Overview of ACI 308R
Guide to External Curing of Concrete

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Chair, ACI 308 – Curing Concrete
What I plan to cover today

- Curing documents overview
- Did the Guide to Curing Concrete need updated?
- What changed?
- What’s next for the Guide?
Curing Specification

• ACI 308.1-11 (metric version is 308.1M-11)
• Reference specification
• Provides requirements for various ways to cure concrete elements
• Applies to external curing only (no IC)
More on the Specification

• Written in mandatory language (‘shall’ is used)
• Uses standard 3-part specification format
• Do not reference if referencing ACI 301
• Contains three checklists which must be used
  o Mandatory Requirements
  o Optional Requirements
  o Submittals
• Covers cast-in-place concrete
Curing Guide

• Current is ACI 308R-01 (Reapproved 2008)
• Provides guidance on curing practices, procedures, materials and monitoring methods
• Updated version in final edits – complete this year!
More on the Guide

• No mandatory language (‘should’ is used)
• Use it to learn more about curing concrete
• Not intended to be directly referenced in project specifications – Don’t do it!
• Committee is responding to final TAC comments for updated version – should be done soon
Report on Internal Curing

• Current version is ACI (308-213)R-13
• Provides an overview and guidance on using lightweight aggregate to internally cure concrete
• Technology is becoming more popular
When should I use what?

- Only reference the specification in your project specifications!
- Guide is for learning more about curing and provides the state-of-the-art on the subject
- Report on Internal Curing covers topic in lots of detail
- Do you need information on curing or need to tell contractor what needs done? This decides which document.
But why update?

• Fundamentally required so we can incorporate new:
  o Curing technologies
  o Research
  o Construction types

• ACI rules require it to maintain its relevancy

• Correct previous errors and omissions

• Well, they are supposed to be ‘state-of-the-art’ documents after all!
How is the Guide organized?

• Six chapters including a short one
  • Chapter 1 – Introduction
    o Discusses what curing is and when you need it
  • Chapter 2 – Definitions
    o Short chapter, document generally relies on ACI Concrete Terminology (CT-13)
  • Chapter 3 – Curing Methods and Materials
    o Discusses curing methods, when to stop them, etc
How is the Guide organized?

• Chapter 4 – Curing for Different Types of Construction
  o Pavements, buildings, bridges, mass concrete, etc

• Chapter 5 – Monitoring Curing and Curing Effectiveness
  o Evaluating environmental conditions, making sure curing is working, curing impact on concrete, etc

• Chapter 6 - References
When did we last change it?

- Last updated in 2001
- Re-approved in 2008

Re-approval was done to comply with ACI sunset rules – no real updates done
A new name!!

• Guide is now called “Guide to External Curing of Concrete”
• Changed to better reflect what the document actually deals with
• Last-minute change
• Internal curing drove the change
• Recognizes curing of concrete can be external and internal
Chapter 1 – Introduction

• Lots of additional citations to new reference material
• Directs user to new Internal Curing report (ACI (308-213)R-13) for internal curing of concrete
• Adds information on the effects of elevated curing temperatures
• Sustainability as it relates to curing is discussed
Chapter 2 – Definitions

• New chapter
• Very short
• Directs user to ACI’s Concrete Terminology on the ACI website (CT-13)
• Majority of definitions used for curing are already included in CT-13 and are not repeated in Guide
• Defines:
  o Curing-affected zone
  o Evaporativity
Chapter 3 – Methods & Materials

- Simplified scope for curing methods and materials section – better reference to Specification (ACI 308.1)
- Additional discussion on final curing measures
  - Current practices, environmental concerns, etc
- Better referencing to elevated curing temps when discussing accelerated curing
- New section and table on elevated curing temperatures with recommendations based on temperature
## New Table 3.10 – Elevated Temps

<table>
<thead>
<tr>
<th>Maximum Concrete Temperature (T)</th>
<th>Level of Prevention Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>T ≤ 158°F (70°C)</td>
<td>No prevention required</td>
</tr>
</tbody>
</table>
| 158°F (70°C) < T ≤ 185°F (85°C)  | Use one of the following approaches to minimize the risk of expansion:  
  • Use portland cement that meets the requirements of ASTM C150/C150M for Type II, IV, or Type V cement and has a fineness value ≤ 400 m²/kg  
  • Use portland cement with a 1-day mortar strength (ASTM C109/C109M) ≤ 2905 psi (20 MPa)  
  • Use the following proportions of pozzolan or slag in combination with ASTM C150/C150M Portland cement or cements meeting ASTM C595 or ASTM C1157  
    • ≥25 percent fly ash meeting the requirements of ASTM C618 for Class F fly ash  
    • ≥35 percent fly ash meeting the requirements of ASTM C618 for Class C fly ash  
    • ≥35 percent slag meeting the requirements of ASTM C989/C989M  
    • ≥5 percent silica fume (meeting ASTM C1240) in combination with at least 25 percent slag  
    • ≥10 percent metakaolin meeting ASTM C618 |
| T > 185°F (85°C)                 | The internal concrete temperature should not exceed 185°F (85°C) under any circumstances. |
Ch. 4 – Curing for Different Types of Construction

• General revisions updating for current industry practice
• New section covering moisture sensitive flooring
• Additional discussion on curing of mass concrete
  o Provide recommendations on sensors and methods to measure and reduce thermal shock
Ch. 5 – Monitoring Curing & Curing Effectiveness

• General revisions which reflect current practice and cleaner discussion

• Reference to an electronic version of the evaporation rate nomograph added
  ○ ACI now has an app for the iPhone as well!

• Added discussion on curing meters and curing compound effectiveness evaluation
Chapter 6 – References

• Updated references based on additional items in the Guide and other changes in the industry
What does the future hold?

• Several TAC comments and other new business to review for next revision
  o Debate if Internal Curing is incorporated in Guide
  o Rework organization of Introduction chapter
  o Review new technologies for possible inclusion
    • Drip-ring fans
  o Work with ACI 310 on techniques and new research to cure Decorative Concrete
  o New diagrams and guidance
    • How much to overlap sheeting?
    • Measuring diagram to use evaporation rate nomograph
Audience Participation!

• Curing Committee has discussed developing TechNotes for Curing
  - Narrowly focused, single topic guide, typically practice oriented with pictures, figures, etc

• Residential Curing?
• Other curing?
• Something else?
• Your thoughts?
Let’s wrap this thing up!

• ACI 308 has three documents currently
  o Specification for Curing Concrete
  o Guide to Curing Concrete
  o Report on Internally Cured Concrete

• Guide should be out this year!
• Internal Curing Report is published
• Guide tweaked it’s name
• Elevated curing temperature better addressed throughout document
Let’s wrap this thing up!

• Final curing discussion enhanced
• New section covering moisture sensitive flooring
• More guidance for Mass concrete
  o Sensor locations
  o Reducing thermal shock
• ACI has an iPhone app for evaporation!
• More guidance on curing meters and curing compound evaluation
• Lots of new business for next revision!