I. Call to Order and Opening Remarks  
Meeting called to order by the Chair at 10:14 am.

A. Brief summary of activities

**2018 Group 1 release**

- 2 new standards published:
  - TP 109-18 – Vibrating Kelly Ball (VKelly) Penetration in Fresh Portland Cement Concrete
  - PP 89-18 – Grinding the Ends of Cylindrical Concrete Specimens
- 4 revised standards published: T 23, T 97, PP 84, and T 359
- 2 provisional standards moved to full Standards:
  - TP 109, now T 379 – Nonlinear Impact Resonance Acoustic Spectroscopy (NIRAS) for Concrete Specimens with Damage from the Alkali–Silica Reaction (ASR)
  - TP 110 now T 380 – Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures Miniature Concrete Prism Test, MCPT)

II. Roll Call

Membership *(Attachment #1)*

Voting Members:

Member states present: TN, VA, AL, AZ, CT, DC, FL, ID, IL, KS, MD, MI, MO, MT, ME, NV, NH, NY, OH, OK, ON, PA, WA

As a reminder, there are some new guidelines in the AASHTO Information Guidelines about how to become a friend of a committee.

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<th>Brian Egan (Chair)</th>
<th>TN</th>
<th>John Staton</th>
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<td>Charles Babish (Vice-Chair)</td>
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<td>Richard Barezinsky</td>
<td>KS</td>
<td>Jose Lima</td>
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III. Approval of Technical Subcommittee Minutes
Meeting date: Midyear Webinar November 14, 2017 [Attachment #2]
Motion: MO
Second: NY
No discussion.
No opposed.

IV. Old Business
A. COMP Ballot Items
   1. Item No. 11 – Dual Ring Test Using Inner Concrete Ring (Fall 2016 Ballot)- 3 Negative votes persuasive, yet to receive revisions from original author.
      Since there has been no activity on this standard for over a year, it will be shelved until there is interest again. Vice Chair to follow-up with Author (Jason Weiss, Oregon State University).
      There has been no activity on this for over two years, so the Chair will sunset this.
   2. Item No. 13 – Make PP 65 a Full Standard (Now R-80)- some edits to Table 6 and Figure 3 are not in the printed version and are still needed. TF 16-01 – to report on significant digits.
      Different zones (1, 2, and 3) in Figure 3 were not published and separation lines in Table 6 – editorial change.
      Editorial edits (Identifying Zones 1, 2, and 3 in Figure 3 and adding lines the table 6) were made (by Brett Trautman) to make the tables easier to understand. Brett Trautman (MO) is the steward for this standard.
      ASTM C1778 update (AASHTO R 80):
      • Looking at clarifying Fig. 1
      • Working on correcting terminology for alkali content and alkali loading; making changes to the structure classification tables and clarify categories for risk
      • They are not changing their significant digits
   3. After Fall 2017 Rolling ballot, several editorial revisions were corrected prior to printing and several “non-editorial” items included in the May TS 3C ballot.

B. TS Ballots
   • TS 3C 2018 Spring Ballot
   • 3 Items were balloted, ALL passed TS ballot
### Item # Description Results Comments

1. **T 358** It was discovered that the Precision statements and the reference document for the Precision statements were incorrect. This TS ballot revises the Precision statement and identifies the correct reference document. See V. New Business, D. Correspondence on pages 7 and 8 of the Minutes.

   Affirmative: 22 of 28  
   Negative: 0 of 28  
   No Vote: 6 of 28

2. **T 380** This ballot item revises a reference in Section 2.1 and revises a mold size in section 4.1.1. See V. New Business, B. AASHTO re:source/CCRL on page 7 of Minutes.

   Affirmative: 22 of 28  
   Negative: 0 of 28  
   No Vote: 6 of 28

3. **P 89** This TS ballot makes revisions to sections 1.2, 2.1, 3.4, 4.1, 5.1, 5.2, 5.3, 6.1, 6.5, and 6.6. Revisions are in response to comments made on Rolling Ballot #1 in the fall 2017. See Item #21 of minutes page 6 of 8.

   Affirmative: 22 of 28  
   Negative: 0 of 28  
   No Vote: 6 of 28

   **PA**  
   Affirmative with comment:  
   1) The proposed revisions have not been added to the published version of PP 85-18. It is recommended to add these proposed revisions to the most current version of PP 85 before going to a SOM ballot; otherwise, there may be a lot of editorial comments.

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**Motion to move T 358, T 380, and PP89 to full COMP ballot:**

Motion: OK  
Second: MO  
No discussion.  
No opposed.

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**C. Task Force Reports**

1. **TF 16-01:** PP 65/R 80 significant digits and notes/equations for Figure 3 (FHWA – Ahlstrom, PA – Horwhat [retired], MO – Trautman)
Lines was drawn, and then equations were determined based on those lines... is there any significance to having the equations since they are based on a line that no one is totally sure how the line was drawn?

Brett will get in touch with the ASTM subcommittee and see if they have any interest in adding the equations.


It was brought the subcommittee’s attention that the precision and bias statements are referencing something completely different than surface resistivity. The TF decided to go with the original numbers from the original report.

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**V. New Business**

A. Research Proposals (John Stanton, MI, Research Liaison)
   1. Quick turnaround RPS
   2. Full NCHRP RPS-
      - FY 2019 Funded of interest to the TS 3C
      - Project 10-103, Problem D-11, *Benchmarking Accelerated Laboratory Tests for ASR to Field Performance: Consideration of Cement and Alkali Contents and Influence of SCMs*
        - Andy Naranjo (TX) is on the panel
      - Project 10-104, Problem D-13, *Evaluating Use of Unconventional Fly Ash Sources in Highway Concrete*

No research proposals submitted.

**ASR Mitigation**

The Chairs of 3a and 3c might team up together and send out a survey to the two groups and figure out what people are doing when/if they run into ASR.

Larry Sutter (Michigan Tech) suggested that we need to get a really good feel for what states are doing with ASR, and whether or not they’re using R80. If states aren’t using/following R80, why? If there are issues with R80, we should figure out what they are, and how to address the problems and improve the standard so people are actually using it.

M85 is going to full committee ballot and the changes in M85 will put a little more emphasis on R80.

B. AASHTO Technical Service Programs Items None.

C. NCHRP Issues (see attachment)

D. Correspondence, calls, meetings None.

E. Presentation by Industry/Academia
1. *National Implementation Activities and Performance Engineered Mixtures (PEM) Pooled Fund Update* by Mike Praul (Senior Concrete Engineer, FHWA) [Attachment #6]

2. *PEM (PP 84) Updates and Affiliated Standards* by Cecil Jones (Diversified Engineering Services) [Attachment #7]
   - Motion to move PP 84 to a concurrent ballot:
     - Motion: NE
     - Second: NY
     - No discussion.
     - No opposed.

   Summary of proposed changes outlined in the referenced attached presentation are:
   - removal of restrained shrinkage language, put in appendix for users applying to concrete other pavement concrete
   - edited SAM criteria
   - editorial clarifications

3. *Accelerated Determination of Potentially Deleterious Expansion of Concrete Cylinders Due to ASR* by Anol Mukhopadhyay (Texas A&M/TTI) [Attachment #8]

F. Proposed New Standards

G. Proposed New Task Forces
   - Jason Weiss proposed changes, Task Force TF 18-01 (Implementation of Changes to PP 84 (Developing Performance Engineered Concrete Pavement Mixtures), TP 119, T 365, and other PP 84 related standards)
     - changes to TP 119, Electrical Resistivity of a Concrete Cylinder Tested in a Uniaxial Resistance Test (up for reconfirmation) and T 365, Quantifying Calcium Oxychloride Amounts in Cement Pastes Exposed to Deicing Salts [Attachment #4]
   - Jason Weiss agreed to hold a webinar for TS and TF members to learn more about the proposed changes to TP 119 and T 365. A webinar will be scheduled in late summer or fall.

   Don Streeter (NY) volunteers to be the lead of the Task Force Group.
   - Other volunteers include: James Krstulovich (IL), John Staton (MI), Matt Romero (OK), Dan Miller (OH), Mike Praul (FHWA), Peter Wu (GA), Brian Hunter (NC) and Cecil Jones (DES).

