



Roller-Compacted Concrete Showcase

Sponsored by LTRC/DOTD, July 8, 2014



Definition

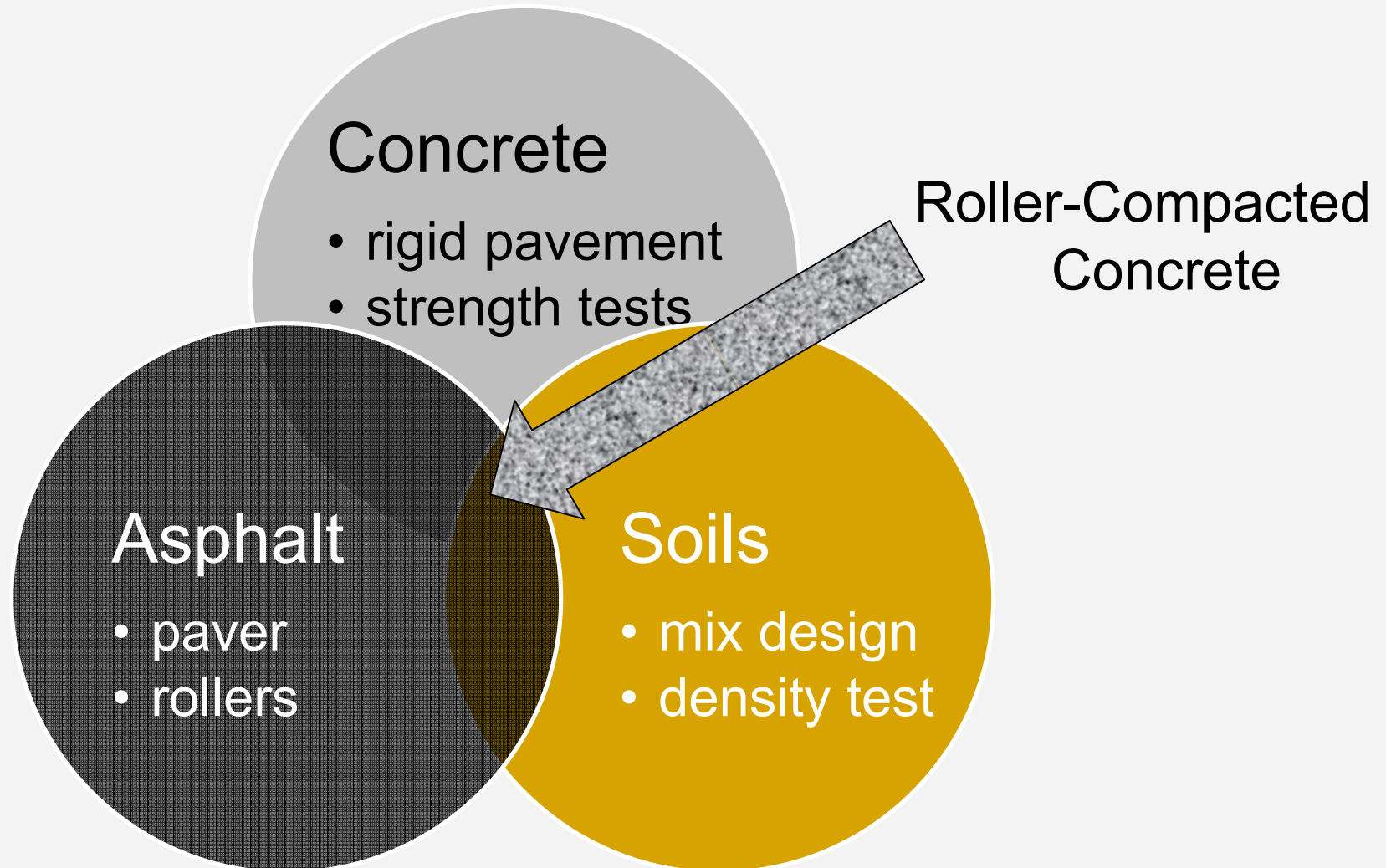
“Roller-Compacted Concrete (RCC) is a no-slump concrete that is placed with asphalt type pavers and compacted by vibratory rollers”

- Zero slump (consistency of damp dense gravel)
- No forms or finishing
- No reinforcing steel
- High production
- Asphalt paving equipment
- Consolidated with vibratory rollers



Concrete placed in a different way!

