Recent Advances in Design & Construction of RCCP
RCC4PA, Camp Hill PA
February 26, 2015
<table>
<thead>
<tr>
<th>AGENDA</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Introduction: What is Roller Compacted Concrete and What Are Its Benefits (Wayne Adaska)</td>
</tr>
<tr>
<td>• RCC Mix Design &amp; Production Process (Wayne Adaska)</td>
</tr>
<tr>
<td>• RCC Placement Process and Case Studies (Corey Zollinger)</td>
</tr>
</tbody>
</table>
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

Concrete
- rigid pavement
- strength tests

Asphalt
- paver
- rollers

Soils
- mix design
- density test

Roller-Compacted Concrete
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
RCC – EXPERIENCING A RENEWAL

- Originally used for heavy-duty pavements
- Growth has accelerated in last decade
- Increase in private & public road use
- Emergence of asphalt contractors placing RCC
VOLATILITY OF ASPHALT PRICES

Paving Material PPI Price Comparisons
1996 = 100

Old Reality: 1982-2004
Average Annual Concrete PPI Increase: +2.1%
Average Annual Asphalt PPI Increase: 1.1%

Average Annual Concrete PPI Increase: +4.5%
Average Annual Asphalt PPI Increase: +14.6%

Source: Bureau of Labor Statistics, Producer Price Indices
RCC MAKES 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

- RCC
- Conventional Concrete

- Asphalt
- RCC

- Diamond Ground
  Conventional Concrete
- Diamond Ground
  RCC

- 1/2” Max Size
- 3/4” Max Size
TECHNOLOGIES TO IMPROVE SURFACE APPEARANCE

RCC Surface Pro

- Colloidal Silica
- Reacts with cement to increase paste
- Improves surface appearance
- Reduces surface dusting
- Improves surface durability
SURFACE APPEARANCE

Maryhill Catholic Cemetery, Niles, IL
SURFACE APPEARANCE
AGENDA

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MIXTURE PROPORTIONING PHILOSOPHIES

RCC Mixture proportioning

Constructability
Mix is constructable, achieves required density with optimal compaction effort

Mechanical strength
Compressive strength, flexural strength

Economics
Use of locally available materials, lower cement consumption, use of SCM

Durability and performance
Low water permeability, good abrasion resistance, no ASR

Long-term RCC performance
RCC MIXTURE DESIGN

Modifications needed in typical no-slump concrete mixture procedures (ACI 211.3R) because RCC is:

- Dryer than zero slump
- Not air-entrained
- Lower cementitious content
- Higher fines content
- Nominal max. size aggregate 1/2 to 3/4 in.
CONVENTIONAL CONCRETE & RCC

Percent by Volume

Conventional Air-Entrained PCC

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td>16</td>
<td>6</td>
<td>22</td>
<td>44</td>
<td>144 pcf</td>
</tr>
</tbody>
</table>

Roller Compacted Concrete

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>14</td>
<td>1.5</td>
<td>36</td>
<td>38.5</td>
<td>153 pcf</td>
</tr>
</tbody>
</table>
SOIL COMPACTION METHOD

- Most common method used in the U.S. for RCC paving mixtures
- Testing equipment readily available at construction materials laboratories
- Three major steps
  1) Select aggregate blend with minimal voids
  2) Determine optimum moisture content and maximum density (ASTM D1557)
  3) Determine cementitious content
STEP 1: AGGREGATE SELECTION

- **Aggregate selection very important**
- 85% of mix by volume
- Responsible for mix workability, segregation & ease of consolidation
- Quality of aggregates should meet ASTM C33
STEP 1: AGGREGATE SELECTION

- Nominal Maximum Size Aggregate
  - Most projects: 5/8” to 3/4”
  - As small as 1/2” for tighter surface and reduced segregation
  - 1-1/2” may be used for non-wearing courses or where surface appearance is not critical
- Plasticity Index (PI) < 5
- Multiple aggregate piles
- Consider availability when preparing specs (during design phase)
STEP 1: AGGREGATE SELECTION