H. Standards Requiring Reconfirmation
   - T 024M/T 024-15, Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
   - T 148-15, Measuring Length of Drilled Concrete Cores
   - T 178-15, Portland-Cement Content of Hardened Hydraulic-Cement Concrete
   - T 198-15, Splitting Tensile Strength of Cylindrical Concrete Specimens
   - T 277-15, Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration
• T 336-15, Coefficient of Thermal Expansion of Hydraulic Cement Concrete
• T 356-15, Determining Air Content of Hardened Portland Cement Concrete by High-Pressure Air Meter
• T 357-15, Predicting Chloride Penetration of Hydraulic Cement Concrete by the Rapid Migration Procedure
• TP 119-15, Electrical Resistivity of a Concrete Cylinder Tested in a Uniaxial Resistance Test – NY has already learned that not preparing the specimens correctly lead to some strange numbers, so preparation should be clarified. Will either be reconfirmed as is or revised with changes as recommended by TF 18-01.

I. COMP Ballot Items (including any ASTM changes/equivalencies/harmonization)
   • Will submit the three (3) TS 3C spring ballot items to COMP
   • PP 84 (concurrent)

J. Technical Subcommittee 3C – Standard Stewards – (Attachment #5)
   Since Stewards have not come forward voluntarily, Chair has decided to assign standards to the voting members of TS3c. See Attachment #5A.

VI. Open Discussion
   T22: Has there been any discussion about harmonizing with C39 about types of cylinder breaks? Chair is not aware of any harmonization efforts in this area. The Chair asked the steward (FL DOT) to look into this issue and report back to the committee at the mid-year meeting. No one is aware of any reason NOT to harmonize with the ASTM standard. Colin Lobo made the suggestion to look at the tolerance on the age of testing between T22 and C39.

VII. Adjourn at 11:56 pm.
Motion: NY
Second: VA
No discussion.
No opposed.
Technical Subcommittee 3C (TS 3C)- Hardened Concrete, Voting Members

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Technical Subcommittee 3C (TS 3C)- Hardened Concrete, Non-Voting Members

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I. Call to Order and Opening Remarks
   Call to order at 2:05pm EST

II. Roll Call (Voting Members Only)

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<td>Michael Santi</td>
<td>ID</td>
<td>NP</td>
<td>Timothy Ramirez</td>
<td>PA Present</td>
</tr>
<tr>
<td>Brian Pfeifer</td>
<td>IL</td>
<td>Present</td>
<td>Jose Lima</td>
<td>RI NP</td>
</tr>
<tr>
<td>Richard Barezinsky</td>
<td>KS</td>
<td>NP</td>
<td>Danny Lane</td>
<td>TN Present</td>
</tr>
<tr>
<td>John Grieco</td>
<td>MA</td>
<td>NP</td>
<td>Darren Hazlett</td>
<td>TX NP</td>
</tr>
<tr>
<td>Woody Hood</td>
<td>MD</td>
<td>Present</td>
<td>Kurt Williams</td>
<td>WA Present</td>
</tr>
<tr>
<td>John Staton</td>
<td>MI</td>
<td>Present</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brett Trautman</td>
<td>MO</td>
<td>Present</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

All attendees listed (compiled from email and the webinar attendance list):
Tim Ramirez (PA)
Denis Boisvert (NH)
Brett Trautman (MO)
III. Approval of Technical Section Minutes
A. Approval of Annual Meeting Minutes, Phoenix, AZ, August 9, 2017  ATTACHMENT #1
Motion to approve minutes by Oklahoma, 2nd by Pennsylvania, No Discussion, No opposing, Motion Passes and Minutes Approved

IV. Old Business
A. SOM Ballot Items
   1. Item No. 11- Dual Ring Test Using Inner Concrete Ring (Fall 2016 Ballot)- 3 Negative votes persuasive, yet to receive revisions from original Author
   Since there has been no activity on this standard for over a year, it will be shelved until there is interest again.  Vice Chair to follow-up with Author (Jason Weiss, Oregon State University)
   2. Item No. 13- make PP 65 a Full Standard (Now R-80)- some edits to Table 6 and Figure 3 are not in the printed version and are still needed.  TF 16-01 – to report on significant digits.
   Different zones (1, 2, and 3) in Figure 3 were not published and separation lines in Table 6 – editorial change.
3. Rolling Ballot #1, Fall 2017- Hardened Concrete, Items 15-23

<table>
<thead>
<tr>
<th>Item Number</th>
<th>15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>Concurrent ballot item to add new Provisional Standard (TP xxx), Vibrating Kelly Ball (VKelly) Penetration in Fresh Portland Cement Concrete. The item is currently Appendix 4 (X4) in PP 84, Developing Performance Engineered Concrete Pavement Mixtures. See p. 4, Item #8 in Appendix C, and Appendix F of the minutes.</td>
</tr>
</tbody>
</table>
| Decisions: | Affirmative: 44 of 51  
Negative: 0 of 51  
No Vote: 7 of 51 |

Comments:

**Pennsylvania DOT (Timothy L Ramirez) (tramirez@pa.gov)** Affirmative with comments:

1) In Section 2.1, shouldn't the year designation be included for T 183 since it is a withdrawn or discontinued standard? This standard was withdrawn/discontinued sometime between 1974 and 1978 as the 1974 AASHTO Published standards included AASHTO T 183-72, but the 1978 AASHTO Published standards did not include AASHTO T 183. If AASHTO T 183 is to be referenced, the year designation would be very helpful to know, so that the user knows how far back in published standards they need to look for this reference. If this reference to T 183 is just to indicate we had a similar test once upon a time (i.e., Note 1 of this standard), then perhaps remove T 183 from Section 2.1 and include T 183 as a subsection reference in Section 11 REFERENCES of this standard.

2) In Section 2.2, similar comment to previous comment, but regarding the withdrawn ASTM C360. Should it be listed as "C360-92" or listed as a subsection in Section 11 REFERENCES?

3) In Section 4.2, should "38 mm [1.5 in.]" be "37.5 mm [1.5 in.]"?

4) In Section 5.1.1.4, should specific tolerances be included for the mass/weight of the Steel Kelly ball to account for slight variations or for wear due to use? By the current specified mass/weight, some tolerance is built in due to rounding to the nearest 0.1 kg (1 lb), but is this enough?

**Missouri DOT (Dave D Ahlvers) (david.ahlvers@modot.mo.gov)** An affirmative vote with a few comments:

1) In Section 6.3, it indicates that a level surface is created. No information is provided on how this is done. Recommend adding some wording to describe how this is to be achieved.

2) In Section 8.1, recommend defining the variables used in the mentioned equation, \( D_s = R_s - R_i \).

3) In Section 8.2, recommend defining the variables used in the mentioned equation, \( D_t = R_t - R_s \).

4) In Section 9.4, recommend removing the words, "without remixing" to avoid possible confusion with Section 7.3.

*Chair/Vice Chair comments:*
**PADOT comment #1** Most recent version was 1977. Most documents do not reference the year to avoid obsolescence. Will check with AASHTO editors to help make this decision, #2) Most recent version was 1999. Most documents do not reference the year to avoid obsolescence. Will check with AASHTO editors to help make this decision, #3) Will be revised, #4) 30 ± 0.1 lb (13.61 ± 0.05 kg)

**MDOT Comment #1** Clarifying language will be added, #2) Ds will be added, Rs and Ri defined in sections 7.1.4 and 7.1.3, #3) Dt and Rt defined in sections 8.2 and 7.2.2, #4) This will be corrected.

**Proposed Editorial changes were acceptable to PA (Ramirez) and MO (Trautman)**

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot item to revise section 5.3 of T 23, Making and Curing Concrete Test Specimens in the Field, to be consistent with ASTM See p. 2, Item #1 in Appendix C, and Appendix G of the minutes.</td>
</tr>
</tbody>
</table>
| Decisions: | Affirmative: 44 of 51  
Negative: 0 of 51  
No Vote: 7 of 51 |
| Comments: | |

**Pennsylvania DOT (Timothy L Ramirez) (tramirez@pa.gov)** Editorial comment:

1) In Section 5.3, last line, suggest revising from "(greater lengths is allowed)" to "(greater lengths are allowed)".

**Oklahoma DOT (Kenny R Seward) (kseward@odot.org)** The end of the additions to 5.3 should be either (greater length is allowed) or (greater lengths are allowed), not (greater lengths is allowed).

**Missouri Department of Transportation (Dave D Ahlvers) (david.ahlvers@modot.mo.gov)** Affirmative vote with an editorial comment:1) In Section 5.3, the last sentence, it states, '(greater lengths is allowed)'. Recommend changing to, '(greater lengths are allowed)'.

