AGENDA
ACI 231: Properties of Concrete at Early Ages

Monday, April 15, 2013 – 2:00 to 3:30 pm
Room C-101 F, Minneapolis Convention Centre, Minneapolis, MN

1. Welcome and Introductions
2. Update on Membership Status
3. Review and Approval of Minutes from the Meeting in Toronto, October 2012
4. TAC Update
5. Status of ACI 231 Technical Sessions

**Minneapolis, MN:** *(Spring 2013 – Responsibility in Concrete Construction)*
- Title: **Early-Age Properties of Repair Binders (Lab, Field and Test Methods)**
  - Session Organizers: Kyle Riding and Matt D’Ambrosia

**Phoenix, AZ:** *(Fall 2013 – Innovation in Conservation)*
- Dates: Preliminary approval = April 19, 2013
- Title: **Innovation in Cooling Mass Concrete**
  - Co-sponsored by ACI Committees 231 and 207.
  - Session Organizers: Anton Schindler, Miguel Azenha, and John Gajda (207)
  - Speakers: 2 × U.S.A., Portugal, Brazil, and Japan

**Reno, NV:** *(Spring 2014 – Theme TBA)*
- Dates: Preliminary approval = April 19, 2013 and final approval = October 25, 2013
- Title: **Low Portland Cement Content Binders: Hydration and Properties**
  - Organizers: Jeff Bullard and Gaurav Sant (and possibly Karthik Obla)
  - Co-sponsors: ACI 231, 232, 233, and 236

**Washington, DC:** *(Fall 2014 – Spanning the Globe)*
- Dates: Preliminary approval = October 25, 2013 and final approval = March 28, 2014
- Title: **Improving Early-Age Properties of Concrete with SCMs**
  - Organizers: Dale Bentz, Jussara Tanesi, and Kyle Riding
  - Potential co-sponsors: ACI 231, 232, and 212
  - April 26, 2013 is the deadline for SP requests
- Title: **Interaction of Limestone Filler with SCMs**
  - Organizers: Wayne Wilson
  - Co-sponsors: ACI 231 and 236
  - This session may get pushed back to a conference after Washington, DC

Other Suggested Topics:
- Title: **Test Methods for Measuring Early-Age Properties: Lab And In-Situ Monitoring**
  - Organizers: by Wayne Wilson and Daniel Cusson
- Title: **Early-Age Volume Change Effects**
  - Potential Organizers: Jason Ideker and Gaurav Sant
  - Target 2014, i.e. either Kansas City or Denver

**Future Conventions:**
- **Kansas City, MO:** *(Spring 2015)*
  - Preliminary session approval requests due: March 28, 2014
- **Denver, CO:** *(Fall 2015)*
  - Preliminary session approval requests due: TBA
6. **Development of ACI Committee 231 Report**
   - Title: Prediction and Control of Thermal Effects at Early Ages
   - Report Outline: Refer to Attachment A
   - Chapter 3: Thermophysical properties
     - Ballot stated on 4/02/2013 and closes on 5/22/2013

7. **New Business**

8. **Adjourn**
Attachment A: ACI Committee 231 Report

Title: Prediction and Control of Thermal Effects at Early Ages

Objectives: Provides guidance on the prediction and control of early-age thermal effects in concrete.

Completion: Finalize during ACI meeting in Reno, March 2014. Chapters will be balloted individually.

