



# ACPA Guide Specification Roller Compacted Concrete Pavement

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CELEBRATING 50 YEARS OF LEADERSHIP AND SERVICE

■ ACPA and RCC...

From... *“Don’t Mess With It!”*

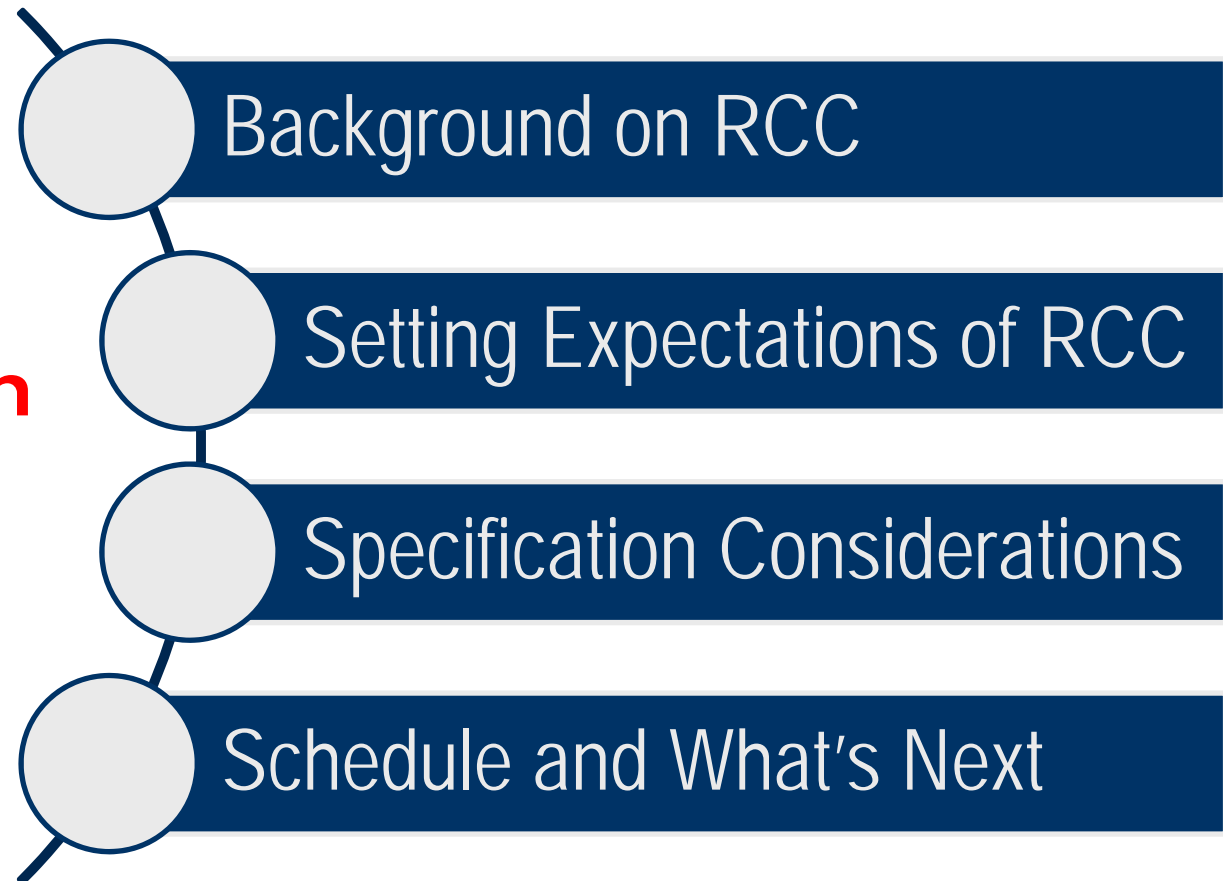
To... *“We must embrace it!”*

# RCC Task Force

- Formed in 2012
  - Co-Chair – John Edwards, IHC
  - Co-Chair – Jim Mack, Cemex
- Three Initial Objectives
  - **Guide Specification**
  - RCC Explorer Web Tool
  - RCC Education and Training
- RCC design also under consideration