Multiple Characteristics



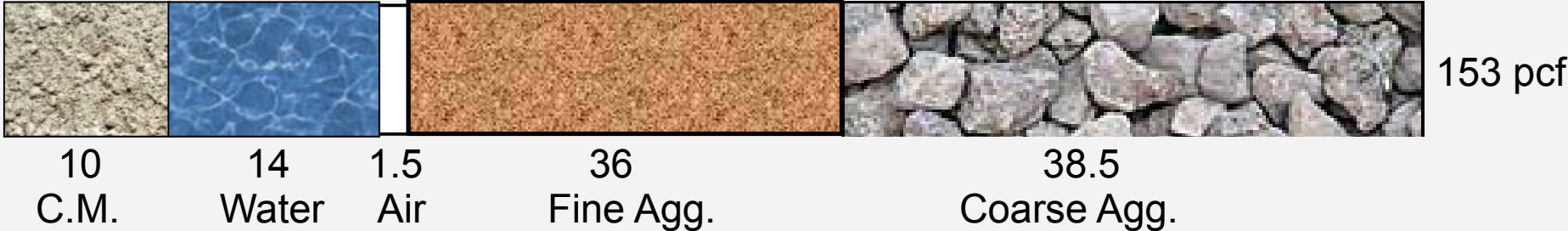
Conventional Concrete & RCC

Percent by
Volume

Conventional Air-Entrained PCC

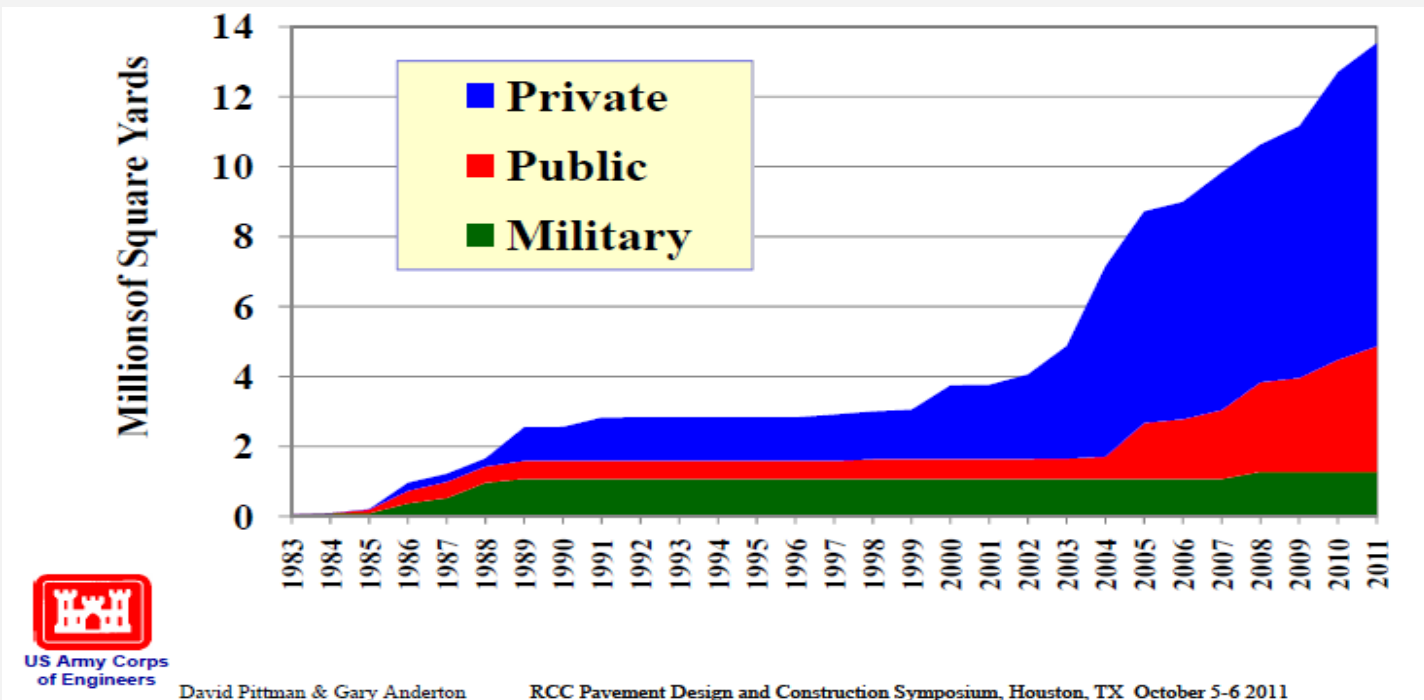


Roller Compacted Concrete



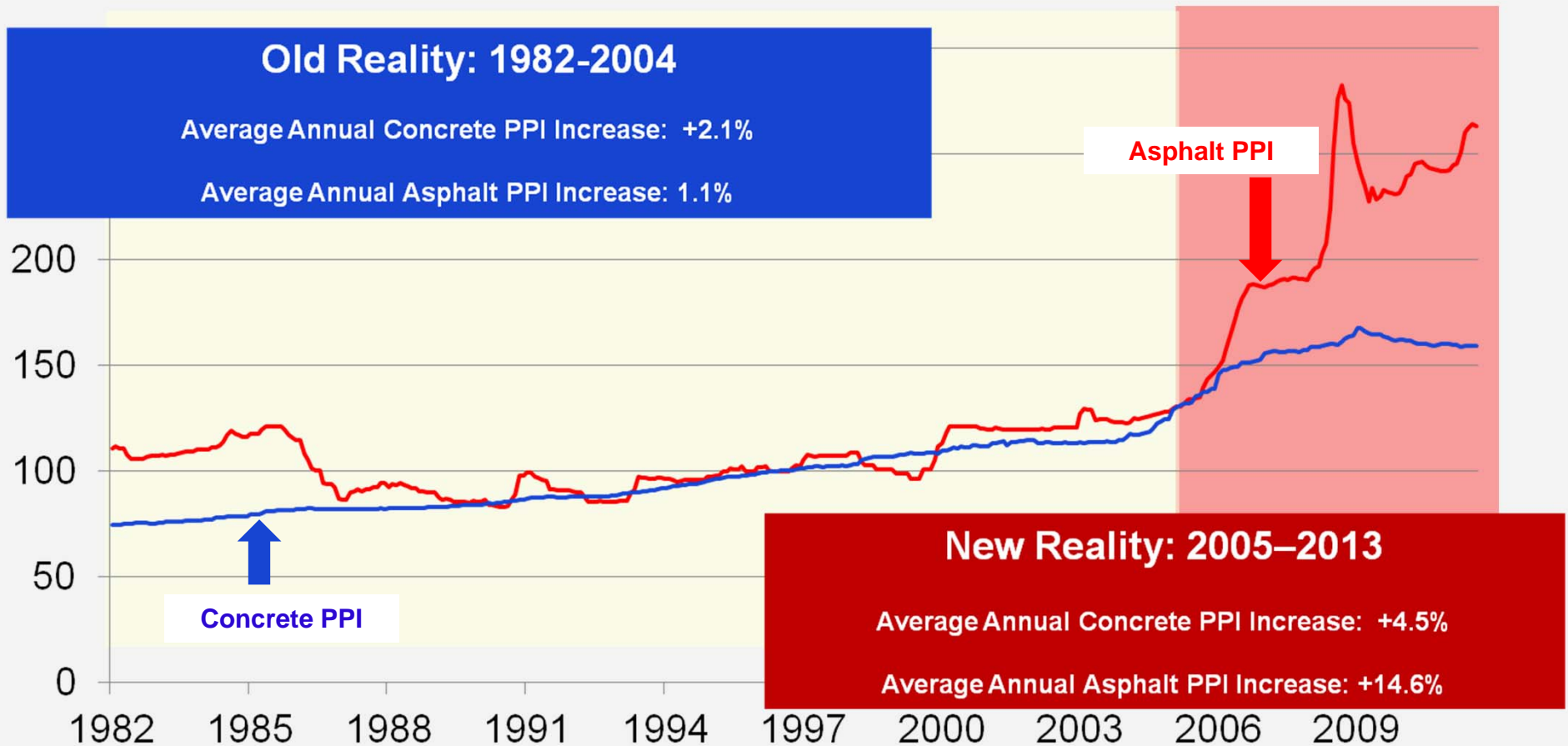
RCC – Experiencing a Renewal

- Originally used for heavy-duty pavements
