





American Concrete Institute®
Advancing concrete knowledge

**Introduction of Revised
Specification for Shotcrete and
Other Shotcrete Development**

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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 "Guniting" (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,
- 1970-1980 Development of concrete pumps and Wet-Mix shotcrete
- 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 ACI 506R

- Introduction
 - History, Application
- Chapter 1 – General
 - 1.1 Payment
 - 1.4 Submittals: Certification of Nozzleman Qualify Contractor
 - 1.5 Preconstruction test: importance, use

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
 - 2.1.2 Expanded:
 - Fly Ash, Silica Fume, Slag
 - 2.1.5.2 Air entrainment
 - 2.1.8 Evaporation retardant
 - 2.4.6 Limitations supplemental materials

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 3 Execution
 - 3.8 Tolerance
 - 3.9 Repair
 - 3.10 Acceptance

Guide to Shotcrete

- Chapter 4 – Equipment
 - Equipment advancements
- Chapter 5 – Crew
- Chapter 6 – Safety (new)
 - Flag hazards
 - Provide check list

Guide to Shotcrete

- Chapter 7 – Sustainability (new)
 - Half the formwork
 - Extending the life of structures
- Chapter 8 - Reference

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



AUTOMATED SHOTCRETE APPLICATION

Shotcrete is Concrete

Only better

Sufficient cement

Low w/cm 0.35-0.42

