AASHTO Cement and Fly Ash Harmonization Committees

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Two topics to discuss today…

- AASHTO – ASTM Harmonization
  - Cement standards harmonization – Joint AASHTO-ASTM Harmonization Group (JAAHG)
  - Coal ash and natural pozzolan standards harmonization
- Proposed changes to material specifications

JAAHG Harmonization

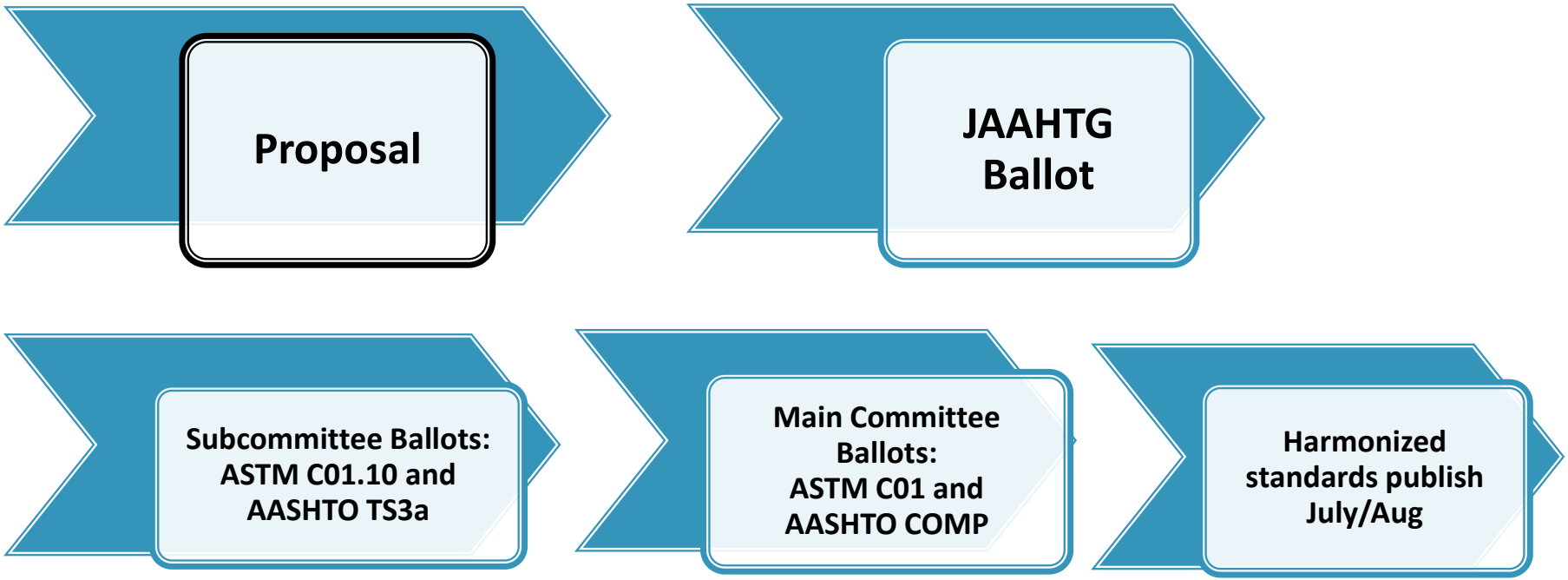
- Active since 2003
- Consistent requirements in several ASTM & AASHTO specifications
  - C150/M 85 Portland cements
  - C595/M 240 Blended cements
  - C465/M 327 Processing additions
  - C989/M 302 Slag cements

JAAHG Task Group Voting Members

Name / *Organization*	Name / *Organization*
Andy Naranjo, Co-chair *Texas DOT*	Jim Pierce, Co-chair *Bureau of Reclamation (Ret)*
Adam Browne *Mississippi DOT*	Doug Hooton *University of Toronto*
Oliver Chung (Sue Zheng) *Florida DOT*	Al Innis *Consultant*
Jon Kunin *New York DOT*	Colin Lobo *NRMCA*
Maria Masten *Minnesota DOT*	Paul Tennis *PCA*

~15 – 20 other participants

Typical Workflow



Key Points - JAAHG

- Changes in specifications managed by JAAHG will occur only after AASHTO and ASTM agreement
  - >80 changes across all standards since 2003
- AASHTO publishes once per year
  - July 2026 is the soonest anything can be changed; cycles are then every July after (e.g., July 2027)
- All standards are currently harmonized

Coal ash/natural pozzolans

Name/*Organization*	Name/*Organization*
Andy Naranjo, Co-chair *Texas DOT*	Larry Sutter, Co-chair *Sutter Engineering LLC*
Adam Browne *Mississippi DOT*	Jeff Hearne *Salt River Materials*
Oliver Chung (Sue Zheng) *Florida DOT*	Doug Hooton *University of Toronto*
Wally Heynen *Nebraska DOT*	Al Innis *Consultant*
Maria Masten *Minnesota DOT*	Ivan Loya-Diaz *Eco Materials*
Brett Trautman Missouri DOT	Joe Thomas *Natural Pozzolan Association*

Key Points – SCMs Harmonization

- Active since 2019 - Little bit less formal
- Proposals on both sides move forward independently and are then harmonized
  - Balloted simultaneously
  - Differences are reconciled
- All standards are currently harmonized

Okay… Before we continue…

Terminology: What is an “emerging” material?