Suggested Blend Gradation

<table>
<thead>
<tr>
<th>Size Number</th>
<th>Percent Passing</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-in (25 mm)</td>
<td>100</td>
</tr>
<tr>
<td>3/4-in (19mm)</td>
<td>90-100</td>
</tr>
<tr>
<td>1/2-in (12.5 mm)</td>
<td>70-90</td>
</tr>
<tr>
<td>3/8-in (9.5 mm)</td>
<td>60-85</td>
</tr>
<tr>
<td>No. 4 (4.75 mm)</td>
<td>40-65</td>
</tr>
<tr>
<td>No. 16 (1.18 mm)</td>
<td>20-40</td>
</tr>
<tr>
<td>No. 100 (150 μm)</td>
<td>6-18</td>
</tr>
<tr>
<td>No. 200 (75 μm)</td>
<td>2-8</td>
</tr>
</tbody>
</table>

RCCP Gradation Band

- 0.45 Power, 3/4" MS
- Suggested Lower Limit
- Suggested Upper Limit

0.45 Power curve

PCA suggested limits
STEP 2: DETERMINE OPTIMUM M/C & MAX. DENSITY

- Select a mid-range cement content (e.g. 12% or 450 pcy)
- Perform a modified Proctor test (ASTM D1557)
- Construct moisture-density relationship curve
- Determine Optimum Moisture Content and Maximum Dry Density
MOISTURE-DENSITY RELATIONSHIP

![Graph showing the relationship between moisture content and dry density. The graph indicates that there is an optimum moisture content for maximum density.](image)
Relationship Between Density and Strength

Dry Density (pcf)

7-day Compressive Strength (psi)

Moisture Content, % by dry wt.

9% cementious content
1 1/2 in. MSA
Modified Proctor (ASTM D 1557)
COMPACTION VERY IMPORTANT

Various RCC Mixes
Various Cement
Various Ash
Various Aggregates

\[ y = -3E-05x^5 + 0.0105x^4 - 1.7042x^3 + 138.45x^2 - 5607x + 90530 \]

\[ R^2 = 0.9786 \]
STEP 3: DETERMINE CEMENTITIOUS CONTENT

● Make and test compressive strength cylinders
  – Maintain percent optimum moisture content (use OMC determined in Step 2)
  – Use varying cement contents, e.g. 10% (370 pcy), 12% (450 pcy), & 14% (530 pcy)
  – Mold three cylinders for each cement content using ASTM C1435 procedure

● Select cement content which yields appropriate strength
STRENGTH TESTING

Fabricating cylinders with vibrating hammer
ASTM C1435
STEP 3: DETERMINE CEMENTITIOUS CONTENT

Compressive strength (psi) vs. Cementitious content (pcy)

- Compressive strength ($f'_c$) vs. Cementitious content (pcy)
- Graph showing linear relationship between compressive strength and cementitious content
- Example data points:
  - 330 pcy: Compressive strength 3300 psi
  - 370 pcy: Compressive strength 3700 psi
  - 410 pcy: Compressive strength 4100 psi
  - 450 pcy: Compressive strength 4500 psi
  - 490 pcy: Compressive strength 4900 psi
  - 530 pcy: Compressive strength 5300 psi
  - 570 pcy: Compressive strength 5700 psi

- Highlighted point at 480 pcy with compressive strength of 5000 psi

- Chart visually represents the increase in compressive strength with an increase in cementitious content.
FREEZE-THAW DURABILITY

- Although not air-entrained, field performance very good
  - Reference: Long-Term Performance of RCC Pavements, RP366
- Most distress along joints
- Minor surface paste (1/8”) erodes, then stabilizes
- 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
- DO NOT use deicing agents on RCC surface for at least 30-days after completion
DRY BATCH CONCRETE PLANT

- Readily available
- Good for small jobs
- 2-step process
  - Feeds transit mixers
  - Discharge into dumps
- Mix 50 - 60% capacity
- Low production
- Dedicated trucks
- Segregation concern
- Intermittent cleaning required
- Portable pugmill mixers
CONCRETE BATCH PLANT