- Growth has accelerated in last decade
- Increase in private & non-military public use
- Emergence of asphalt contractors placing RCC



Asphalt Prices Have Soared

Paving Material PPI Price Comparisons 1996 = 100



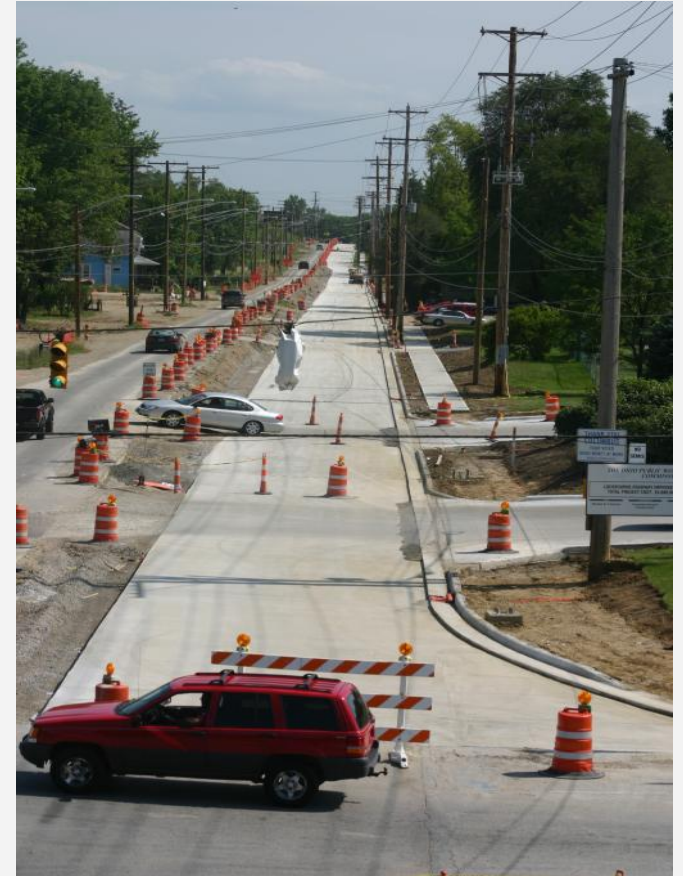
Source: Bureau of Labor Statistics, Producer Price Indices

