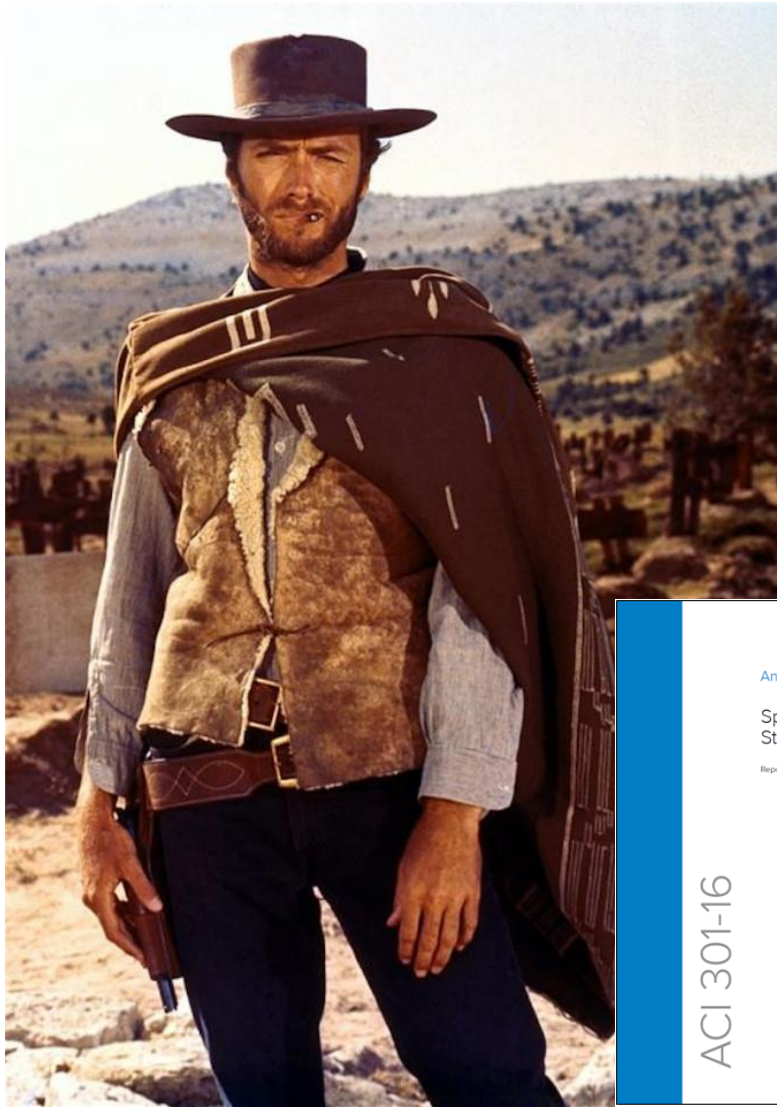




# Concrete Specifications: The Good, The Bad, and The Ugly



**Presented by:**

Michelle L. Wilson, FACI  
Director, Concrete Technology  
**Portland Cement Association**



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# Ward

- Met in 1999
- Mentor
- Nap time
- Favorite Curmudgeon





# CSI Guiding Principles for Specification Language

## The Four Cs

- **Clear**
- **Correct**
- **Concise**
- **Complete**



# Two more needed Cs

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# CSI Guiding Principles for Specification Language

- Clear
- Correct
- Concise
- Complete
- **Consistent**
- **Coordinated**



# Purpose of Specifications

- **Informs the contractor what needs to be done to construct a structure that will meet the needs of the owner**
- **Does not tell the contractor how to construct the structure unless you WANT them to do it**



# Do you know your defaults?

- 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*



# Ward's Goals

- Remove Subjective Terms
- Question Limits/Tolerances
- Use Mandatory Language





# Eliminating subjective terms

Word	301-16	301-10	301-99	301-96	301-89
Any	26	42	53	58	71
Coordinate	3	5	1	1	1
Excessive	4	10	6	4	4
Immediately	6	23	15	15	18
Minimum	52	84	68	58	42
Uniform	13	19	16	15	22
Total	104	183	159	151	158



# The Good

## ACI 301-10 surface finishes

- **SF-1.0, 2.0, and 3.0 replaced smooth-form and rough-form finishes**
- Objectivity replaces subjectivity
- Measurements, not opinions, determine any needed surface repairs
- Fewer disputes about surface features



# The “Bad”: ACI 301-16

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

**architectural concrete**—concrete that is typically exposed to view, is designated as architectural concrete in Contract Documents, and therefore requires care in selection of the concrete materials, forming, placing, and finishing to obtain the desired architectural appearance.

**5.2.1.6 *Surface repair materials***—Unless otherwise specified, use repair mortar to repair surface defects. For concrete exposed to view, repair mortar shall match adjacent concrete color.



# The UGLY- non-ACI Specification

## PART 1 GENERAL

### 1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

#### ACI INTERNATIONAL (ACI)

ACI/MCP-1	(2010) Manual of Concrete Practice Part 1
ACI/MCP-2	(2010) Manual of Concrete Practice Part 2
ACI/MCP-3	(2010) Manual of Concrete Practice Part 3
ACI/MCP-4	(2010) Manual of Concrete Practice Part 4

### 1.4 MODIFICATION OF REFERENCES

Accomplish work in accordance with ACI publications except as modified herein. Consider the advisory or recommended provisions to be mandatory. Interpret reference to the "Building Official," the "Structural Engineer," and the "Architect/Engineer" to mean the Contracting Officer.



