Evolution of RCC Construction in Texas

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Concrete Pavement – Types

Jointed-Reinforced

Jointed-Plain (unreinforced)

Continuously Reinforced

Roller Compacted Concrete
Concrete pavement placed a different way
- No slump concrete (very stiff)
- No forms
- No reinforcing steel
- Placed with asphalt-style pavers
- Consolidated with Vibratory Rollers
- No finishing
- Low water-cement ration (i.e. less shrinkage)
RCC vs. Conventional Paving

- RCC vs. Asphalt
  - Less expensive
  - Rigid—less subgrade stress
  - Less maintenance
  - Placement time same or less
  - Asphalt smoother

- RCC vs. Conventional Concrete
  - Less expensive (no reinforcing/dowels)
  - Faster, high production
  - Carries light traffic in hours
  - Higher speed – grinding

- Project size/complexity can dictate economic benefits
“Growing Pains” with RCC

- 1980’s – 2000: Lack of experienced contractors
- “One bad project” can hamper market or owner in a region
- Project size: small vs. large projects
- Equipment requirements
  - Pug mill & high density asphalt paver
  - Ready mixed plant and conventional asphalt paver
- Types of projects
- Over and under specifying
- Managing expectations
Texas – “Birthplace” of RCC Pavement in the U.S.

- First large RCC job – Fort Hood
  - Attribute COE acceptance to Dr. David Pittman
- 1984 – 18,000 sy, 10” thick, $58/sy at time
- 300 lb cement, 160 lb FA
- 1 ½” aggregate had some segregation
- ¾” agg test area better
- Placed in very hot, windy weather
- Natural cracks
- Flex strength of 800–900 psi
- 1987 – Second RCC project at Fort Hood
Central Freight Distribution Ctr.
Austin, Texas – 1987

- Truck terminal
  - 7” & 8” pavements
  - 90,000 sy
  - RCC bid 25% less than asphalt

- Natural cracks
  - 23–50’ spacing
  - Routed/sealed @ 5 yr

- Continuous use, little maintenance @ 26 yrs:
  - Still performing – now used for post office and UPS
  - ~5,500 sy repairs performed in 2014

- Peltz
Hornsby Bend Compost Yard
Austin, TX – 1987 & 90

- 90,000 sq yd, Five basins – “Dillo Dirt”
  - 12 in thick, 2 lifts
  - Haul roads, 9 in RCC
  - 3:1, 5:1 and 10:1 slopes

- Mix Design
  - 12% cement, no fly ash
  - ¾ in max aggregate
  - 3300 psi @ 38 D

- $43.47/cu yd or
  ~$31/sq yd

- Still functions daily
- Peltz
Los Tomates Border Station
Brownsville

- 1999, 15 Acres
- 10 in, 2 lifts
- 5000 psi, 520 lbs cement
- Pavement underdesigned, replaced w/ conventional pavement ~2011
- Peltz
Spurred RCC Renaissance in TX
Largest RCC site in U.S.
- 45, 48, 35, 30 acres – 2007, 09, 12 and 15
14 and 18” RCC
- 2-lift construction
- 30 yr design
- 8” CTB, 4” perv, 12” lime/cem
Production:
- 8–11 acres/month RCC
- 2 acres/month PCC (2004 60 acre project)
Costs:
- RCC $45–$72/sy (18”)
- PCC $65–$100/sy (15”)
- 2009 alt: $32.2 Conv. vs. $27.5M RCC (15% savings)
By 2020, POH will have 380 acres of mostly 18” RCC, Nearly 1,000,000 cubic yards of RCC.
City Arterials
San Angelo, TX – 2011 & 2012

- Grape Creek Road: 15,000 sy
- 50th Street: 30,000 sy
- 50–year design life
- Years of deferred maintenance on asphalt roads
- 75 yr maintenance:
  - Asphalt (8 yr sealcoat + 24–year mill/o'lay) = $7.5M
  - RCC (overlay @ 50–60 yrs = 1.4 M)

- Reece Albert
Pioneer Natural Resources
Victoria, TX – 2013

- Rollcon, LLC Contractor
- Pipe fabrication for Eagle Ford oil/gas
- 60 acres
- Originally 15” unsurfaced aggregate
- Replaced with 7” RCC on stabilized base
- 20% cost savings
- Significant maintenance savings
- Owner cited less risk/clean-up in fuel/oil spills
- 60 acres placed in less than two months
Midland, TX
Lamesa Road Arterial, 2014

- 1 ¼ mile, 4-lane principal arterial, 36,000 sy
- Justified on life cycle cost:
  - 3.5” Asphalt/12” base – $2.3M
  - 7” RCC – $2.7M
  - Reece Albert – Low bid on both asphalt and concrete
- First concrete pavement in Midland in 40+ years
  - 2 days of open house
- True inlay
  - 4 days – Southbound
  - 3 days – Northbound
Residential Developments
Liberty County

- County standards added for RCC
- Developer wanted added value and eliminate repairs
- 5” on CMS same cost as 2” asphalt + 6” flex base
- Largest RCC residential developments in US
- Bella Vista – + more
- > 60 miles of streets, nearly 1,000,000 sy
- Rollcon
Asphalt vs. RCC Comparison
Residential Street or Car Parking

- 3 Trucks per day, sandy subgrade, 20-year life, 1 mile x 24 ft (126,000 sf)

### Traditional Asphalt + Aggregate

- 2” Asphalt
- 6” Graded Agg.
- 6” Cement Stab. Soil Compacted Subg.
- Total Cost: $416,329

### RCC Pavement

- 5” RCC
- 6” Cement Stab. Soil Compacted Subg.
- Curing Saw Cutting
- Total Cost: $403,177

### Comparison Costs

- Traditional Asphalt + Aggregate: $155,145
- RCC Pavement: $132,902
- Cost Differential: $13,152
Kendleton, TX (SW of Houston)
- Started as opportunity during 1st Port of Houston
- Several KCS yards in US and Mexico
- Most recent, 57 ac, Wylie (DFW-area), 10” and 7”
- AG Peltz and Rollcon
TxDOT beginning to use RCC

- TxDOT beginning to use RCC
  - Special spec approved
  - First project let: 16 lane-miles frontage I-20 Abilene (alt bid w/ asphalt – placed as asphalt)
  - Several safety rest areas (in construction or bid)
  - First State Highway – San Angelo District, 2016
RCC Promotional Benefits

- RCC can fill “gap” between asphalt and conventional concrete
- Non-concrete users may consider RCC after dismissing conventional concrete
- Asphalt contractors can transition to RCC
- RCC can allow designers to “think outside the box” with design
Future of RCC in Texas

- Continued use in industrial pavements
  - Houston ship channel/intermodal, industrial
  - Dallas intermodal
  - South Texas trucking and industrial

- TxDOT use should expand gradually
  - Safety rest areas
  - Rural frontage roads
  - Lower volume FMs and oil/gas/wind farms with overweight vehicles

- Local public roads
  - Arterials
  - Residential

- Smaller projects, RM production
Thank You!

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