RCC Makes for Strange Bedfellows



Benefits of Roller-Compacted Concrete

- Fast construction
- Economical
- Early load carrying capacity
- Supports heavy loads
- Low maintenance
- Durable
- Light surface reduces lighting requirements and Urban Heat Island effects

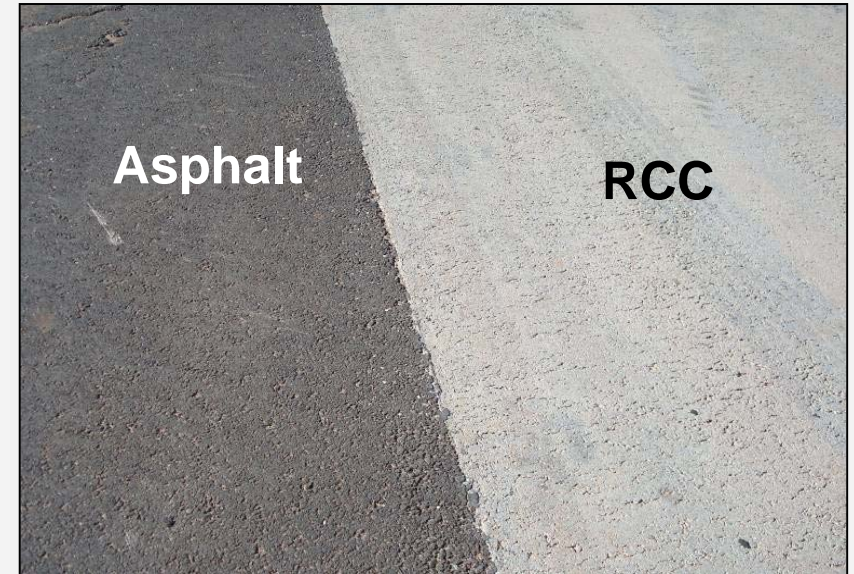


Project Considerations

- Project size
- Site geometry
- End use
- *Client expectations*



Surface Appearance



Applications

- Ports, intermodal yards and military hard stands
- Warehouse facilities
- Parking areas
- Maintenance & storage yards
- Airport service areas
- Arterial roads
- Highway shoulders
- Local streets & intersections
- Pothole patches



Log Sort Yards



Vancouver Island, BC, 1978



Military Facilities



Ft. Lewis, WA, 1986



Ft. Drum, NY, 1990

Ft. Carson, CO, 2008



Intermodal Yards



**Burlington Northern,
Denver, 26 Acres, 1986**



Long-Term Performance

- Although not air-entrained, field performance very good,
 - Reference: PCA publication Long-Term Performance of RCC Pavements, RP366
- Minor surface paste (1/16") erodes, then stabilizes
- Most distress along joints
- RCC results variable under ASTM C666 (F-T) and C672 (Deicing/scaling)
- Conventional concrete tests appear to be too severe based on actual experience
- Durability tests used for concrete masonry units (ASTM C1262) and precast paving units (ASTM C67) possibly more appropriate



BN Intermodal Yard, CO
Built 1985; Photo 2009



Fort Drum, NY
Built 1988; Photo 2013

Edges Critical to Performance

- Compaction more difficult
- Segregation more likely
- Try to minimize number of cold joints
- Care needed to match grade from cold to fresh joint

Edge Compaction

Compaction shoe



Fresh Longitudinal Joint



- Adjacent lane should be placed within 60-minutes
- Must keep edges moist until adjacent lane placed

Highway Shoulders



I-285 highway shoulders
Atlanta, GA, 2004



Port Terminals



Norfolk International
Terminal, VA, 20 acres, 2005



Choctaw Point Terminal,
Mobile, AL, 95 acres, 2009

Warehouse Facilities



Warehouse, Appleton, WI



RCC used as working platform for
cast-in-place tilt-up walls

LOWE'S DISTRIBUTION CENTER

Rome, GA - 2012

Project Information

- Owner: Lowe's
- Use Type: Distribution Center
- Year Built: 2012
- Size: 69 Acres
- Volume: 65,000 CY



Additional Details

- Thickness: 7" RCC / 6" Aggregate Base
- Traffic: 400 Trucks / day
- Paved 30 ft wide, 150 to 180 CY/ hour
- RCC paving completed in 2 months, 11 days (Calendar)
- Saved \$3.5 M versus asphalt with concrete dolly strips