*Chair/Vice Chair comments- Agree, editorial change will be made before printing*

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>17</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot item to revise section 5.3, 5.4, 6.1 and various notes in T 97, Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), to be consistent with ASTM. See p. 2, Item #2 in Appendix C, and Appendix H of the minutes.</td>
</tr>
</tbody>
</table>
| Decisions: | Affirmative: 44 of 51  
Negative: 0 of 51  
No Vote: 7 of 51 |
| Comments: | None |

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>18</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot item to revise section 10 in T 97, Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading), to include updated precision and bias statements derived after a multi-lab study completed in accordance with ASTM C670.</td>
</tr>
</tbody>
</table>
The AS TM C78 was balloted and passed with this new precision statement. The RR# xxx will be available after October 1 and will be included in the standard before publishing. See p. 2, Item #3 in Appendix C, Appendix D, and Appendix I of the minutes.

Decisions:

<table>
<thead>
<tr>
<th></th>
<th>Affirmative: 44 of 51</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>0 of 51</td>
</tr>
<tr>
<td>No Vote</td>
<td>7 of 51</td>
</tr>
</tbody>
</table>

Comments: Pennsylvania DOT (Timothy L Ramirez) (tramirez@pa.gov)

Technical comments:

1) In Table 1, the second row for 100 mm [4 in.] has a very specific modulus of rupture of 6.9 MPa [1000 psi]; whereas all the other rows include a range (e.g., 4.1 to 5.5 MPa [600 to 800 psi]), how is the user to use the second row? If they have a 100 mm [4 in.] beam depth with a modulus of rupture of somewhere between 5.5 and 6.9 MPa [800 and 1000 psi], when does the acceptable difference of 17.1% become 31.8%? Is this at 6.2 MPa [900 psi], halfway between the two rows for 100 mm [4 in.] beam depths? More guidance should be provided here due to the significant increase in acceptable percentage difference of 17.1% to 31.8%.

Editorial comment:

2) In Table 1, table footnotes should be superscript small letters, not superscript numbers. Revise Table 1 superscript "1" to superscript "a" so this reference is not confused with the numbered references at end of standard.

Chair/Vice Chair comments: Table 1 was presented as is due to the available data when determining the Precision of the test results. The author of the P&B report has provided the following explanation as to why the Precision table is as written:

We had 3 mixes with the following averages:

<table>
<thead>
<tr>
<th>Mix</th>
<th>4 by 4 by 14 in.</th>
<th>6 by 6 by 21 in.</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>986</td>
<td>935</td>
</tr>
<tr>
<td>3</td>
<td>816</td>
<td>785</td>
</tr>
<tr>
<td>4</td>
<td>609</td>
<td>580</td>
</tr>
</tbody>
</table>

So, we had 2 mixtures between 600 and 800 psi and one mixture around 1,000 psi. I would expect that the variability results obtained for mixture 2 (around 1,000 psi) would apply to mixtures above 1,000 psi but, since we didn’t have any other mixture above that value, we can’t for sure affirm that the variability is for 1,000 and above.

In appendix J of the ASTM report, I explained what the possible reasons for the multilaboratory precision of the 1,000 psi 4 by 4 in. beams was much higher.

One of the main reasons was the use of the Rainhart machine. When you look at table J.3, you see that the COV when Rainhart machine is eliminated is 8.8 % for mix 2, while for the labs using Rainhart, that number was 16.3%. As the MR decreases, the difference in COV between all other machines and Rainhart, significantly decreases. On the same appendix, I explain several contributors for the bad performance (in terms of variability) of the Rainharts: Calibration, reading accuracy, effect of size, load capacity.

We agree with the Editorial comment and will correct before printing.
Technical Explanation and Editorial change acceptable to PA(Rameriz). It is recognized that users will have some interpretation needed for test results between 800-999 psi and > 1000 psi. The full ASTM Research Report/Interlaboratory Study (ILS 1265) is available upon request.

After the webinar, the Chairman found a typographical error in TABLE 1. The coefficient of variation for the 100 mm, 4.1 to 5.5 MPa Modulus of Rupture, will be revised from 6.0 to 6.1 to properly reflect the results in the ASTM Research Report.

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>19</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot item to revise multiple sections, notes, and Appendices in PP 84, Developing Performance Engineered Concrete Pavement Mixtures. (Note- If ballot Item #1 passes and becomes a Provisional Standard, editorial changes will be made to sections 2.1, 6.8, Table 3, Appendix X4 and X6 and as needed for proper reference). See p. 3, Item #5 in Appendix C, and Appendix J of the minutes.</td>
</tr>
<tr>
<td>Decisions:</td>
<td>Affirmative: 44 of 51</td>
</tr>
<tr>
<td></td>
<td>Negative: 0 of 51</td>
</tr>
<tr>
<td></td>
<td>No Vote: 7 of 51</td>
</tr>
</tbody>
</table>

Comments: None

Future changes to PP84 discussed by Cecil Jones. It is expected to have several proposed changes for the spring 2018 Technical Section ballot.

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>20</th>
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</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot to revise T 359, Pavement Thickness by Magnetic Pulse Induction. See p. 4, Item #6 in Appendix C, and Appendix K of the minutes</td>
</tr>
<tr>
<td>Decisions:</td>
<td>Affirmative: 44 of 51</td>
</tr>
<tr>
<td></td>
<td>Negative: 0 of 51</td>
</tr>
<tr>
<td></td>
<td>No Vote: 7 of 51</td>
</tr>
</tbody>
</table>

Comments: None

<table>
<thead>
<tr>
<th>Item Number:</th>
<th>21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description:</td>
<td>SOM ballot item to add a new Provisional Practice (PP xxx), Grinding the Ends of Cylindrical Concrete Specimens. See p. 4, Item #7 in Appendix C, and Appendix L of the minutes.</td>
</tr>
<tr>
<td>Decisions:</td>
<td>Affirmative: 44 of 51</td>
</tr>
<tr>
<td></td>
<td>Negative: 0 of 51</td>
</tr>
<tr>
<td></td>
<td>No Vote: 7 of 51</td>
</tr>
</tbody>
</table>

Comments: None

Tennessee DOT (Brian K. Egan) (brian.egan@tn.gov) In 1.2 and 4.1 There should be an option for a single cylinder grinding machine. In 4., There should be wording to make sure that the grinding machine can accommodate various standard cylinder and core sizes. (i.e. 4" or 6" cylinders, 3.70" cores) In Section 5, References to R18 should be removed and the appropriate annex of R18 should be updated with this equipment specifying concrete cylinder grinder.
Suggest consideration be given to adding ASTM C 1604 Standard Test Method for Obtaining and Testing Drilled Cores of Shotcrete to this method in sections 2.2, 3.4, 6.1, 6.5.1 and 6.6?

Chair/Vice Chair comments: Agree, however these are considered “Technical changes” and need to be balloted. Will be balloted this spring.

**Item Number:** 22
**Description:** SOM ballot item to move TP 109, Nonlinear Impact Resonance Acoustic Spectroscopy (NIRAS) for Concrete Specimens with Damage from the Alkali Silica Reaction (ASR), to a full standard. See p. 6 and Appendix M of the minutes.

| Decisions: | Affirmative: 44 of 51 | Negative: 0 of 51 | No Vote: 7 of 51 |

Comments: None

**Item Number:** 23
**Description:** SOM ballot item to move TP 110, Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures (Miniature Concrete Prism Test, MCPT), to a full standard. See p. 6 and Appendix N of the minutes.

| Decisions: | Affirmative: 44 of 51 | Negative: 0 of 51 | No Vote: 7 of 51 |

Comments: None

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B. Task Force Reports
1. TF 16-01- PP 65/R 80 Significant Digits and notes/ equations for Figure 3 (FHWA (Ahlstrom), PA (Horwart), MO (Trautman))

   Haven’t had a chance to get together on this issue yet (the only outstanding issue left). Brett and Colin are going to follow up with Gina. Bob Horwart (PA) has retired. ASTM with supposedly same Significant Digit issue.

V. New Business
A. Research Proposals (Research Liaison: John Stanton (MI))
   1. 20-7 RPS
   2. Full NCHRP RPS
B. AASHTO Resource/CCRL
   1. TP 110- “Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures Miniature Concrete Prism Test, MCPT” Brian Johnson e-mail (Attachment 2)

   Section 4.1.1 states the mold sizes shall have a square cross section of 50.0 ± 0.7 mm (2.00 ± 0.03 in.), however the molds are only able in 51 mm dimensions. Believe this to be a metric soft rounding issue when the standard was first written.  **ATTACHMENT #2**

   There will be a technical section ballot to revise mold sizes (and change reference from M210 to R70).

C. NCHRP Issues
D. Correspondence, calls, meetings
   1. T 358 “Surface Resistivity Indication of Concrete’s Ability to Resist Chloride Ion Penetration”, formally TP 95.

