

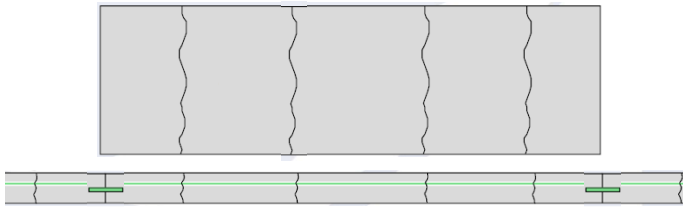
Evolution of RCC Construction in Texas

ACI - Milwaukee
April 18, 2016a

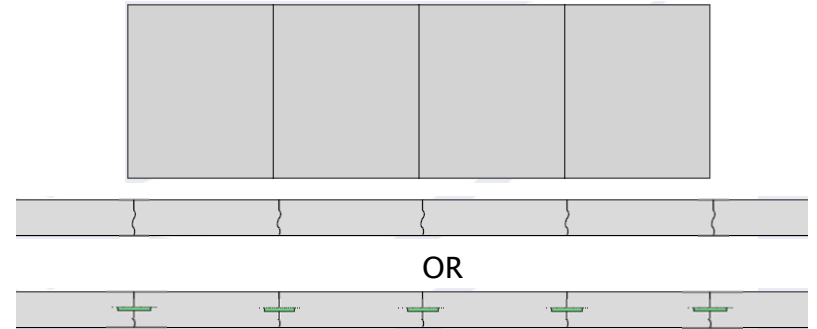


Jan Prusinski, P.E.
Executive Director
Cement Council of Texas

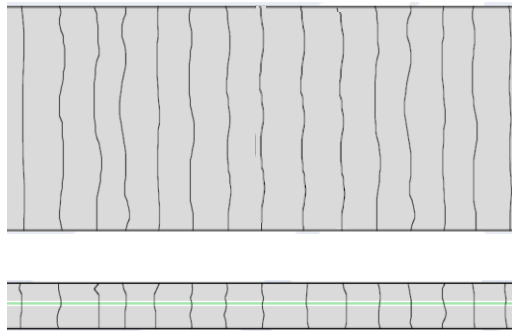
Concrete Pavement – Types



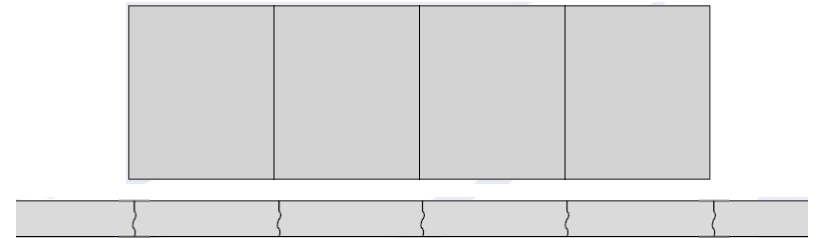
Jointed-Reinforced



Jointed-Plain (unreinforced)



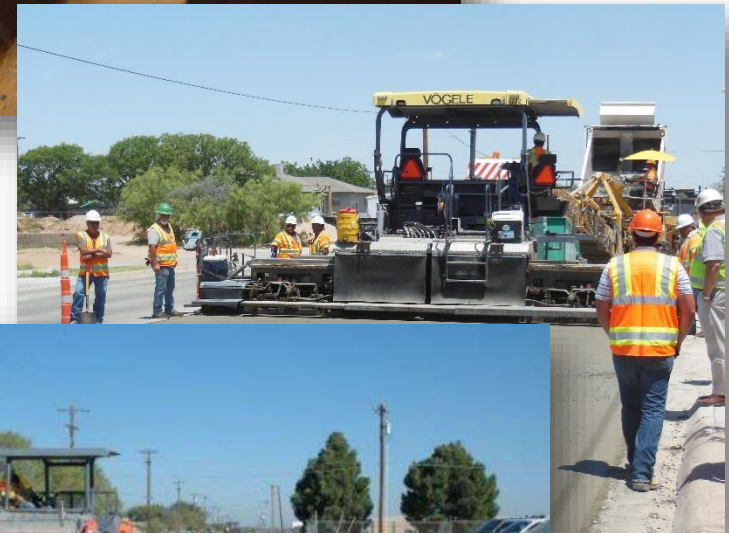
Continuously Reinforced



Roller Compacted Concrete

Roller Compacted Concrete

- ▶ Concrete pavement placed a different way
- ▶ No-s 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 maintenace @ 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



Port of Houston

Bayport Container Terminal – 2007 to 2016

- ▶ 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)



Port of Houston

Future Projects, 2016–2019

Project	Area	Year	
Ph. 6, S. Container	22 ac/18"	Let 3/30/16	
"West Yard" Container	25 ac/18"	2016	Private lease
Barbours Cut Container	~15 ac/14–18"	2016	
Phase 2 Container	30 ac/18"	2017	
Phase 1 Container	60 ac/18"	2017	Possibly 2 contracts
Phase 7 Container	70 ac/18"	2019	Possibly 2 contracts

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

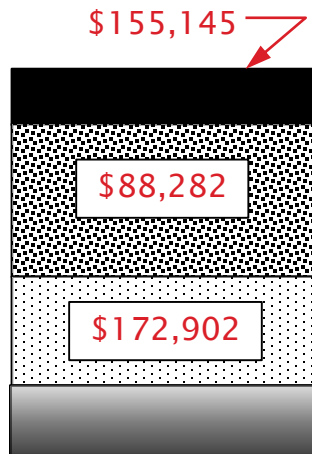


Asphalt vs. RCC Comparison

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

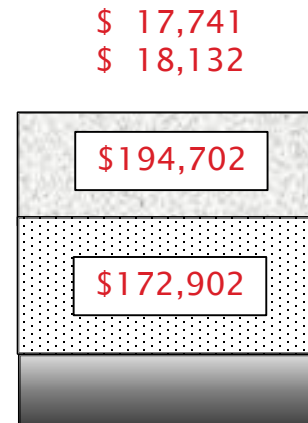


\$416,329

2" Asphalt
 6" Graded Agg.
 6" Cement Stab. Soil
 Compacted Subg.

Total Cost

RCC Pavement



\$ 17,741
 \$ 18,132

Curing
 Saw Cutting

5" RCC
 6" Cement Stab. Soil
 Compacted Subg.

\$403,177

Total Cost

\$13,152 Cost Differential

Kansas City Southern Intermodal Yards 2007–2015

- ▶ 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!

- ▶ Jan R. Prusinski, P.E.
 - Cement Council of Texas (Texas PCA affiliate)
 - jprusinski@cementx.org
 - 832-265-7130