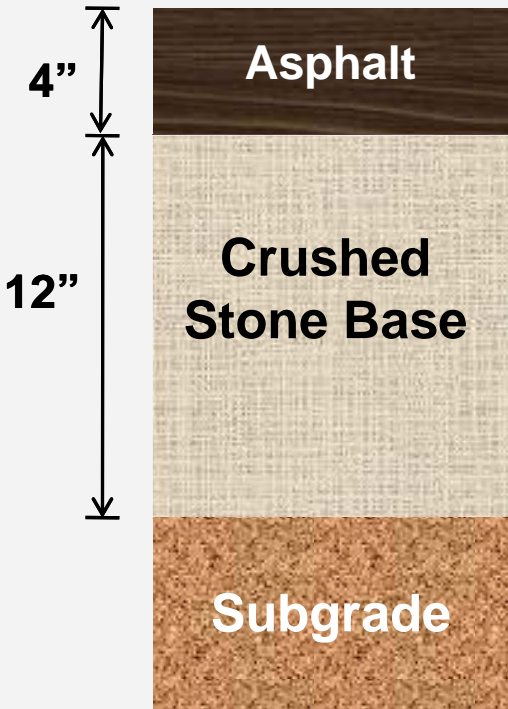
Parking Areas



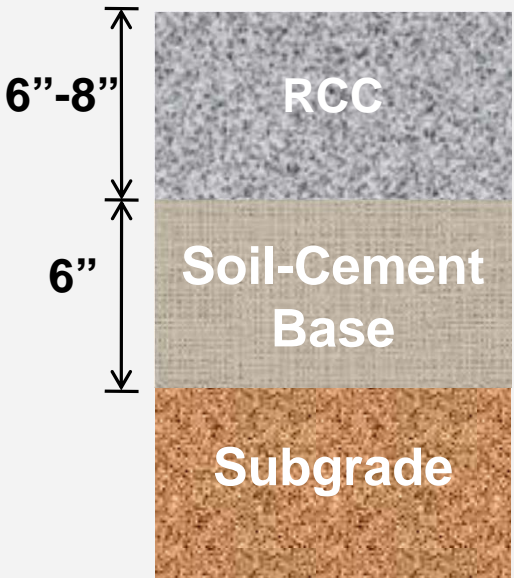
Honda plant, AL, 2001
Saturn plant, TN, 1988
207 acres
134 acres

Parking Areas

Design/Bid Section



As Constructed



Sustainable Contributions

Less damage to area roads
BMW, SC, 2009
50 acres

This block contains a photograph of a large, paved parking lot at a BMW facility in South Carolina, 2009. The parking lot is mostly empty, with a few cars and trucks visible. In the background, there are several large, white industrial buildings. The photograph is framed by a green border. Below the photograph, the text "Less damage to area roads" is written in blue, "BMW, SC, 2009" is written in black, and "50 acres" is written in black.

Village of Streamwood Streets

Streamwood, IL - 2013

Project Information

- Owner: Village of Streamwood
- Use type: Residential
- Year built: 2011, 2013
- Quantity: 1000 CY each

Additional Details

- Thickness: 2" HMA / 6" RCC / 4" stone
- Asphalt alt: 3" HMA / 7" Asphalt base / 4" stone
- City forces completed all work with village equipment
- Joints cut at 20' spacing



\$ Cost Savings\$

2013 Material Costs:

- RCC = \$71/cy (Same price last 4 years)
- HMA = \$88/cy (2 tons @ \$44/ton)

Savings Breakdown:

- Material Savings = 13%
- Reduced Thickness Savings = 20%

Asphalt Costs

- 1995: \$17/ton
- 2000: \$19/ton
- 2008: \$28/ton
- 2012: \$47/ton
- 2013: \$44/ton

Since 2001 RCC Used on Many Ohio Residential Streets

Short List of Developments with RCC in Columbus, OH Area

- Longwood
- Marble Cliff Crossing
- Quarry Pointe
- Alkire Place
- Crawford Farms 6-1
- Creekstone
- Prestwick Green
- The Preserves
- Kensington
- Grant Run
- Taylor Glen, Section 1
- Longview
- Park of Waggoner
- Quarry Park 1
- Woods of Reynoldsburg
- Villages of Hilliard Green
- Cumberland Trails
- Watkins Grove
- Sunbury Estates
- Abbie Trails
- Blendon Reserve



Grape Creek Road San Angelo, TX

Project Information

- **Owner: City of San Angelo**
- **Use Type: Collector / Arterial**
- **Year Built: 2011**
- **Quantity: 2550 CY**

Additional Details

- **Thickness: 6" RCC / 8" Stabilized Subgrade (Lime & Cement)**
- **Diamond Ground Surface**
- **First RCC pavement in West Texas**



Richland Ave (US 78) Aiken, SC - 2009

Pavement Design Information

- Owner: South Carolina DOT
- Use Type: US Highway
- Year Built: 2009
- Thickness: Milled 10" asphalt
Placed 10" RCC
- Traffic: 6000 ADT, 4 lanes
- Speed: 45 mph