# What We'll Cover Today...

## **Presentation Outline**

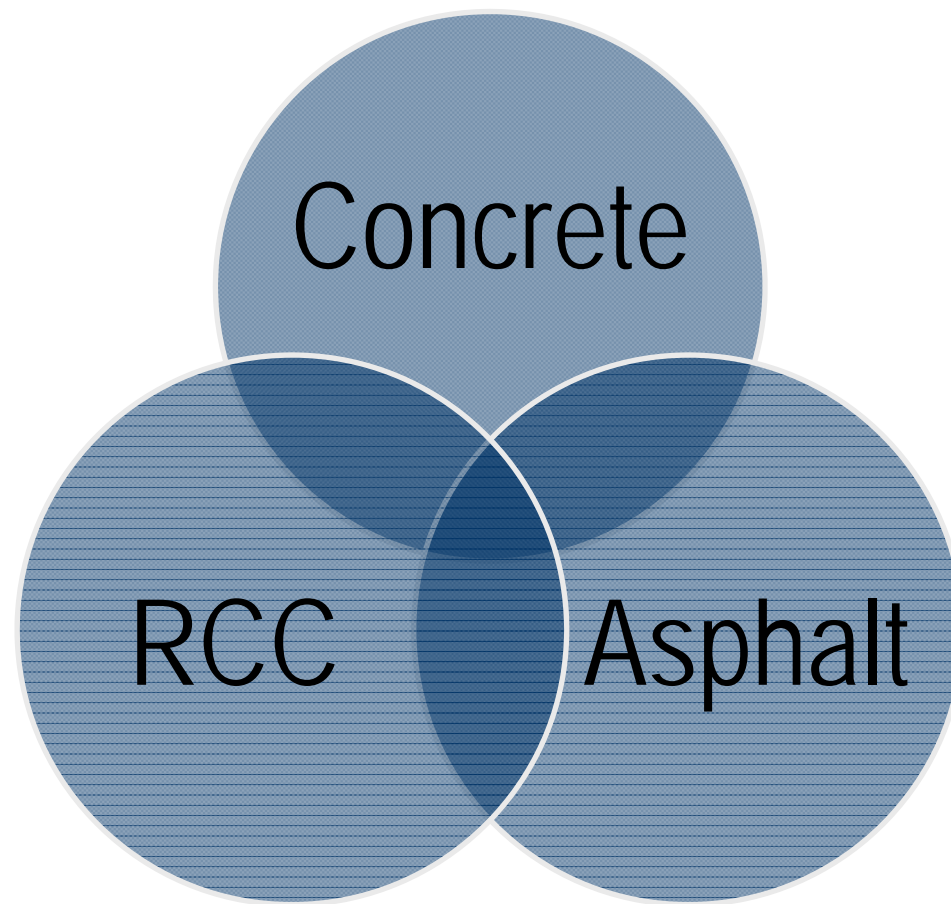




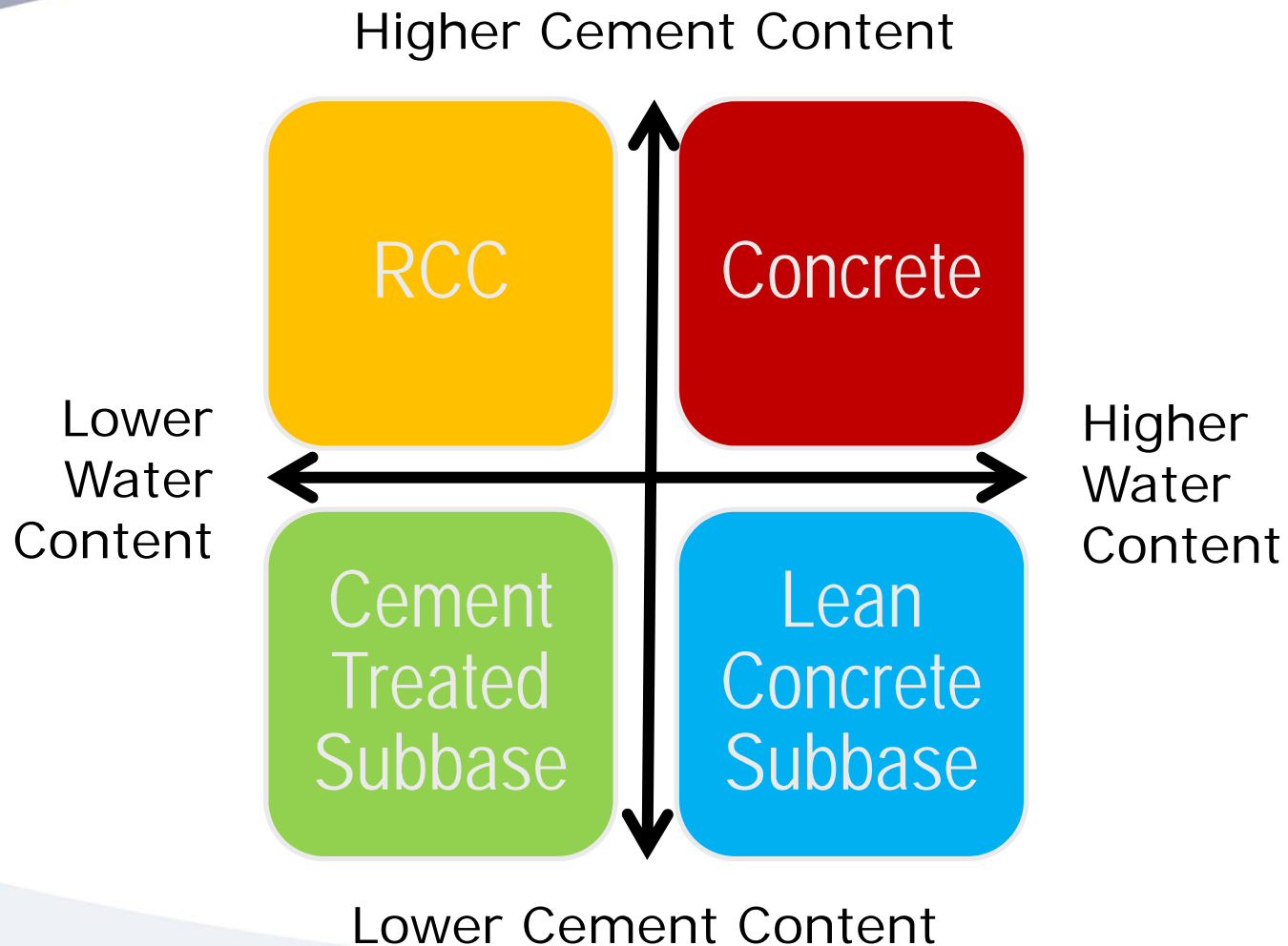


# BACKGROUND

# The Third Pavement...



# Where Does it Fit as Cement-Based Product?



# RCC Definition



A no-slump concrete that is compacted not consolidated.

- Zero slump. No internal vibration. (consistency of damp gravel).
- No forms.
- No reinforcing steel or dowels.
- No finishing.
- Compacted w/ high-density pavers and rollers.

**RCC is a concrete pavement that is designed and placed in a different way!**

# Benefits of RCC Pavements

- Competitive cost
  - Asphalt
  - Conventional concrete
- Speed of construction
  - Simple preparation
  - High-volume production
  - Early strength gain

