Introduction of Revised Specification for Shotcrete and Other Shotcrete Development

ACI Spring 2012 Convention
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Guide to Shotcrete
ACI 506R-XX

Shotcrete is Concrete

Definition of Shotcrete
“Concrete projected at high velocity onto a properly prepared surface.”

What is difference between Concrete and Shotcrete?
Concrete is to shotcrete as the infantry is to airborne
They both do the same job

They just get there differently

Concrete is vibrated to achieve consolidation

Shotcrete is consolidated by material impact

**Shotcrete**

- Applications:
  - New Structures
  - Linings tunnels/mines
  - Repair
  - Reinforcing
  - Ground support/ Soil nailing
  - Refractory
  - Fiber reinforced

**History of Shotcrete**

- 1910 Carl Akeley introduced cement gun
- 1930-1950 Cement Gun Company promoted “Gunite” (Dry-Mix) with engineering data and construction of structures
- 1951 ACI Adopted “Shotcrete” for both Dry-Mix & Wet-Mix
History of Guide

- 1966 Original “Recommended Practice for Shotcrete”
- 1966 SP-16 Compilation of shotcrete papers Al Litvan, Lorman,
- 1978 Ted Crom published “Dry-Mix Nozzling”
- 1980 Wet-Mix expanded to east coast

History of Guide

- 1983: “Guide to Shotcrete” Revised
- 1980-1990: Equipment improvements expanded Wet-Mix
- 2005: Latest edition 506R-05

Changes in Shotcrete Industry

- American Shotcrete Association (ASA) formed in 1999 has promoted and expanded use of shotcrete
- Expanded use of shotcrete
  - Volume of shotcrete placed
  - Number contractors increased
- ASA & ACI: Emphasis on quality

“Guide to Shotcrete” is…

- NOT a “How to” book
- NOT a design guide
- NOT to be used in specifications
  - “Reference to this document shall not be made in contract documents”
  - “If items found in this document are desired by the architect/Engineer to a part of the contract documents, they shall be restated in mandatory language”

Goals of new Guide

- Better integration of all ACI 506 Shotcrete documents
  - Specification
  - Guide
  - Evaluation
  - Qualification
  - Fiber reinforced Shotcrete
New Guide to Shotcrete
ACI 506R

- Reorganized
- Chapters 1, 2, 3 is commentary to new shotcrete specification 506.2
- Chapters 4, 5, 6, 7 provides guidance for users, designers, and contractors Ch 4, 5, 6

New Guide to Shotcrete
1.6.1 QA owner
1.6.2 QC contractor
1.6.3 Panels:
  materials, qualification, nozzleman evaluation

Guide to Shotcrete
Chapter 2 – Materials
2.4.7 Boiled water absorption baseline
2.4.8 Flexural strength Fiber shotcrete
2.4.11 Slump

Guide to Shotcrete
Chapter 3 Execution
3.4.1 Impact effect on consolidation
3.4.6 Shotcrete temperatures
3.6.1 Expanded curing methods
3.7 Protection

Guide to Shotcrete
Chapter 1 – General
1.1 Payment
1.4 Submittals: Certification of Nozzlemen Qualify Contractor
1.5 Preconstruction test: importance, use
Guide to Shotcrete

- Chapter 3 Execution
  - 3.8 Tolerance
  - 3.9 Repair
  - 3.10 Acceptance

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- Chapter 4 – Equipment
  - Equipment advancements

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- Chapter 5 – Crew
  - Flag hazards
  - Provide check list

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- Chapter 7 – Sustainability (new)
  - Half the formwork
  - Extending the life of structures

Guide to Shotcrete

- Pioneers in Shotcrete industry
  - Ted Crom
  - Al Litvin
  - Leon Glassgold
  - John Fredericks
  - Ray Schutz
  - Tom Reading
  - Steve Gebler
  - Brian Collier

506R-XX

- Expand to include new developments
- Integrate better with other 506 documents

Shotcrete is Concrete

Only better

Sufficient cement

Low w/cm 0.35-0.42