Upon his selection to the Senior Executive Service in January 2005, Dr. David W. Pittman became the Director of the Geotechnical and Structures Laboratory at the US Army Engineer Research and Development Center in Vicksburg, Mississippi. Dr. Pittman leads a team of about 500 researchers and support staff in developing technologies primarily within the realm of geotechnical and structural engineering and the geosciences, addressing both civil works and military engineering challenges for the warfighter and the nation. For example, GSL researchers develop innovative technologies in force protection, force projection, maneuver support, and civil works infrastructure, and provide operational support and technology transfer to soldiers and civilians around the world. Dr. Pittman also leads ERDC’s Military Engineering Business Area, which focuses on warfighter support in force protection, force projection, and maneuver support. Dr. Pittman conducted research on roller compacted concrete pavement design and construction, completing a Master’s degree and a PhD on these topics. He has published numerous reports and technical papers on the subject. He serves as the current Chairman of ACI Committee 325, Concrete Pavements, and is a member of ACI Committee 327, Roller-Compacted Concrete Pavements. He contributed to the latest state-of-the-art “Guide for Roller Compacted Pavements” published by the National Concrete Pavement Technology Center in June 2010.
**RCC Materials and Construction**

**Typical RCC Aggregate Gradation and Mixture Proportions**

- RCC combined aggregate grading band
- Well-graded aggregate blend; maximum size = 19 mm

**Continuous Mixing Pugmill Plant**
- 1980's
- 1990's
- 2000's

**Hauling, Placing and Compacting**
- Modified Asphalt Concrete Paver (mid-1980's)
- High-Density Screed Paver (late 1980's - present)

**Moisture Control and Curing**
- Water Spray Truck
- Moist Curing
- Curing Compound

**Quality Control and Assurance**
- Extracting cores from test section
- Checking density with nuclear gauge
- Measuring smoothness with straightedge

*Photo courtesy of John Hawkins, USACE*
Advantages and Limitations

**Advantages**
- Low construction cost
  - Rapid placement, high production
  - No reinforcing steel, dowels, forms
  - Less equipment, labor
- Ease of construction
  - Uses existing construction methods
- High strength
  - Low w/c, high density
- Early loading
  - Inherent stability of fresh, stiff concrete

**Limitations**
- Smoothness
  - Most applications limited to low-speed traffic
- Surface texture
  - Coarser than PCC
  - Similar to AC
- "Uncontrolled" cracking
  - Used to save costs
  - Most use sawed joints now
- Surface raveling
  - When poor curing, finishing practices used
- Freeze-thaw durability
  - Poor lab, excellent field performance

RCC Advantages and Limitations

Military Application
**Ft. Campbell, Kentucky**
- Motor Pool (military tanks, heavy trucks)
- Built in 1987
- $16.50/sq m ($13.84/sq yd)
- 30% savings over conventional concrete
- 57,000 sq m (5.7 ha), 190 mm (7.5 in) thick
- Cracks at 15 to 56 m (50 to 180 ft) spacing
- 60 freeze-thaw cycles/year; little/no damage
- Designed for 20 years’ traffic

Military Application
**Ft. Carson, Colorado**
- Motor Pools, Tank Trails (military tanks, heavy trucks)
- Built in 2008
- 170,000 sq m (200K sq yds), 250 mm (10 in) thick
- Longitudinal cracks observed one year after placement

Use of RCC Pavements in the US, Mairepav, July 2009
**Public Sector Application**

*I-285 Shoulder Replacement, Atlanta, GA*

- Shoulder replacement
- First use on U.S. Interstate Highway
- October 2004 – Sept 2005
- $45/sq m ($38/sq yd)
- 28 km (17 miles) long, 3 to 4 m (10 to 13 ft) wide
- 150 to 200 mm (6 to 8 in) thick
- Joint spacing matched main-line paving joints
- Designed for 20 years’ traffic

**Private Sector Application**

*Saturn Plant, Tennessee*

- Roads, parking areas, loading docks
- Built in 1989
- $10.76/sq m ($9/sq yd)
- 540,000 sq m (134 acres)
- 125 to 180 mm (5 to 7 in) thick
- Served as staging areas during vertical construction
- Zero to low maintenance to date

**RCC Functional Applications**

- Light Industrial 33%
- Heavy Industrial 12%
- Roads, Streets, Shoulders 14%
- Logging, Compost, Storage 2%
- Airfields 2%
- Totals 100%

**Cumulative RCC Pavement Placing by Decade**

<table>
<thead>
<tr>
<th>Decade</th>
<th>Light Industrial</th>
<th>Heavy Industrial</th>
<th>Roads, Streets, Shoulders</th>
<th>Logging, Compost, Storage</th>
<th>Airfields</th>
<th>Totals</th>
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<tbody>
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<td>1980's</td>
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**RCC Pavement Owners**

- Private 33%
- Public 21%
- Military 10%
- Light Industrial 40%
- Heavy Industrial 12%
- Roads, Streets, Shoulders 14%
- Logging, Compost, Storage 2%
- Airfields 2%

**Proportion of owners and functions of RCC pavements in the United States, by surface area, 1983-2011**

**Roller-Compacted Concrete (RCC) pavement production in the United States, 1983-2011**

- 1983: 0
- 2003: 8
- 2011: 14

**RCC placement per decade, by function, 1983 – 2011**
Locations of RCC pavement projects in the United States.

Total RCC Pavement Area, and average RCC pavement size, per region

Top ten states for RCC pavement usage

Analysis of RCC pavement size, by function

Analysis of RCC pavement thickness, by function

Cost data for RCC pavements
Summary

- RCC is an excellent, low cost paving alternative in the United States
  - Used for over 30 years
  - Over 13.5M sq yds in military, public, private applications
- Demand for low-cost, durable, heavy-duty paving alternatives is growing
  - U.S. infrastructure condition is declining
  - Investment in public, private infrastructure is growing
    - Over 60% of RCC paving has occurred in last 7 years
- RCC should provide a viable paving alternative for years to come

Questions?