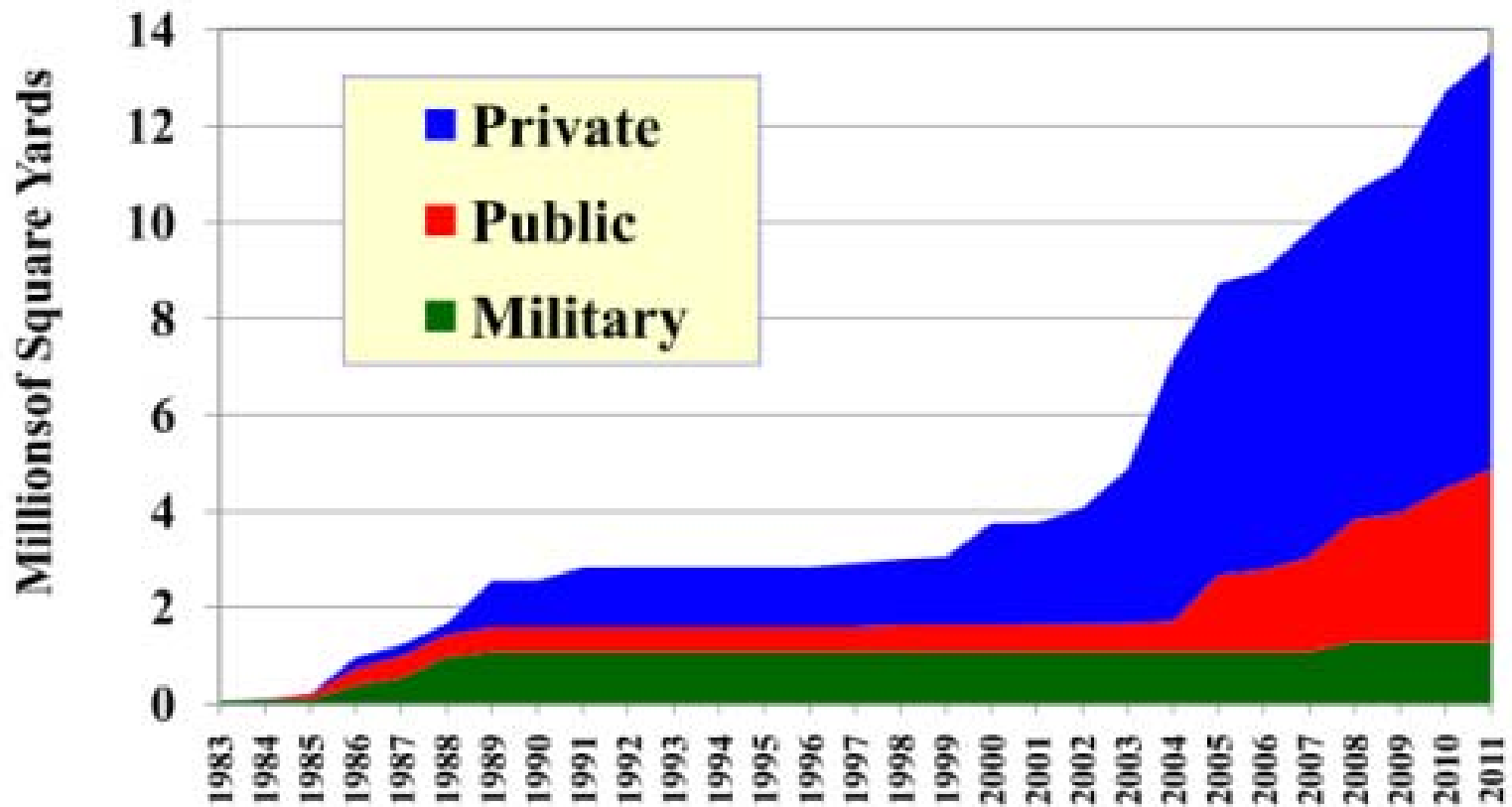


# Challenges of RCC Pavements

- Surface
  - Open texture
  - Abrasion resistance
- Control of:
  - Surface elevation
  - Smoothness