- Highly accurate proportioning
- Local availability
- Smaller output capacity
- Longer mix times than conventional concrete
- More cleaning with drum mixer
- Dedicated production
- Horizontal shaft spiral blade mixer very efficient
CONTINUOUS PUGMILL

- High-volume applications
- 100 to 250+ cy/hr
- Excellent mixing efficiency
- Mobile, erected on site
TRANSPORTING

● Rear dump trucks normally used
● Minimizes transport time
● Covers required for long hauls or in hot/windy conditions
Moisture Content

- Moisture content is critical
- Check at plant
- +/- 0.5% of optimum
Load in multiple piles to avoid segregation
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
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• RCC Placement Process and Case Studies (Corey Zollinger)
THE FINAL SURFACE TYPE WILL DICTATE THE NECESSARY TECHNIQUES & EQUIPMENT NEEDED TO BE SUCCESSFUL

<table>
<thead>
<tr>
<th>Natural RCC</th>
<th>Diamond Ground RCC</th>
<th>Asphalt</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Natural RCC" /></td>
<td><img src="image2" alt="Diamond Ground RCC" /></td>
<td><img src="image3" alt="Asphalt" /></td>
</tr>
</tbody>
</table>

**Applications**
- Ports
- Distribution centers
- Industrial yards
- Residential roads
- Parking lots
- Collector / Arterial local roads
- Highway Shoulders
- State routes
- Any pavement type

**Factors**
- Lowest Cost
- Most sensitive to contractor skill level
- Least smooth
- Ugly surface appearance
- Medium cost increase
- Increased construction time
- Improved smoothness, skid resistance
- Reduced noise
- Highest cost
- Increased construction time
- Least sensitive to contractor skill level
- Improved smoothness, skid resistance
### FACTORS TO CONSIDER FOR PAVING

**Consistent Mix Delivery to Paver**

<table>
<thead>
<tr>
<th>Mix Delivery</th>
<th>Paver Operation</th>
</tr>
</thead>
<tbody>
<tr>
<td>• 10 Wheel dump trucks - Cover loads</td>
<td>• Balance speed of paver with mix delivery</td>
</tr>
<tr>
<td>• Keep trucks clean</td>
<td>• Use paving calculator</td>
</tr>
<tr>
<td>• Plan trucking route (traffic, truck staging)</td>
<td>• Keep paver moving (material transfer machine)</td>
</tr>
<tr>
<td>• Avoid segregation in truck loading / unloading</td>
<td>• Keep head of material constant in hopper and screed</td>
</tr>
<tr>
<td>• Avoid end of load segregation</td>
<td>• Keep augers feeding material consistent</td>
</tr>
<tr>
<td>• Consider using material transfer machine &amp; insert hopper</td>
<td>• Use grade control devices (string, big ski, etc)</td>
</tr>
<tr>
<td></td>
<td>• Don’t pave over standing water</td>
</tr>
</tbody>
</table>
# RCC IS PAVED WITH ASPHALT EQUIPMENT
Achieving Density & Smoothness is Critical

<table>
<thead>
<tr>
<th>Standard Paver</th>
<th>HIGH DENSITY PAVER</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Standard paver (80% to 85% initial density)</td>
<td>• High density screed (Vogele or ABG Titan)</td>
</tr>
<tr>
<td>• Available in all markets</td>
<td>• High initial density (&gt; 90%)</td>
</tr>
<tr>
<td>• High-production (6 to 8 ft/min)</td>
<td>• Availability is increasing, but still limited</td>
</tr>
<tr>
<td>• Lift thick range: 4” to 6”</td>
<td>• Smoother surface with higher initial density</td>
</tr>
<tr>
<td>• May require multiple lift paving</td>
<td>• Less roll down to achieve density</td>
</tr>
<tr>
<td>• Impossible to pave adjacent lanes</td>
<td>• High-production (6 to 8 ft/min)</td>
</tr>
<tr>
<td>• Increased roll down to achieve density (grade control problems)</td>
<td>• Lift thick range: 4” to 9”</td>
</tr>
<tr>
<td>• Easier to fix segregated areas before compaction</td>
<td>• Adjacent lanes easily paved</td>
</tr>
<tr>
<td></td>
<td>• Recommended</td>
</tr>
</tbody>
</table>
THICK RCC IS PLACED WITH HIGH DENSITY ASPHALT PAVERS
Achieving Density & Smoothness is Critical