Additional Details


- Replaced 27,500 SY in 15 days
- Placed 10" RCC in 1 lift
- All milled areas were paved within same day
- Maintained 1 lane open in each direction
 - Transverse Joints : 20 ft, early entry saw cut within 3 hours
- Traffic re-opened within 24 hours
- Diamond ground entire RCC surface



RICHLAND AV. (US 78) AIKEN, SC Completed Project



ACPA – National RCC Explorer

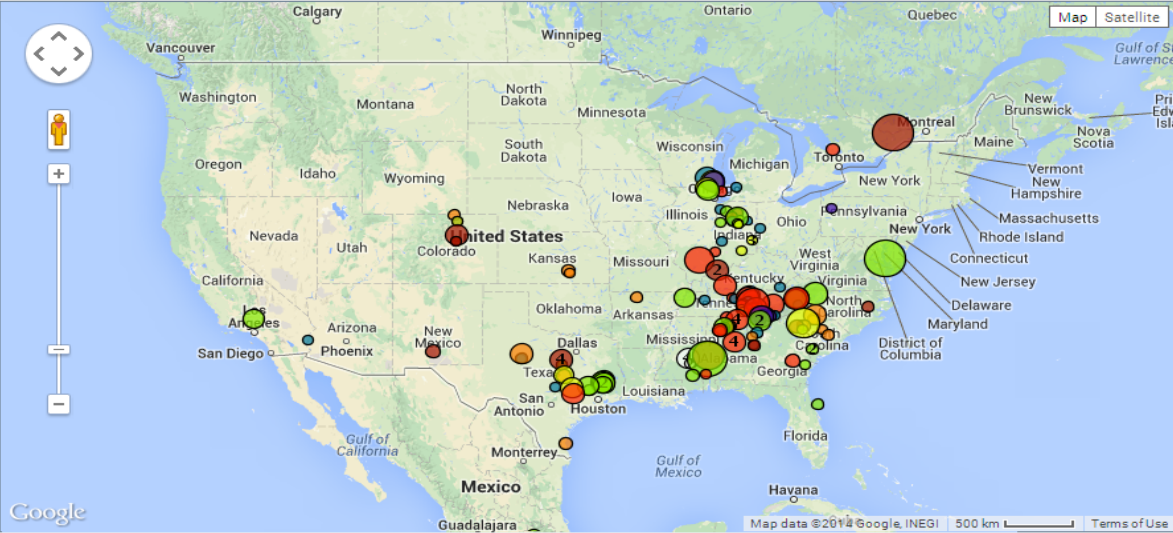
 The National RCC Explorer

[Instructions](#)

259 Items

[MAP VIEW](#) • [TABLE VIEW](#) • [DETAILS VIEW](#)

[93 results](#) out of 259 cannot be plotted.



Application

- Airport
- Arterial Street
- Industrial/Trucking Facility
- Local Street
- Military
- Other (e.g., Logging Facility, Composting Area, Storage Yard)
- Port or Intermodal Facility
- Widening or Shoulder
- mixed

Application

- 73 Industrial/Trucking Facility
- 52 Local Street
- 42 Port or Intermodal Facility
- 31 Military

State

- 1 AL
- 32 AR
- 1 AZ

RCC Thickness (in.)

- 5 4 - 5
- 22 5 - 6
- 49 6 - 7
- 47 7 - 8

Contractor


- 44 A. G. Peltz
- 1 Abramson L
- 1 APAC-Georg
- 1 Archer Wes

Year Constructed

- 2 1975 - 1980
- 8 1980 - 1985
- 36 1985 - 1990
- 5 1990 - 1995

Project Size (\$)

