Andale’s Pavement Technologies
A New Perspective For A New Era
How many people are on the earth?
7.4 Billion

How many Pavement/Traffic engineers are there in the world?
7.4 Billion
Five hundred years ago, everybody knew the earth was flat

“If you don't know where you're going, you might not get there.” - Yogi Berra
Pavement Choice Considerations:

- What do we want our pavements to do?
- Perform as engineered
- Long service life
- Low maintenance
- Aesthetically satisfying
- Short construction schedules
- Ride quietly and smoothly
- Have the Value that we intend it to have
The tougher question is:

How do we get there?
How do we design?
How do we implement

Do we keep doing the same thing over and over, or do we look for a better answer?
### Pavement Matrix

<table>
<thead>
<tr>
<th></th>
<th>Lower Initial Cost</th>
<th>Structurally Sound</th>
<th>Longevity</th>
<th>Speed of Construction</th>
<th>Aesthetics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asphalt and Stone Base</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Conventional Reinforced Concrete</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>CCP Compacted Concrete Pavement</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
</tr>
</tbody>
</table>

**What is the difference, now?**

**Advancements in RCC admixtures and curing compounds**
<table>
<thead>
<tr>
<th>Description</th>
<th>SY</th>
<th>Price</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>12&quot; FDR One Mile</td>
<td>14,080.00</td>
<td>$9.00</td>
<td>$126,720.00</td>
</tr>
<tr>
<td>12&quot; FDR with Double Treatment One Mile</td>
<td>14,080.00</td>
<td>$17.00</td>
<td>$239,360.00</td>
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<tr>
<td>12&quot; FDR with 6&quot; CCP One Mile</td>
<td>14,080.00</td>
<td>$30.00</td>
<td>$422,400.00</td>
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<tr>
<td>8&quot; FDR with 8&quot; Base &amp; 4&quot; HMA</td>
<td>14,080.00</td>
<td>$34.50</td>
<td>$485,760.00</td>
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<td>8&quot; FDR with Geogrid, 8&quot;: Flex Base, Double Treatment</td>
<td>14,080.00</td>
<td>$49.72</td>
<td>$700,057.60</td>
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</table>
What is RCC CCP?

CCP is a no-slump concrete that is compacted by vibratory rollers.

- Zero slump (very dry...less paste)
- Little to no forming—depends on application
- No reinforcing steel
- Limited finishing required
- Compacted with vibratory rollers (Maybe)
- High and Fast strength gain
- Resistant to freeze/thaw cycles and permeability
- Very dense
- Highly efficient installation methods
Why Choose RCC or CCP?

✔ Engineering Benefits
  ✔ Spread loads, Increase Rigidity, Increase life cycle, and Thinner pavement sections

✔ New Construction, or Re-Construction

✔ Sustainability-Heat island, Solar reflectivity, Less lumens required, Use recycled materials, lower carbon footprint to construct

✔ Economy

✔ Reduce Risk of price escalations

✔ Fast installations

✔ Open to traffic quickly

✔ Value
  ✔ Budgets, Schedule, and Maintenance
Compacted Concrete Paving
“The new RCC”
RCC has been called and “ugly” pavement; What about CCP?
Missouri DOT
MNRoad
Walla Walla County, Washington
Roseville, CA
Bel Aire, KS
Harper County, KS
Sedgwick County, KS
City of Laredo, TX
City of Rolla, MO

43-3.01G CHEMICAL ADMIXTURES
Chemical admixtures shall conform to ASTM C 494. The following admixture, or approved equal, is required by the City for use as shown on the plans. Please refer to the manufacturer’s recommendations for dosage rates.

- ACEIT Plus Manufactured by ACEIT Industries

The contractor is allowed to use proprietary chemical admixtures improving the formability of RCC, provided the record of the previous experience certifying the beneficial use of admixtures is provided with the submittal.
1. GENERAL

1. Description: Compacted Concrete Pavement (CCP) consists of aggregate, Portland cement and possibly other supplementary cementitious materials (fly ash, slag), water and an admixture that allows for mechanical and physical finishing of the surface, edges, and joints. CCP is proportioned, mixed, placed, compacted, finished, and cured in accordance with these specifications. Ensure that the CCP conforms to the lines, grades, thickness, and typical cross section shown in the plans or otherwise established by the Engineer. When used as base course, it will be covered with one or more lifts of asphalt as shown on the Plans. Otherwise, the CCP will provide the final riding surface.

1. REFERENCED DOCUMENTS

1. ASTM C 31 – Practice for Making and Curing Concrete Test Specimens in the Field
2. ASTM C 33 – Specifications for Concrete Aggregates
3. ASTM C 39 – Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens
4. ASTM C 42 – Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete
7. ASTM C 309 – Specification for Liquid Membrane-Forming Compounds for Curing Concrete
8. ASTM C 595 – Specification for Blended Hydraulic Cements
9. ASTM C 618 – Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete
10. ASTM C 778 – Standard Specifications for Standard Sand
11. ASTM C 989 – Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars
12. ASTM C 1040 – Density of Unhardened and Hardened Concrete In Place By Nuclear Methods
14. ASTM C 1240 – Specification for Use of Silica Fume as a Mineral Admixture in Hydraulic Cement Concrete, Mortar, and Grout
15. ASTM C 1435 – Standard Practice for Molding Roller Compacted Concrete in Cylinder Molds Using a Vibrating Hammer
16. ASTM D 994 – Standard Specifications for Preformed Expansion Joint Filler for Concrete (Bituminous Type)
17. ASTM D 1557 – Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort
Flexural Strengths

- **Conventional Concrete City of Wichita 650 Flex Mix**
- **Conventional Concrete KDOT 4.0 AE**
- **Traditional RCC Mix, No Ash, No ACEiT Control 1**
- **Traditional RCC Mix, Ash, No ACEiT Control 2**
- **ACEiT, No Ash, Rolled, Troweled**
- **ACEiT, Ash, Rolled, Troweled**
Conventional Concrete City of Wichita 650 Flex Mix
Conventional Concrete KDOT 4.0 AE
Traditional RCC mix, No Ash, No ACEiT
Traditional RCC mix with Ash, No ACEiT
ACEiT No Ash, Rolled, Troweled
ACEiT, Ash, Rolled, Troweled
Sustainability of CCP

Lower Heat Island Effect. It’s a cooler pavement.

Greater Solar Reflectivity, therefore you need less night time lighting.

Ability to use recycled aggregates and more fly ash than conventional concrete.

Less initial cement than conventional concrete which lowers carbon foot print to construct and maintain. (No repetitive milling and repaving).

We can achieve up to 8 LEED points by using CCP.
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