High Density Paver

• High density screed (Vogele or ABG Titan)
• High initial density from paver (90% - 96%)
• Smoother surface due to higher initial density
• Less “roll down” to achieve final density
• High-production (6 to 8 ft/min)
• 10 to 30 ft width
• Lift thick range: 4” to 9”
ROLLERS ARE USED TO ACHIEVE DENSITY AND PROVIDE FINISH

<table>
<thead>
<tr>
<th>Initial Compaction</th>
<th>Finish Rolling</th>
</tr>
</thead>
</table>
| • Initial: 10 - 12 ton static & vibratory roller  
  • Thinner lifts may allow smaller roller  
  • Establish roll pattern (check density a lot!)  
  • Adjust roll pattern based on moisture content (visual observation and lab measurements to confirm)  
  • Compact to 98% of modified proctor (wet density)  
  • Adjust moisture content if needed – impacts smoothness  
  • Finer mixes achieve density easier  | • Combination, dual steel or rubber tired  
  • Maximum weight - 6 short ton  
  • Remove roller marks  
  • Once completed, keep roller off of the area |

Grape Creek Road – San Angelo, TX  
Fairforest Way Greenville, SC
**LONGITUDINAL JOINTS CAN BE BUILT 3 DIFFERENT WAYS**

<table>
<thead>
<tr>
<th>Vertical Cold Joint</th>
<th>Angular Cold Joint</th>
<th>Fresh (Hot) Joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Pave width of lane</td>
<td>• Need high density paver</td>
<td>• Pave for 50 minutes then move back to beginning and match original lane</td>
</tr>
<tr>
<td>• Saw cut full depth early next morning</td>
<td>• Attach shoe to screed</td>
<td>• Do not compact original lane within 2 ft of edge until adjacent lane is paved</td>
</tr>
<tr>
<td>• Remove with blade &amp; loader</td>
<td>• Maximum angle 15°</td>
<td>• Recommend a longitudinal saw cut</td>
</tr>
<tr>
<td>• Expect waste</td>
<td>• Use plate tamper to improve edge durability</td>
<td>• Use small loader to create fresh vertical transverse joint</td>
</tr>
<tr>
<td>• Reduce waste with paver shoe &amp; plate tamper</td>
<td>• No saw cutting required</td>
<td>• Move quickly – keep moist!</td>
</tr>
<tr>
<td>• Pave adjacent lane and match thickness of existing lane</td>
<td>• Pave adjacent lane next day</td>
<td>• Coordination is key, avoid breakdowns</td>
</tr>
</tbody>
</table>
| • Good performance, limited load transfer | • Debatable performance, possible shear crack | ![Longitudinal joint construction image](image1.png) ![Angular cold joint image](image2.png) ![Fresh (Hot) joints image](image3.png)
MANHOLES & CURBS ARE EASILY INCORPORATED

<table>
<thead>
<tr>
<th>Curb &amp; Gutter</th>
<th>Manholes, Inlets</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Traditional curb &amp; gutter placed before RCC</td>
<td>• Plywood plate is placed on top of hole before RCC is placed</td>
</tr>
<tr>
<td>• Serves as compaction aid</td>
<td>• After paving, two methods are available:</td>
</tr>
<tr>
<td>• Joint may need to be sealed</td>
<td>• Dig RCC immediately while fresh, place manhole and re-compact material with hand tampers</td>
</tr>
<tr>
<td>• Alternately, ribbon curb can be placed</td>
<td>• Saw cut hardened RCC, place manhole, tie in with conventional concrete</td>
</tr>
<tr>
<td>• Drill &amp; grout rebar into cold RCC</td>
<td></td>
</tr>
<tr>
<td>• Place ribbon curb afterwards</td>
<td></td>
</tr>
</tbody>
</table>