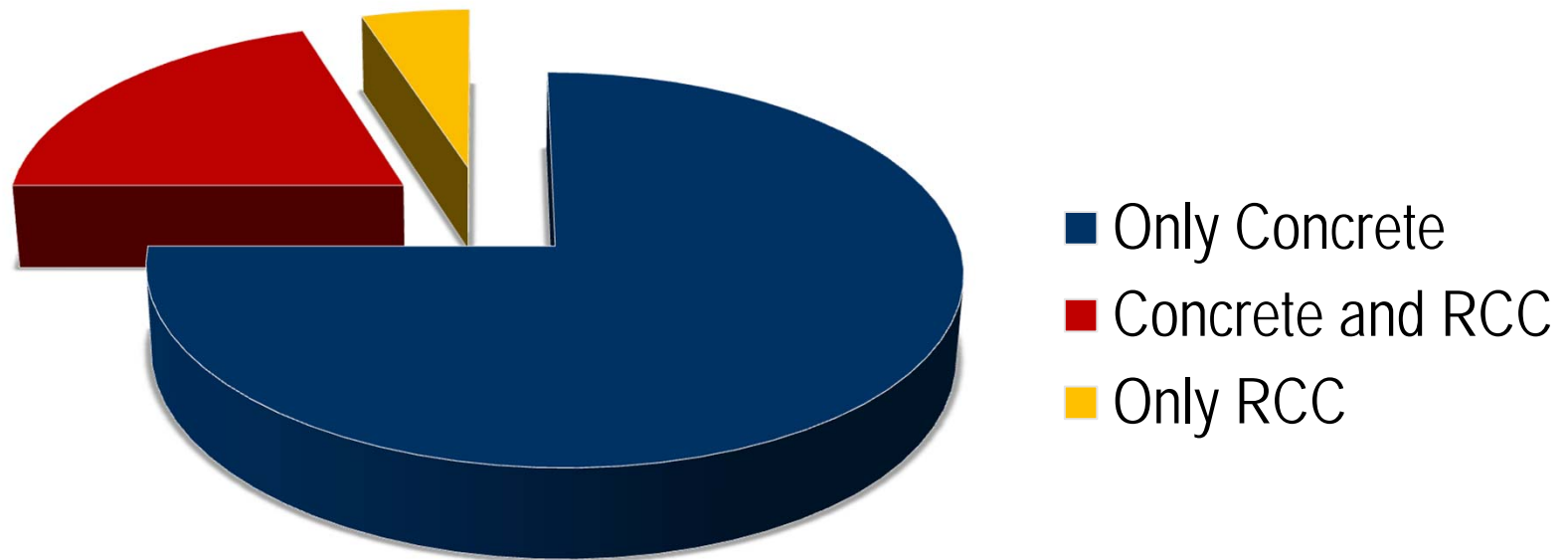
# Use of RCC Pavements in US



Source: U.S. Army Corps of Engineers

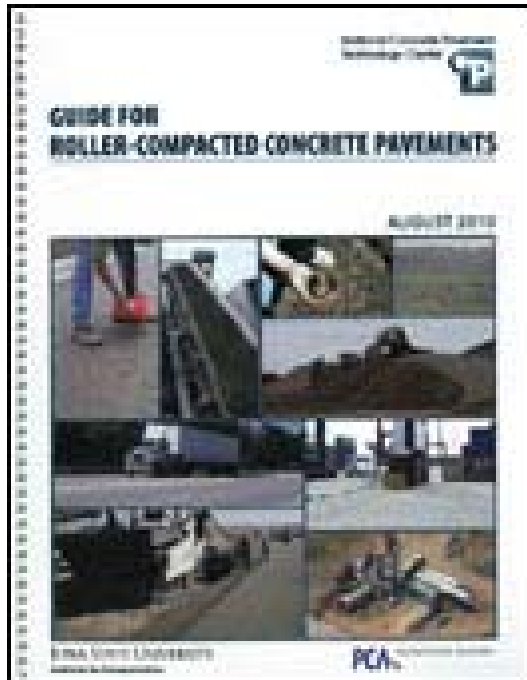
# ACPA Contractor Members...

Type of Paving





# Excellent Technical Reference



- By CP Tech Center.
- Covers all aspects.
- Available through PCA.



# SETTING EXPECTATIONS

# Log Sorting Pavements



Log Sort Yard  
Port McNeill, Vancouver (1978)