- 165 0 - 50000
- 27 50000 - 100
- 8 100000 - 15
- 7 150000 - 20



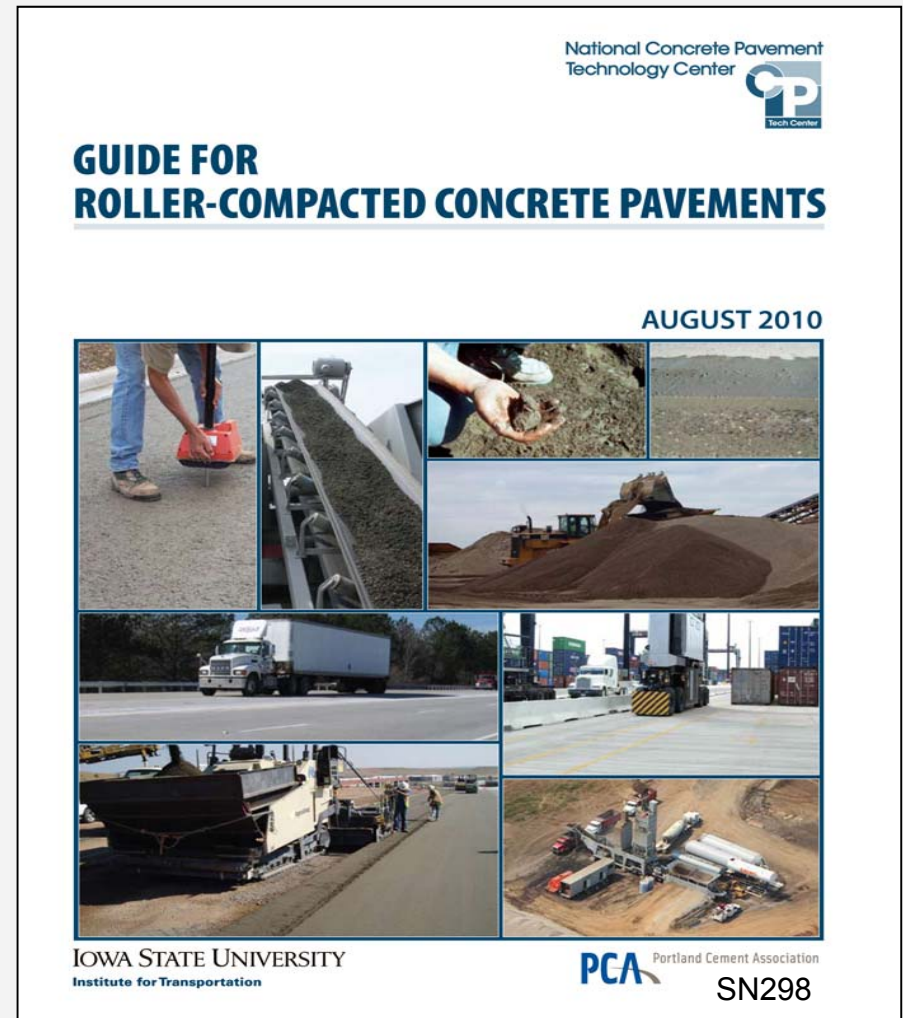
RCC and PCC Installation
Image 1 of 2

Close X

rcc.acpa.org

Resource Material

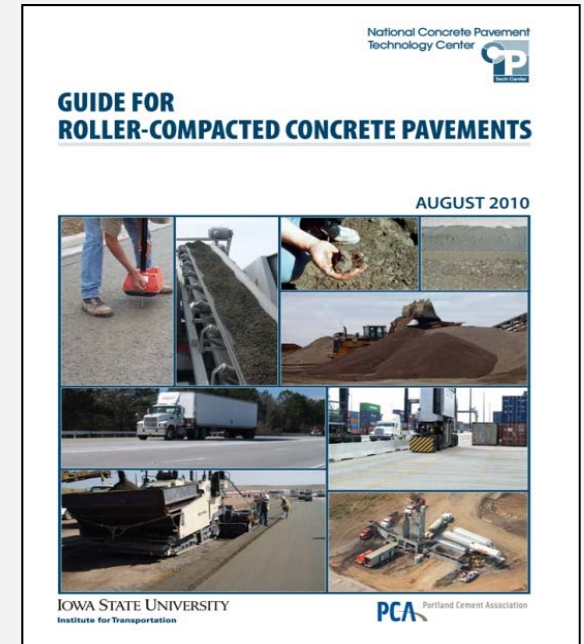
- Introduction
- Applications
- Properties
- Mixture Proportioning
- Structural Design
- Production
- Construction
- Troubleshooting



www.cement.org/bookstore

RCC Training Modules

- Based on RCC Guide
- Six One-Hour Modules
 - Introduction & Uses
 - Properties
 - Mixture Proportioning
 - Structural Design
 - Production
 - Construction
- Free
- Available at www.nhi.fhwa.dot.gov

