Trends in Concrete Materials Specifications

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Hydraulic Cement
Hydraulic Cement
Portland Cement

- Type I – general purpose
- Type II – mod SO₄, mod heat
- Type III – high early
- Type IV – low heat
- Type V – high SO₄

Increasing strength
Increasing heat
FAPP doesn’t exist
AASHTO – ASTM Harmonization

- Current Activity
- Develop a common PC spec
- Major revision of Type II
  - Limit on heat of hydration
  - Limit on fineness
Hydraulic Cement
P2P

• C 150 – Portland Cement
• C 595 – Blended Cement
• C 1157 – Hydraulic Cement
Major Industry Trends

- **Strength**
  - Increasing 1970 - 1995

- **Fuel costs**
  - Waste fuel initiatives

- **Waste management**
  - Dust recycling – high alkali levels

- **CO$_2$ Emissions**
  - Non PC additions
Additions

- Carbonate rock dust - 2004
- Slag – as a processing addition
- CKD - ???
Major Industry Trends

- Increasing Class C
- “Spot Market” coal supplies
- SO$_2$ emissions
- Ash from alternative fuels
- Development of *Performance* stds
Slag
Industry Trends

• Increased marketing
• Shifting emphasis to finer materials
  – Grade 80 uncommon
  – Grades 100 & 120
• Name: GGBFS Slag Cement
Aggregate
Industry Trends

• ASR testing
  – Mortar bar

C 1260 – accel mortar
C 1293 – concrete prism

• Manufactured Fine Aggregate
  – High fines concrete
  – Appendix to ASTM C 33
Admixtures
Industry Trends

• New Products, new versions of old products
  – SCC
  – Antiwashout
  – Antifreezing
  – Anticorrosion

• Cement – Admixture Interaction
  – Early stiffening
  – Delayed setting HRWRA
  – polycarboxylate
Repair Materials

- Historically: few or no spec’s
- Rapid-strength-gaining cements
- Corps of Engineers – REMR
  - Focus on compatibility
    - Modulus
    - Thermal expansion
    - Volume stability
The End