- Plywood plate is placed on top of hole before RCC is placed
- After paving, two methods are available:
  - Dig RCC immediately while fresh, place manhole and re-compact material with hand tampers
  - Saw cut hardened RCC, place manhole, tie in with conventional concrete
QC / QA PROCESS INCLUDES TESTING FOR DENSITY, MOISTURE CONTENT & COMPRESSIVE STRENGTH

<table>
<thead>
<tr>
<th>Moisture &amp; Density</th>
<th>Compressive Strength</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Tested with nuclear gage in direct mode</td>
<td>• Cylinders prepared with vibratory hammer according to ASTM C1435</td>
</tr>
<tr>
<td>• Test density behind paver &amp; after roller to establish rolling patterns to achieve density</td>
<td>• 3 to 4 cylinders per set</td>
</tr>
<tr>
<td>• Achieve 98% of modified proctor wet density</td>
<td>• Strength timing often depends on traffic opening (1, 3, 7, 28 days)</td>
</tr>
<tr>
<td>• Nuclear gage gives general moisture fluctuation indication - Calibrate with oven dried moisture</td>
<td>• Cores can be obtained where density is not being achieved</td>
</tr>
<tr>
<td>• Oven dried is most accurate</td>
<td></td>
</tr>
</tbody>
</table>

Cylinders prepared with vibratory hammer according to ASTM C1435:
- 3 to 4 cylinders per set
- Strength timing often depends on traffic opening (1, 3, 7, 28 days)
- Cores can be obtained where density is not being achieved
# RCC PAVEMENTS NEED TO BE CURED & SAW CUT FOR PERFORMANCE & AESTHETIC BENEFITS

<table>
<thead>
<tr>
<th>Curing</th>
<th>Saw Cut &amp; Fill Joints</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Applied at same rate or slightly higher than conventional concrete</td>
<td>• More aesthetically pleasing</td>
</tr>
<tr>
<td>• Ensure uniformity with application process</td>
<td>• Early entry saw very effective, shortly following placement</td>
</tr>
<tr>
<td>• Apply as soon as possible behind roller operation</td>
<td>• Recommend sawing within 2 - 6 hours to avoid uncontrolled cracking</td>
</tr>
<tr>
<td>• Recommend WR Meadows 1200 to 1600</td>
<td>• Depth: 1” to 2”</td>
</tr>
<tr>
<td>• Ensures durable surface</td>
<td>• Spacing: Maximum 36 times thickness</td>
</tr>
</tbody>
</table>
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
GRAPE CREEK ROAD
IRI Measurements (Average)

Overall AVG  78.4
Overall Max  94.1
Overall Min  54.1
LAKE VIEW HEROES DRIVE
SAN ANGELO, TX
LAKE VIEW HEROES DRIVE
IRI Measurements (Average)

Overall AVG: 63.7
Overall Max: 116.7
Overall Min: 31.7
OVER THE PAST 10 YEARS, DOT’S HAVE PAVED SHOULDERS & SURFACE ROADS USING RCC

South Carolina DOT Projects

<table>
<thead>
<tr>
<th>US 21</th>
<th>Greystone Blvd</th>
<th>US 25</th>
<th>SC 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>New State Road</td>
<td>S. Beltline Blvd</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

I 285 – Atlanta, GA
I-85 Interchange – Lagrange, GA
SR 6 – Powder Springs, GA
US 78 – Aiken, SC
I 385 - Greenville, SC
I 75 – Tift Cook, GA
### 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
RICHLAND AV. (US 78) AIKEN, SC
Completed Project
**Village of Streamwood Streets**  
*Streamwood, IL*

<table>
<thead>
<tr>
<th>Project Information</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Owner:</strong> City of Streamwood</td>
<td></td>
</tr>
<tr>
<td><strong>Use Type:</strong> Residential</td>
<td></td>
</tr>
<tr>
<td><strong>Year Built:</strong> 2011, 2013</td>
<td></td>
</tr>
<tr>
<td><strong>Quantity:</strong> 1000 CY each</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Additional Details</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Thickness:</strong> 2” HMAC / 6” RCC</td>
<td></td>
</tr>
<tr>
<td><strong>City forces completed all work</strong></td>
<td></td>
</tr>
</tbody>
</table>
ROLLER COMPACTED CONCRETE HAS BEEN USED ON MANY SUBDIVISION STREETS IN OHIO SINCE 2001