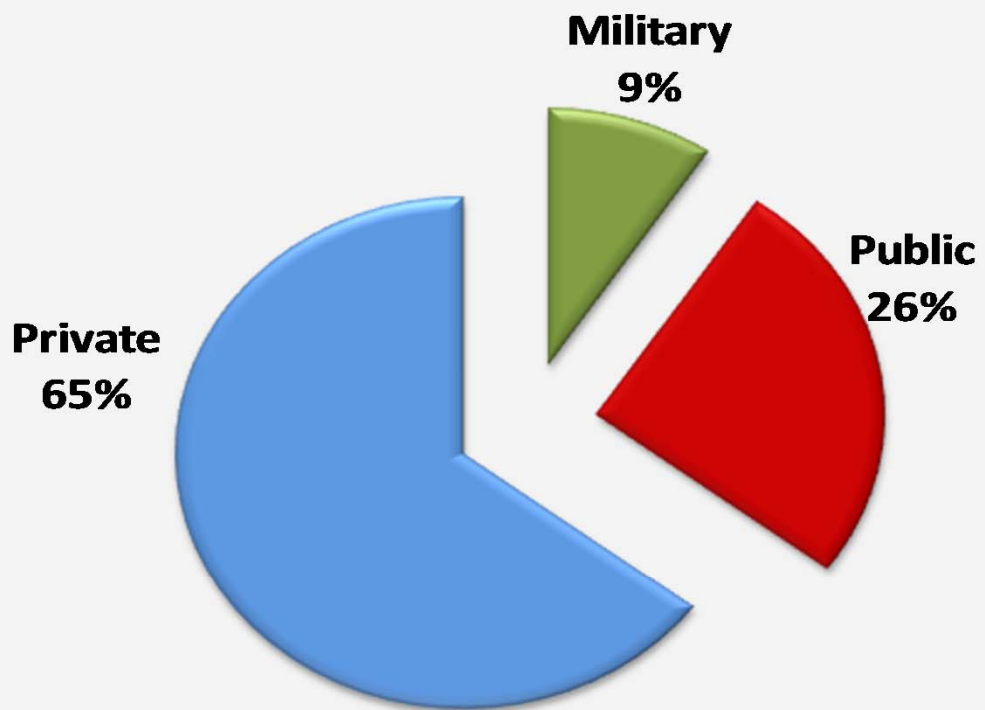




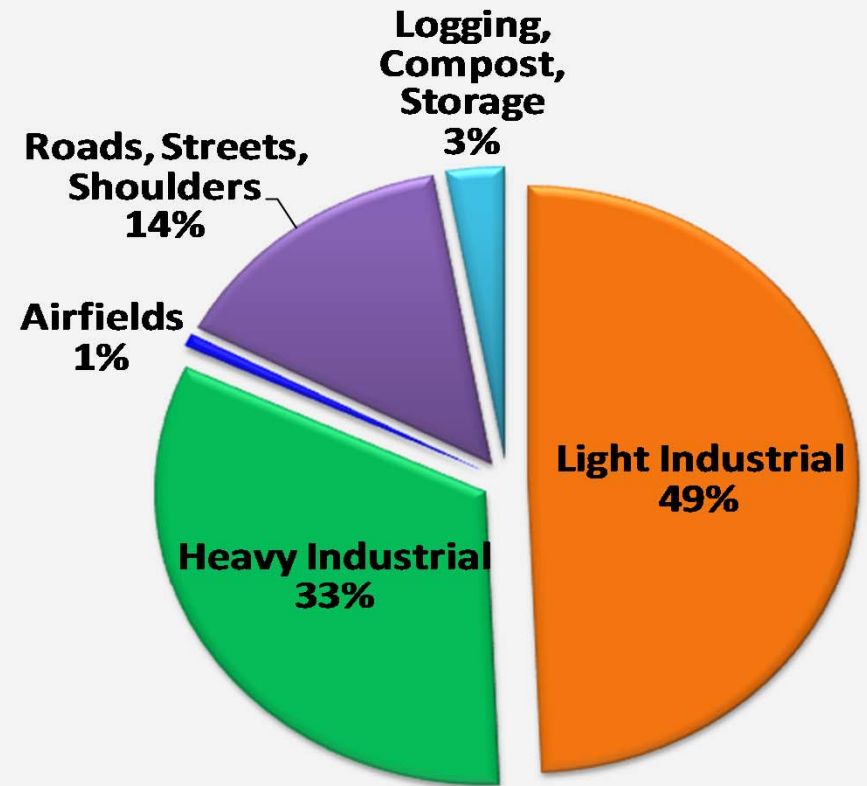
Questions?

Discover how beautiful concrete can be

Type of Owners and Applications, 1983-2011



Type of Owners



Type of Applications

Project Considerations

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- Site geometry
- End use
- *Client expectations*



Parking Areas



Ohio Turnpike Service Plaza, 2010
30 acres

Streets and Intersections



Residential street
Columbus, OH

Intersection replacement Calgary,
AB



Choctaw Point Terminal, Mobile, AL



- Heavy duty section: 15.5" RCC on 6" stabilized sand
- Medium duty section: 8" RCC on 6" stabilized sand
 - 95 acres for Phase I
- 350,000 twenty-foot equivalent container units

Choctaw Point Terminal, Mobile, AL



- RCC Mix, lb/yd³
 - Cement: 525
- Coarse agg. 1,350
 - Fine agg. 1,800
 - 6.9% moisture

- Test Section Test Results
 - f'c: 6,050 psi at 28 days
 - MR: 1,000 psi at 28 days

Distribution Centers



18 acre distribution center in Austin, TX (1987)



10 years after construction

Central States Trucking

Joliet, IL – 2013

Project Information

- Owner: Central States Trucking
- Use Type: Container storage
- Year Built: November 2013
- Size: 12 Acres
- Volume: 11,000 CY

Additional Details

- Used low density paver
- Thickness:
 - 7” RCC for container storage
 - 9” RCC for stacked containers, placed in two 4.5 in. lifts
- Plastic sheeting used for thermal protection
- 14-day strengths of 5,600 psi



Waste Handling Facilities



5 acre composting yard near Toronto



25 acre sludge drying basins in Austin, TX



1 acre composting yard in North Augusta, SC

Construction Cold Joints

- Cut joints back to fully compacted RCC
- Cut edge should be vertical and clean
- Place fresh RCC slightly higher to allow for reasonable “roll down”