---

Tech Section 3C
Page 7 of 8
The Precision and Bias Statements in TP 95 (published in 2011), and now T 358, reference to ASTM Research Report (RR) C-9-1004. RR C-09-1004 is for “Inter-laboratory Study to Establish Precision Statements for ASTM Standard Test Method for Determining the Chloride Permeability of Concrete”. This report is what established the P&B in ASTM C1202 and AASHTO T 277 “Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration”. The P&B values are not the same reported in RR-C-09-1004, nor could the printed values be supported anywhere. Therefore the current P&B in T 358 are determined to be incorrect.

After some researching, FDOT provided the report “Results of Round-Robin Testing for the Development of Precision Statements for the Surface Resistivity of Water Saturated Concrete (2011)” for the P&B for T358. Concerns are: the statistics for P&B may be incorrect, and the data was collected from samples that were cured in lime saturated water, and T 358, Section 8.1/Note 2 states that “moist cure in a 100% RH moist room is the preferred curing method”, and Section 5.2, notes that “lime water curing on average reduces resistivity by 10%”. Therefore if the statistics are “correct”, would the P&B be correct for moist room cured cylinders? ATTACHMENT #3

Mike is going to contact some of the people involved in this research (they are still working in the corrosion lab). Don will also join the group with looking into this issue.

This will become a Task Force (TF 17-01).

E. Presentation by Industry/Academia
F. Proposed New Standards
G. Proposed New Task Forces
H. Standards Requiring Reconfirmation
I. SOM Ballot Items (including any ASTM changes/equivalencies)
   1. PP xxx, “Grinding the Ends of Cylindrical Concrete Specimens”, revise to include reference to ASTM 1604 and single grinding machine (see Ballot #21 comments above)
   2. TP 110/ New Standard number “Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures Miniature Concrete Prism Test, MCPT”- revise section 4.1.1 mold size to 50.8 ±0.07 mm and revise reference from M 210 to R 70.

These will be sent to TS ballot.

J. Standard Stewards- Assignment of standards to State/Industry
   i. Volunteers ATTACHMENT #4

STILL in need of Volunteers

VI. Open Discussion

Referencing withdrawn/outdated/obsolete standards:

Evan Rothblatt via Brian Johnson: No need to reference the date on withdrawn/obsolete standards. Maybe the last date can be referenced in Significance and Use?
Oak: From the EC meeting in August, if there’s no date, then it’s assumed to be last published version.
Cecil: It’s assumed to be the last published date.
Tim (PA): Aren’t we replacing these standards? Include it in the references anyway so that the reader knows what the new standard is based on.

VII. Adjourn at 3:06pm EST.

T 358- Surface Resistivity Indication of Concrete’s Ability to Resist Chloride Ion Penetration

Precision History

October 2017-

- TS Chair was made aware of an apparent discrepancy in the precision statement as currently written in AASHTO T 358- Standard Method of Test for Surface Resistivity Indication of Concrete’s Ability to Resist Chloride Ion Penetration.

- Specifically, the “Precision and Bias” statement in T 358, formally TP 95, are likely incorrect and does not state the correct ASTM Research Report. TP 95 was first published in 2011 and the reference to ASTM Research Report (RR) C-9-1004 was included in the original, as it is with the current T 358.

- RR C-09-1004 is for “Inter-laboratory Study to Establish Precision Statements for ASTM Standard Test Method for Determining the Chloride Permeability of Concrete”. This report is what established the P&B in ASTM C1202 and AASHTO T 277 “Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration”.

- Mike Jackson has completed research for the Precision statements and completed 2 different reports, 1) “Results of Round Robin testing for the Development of Precision Statements for the Surface Resistivity of Water Saturated Concrete”. This was presented at AAHTO TIG and attached as “Jackson TIG Lead states Round Robin Results.pdf”. It does not appear that any data was removed based on the “hcrit and kcrit” statistical analysis required in ASTM C802 and 2) “Precision Statements for the Surface Resistivity of Water Cured Concrete Cylinders in the Laboratory” and was presented to the ASTM Journal and is also attached. In this study a statistical analysis was complete using the “hcrit and kcrit” and some lab results were discarded. Obviously the 2 reports have different P&B statements since the data is different based on the analysis, but the second report’s P&B is more in line with the ASTM C802.

- Mike provided the TF with all the raw data and statistical data. Jusarra did a separate, independent statistical analysis using software and following her interpretation of ASTM C 802.

- Jussara’s analysis was similar to Mike’s with some comments. One of the comments was that only a single brand manufacture was used. That was reviewed and commented on page 20 of the ASTM report. Another concern was the difference in the confidence level used. Jussara used 0.5% as required in ASTM C802, but Mike used 1.0% (Not being a statistician, I don’t know how much affect that has on the results/data) Also, Jussara removed all data point above, or below, the hcrit and kcrit values, whereas Mike only removed what he considered outliers. Jussara indicated that is what ASTM does, remove all points above and below the h and k crit. (ASTM C802 section 9.5 and 10.4 provides
“guidance” on what data points should be removed and not be used in the analysis. To me, it is still somewhat subjective).

Following is the comparison of the data:

<table>
<thead>
<tr>
<th></th>
<th>COV within lab</th>
<th>COV between lab</th>
<th>Precision d2s within lab</th>
<th>Precision d2s between lab</th>
</tr>
</thead>
<tbody>
<tr>
<td>28d</td>
<td>Mike</td>
<td>4.28</td>
<td>8.52</td>
<td>11.98</td>
</tr>
<tr>
<td></td>
<td>Jussara average all mixes</td>
<td>4.40</td>
<td>7.50</td>
<td>12.32</td>
</tr>
<tr>
<td></td>
<td>Jussara Best fit line (std dev vs average)</td>
<td>4.98</td>
<td>8.46</td>
<td>13.94</td>
</tr>
<tr>
<td></td>
<td>R2 of best fit</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- After reviewing all the data (avoiding “analysis paralysis” and “statistical rabbit holes”), the TF agreed to use the original statistical data provided by Mike Jackson in the “Precision Statements for the Surface Resistivity of Water Cured Concrete Cylinders in the Laboratory” report. This is what was voted on, and passed the TS Spring Ballot, Item #1.

13. **PRECISION AND BIAS**

*Precision:*

*Single-Operator Precision*—The single-operator coefficient of variation of a single test result has been found to be **4.3 percent** (Note 5). Therefore, the results of two properly conducted tests by the same operator
on concrete samples from the same batch and of the same diameter should not differ by more than 12.1% percent of their average (Note 5).

**Multilaboratory Precision**—The multilaboratory coefficient of variation of a single test result has been found to be 11.5 percent (Note 5). Therefore, results of two properly conducted tests in different laboratories on the same material should not differ by more than 32.5 percent of their average (Note 5).

**Note 5**—These numbers represent, respectively, the (1s percent) and (d2s percent) limits as described in ASTM C670. The precision statements are based on the variations in tests on twelve different concrete mixtures, each tested in triplicate in 13 laboratories. All specimens were 100-by-200-mm (4-by-8-in.) cylinders cured in a lime water bath and tested using meters manufactured by CNS Farnell Ltd. at 28, 56, and 91 days.

The percentage cited represents the (d2s percent) limit based on the value for the multilaboratory coefficient of variation.

**Bias**—The procedure of this test method for measuring the resistance of concrete to chloride ion penetration has no bias because the value of this resistance can be defined only in terms of a test method.
From: Weiss, William Jason <Jason.Weiss@oregonstate.edu>
Sent: Wednesday, June 20, 2018 11:52 AM
To: Brian Egan; 'Cecil L. Jones, PE' (Cecil.Jones@nc.rr.com)
Subject: FW: Pore Solution Standard, Pore Solution Resistivity Temperature Correction Standards, LTDSC revision
Attachments: Task 1.2a-clean.pdf; Task 1.5-wjw-edit-clean.pdf; Task 1.2c-done.pdf; Task 1.6b-wjw-rev180603.pdf; Task 1.6a-wjw-rev180603.pdf; Task 1.3r.pdf; Task 1.7-wjw-simplified.pdf

*** This is an EXTERNAL email. Please exercise caution. DO NOT open attachments or click links from unknown senders or unexpected email - STS-Security. ***

Brian

I thought these may provide a good look at the updated drafts of these documents I mentioned in the earlier email

I think they are pretty straight forward but am glad to discuss and to draft a cover memo presentation to help move this ahead

To avoid overloading anyone I am thinking it may be good for us to package these into smaller work plans

Package 1 – resistivity and formation factor
Task 1.3 – Revised TP119
Task 1.2a, c pore solution measurement and temperature corrections

Package 2 – Salt and Freeze thaw
Task 1.5 Revised 365
Task 1.6a, b Measuring pore volume and degree of saturation
Task 1.7 Measuring air void infilling rate (S2)

It may also be good to have a smaller group to work on updating the surface resistivity. I would be glad to help/lead this but will need some input from SOM members. I am thinking maybe we could set up a monthly conference call to go through the document and then the updates.