# Log Sorting Pavements



***Log Carrier, 200k Axle Loads!***

**Log Sort Yard  
Caycuse, British Columbia**

# Log Sorting Pavements



**Log Sort Yard  
Austin, Texas (1986)**

# Pond Linings



Hornsby Bend (sludge ponds)  
Austin, Texas

# Industrial Pavements



**GM Saturn Plant - 1989**



# Industrial Pavements



**Central Freight Truck Terminal  
Austin, Texas**



# Railroad Intermodal Terminal



**Railroad Intermodal Terminal  
Denver, Colorado (1986)**

# Railroad Intermodal Pavement



**BN Intermodal Yard  
Denver, Colorado**

# Port Facilities



**Conley, MA 1986**



# Dams



Saluda Dam (facing)  
Columbia, SC

# Military – Tank Hardstands



**Tank Hardstands  
Fort Benning, Georgia**

# Industrial Floors



Lynnterm Terminal (floors)  
Vancouver, British Columbia

# Airfield Pavements



DIA (snow dump pads)  
Denver, Colorado



# Highway Shoulders



**Interstate Highway Shoulders  
Atlanta, Georgia**



# Temporary Pavement



State Highway Connector  
Near St. Louis, MO



# Local Streets and Roads



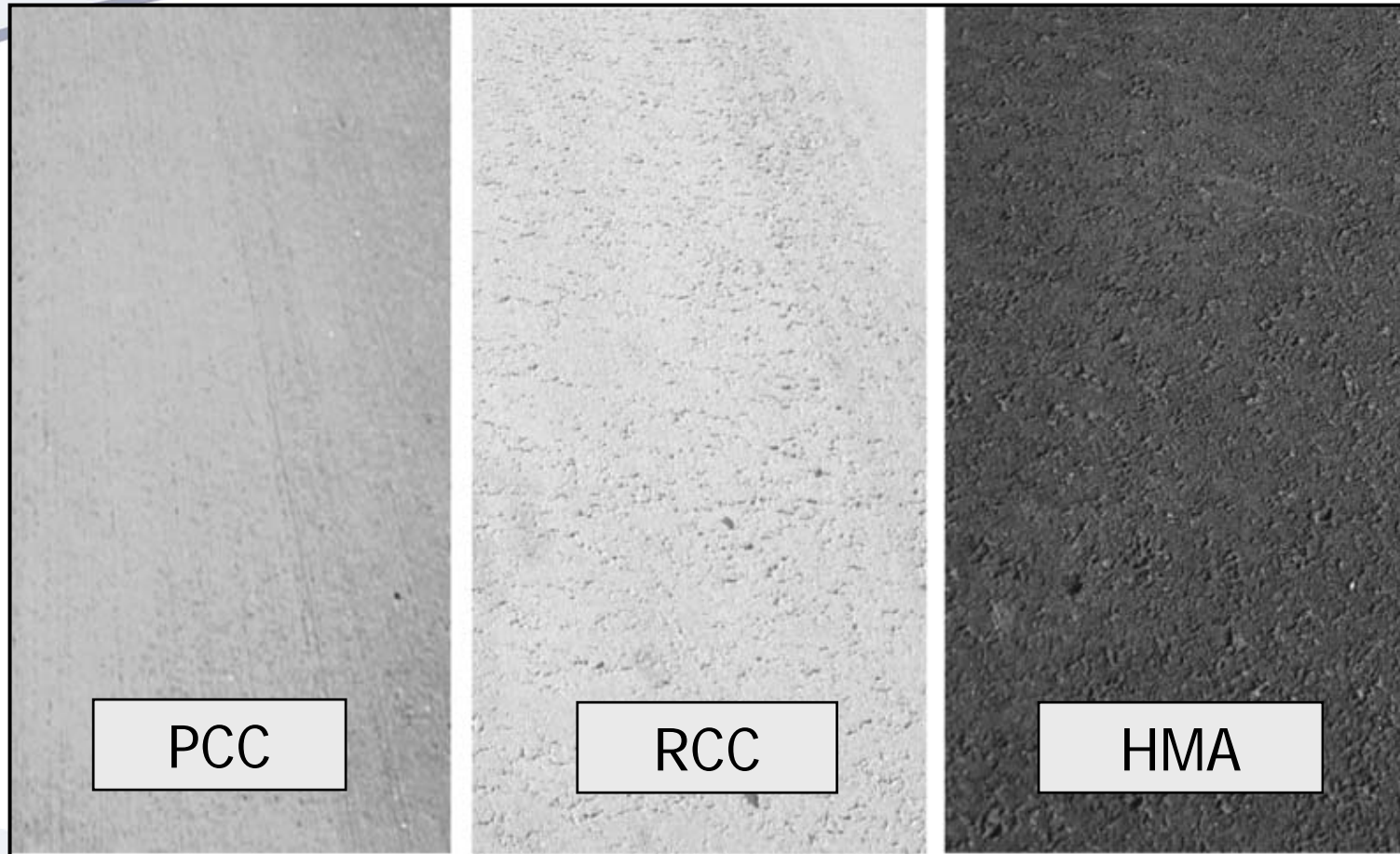
**Subdivision Streets (surfaced)  
Columbus, Ohio**

# Local Streets and Roads

**Subdivision Streets (unsurfaced)  
Alliance, Nebraska**



# Texture...





# GUIDE SPECIFICATION



# Format

- Commented guide spec
  - Provide background on “why”
  - Provide options to specifier
- Include ASTM, AASHTO and CSA standards as options
- Use “active voice”
- “End result” more than “method”
- Starting w/ spec for RCC-surfaced applications

# ■ Applicability

- Heavy-duty applications, such as:
  - Ports – Intermodal facilities
  - Military installations
- Light industrial applications, such as:
  - Warehouses – Manufacturing facilities
  - Commercial parking lots
  - Maintenance and storage yards
- Roadway applications, such as:
  - Highway shoulders
  - Streets and roads

RCC is Riding  
Surface

# Guide Spec Divided Into...

- Definitions and Material/Testing Standards
- General
  - Applicability & Prequalification
- Materials
  - Gradations
- **Quality Management Plan**
  - Contractor's Plan
  - Requirements at Plant
  - Requirements at Placement Site



# Guide Spec Divided Into...

- RCC Mixture Design
  - Cementitious requirements
  - Strength requirements
- Equipment
  - Plant
  - Paving Machine
  - Compaction Equipment
- Construction
  - Test Section
  - Mixing, placing, compacting, curing