OUTLINE

Last Updated on November 28, 2012

Chapter 1: Introduction
Lead authors: Anton Schindler and Will Hansen

Chapter 2: Hydration
Lead authors: Wayne Wilson, Anton Schindler, and Jason Ideker
Editorial committee: Dale Bentz and Gaurav Sant

2.1 Hydration Kinetics
   2.1.1 Effect of Temperature
   2.1.2 Temperature Sensitivity (Activation Energy)

2.2 Factors Impacting Hydration
   2.2.1 Cement Chemistry (Including alkalinity)
   2.2.2 Cement Fineness
   2.2.3 Supplementary Cementing Materials (SCMs)
   2.2.4 Chemical Admixtures
   2.2.5 Potential Incompatibility Issues

2.3 Delayed Ettringite Formation (DEF)

2.4 Measurement Methods

2.5 Maturity Methods

Chapter 3: Thermophysical Properties
Lead authors: Miguel Azenha, Geert DeSchutter, and Anton Schindler

3.1 Introduction
3.2 Density
3.3 Thermal Conductivity
3.4 Specific Heat
3.5 Coefficient of Thermal Expansion

Chapter 4: Mechanical Properties
Lead author: Geert De Schutter

4.1 Strength Development
4.2 Stiffness Development (Ben Byard offered assistance to add data for this section)
4.3 Creep and Relaxation (Ben Byard and Matt D’Ambrosia offered to help add data to this section)
4.4 Limiting Strain or Stress Capacity
Chapter 5: Heat Transfer and Stress Analysis  
Lead author: Kyle Riding  
Complete First Draft: August 2013  
Ballot: Before Phoenix, Oct. 2013

5.1 Heat Transfer Fundamentals (Lead author: Miguel Azenha)  
- ACI 207.2R may be a good reference to cite  
- Manual methods (Schmidt method) should be mentioned

5.2 Software Programs  
5.2.1 Introduction (what makes the software special is that they have the constitutive laws built in.)  
5.2.2 HIPERPAV (Lead author: Kyle Riding)  
5.2.3 ConcreteWorks (Lead author: Kyle Riding)  
5.2.4 FEMMASSE (Lead author: Kambiz Raoufi and Will Hansen)  
5.2.5 4C-Temp and Stress (Anton Schindler will correspond with the developers)

Chapter 6: In-Situ Monitoring  
Lead authors: Zach Grasley and Matt D’Ambrosia  
Editorial committee: Anton Schindler and Kyle Riding  
Complete First Draft: Feb. 2013  
Ballot: Before Minneapolis, March 2013

6.1 Introduction
6.2 Temperature and Relative Humidity  
6.2.1 Instrumentation Equipment  
  6.2.1.1 Strain Sensors  
  6.2.1.2 Thermocouples  
  6.2.1.3 Digital Temperature Sensors and Wireless Data Collection  
  6.2.1.4 Accuracy and Sources of Potential Error  
  6.2.1.5 Sensor Validation  
6.2.2 Relative Humidity
6.3 Strength  
6.3.1 Maturity Meters  
6.3.2 In-Place Strength Tests

Chapter 7: Control of Thermal Effects  
Lead author: Kambiz Raoufi  
Complete First Draft: Jan. 2014  
Ballot: Before Reno, March 2014

7.1 Introduction  
- Scope is limited to thermal effects which is only one component of strains that can lead to cracking – can reference earlier document for fibers and SRAs
7.2 Placement Scheduling (Authors: Jan Olek and Anton Schindler)  
7.3 Fresh Concrete Temperature Control (Author: Maria Juenger)  
7.4 Control of Thermal Gradients (Author: Kamran Nemati and Miguel Azenha)  
  - Add Three Gorges Dam Data  
  - CI articles by Ric Maggenti about the use of cooling pipes by Caltrans may be useful.
7.5 Mixture Modifications (Author: Maria Juenger)  
7.5.1 Use of SCMs (Author: Maria Juenger)  
7.5.2 Chemical Admixtures  
  - Contact Emmanuel Attiogbe to help develop this section  
7.5.3 Use of Aggregates (Authors: Ben Byard and Jason Weiss)  
  7.5.3.1 Normalweight Aggregates  
  7.5.3.2 Lightweight Aggregates  
  7.5.3.3 Fillers (Amal Jayapalan) [Perhaps part of 7.5.1 ?]
7.5.4 Fibers (Jason Ideker)