Would it help to have some sort of a short video on how these are used. We do have videos on the tests if that helps

Thanks

Jason
Brian Egan

From: Weiss, William Jason <Jason.Weiss@oregonstate.edu>
Sent: Wednesday, June 20, 2018 11:39 AM
To: Brian Egan
Cc: Cecil.Jones@nc.rr.com; 'Tanesi, Jussara CTR (FHWA)'; 'Duval, Richard (FHWA)'
Subject: AASHTO Test Method Question

Brian

I hope all is well.

I was on a phone call last week with folks from Federal Highway Administration (Jussara and Richard Duvall) discussing some standard test methods that have been written for potential use in the performance engineering mixtures and performance related specification works. Ultimately it would be expected that these would be referenced in the PP 84 document.

I believe we are nearing the completion of these documents there are clean versions it could be put forward to ballot.

There are two packages of documents (each with about three tests) that I would like to discuss with you.

The first set of documents is related to formation factual resistivity. It includes an update to TP119, a pore solution resistivity test, and a temperature correction test.

The second set of documents related to freeze-thaw and salt damage. It includes an update to TP 365, a pore volume, a degree of saturation, an a test on rate of air void filling.

There is also question on what existing specification for surface resistivity. If it may be possible to set up a small task group that I could work with to determine whether we can were to improve the existing test method. As this is not a document I have drafted I would want to make sure we work with a good cross section of users to make sure that what we are adding is clear and does not alter some other use. It is primarily around avoiding alkali leaching and improving sample conditioning. Ultimately this would be closer to the revisions for TP 119.

It would be helpful to me if we could talk about timeline to get these to you, to ballot them, to resolve these and to move ahead.

I would also like to discuss the best way to get this information to you and a best way to provide a cover memo etc that could talk how these documents work together and with PP-84.

The idea would not be that this is a long item but more that this would just provide clarity. This may be able to be shared at the August meeting for example so that they are ready for documents coming.

I am happy to give a call to discuss if there is a time that is good for you.

Thanks

Jason
Package #1

Standard Method of Test for

Electrical Resistivity of a Concrete Cylinder Tested in a Uniaxial Resistance Test

AASHTO Designation: TP 119-15 (2017)\textsuperscript{1}

Technical Section: 3c, Hardened Concrete

Release: Group 1 (April 2017), Last Revised 6/17/2018

1. SCOPE

1.1. This test method covers the determination of the electrical resistivity of concrete to provide a very rapid indication of its resistance to ionic transport (e.g., the penetration of chloride ions). This test method is applicable to types of concrete where correlations have been established between this test procedure and long-term durability performance.

Task 1.2a Standard Method of Test for

Quantifying Electrical Resistivity of Cementitious Pore Solution

1. SCOPE

1.1. This test method covers the procedure for quantitative determination of the electrical resistivity of cementitious pore solution.

Task 1.2c: Standard Practice for

Determination of Temperature Corrections for Resistivity Measurements using Activation Energy of Conduction

1. SCOPE

This test method covers the determination of activation energy of conduction to provide a parameter to be used in temperature corrections in concrete resistivity and pore solution measurements.
Task 1.5 – Revision of Standard Method of Test for

Quantifying Calcium Oxychloride Formation Potential of Cementitious Pastes Exposed to Deicing Salts

AASHTO Designation: T 365-17

Technical Section: 3c, Hardened Concrete

Release: Group 1 (April 2017)

1. SCOPE

1.1. This test method covers the procedure for quantitative determination of the formation potential for calcium oxychloride amounts formed in cement pastes exposed to chloride-based deicing salts, particularly calcium and magnesium chloride. The amount of calcium oxychloride that forms is an indicator for potential susceptibility of these mixtures to undergo damage when exposed to chloride-based deicing salts in field.

Task 1.6a - Standard Method of Test for Determining the

Total Pore Volume in Hardened Concrete Using Vacuum Saturation

1. SCOPE

1.1. This test method covers the procedure for determination of the total pore volume in hardened concrete using vacuum saturation. The values stated in SI units are to be regarded as the standard, with exception of the pressure values given in units of Torr, that can be used as standard.
Task 1.6b Standard Method of Test for Determining the 
Degree of Saturation of Hydraulic-Cement Concrete

1. SCOPE
1.1. This test method is used to determine the degree of saturation of hydraulic cement concrete by measuring the mass of the conditioned specimen, the oven dry mass and the saturated surface dry mass of the specimen.

Task 1.7 Standard Method of Test for Determining the Determining the Secondary Rate of Absorption of Water by Hydraulic-Cement Concrete