<table>
<thead>
<tr>
<th>Short List of Developments with RCC in Columbus, OH Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Longwood</td>
</tr>
<tr>
<td>• Marble Cliff Crossing</td>
</tr>
<tr>
<td>• Quarry Pointe</td>
</tr>
<tr>
<td>• Alkire Place</td>
</tr>
<tr>
<td>• Crawford Farms 6-1</td>
</tr>
<tr>
<td>• Creekstone</td>
</tr>
<tr>
<td>• Prestwick Green</td>
</tr>
<tr>
<td>• The Preserves</td>
</tr>
<tr>
<td>• Kensington</td>
</tr>
<tr>
<td>• Grant Run</td>
</tr>
<tr>
<td>• Taylor Glen, Section 1</td>
</tr>
<tr>
<td>• Longview</td>
</tr>
<tr>
<td>• Park of Waggoner</td>
</tr>
<tr>
<td>• Quarry Park 1</td>
</tr>
<tr>
<td>• Woods of Reynoldsburg</td>
</tr>
<tr>
<td>• Villages of Hilliard Green</td>
</tr>
<tr>
<td>• Cumberland Trails</td>
</tr>
<tr>
<td>• Watkins Grove</td>
</tr>
<tr>
<td>• Sunbury Estates</td>
</tr>
<tr>
<td>• Abbie Trails</td>
</tr>
<tr>
<td>• Blendon Reserve</td>
</tr>
<tr>
<td>• Cedar Run</td>
</tr>
<tr>
<td>• Chestnut Estates</td>
</tr>
<tr>
<td>• Creekstone 2-4</td>
</tr>
<tr>
<td>• Haley Hollow</td>
</tr>
</tbody>
</table>
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
Heavy Industrial
Exist: 14 – 18” CTB
Issues: Water ponding, mud, dust
Solution:
• Mill 14” Existing
• Cement treat remaining base / subgrade 8”
• 14” RCC
Project Information

- Owner: Southern Company
- Use Type: Distribution Center
- Year Built: 2012
- Size: 363,000 SY
- Volume: 51,500 CY

Additional Details

- Thickness: 4, 6, 7, 10 & 18” RCC
- Pavement Types: Parking lot, Laydown areas, Haul Roads, Industrial area
- Converted 2” AC / 6” Ag. Base to 4” RCC / 6” Soil cement
- Reduced lighting by 50%
- Saved owner 25%
**Yuma East Wetlands Hike Trail**  
Yuma, AZ

### Pavement Design Information
- Owner: City of Yuma
- Use Type: Trail
- Year Built: 2013
- Thickness: 5” RCC / Compacted Subgrade
- Quantity: 1,700 CY

### Additional Details
- City Park, environmentally sensitive area
- Did not want Asphalt due to hydrocarbons
- Lacked funds for conventional concrete
- RCC made it feasible
### Project Information

- Owner: Yuma Truck Driving School
- Use Type: Truck Parking
- Year Built: 2013
- Size: 6280 SY
- Volume: 1,215 CY

### Additional Details

- Thickness: 7” RCC / Compacted Subgrade
- Traffic: 20 Trucks / day
- Paved 16 ft wide
- RCC paving completed in 3 days
- Used 90% passing ½” Sieve
- Owner knew that asphalt wouldn’t hold up to the turning movements of the trucks
YUMA COUNTY WATER USERS
Yuma, AZ - 2014

Project Information

- Owner: Yuma County Water Users
- Use Type: Roadway
- Year Built: 2014
- Size: 6280 SY
- Volume: 1,215 CY

Additional Details

- Thickness: 7” RCC / Compacted Subgrade
- Traffic: 20 Trucks / day
- Paved 16 ft wide
- RCC paving completed in 3 days
- Used 90% passing ½” Sieve
- Owner knew that asphalt wouldn’t hold up to the turning movements of the trucks
Questions?

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