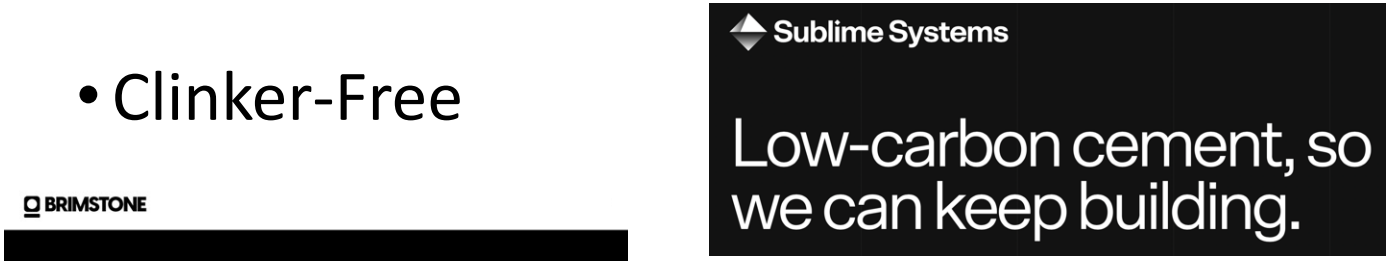
- **Two types**
  - **New shiny objects –** *ASCMs, ACMs,* low-clinker blends
  - **Same, same, different –** *ASTM C595 blended cements (IL, IP, IS, IT)*

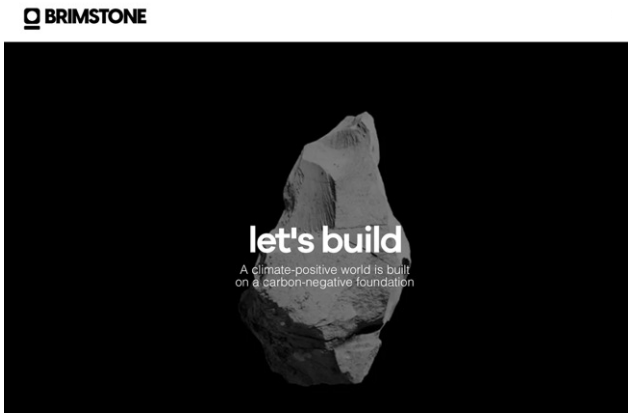
Terminology: What is an “emerging” material?

- **Two types**
  - **Shiny objects –** *ASCMs, ACMs,* low-clinker blends
  - **Same, same, different –** *ASTM C595 blends (IL, IP, IS, IT)*
- Shiny objects – not an immediate solution
  - No production capacity – 3-5 years from reality, longer for most
  - Limited performance data/history
  - Significant performance issues with things we cannot measure like workability and finishability
  - QA performance tests need to be developed for cements

Alternative Cementitious Materials (ACMs)

- Clinker-Free





chement

- Chemically derived
- Bio-cements
- Different feedstocks
- Different processes

Alternative Cementitious Materials (ACMs)

- Alkali-Activated – partially or completely

Alternative Supplementary Cementitious Materials (ASCMs)

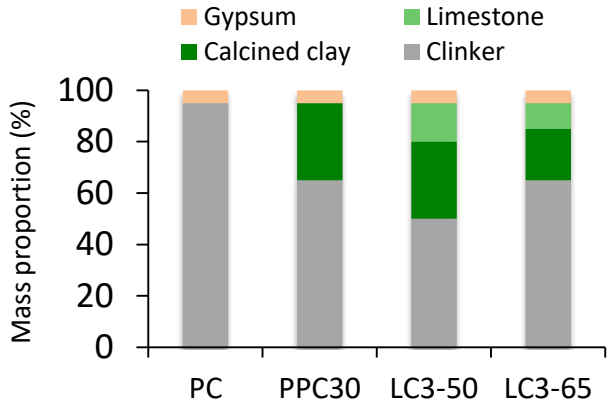
- Different feedstocks
- Different processes
- Some are manufactured new materials
- Some are modified old materials

New binder systems

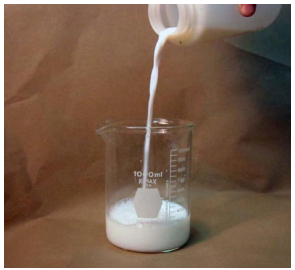
- Old materials, new combinations
  - Significant clinker reductions
- Nano-materials
- ASTM specifications under development