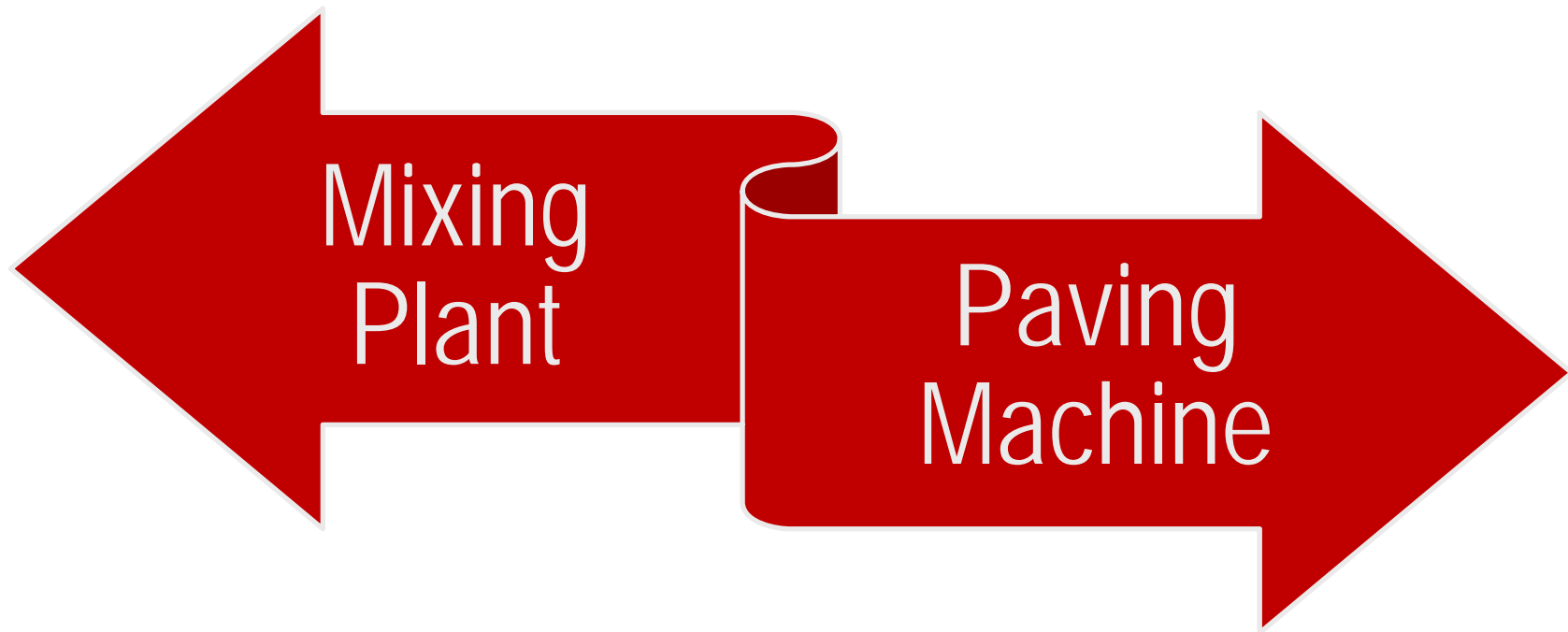
# Guide Spec Divided Into...

- Construction, Cont.
  - Weather considerations
  - Cold joints (lifts and adjacent placements)
  - Jointing (crack control)
- Acceptance Criteria
  - Smoothness
  - Thickness
  - Strength (including referee provision)
- Measurement & Payment

# Quality Considerations



# Quality Considerations



# Paving Machine

## High Density Pavers

- Vibrating screed
- Dual tamping bars
- Produce high initial density (90% to 95%)
- Reduce subsequent compaction required.
- Produce smoothest surface.







# Required Quality Management Plan

- Submit to the Engineer at least 30 days prior to start of paving operations.
- Information defined for submittal:
  - Organizational chart that identifies the key individuals assigned to production and placement operations.
  - Chain of command for decision-making.
  - List of subcontractors, including proposed job site personnel, for any construction operations.

# Required Quality Management Plan

- Information defined for submittal (continued):
  - Identification of the independent testing firm, including personnel for both laboratory and field testing operations.
  - Construction schedule for all RCC work.
  - List of all mixing, hauling, placing, compaction, curing and sawing equipment with manufacturer's data, specifications and certifications.
  - Outline of procedures for calibrating the mixing plant and monitoring materials during construction.