1. SCOPE
1.1. This test method is used to determine the secondary rate of absorption of water by hydraulic cement concrete. An increase in the mass of a specimen is measured. The specimen is initially conditioned by oven drying. One surface of the oven dry specimen is immersed in water and the mass of the sample is measured for 7 days.
<table>
<thead>
<tr>
<th>Designation</th>
<th>Title</th>
<th>Steward</th>
<th>DOT/Affiliate</th>
<th>Phone/e-mail</th>
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<tr>
<td>R 39-17</td>
<td>Making and Curing Concrete Test Specimens in the Laboratory</td>
<td>Moved to TS 3B- Summer</td>
<td>2017</td>
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<tr>
<td>R 72-16</td>
<td>Match Curing of Concrete Test Specimens</td>
<td>Scott George</td>
<td>Alabama DOT</td>
<td><a href="mailto:georges@dot.state.al.us">georges@dot.state.al.us</a></td>
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<tr>
<td>R 80-17</td>
<td>Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction</td>
<td>Brett Trautman</td>
<td>Missouri DOT</td>
<td>573-751-1036 <a href="mailto:Brett.Traitman@modot.mo.gov">Brett.Traitman@modot.mo.gov</a></td>
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<tr>
<td>T 22-17</td>
<td>Compressive Strength of Cylindrical Concrete Specimens</td>
<td>Tim Ruelke</td>
<td>Florida DOT</td>
<td><a href="mailto:Timothy.Ruelke@dot.state.fl.us">Timothy.Ruelke@dot.state.fl.us</a></td>
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<tr>
<td>T 24M/T 24-15</td>
<td>Obtaining and Testing Drilled Cores and Sawed Beams of Concrete</td>
<td>Timothy Ramirez</td>
<td>Pennsylvania DOT</td>
<td><a href="mailto:tramirez@pa.gov">tramirez@pa.gov</a></td>
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<tr>
<td>T 97-17</td>
<td>Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)</td>
<td>Tim Ruelke</td>
<td>Florida DOT</td>
<td><a href="mailto:Timothy.Ruelke@dot.state.fl.us">Timothy.Ruelke@dot.state.fl.us</a></td>
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<tr>
<td>T 140-97 (2016)</td>
<td>Compressive Strength of Concrete Using Portions of Beams Broken in Flexure</td>
<td>Richard Giessel</td>
<td>Alaska DOT</td>
<td><a href="mailto:richard.giessel@alaska.gov">richard.giessel@alaska.gov</a></td>
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<tr>
<td>T 148-15</td>
<td>Measuring Length of Drilled Concrete Cores</td>
<td>Mick Syslo</td>
<td>Nebraska DOT</td>
<td><a href="mailto:Mick.Syslo@nebraska.gov">Mick.Syslo@nebraska.gov</a></td>
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<tr>
<td>T 160-17</td>
<td>Length Change of Hardened Hydraulic Cement Mortar and Concrete</td>
<td>Dan Miller</td>
<td>Ohio DOT</td>
<td><a href="mailto:daniel.miller@dot.ohio.gov">daniel.miller@dot.ohio.gov</a></td>
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<tr>
<td>T 161-17</td>
<td>Resistance of Concrete to Rapid Freezing and Thawing</td>
<td>John Staton</td>
<td>Michigan DOT</td>
<td><a href="mailto:statonj@michigan.gov">statonj@michigan.gov</a></td>
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<tr>
<td>T 177-17</td>
<td>Flexural Strength of Concrete (Using Simple Beam with Center-Point Loading)</td>
<td>Paul Burch</td>
<td>Arizona DOT</td>
<td><a href="mailto:pburch@azdot.gov">pburch@azdot.gov</a></td>
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<tr>
<td>T 178-15</td>
<td>Portland-Cement Content of Hardened Hydraulic-Cement Concrete</td>
<td>Robert Lauzon</td>
<td>Connecticut DOT</td>
<td><a href="mailto:robert.lauzon@ct.gov">robert.lauzon@ct.gov</a></td>
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<tr>
<td>T 198-15</td>
<td>Splitting Tensile Strength of Cylindrical Concrete Specimens</td>
<td>Wasi Khan</td>
<td>District of Columbia DOT</td>
<td><a href="mailto:wasi.khan@dc.gov">wasi.khan@dc.gov</a></td>
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<td>Capping Cylindrical Concrete Specimens</td>
<td>Mike Santi</td>
<td>Idaho DOT</td>
<td><a href="mailto:mike.santi@itd.ida.gov">mike.santi@itd.ida.gov</a></td>
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<td>T 259-02 (2017)</td>
<td>Resistance of Concrete to Chloride Ion Penetration</td>
<td>Richard Barezinsky</td>
<td>Kansas DOT</td>
<td><a href="mailto:rick.barezinsky@ks.gov">rick.barezinsky@ks.gov</a></td>
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<td>T 260-97 (2016)</td>
<td>Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials</td>
<td>Woody Hood</td>
<td>Maryland DOT</td>
<td><a href="mailto:whood@sha.state.md.us">whood@sha.state.md.us</a></td>
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<td>Measuring Early-Age Compression Strength and Projecting Later-Age Strength</td>
<td>Oak Metcalf</td>
<td>Montana DOT</td>
<td><a href="mailto:rmetcalfe@mt.gov">rmetcalfe@mt.gov</a></td>
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<td>T 277-15</td>
<td>Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration</td>
<td>John Staton</td>
<td>Michigan DOT</td>
<td><a href="mailto:statonj@michigan.gov">statonj@michigan.gov</a></td>
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<td>T 323-03 (2016)</td>
<td>Determining the Shear Strength at the Interface of Bonded Layers of Portland Cement Concrete</td>
<td>Denis Boisvert</td>
<td>New Hampshire DOT</td>
<td><a href="mailto:Denis.Boisvert@dot.nh.gov">Denis.Boisvert@dot.nh.gov</a></td>
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<td>T 332-07 (2016)</td>
<td>Determining Chloride Ions in Concrete and Concrete Materials by Specific Ion Probe</td>
<td>Becca Lane</td>
<td>Ontario MOT</td>
<td><a href="mailto:Becca.Lane@ontario.ca">Becca.Lane@ontario.ca</a></td>
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<td>T 334-08 (2016)</td>
<td>Estimating the Cracking Tendency of Concrete</td>
<td>Dan Miller</td>
<td>Ohio DOT</td>
<td><a href="mailto:daniel.miller@dot.ohio.gov">daniel.miller@dot.ohio.gov</a></td>
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<td>T 336-15</td>
<td>Coefficient of Thermal Expansion of Hydraulic Cement Concrete</td>
<td>Brett Trautman</td>
<td>Missouri DOT</td>
<td>573-751-1036 <a href="mailto:Brett.Trautman@modot.mo.gov">Brett.Trautman@modot.mo.gov</a></td>
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<td>T 356-15</td>
<td>Determining Air Content of Hardened Portland Cement Concrete by High-Pressure Air Meter</td>
<td>Jose Lima</td>
<td>Rhode Island DOT</td>
<td><a href="mailto:jose.lima@dot.ri.gov">jose.lima@dot.ri.gov</a></td>
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<td>T 357-15</td>
<td>Predicting Chloride Penetration of Hydraulic Cement Concrete by the Rapid Migration Procedure</td>
<td>Andy Babish</td>
<td>Virgina DOT</td>
<td><a href="mailto:andy.babish@vdot.virginia.gov">andy.babish@vdot.virginia.gov</a></td>
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<td>T 358-17</td>
<td>Surface Resistivity Indication of Concrete’s Ability to Resist Chloride Ion Penetration</td>
<td>Darrin Tedford</td>
<td>Nevada DOT</td>
<td>(775) 888-7784 <a href="mailto:DTedford@dot.nv.gov">DTedford@dot.nv.gov</a></td>
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<td>T 359-16</td>
<td>Pavement Thickness by Magnetic Pulse Induction</td>
<td>Brian Egan</td>
<td>Tennessee DOT</td>
<td><a href="mailto:Brian.Egan@tn.gov">Brian.Egan@tn.gov</a></td>
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<td>T 363-17</td>
<td>Evaluating Stress Development and Cracking Potential due to Restrained Volume Change Using a Dual Ring Test</td>
<td>Darrin Tedford</td>
<td>Nevada DOT</td>
<td>(775) 888-7784 <a href="mailto:DTedford@dot.nv.gov">DTedford@dot.nv.gov</a></td>
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<td>T 364-17</td>
<td>Determination of Composite Activation Energy of Aggregates due to Alkali-Silica Reaction (Chemical Method)</td>
<td>Kurt Williams</td>
<td>Washington DOT</td>
<td><a href="mailto:willikr@wsdot.wa.gov">willikr@wsdot.wa.gov</a></td>
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<td>T 365-17</td>
<td>Quantifying Calcium Oxychloride Amounts in Cement Pastes Exposed to Deicing Salts</td>
<td>Matt Romero, Kenny Seward</td>
<td>Oklahoma DOT</td>
<td><a href="mailto:kseward@odot.org">kseward@odot.org</a></td>
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<td>T 379-18</td>
<td>Nonlinear Impact Resonance Acoustic Spectroscopy (NIRAS) for Concrete Specimens with Damage from Alkali-Silica Reaction (ASR)</td>
<td>John Grieco</td>
<td>Massachusetts DOT</td>
<td><a href="mailto:John.Grieco@dot.state.ma.us">John.Grieco@dot.state.ma.us</a></td>
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<td>T 380-18</td>
<td>Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures (Miniature Concrete Prism Test, MCPT)</td>
<td>Mick Syslo, Wally Heyen</td>
<td>Nebraska DOT</td>
<td><a href="mailto:Mick.Syslo@nebraska.gov">Mick.Syslo@nebraska.gov</a>, <a href="mailto:wally.heyen@nebraska.gov">wally.heyen@nebraska.gov</a></td>
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<td>Match Curing of Concrete Test Specimens</td>
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<td>PP 58-12</td>
<td>Static Segregation of Hardened Self-Consolidating Concrete (SCC) Cylinders</td>
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<td>PP 65-11</td>
<td>Determining the Reactivity of Concrete Aggregates and Selecting Appropriate Measures for Preventing Deleterious Expansion in New Concrete Construction</td>
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<td>TP 109-14</td>
<td>Nonlinear Impact Resonance-Acoustic Spectroscopy (NIRAS) for Concrete Specimens with Damage from Alkali-Silica Reaction (ASR)</td>
<td>Mick Syslo, Wally Heyen, Nebraska DOT</td>
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<td>TP 110-14</td>
<td>Potential Alkali Reactivity of Aggregates and Effectiveness of ASR Mitigation Measures (Miniature Concrete Prism Test, MCPT)</td>
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<td>TP 119-15</td>
<td>Electrical Resistivity of a Concrete Cylinder Tested in a Uniaxial Resistance Test</td>
<td>Donald Streeter, New York DOT</td>
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<td>PP 84-17</td>
<td>Performance Engineered Concrete Pavement Mixtures</td>
<td>Donald Streeter, New York DOT</td>
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<td>PP 89-18</td>
<td>Standard Practice for Grinding the Ends of Cylindrical Concrete Specimens</td>
<td>Michael Doran, Brian Egan, Tennessee DOT</td>
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<td>TP 129-18</td>
<td>Standard Method of Test for Vibrating Kelly Ball (VKelly) Penetramt Grinding the Ends of Cylindrical Concrete Specimens in Fresh Portland Cement Concrete</td>
<td>Brian Pfeifer, James Krstulovich, Illinois DOT</td>
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</table>
Update on Performance Engineered Mixtures (PEM)

MICHAEL F. PRAUL, PE
SENIOR CONCRETE ENGINEER
PAVEMENT MATERIALS TEAM

PEM Pooled Fund Partners

- FHWA
- State Departments of Transportation (DOTs)
- Industry (American Concrete Pavement Association, Portland Cement Association, National Ready Mixed Concrete Association, others)

Pooled Fund Participants

16 States + FHWA & Industry (July 2018)

Pooled Fund Emphasis

- Implementation
- Education and Training
- Adjustments in specifications based on field performance
- Continued development of a knowledge base relating early age properties to performances