Based on calcined kaolinite; low purity (40%)

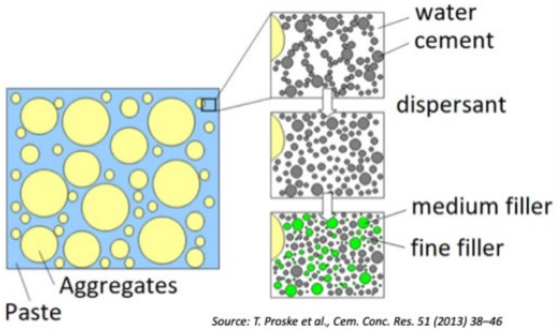
Limestone Calcined Clay Cement LC3



Colloidal Silica - Nano-materials



High-Filler Low-Water (HFLW)



Terminology: What is an “emerging” material?

- Two types
  - **Shiny objects** – *ASCMs, ACMs,* low-clinker blends
  - **Same, same, different** – *ASTM C595 blends (IL, IP, IS, IT)*
- Same, same, different – immediate solution (potentially)
  - Today’s materials used differently
  - Some of the same issues as new materials (finishability, workability) but we know better how to solve those issues
  - Can be implemented but there is still a need to demonstrate performance
  - Communications and support are essential

What does this all mean?

- Near term (next 5-10 years)
  - Focus on **same, same different**
  - Increased SCM use in existing mixtures, where possible
  - Increased SCM use can be accomplished either by
    - Blending at the point of concrete production
    - Blended cements produced at the cement plant or blending facility

Current activities at ASTM and AASHTO

- Performance specification for SCMs **(in progress)**
- New specification for natural pozzolans (ASTM C1945) **(completed, in progress AASHTO)**
- Changes to ASTM C1945 for natural pozzolans **(in progress)**
- Allowing limestone as a blending component in blended SCMs under ASTM C1697 to support LC2 **(in progress)**
- Material specification for colloidal silica **(in progress)**

Current activities at ASTM and AASHTO

- Type IP, IS, IT - changes to permit blends using more SCMs **(in progress)**
- Type IC - new type of blended cement in ASTM C595 to allow for increased clinker reduction **(in progress)**
- ASTM specification for alkali activated cements **(completed, no AASHTO equivalent)**
- ASTM specification for cements that set by carbonation **(completed, no AASHTO equivalent)**

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- **Type IP, IS, IT - changes to permit blends using more SCMs (in progress)**
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- ASTM specification for cements that set by carbonation **(completed, no AASHTO)**

Current activities at ASTM and AASHTO

- Changes to Types IP and IS
  - Permit up to 15% limestone in Type IP and Type IS
  - Current limits on slag and pozzolan remain unchanged
  - Report all constituents
  - Example Type IP(L8)(P30)
  - Similar blends currently delivered by ready mixed

Current activities at ASTM and AASHTO

- Changes to Types IT
  - Permit up to 15% limestone in Type IT
  - Can include limestone and one (1) pozzolan & one (1) slag; or two (2) pozzolans
  - Current limits on slag and pozzolan remain unchanged
  - Report all constituents
  - Example Type IT(P30)(P10); Type IT(L8)(P30)(S20)
  - Similar blends currently delivered by ready mixed

Current activities at ASTM and AASHTO

- New Type – Type IC
  - Permit up to 70% limestone, pozzolan, and slag, blended in any combination
  - Remainder (30%) shall be either portland cement or clinker
  - Report all constituents
  - Example Type IC(L20)(P30)

What does all of this mean?

- First – *consider what a material specification is?*
- The basis of a contract between a buyer and a seller
  - Not a textbook
  - Not a research report
  - Doesn't tell us how to use the material to make concrete
- No matter what we do, we need a specification framework that includes all possible materials; using them is a different discussion
- That's what we are building here

What does all this mean?

- Next – *Because it can be specified does not mean it will be produced*
- Flexibility in specifications does not mean an infinite number of products will be produced
- No one benefits from a plethora of products
- The blends to be produced will be determined by many factors

What does all this mean?

- Some factors affecting what will be produced
  - Owner/specifiers specifications
  - Application (e.g., paving, structural)
  - Regionally availability materials
  - Performance requirements
    - The “ilities” – durability, workability, finishability, etc.
  - Cost-competitiveness of solutions

Closing

- AASHTO and ASTM are committed to harmonization of cement- and SCM-related standards
- The goal is to create a specification environment that allows for technical solutions to be adopted without re-working standards continuously
- Near term focus should be on using existing materials but towards clinker reduction – while achieving all the “ilities”
- What gets specified will get produced

Questions?

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periculosum est tempus indoctus