# Required Quality Management Plan

- Information required for submittal (continued):
  - Plan for mixing plant location and related logistics for haul times to the furthest location of the placement.
  - The proposed placement pattern showing:
    - Lift thicknesses (if multiple lifts are necessary).
    - Paving width and staging plan.
    - Direction of paving and hourly/daily production.
    - Planned longitudinal and transverse cold joint locations.
    - Location of mixing plant, cement and aggregate storage and water supply on or off site.

# Required Quality Management Plan

- Information defined for submittal (continued):
  - Certifications:
    - For aggregate source, quality and sizing as required by the appropriate material specifications.
    - All cementitious materials and chemical admixtures as required by the appropriate material specifications.
  - Outline of procedures for curing & weather protection
    - Cold placement [less than 40°F (4.5°C)]
    - Hot placement [more than 90°F (32°C)]
    - Rainy conditions.



# Required Quality Management Plan

- Information defined for submittal (continued):
  - Mixture design:
    - Cementitious materials content
    - Supplementary material replacement rates
    - Aggregate gradations
    - Admixtures/dosages



# Quality Control at Plant

- ASTM C685 for volumetric batch or continuous mixer
- ASTM C94 for central rotary drum mixer
- Frequency:
  - Prior to start-up, after equipment changes, and after shutdowns longer than 14 days
- Must meet tolerances in C685 or C94

# Quality Control at Paving Site

- RCC moisture content (ASTM C566)
- Density (ASTM C1040 direct mode)
  - In-place wet mat density
  - In-place wet joint density
- Compressive strength
- Surface smoothness
- Thickness



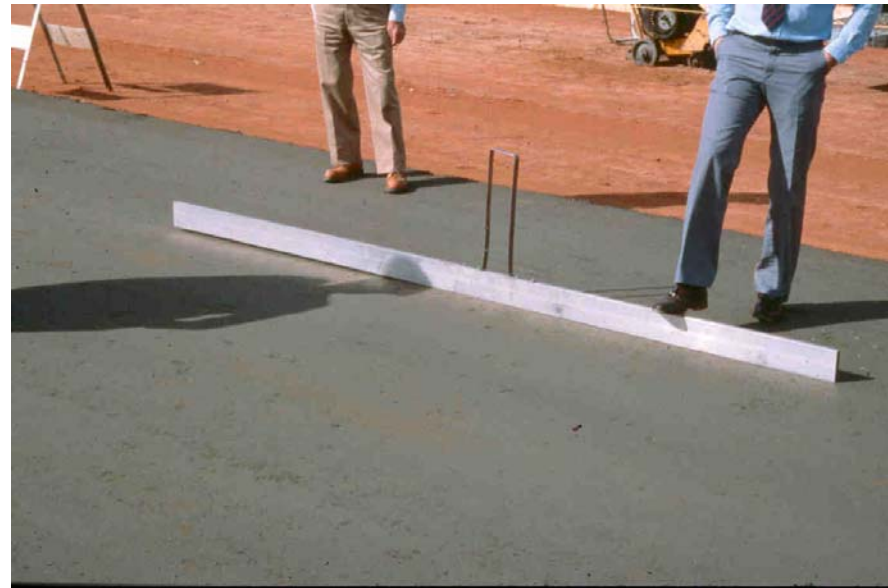
# Compressive Strength Testing

- Cylinders basic approach
- Referee testing using field cores to test for compressive strength.



# Smoothness

- Smoothness
  - 3/8-inch over a 10-foot length
- Appearance
  - 5/8-inch max agg. can be used to tighten surface texture







# WHAT'S NEXT?

# What's Next?

- Finish spec development and review
- Task Force to approve in December
- Format:
  - Full-commented publication
  - Text only for cut and paste
- Distribution:
  - [www.acpa.org](http://www.acpa.org)
  - ACPA resources center (affiliated chapters)



# Thank You



[www.acpa.org](http://www.acpa.org)

[apps.acpa.org](http://apps.acpa.org) | **ACPA Application Library**

[local.acpa.org](http://local.acpa.org) | **ACPA-affiliated Chapter/States**

[resources.acpa.org](http://resources.acpa.org) | **Concrete Pavement Resource Center**

[wikipave.org](http://wikipave.org) | **ACPA's paving wiki**



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