Recent PEM Activity

- PEM TAC Meeting—Chicago, February 2018
- Presentations and industry discussions at spring meetings of NRMCA and PCA—Houston, March 2018
- Presentations and discussion at National Concrete Consortium—Coeur D'Alene, April 2018
- Shadow Testing and Open Houses: Colorado (May), Minnesota (July), Iowa (August)
- Website development
- Active projects in Wisconsin, Michigan, and New York

Looking Ahead

- PP-84-19 to AASHTO COMP Technical Section 3C
- South Dakota shadow testing (I-90), Sept 2018
- Pennsylvania shadow testing and workshops, Sept 2018
- PEM TAC meeting, Sept 2018
- Ongoing website updates
  Actively seeking states/projects for 2019 shadow testing and open houses
PEM Implementation Incentive Funds

- Available to pooled fund participating states
- $40,000 for two or more new tests in the mix design/approval process (shadow testing acceptable)
- $20,000 for one or more new tests in the acceptance process (shadow testing acceptable)
- $20,000 for requiring an “enhanced” QC Plan from the contractor
- $20,000 for requiring the use of control charts
- Report required within 4 months of construction

PEM Incentive Implementation Funds

- Five states: Categories A, B, C, and D
- One state: A, B, D
- Two states: A, B
- Six states: Currently considering/working on application
- Two states: No submittal (no concrete paving)

Kudos to Maria Masten and Minnesota!
Kudos to Don Streeter and New York!

Implementation Incentive Funding

Questions?

- Contact info
  Michael.Praul@dot.gov
  207-512-4917
Performance Engineered Mixtures – PP 84-19

AASHTO COMP Meeting
Technical Section 3c
Cincinnati, Ohio
August 8, 2018

Cecil L. Jones, PE
Diversified Engineering Services, Inc.

Acknowledgements

➢ Development Team
  • Dr. Peter Taylor, Director CP Tech Center
  • Cecil Jones, Diversified Engineering Services, Inc.
  • Dr. Jason Weiss, Oregon State University
  • Dr. Tyler Ley, Oklahoma State University
  • Dr. Tom VanDam, NCE
  • Mike Praul, FHWA
  • CP Tech Center

➢ Industry Participants/Reviewers
  • Champion States & ACPA Chapter Execs
  • ACPA National
  • PCA
  • NRMCA

PP 84 – What it is

➢ An AASHTO Provisional Standard Practice
  • Expected to have changes
  • Additional research possible
  • Ready to be used and shared
  • Definitive instructions for performing specific operations that does not produce a test result

PP 84 – What it is

➢ Target performance characteristics rather than means and methods
  • Tell the contractor what you want, not how to do it.
  • Test for properties that matter
  • Test methods must accurately predict performance

PP 84 – What it is not

• PP 84 – What it is
• PP 84 – What it is not
• What is happening now?
• Proposed changes for 2019
• What’s Next?

PEM – Delivering concrete to survive the environment

Equitable risk allocation
• Agency assumes all risk with prescriptive
• Balanced risk allocation with performance
• Contractor innovation rewarded
• Economy improvement possible
PP 84 – What it is

- Includes prescriptive and performance measures
  - Agency selects best fit
  - Multiple choices exist for most properties
- Respects agency traditions and knowledge
  - Keep existing requirements that make sense based on local knowledge and experience

PEM is a Framework that allows agencies to measure the right properties at the right time during mixture qualification, process control, and/or acceptance

What’s Happening Now?

- Shadow Testing and Open Houses
  - Colorado in May
  - Minnesota in July
  - Iowa in July/August
  - Pennsylvania TBD

- Comparative Testing with CP Tech & South Dakota planned for September

It’s all About Choices

<table>
<thead>
<tr>
<th>Property</th>
<th>Specified Test</th>
<th>Specified Value</th>
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<tbody>
<tr>
<td>Concrete Strength</td>
<td>Reducing Shrinkage</td>
<td>Increase Workability if Cracking is a Concern</td>
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<td>Durability of Hydrated Cement Paste for Freeze-Thaw Durability</td>
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<td>Transport Properties</td>
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<td>Aggregate Stability</td>
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<tr>
<td>Workability</td>
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</table>

What’s Happening Now?

- FHWA Mobile Laboratory Demonstrations
  - Shadow projects
  - Elsewhere

- Changes to the document
  - Some changes for 2019
  - Planning for 2020 underway

Proposed Changes for 2019

- Received Stakeholder feedback
  - Industry
  - National Concrete Consortium agencies
  - PEM Team discussions

- Changes predominately editorial
  - Clarified some sections

- Some technical changes
  - Restrained shrinkage
  - SAM

PP 84 – What it is not

- A one size fits all solution
- A “drop in” specification
- A specification
- Intended to overrule agency culture and traditions
- A mandate to change
Proposed Changes for 2019

- Editorial examples
  - Clarified flexibility (e.g. "other SHA approved methods", "if required by the SHA", etc.)
  - Changed calibration to correlation of flexural and compressive strengths in Table 2
  - Accepted stakeholder suggestions regarding clarity of several sections
  - Simplified and clarified some items in appendices and commentary

Proposed Changes for 2019
Cracking

- Removed restrained shrinkage
  - T 334, T 363, and Modeling (in Appendix X.1)
  - Pavements not typically restrained
  - Kept in Appendices for those interested in PEM for other structures
  - Note making reference to location of cracking tendency under restraint if interested

Proposed Changes for 2019
SAM

- SAM criteria
  - Proportioning (6.5.1.3) – Air 4% or greater and SAM equal or less than 0.02 (using TP 118)
  - Removed maximum air with SAM
  - Field Acceptance (7.1.2) – Air 4% or greater and SAM equal to or less 0.25 (using TP 118)
  - Reject concrete if SAM above 0.30

What's Next?

- Consider concurrent ballot
- Planning for 2020 revisions under discussion
- Incorporate lessons learned into revisions
- May include new/revised methods
- Move from methods in appendices to stand alone standards
- Suggestions welcomed

Thank You
Accelerated Determination of Potentially Deleterious Expansion of Concrete Cylinder Due to Alkali-Silica Reaction (Accelerated Concrete Cylinder Test, ACCT)

Anol Mukhopadhyay, PhD, PG, Research Scientist / Graduate Faculty
Kai-Wei (Victor) Liu, PhD, EIT, Assistant Transportation Researcher

Proposed AASHTO Test Method
8th August, 2018

Some of the limitations of the Current Test Methods
Proposed New Test Method
Accelerated Concrete Cylinder Test (ACCT)

- Procedure
- Data Processing and Calculation
- Results
- Differences, Benefits, and Challenges

Growing Demand for a Rapid and Reliable ASR Test Method

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<tr>
<th>Test Methods</th>
<th>Time</th>
<th>Some of the Limitations</th>
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<td>C 1260 (Accelerated</td>
<td>14 day</td>
<td>Severe test conditions (70°C) Not for evaluating job concrete mix</td>
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<td>mortar bar, AMBT)</td>
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<td>C 1293 (Concrete</td>
<td>1-2 yrs</td>
<td>Better reliability but long duration</td>
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<tr>
<td>Prism Test, CPT)</td>
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<td>Not for evaluating job concrete mix</td>
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<tr>
<td>Exposure block</td>
<td>&gt; 5 yrs</td>
<td>High reliability but long duration</td>
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<td>Approaches for Reducing the Risk of Deleterious ASR in Concrete</td>
</tr>
</tbody>
</table>

Agenda

- Some of the limitations of the Current Test Methods
- Proposed New Test Method
- Accelerated Concrete Cylinder Test (ACCT)

Procedure

1. Cast concrete cylinders and keep the cylinders in a moisture room for 7 days (ASTM C470)
2. Demold and measure the height of the cylinder (L0) using a caliper
3. Place the cylinder inside the container and add soak solution until the cylinder is immersed (the alkali concentration of soak solution shall equal to pore solution alkalinity (PSA) of the tested concrete specimens in order to prevent alkali leaching)
4. Screw the lid onto the container
5. Place the container-lid system in the oven
6. Insert the LVDT through the center hole of the lid and tighten the screw
7. Close the oven and set up the oven temperature at 60°C followed by length measurement through data acquisition - computer
Soak Solution Determination

- Specimens NOT containing SCMs
  - NIST model (e.g., http://ciks.cbt.nist.gov/poresolncalc.html)

- Specimens containing SCMs
  - Pore solution extraction [some SCMs (especially some fly ashes) may or may not contribute soluble alkalis in pore solution]
  - If extraction techniques is not available
    - NIST model + available alkalis (ASTM C311)

- Add an additional 1 g of Ca(OH)\(_2\) per liter in order to saturate the solution.