# Improving Specifications

- Many good provisions in ACI specifications
- We seek progress, not perfection
- Need to guard against provisions that are:
  - Not achievable
  - Not enforceable
  - Out of date
  - Ambiguous



# Some of Ward's Contributions to 301

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## 301-10

**11.3.5** *Finishing slab surface*—Unless otherwise specified, comply with **5.3.4**. Finishing shall be **properly timed** to **project conditions**.

Water shall not be added to slab surface during finishing. When required, apply surface hardener according to manufacturer's recommendation.



## Comment by Ward:

11.3.5 The following statement is vague and unenforceable:

Finishing shall be properly timed to project conditions.

Suggestion: Delete it or describe how finishing must be properly timed to project conditions.





## 301-16

**11.3.5** *Finishing slab surface*—Unless otherwise specified, comply with **5.3.4.2(c)** and **5.3.6.2** to provide a hard-troweled finish. Water shall not be added to slab surface during finishing. If specified, apply surface hardener according to manufacturer’s recommendation.



# 301-16 to TAC

## 5.3.2.4 *Depositing*—

...

5.3.2.4.h If underwater placement is required, place concrete by an acceptable method. Deposit fresh concrete so concrete enters the mass of previously placed concrete and not in **immediate** contact with the water.



## Comment by Ward:

5.3.2.4(h) Delete the word “immediate.” One meaning is “having no space intervening” but the more common meaning is “instant” and that can cause confusion.



## 301-16

**5.3.2.4(h)** If underwater placement is required, place concrete by an acceptable method. Deposit fresh concrete so concrete enters the mass of previously placed concrete and **not in contact** with the water.



# 301-10

## *5.3.4.2.e Dry-shake finish*

...Float-finish the concrete surface and make initial application of dry material at approximately 2/3 of manufacturer's recommended application rate by a method that ensures **even coverage without segregation**.

... Begin final floating and finishing **immediately** after dry-shake application. After selected material is embedded by the two floatings, complete operation with a broomed, floated, or troweled finish, as specified in Contract Documents.



## Comment by Ward:

“even coverage without segregation” is another vague phrase, similar to “uniform coverage” that is not measureable and is unenforceable. The word “immediately” is not appropriate for this application because it means instantly, and that isn’t going to happen when both floating and finishing are stated.



## 301-16

**5.3.4.2(e) *Dry-shake finish***—If specified, blend metallic or mineral aggregate with portland cement in the proportions recommended by the aggregate manufacturer. Finishing operations shall not seal the surface before the end of bleeding to minimize potential of delamination or blistering. Float-finish concrete surface and **make initial application of dry material by mechanical spreader or by broadcasting with shovels.** **Begin final floating after final dry-shake application.** Following floating, provide a hard-troweled finish. Alternatively, if specified in Contract Documents, use bagged, premixed material applied in accordance with manufacturer’s recommendations.



## 301-10

**5.3.2.5 Consolidating**—Unless otherwise specified, consolidate concrete by vibration. Consolidate concrete around reinforcement, embedded items and into corners of forms to eliminate honeycombing or planes of weakness due to air voids and stone pockets. Unless otherwise specified, use the largest and most powerful internal vibrators to consolidate the concrete. Use immersion-type vibrators with nonmetallic heads when consolidating concrete around epoxy-coated reinforcement. Workers shall be experienced in the use of vibrators. Do not use vibrators to move concrete within the forms. Spacing of immersion vibrator insertions shall not exceed 1-1/2 times the vibrator's radius of action in the concrete being consolidated.





## Comment by Ward:

Too prescriptive. What is intent? Vibrators will move concrete in forms.



## 301-16

**5.3.2.5 Consolidating**—Unless otherwise specified, consolidate concrete by vibration. Consolidate concrete around reinforcement, embedded items, and into corners of forms. Use immersion-type vibrators with nonmetallic heads for consolidating concrete around epoxy-coated or zinc and epoxy dual-coated reinforcing bars. **Do not use vibrators to move concrete in a manner that will result in segregation.** Spacing of immersion vibrator insertions shall not exceed 1-1/2 times the vibrator's radius of action in concrete being consolidated.



## More to come...

- Temperature Limits of reinforcement and curing water
- Exposed to View
- Matching surface appearance
- Tolerances of WWR
- Preconstruction Conferences



# **In Summary...**

# **the Goal of a Good Specification**

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## Clear on Desired Outcome

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



## States the Obvious

- **Know what's written.**

**Ex:**

- **Curing Condition**
- **Thermal Control**
- **Performance Testing**





# Cautions Requirements that Bind Contractors Hands

- Means and Methods
- Materials Types, Limits



# Default vs. Optional Requirements



**There is more than one way to get the job done.**





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# Questions and Further Information

***Michelle L. Wilson, FACI***  
***Director, Concrete Technology***  
***Portland Cement Association***

**[www.cement.org](http://www.cement.org)**

**[mwilson@cement.org](mailto:mwilson@cement.org)**



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