- Soak solution = PSA
  - Prevent alkali leaching
  - May have the ability to pick up the effects of cement alkalis as well as soluble alkalis from SCMs

ACCT Testing Conditions: Similar to Testing a Hypothetical Concrete Cylinder in Field Concrete

- A hypothetical concrete specimen inside concrete structure receives constant supply of alkalis and/or moisture from the surroundings to sustain ASR. ACCT simulates this condition. However, CPT creates opposite situation (i.e., alkali leaching) and as a result it takes longer time in one hand and it may leads to create case of underestimation (mixes passed by CPT but failing in the exposure blocks).

Data Processing and Calculation

\[
\text{Length change (\%)} = \frac{L_a - L_r}{L_0} 
\]

- \(L_r\) = the reference LDT reading
- \(L_a\) = the subsequent LDT readings of \(L_r\)
- \(L_0\) = measured length of cylinder at room temperature by a caliper

Determination of ASR aggregate reactivity (45 days) (ACCT & ASTM C1293)
Repeatability (Within the Lab)

The expansion corresponding to three replicas were used to calculate the coefficient of variation (COV). The majority of expansion-based COV is within 10 percent after the 28-day expansion for the tested mixes at the level of alkalinity 4.5 lb/cy

| ACCT method - Acceptable repeatability (within the lab) |
|-----------------|-----------------|
| Day  | 28  | 35  | 42  | 49  |
| CDV% | 10  | 8-9 | 7-8 | 6-8 |

ASR Aggregate Reactivity in ACCT

<table>
<thead>
<tr>
<th>Aggregate Reactivity</th>
<th>45-day Expansion in ACCT, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonreactive</td>
<td>&lt; 0.04</td>
</tr>
<tr>
<td>Slow Reactive</td>
<td>0.04 - 0.12</td>
</tr>
<tr>
<td>Moderate Reactive</td>
<td>0.12 - 0.24</td>
</tr>
<tr>
<td>Highly Reactive</td>
<td>&gt; 0.24</td>
</tr>
</tbody>
</table>

AASHTO R80-17 / ASTM C1778

Differences, Benefits, and Challenges

<table>
<thead>
<tr>
<th>Specimen size</th>
<th>Concrete cylinder 3 x 4&quot;</th>
<th>Mortar bar 3 x 3 x 12.5&quot;</th>
<th>Concrete prism 3 x 3 x 12.5&quot;</th>
<th>Mortar prism 2 x 2 x 11.25&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature</td>
<td>60°C</td>
<td>80°C</td>
<td>60°C</td>
<td>60°C</td>
</tr>
<tr>
<td>Test solution</td>
<td>PSA 1N NaOH - 1N NaOH</td>
<td>PSA 1N NaOH - 1N NaOH</td>
<td>PSA 1N NaOH - 1N NaOH</td>
<td>PSA 1N NaOH - 1N NaOH</td>
</tr>
<tr>
<td>Cement content, lb/cy</td>
<td>563±38</td>
<td>708±17</td>
<td>708±17</td>
<td>708±17</td>
</tr>
</tbody>
</table>

Aggregate gradation required

Nonreactive

Slow Reactive

Moderate Reactive

Highly Reactive

0.45 0.47 0.42–0.45 0.45

Coarse aggregate factor

0.9±0.05% Na 2Oe 0.9±0.1% Na2Oe 0.9±0.1% Na2Oe 0.9±0.1% Na2Oe

Temperature 60°C 80°C 38°C 60°C

Alkali boost No (4.5 lb/cy) No Yes (8.9 lb/cy) Yes (8.9 lb/cy)

Cement alkali 0.8±0.05% Na 2Oe < 0.6% Na2Oe 0.8±0.05% Na 2Oe 0.8±0.05% Na2Oe

Soak solution PSA 1N NaOH ‐ 1N NaOH PSA 1N NaOH ‐ 1N NaOH PSA 1N NaOH ‐ 1N NaOH PSA 1N NaOH ‐ 1N NaOH

Testing duration 45-75 days 14 days 1-2 years 56-84 days

Ease of testing Automatic data collection Comparator Comparator Comparator

Benefits

Cost

Concurrency

Longer testing duration

High alkali loading

Challenges/Constraints

Cost

Concurrency

Complexity

High alkali loading
A test method of this type can be used as an alternative to ASTM C 1293.

The effect of cement alkalis as well as soluble alkali contributions from SCMs on ASR expansion – Chance to detect by the ACCT.

This test method is intended to detect the alkali silica reactivity of aggregate or assess the effectiveness of mitigation measures for SCMs - SCMs from a specific source can be tested individually or in combination with SCMs from other sources.

Aggregate reactivity (45 days) and job mix (75 days)

A test method of this type can be used as an alternative to ASTM C 1293.

<table>
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<tr>
<th>Research Projects: Acknowledgements</th>
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<tr>
<td>Texas Department of Transportation (TxDOT)</td>
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<tr>
<td>Implementation Project, (Sep, 18 – August, 19)</td>
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<tr>
<td>Research Team</td>
</tr>
<tr>
<td>Anol Mukhopadhyay – PI</td>
</tr>
<tr>
<td>Members – Kai-Wei (Victor) Liu</td>
</tr>
</tbody>
</table>

Texas Department of Transportation (TxDOT)
Project 0-6656-01 – Further Validation of ASR Testing and Approach for Formulating ASR Resistant Mix Concrete. (Sep, 15 – August, 18)

Research Team
Anol Mukhopadhyay – PI
Members – Ali Wei (Victoria) Liu, Dan Zollinger, Andrew Wimsatt

Texas Department of Transportation (TxDOT)
Project 0-6656 - ASR Testing: A New Approach to Aggregate Classification and Mix Design verification. (Sep, 10 – August, 13)

Research Team
Anol Mukhopadhyay – PI
Kai-Wei (Victor) Liu - Graduate Student
Members – Den Zollinger, Andrew Wimsatt

<table>
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<th>Publications</th>
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<tr>
<th>ACCT: Test Parameter Optimization</th>
</tr>
</thead>
<tbody>
<tr>
<td>Why 7 days curing</td>
</tr>
<tr>
<td>- ACCT was testing with 7, 14, and 28 day curing – slight increase of expansion with increasing curing age – 7 days - good representation and save time – Pozzolanic index test in ASTM C 618 specifies meeting 7 or 28 days strength index</td>
</tr>
<tr>
<td>Why 3 x 6 inches</td>
</tr>
<tr>
<td>- The max. aggregate size (1 inch) for the tested coarse aggregates in the study allows using the 3 x 6 inches concrete cylinder as the lowest possible dimension.</td>
</tr>
<tr>
<td>- The expansion difference between 3x6 and 4x8 inches specimens was found to be smaller</td>
</tr>
<tr>
<td>- The effect of specimen dimension has been studied in a similar setup, i.e., use of UDT to measure length change of mortar in 1N NaOH solution [M Pour-Ghaz, R Spragg, J Castro, and J Weiss, 2012 – negligible difference was observed between specimens of different dimensions</td>
</tr>
</tbody>
</table>

Why testing period of 45 and 75 days |
| - ACCT with less than 40 days to ASTM C 1293 – not 100% match – Aggregates identified as nonreactive by C1293 but reactive by ACCT and vice versa |
| - But satisfactory correlation between ACCT and C 1293 with the ACCT testing period of 45 and 50 days – was adequate to evaluate the ASR reactivity in ACCT with the expansion limit of 0.04% at alkali level of 4.5 lb/cy |
| - It has been found that an additional 30 days is recommended to ensure the effectiveness of mitigation measures for job concrete mix with slowly reactive aggregate |

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<td>ASR aggregate reactivity prediction Accelerated concrete cylinder (ACCT)</td>
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</table>

| Mix-design validation / SCMs optimization Accelerated concrete cylinder (ACCT) |
ACCT: Test Parameter Optimization

- Soak solution quantity (solution to solid ratio 3 vs. 0.3)
  - Acceleration effects with S/C = 3 (larger quantity of solution)
  - A highly reactive aggregate reaches the expansion limit of 0.04% within 10 days with S/C = 3 and within 14 days with S/C = 0.27.
  - For slowly reactive aggregate, the time to reach the expansion of 0.04% increases from 21 days to 42 days when the S/C decreases from 3 to 0.3.

- Why 4.5 lb/cy?
  - Based on the data generated in projects with varying alkali loading (3 to 8.9 lb/cy), the ACCT with relatively low alkali loadings including, but not limited to 4.5 lb/cy and 60°C can effectively be used to pass/fail a concrete mix in a relatively short time.
  - Eliminate alkali boosting
  - Close to field alkalinity