

# Roller-Compacted Concrete Pavement

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## RCC: A New Alternative

- Concrete pavement placed a different way
  - Zero slump
  - No forms
  - No dowels or reinforcing
  - No finishing
  - Vibratory compaction



## Limitations of RCC

- RCC does not provide all the features of conventional concrete pavement
  - Surface texture and uniformity
  - Pavement smoothness
  - Aesthetics

## Engineering Properties

- Compressive strength
  - 4,000 to 10,000 psi
- Flexure strength
  - 500 to 1,000 psi
  - $f_r = C(f'_c)^{1/2}$  where C = 9 (up to 11)
- Modulus of elasticity
  - 3,000,000 to 5,500,000 psi
  - $E = C_e(f'_c)^{1/2}$  where  $C_e = 57,000$  (up to 67,000)

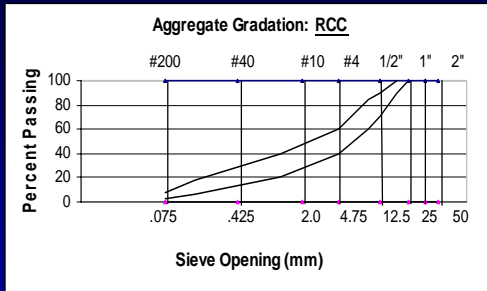
## Thickness Design of RCC Pavements

- Design methods based on CTL and COE Research
- Follows rigid pavement design strategies
- Plain, undoweled, unreinforced concrete pavement

## Mixture Design

- Dry enough to support vibratory roller
- Wet enough to permit adequate distribution of paste





## Soil Compaction Method

- Determine moisture content
  - Construct moisture/density curve
  - Modified proctor ASTM D1557
  - Assume a median cement content (e.g. 15%)

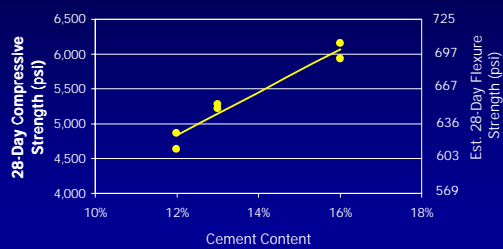
## View Of Casting First Lift Of Cylinder Using ASTM C1435



## Completed Test Cylinders



## Strength vs. Cement Content



## RCC Production

Batching & Mixing

## Continuous Pug Mill

- High-volume applications
- Excellent mixing efficiency for dry materials
- 250 to 500+ tons/hr
- Mobile, erected on site
- Higher mobilization costs



## Central Concrete Batch Plant

- Highly accurate proportioning
- Local availability
- Smaller output capacity
- Longer mix times than conventional concrete
- Frequent cleaning
- Dedicated production



## Horizontal Shaft Batch Mixer



## Transporting

- Rear dump trucks normally used
- Minimize transport time
- Covers required for long hauls, or hot/windy conditions



## Placing

- Layer thickness
  - 4 in. minimum
  - 8 in. maximum (10 in. with heavy-duty pavers)
- Timing sequence
  - Adjacent lanes placed within 60 minutes for "fresh joint"
  - Multiple lifts placed within 60 minutes for bond
- Production should match paver capacity
  - Continuous forward motion for best smoothness

## Placing Equipment

- High density ABG pavers
  - Vibrating screed
  - Dual tamping bars
  - High initial density, 90-95%
  - Reduces subsequent compaction
  - High-volume placement (1,000 to 2,000 cubic yards per shift)
  - Designed for harsh mixes
  - Smoothest RCC surface



### Access Provided Directly Behind the ABG Paver (Prior to Roller Compaction)



### Placing Equipment

- Conventional Asphalt Pavers
  - Provides some initial density (80-85%)
  - Relatively smooth surface
  - May require modification
  - Increased cleaning and maintenance



### Compaction

- Proper compaction is critical for strength and durability
- Compact to 98% Modified Proctor
- Vibratory roller
- Rubber-tire roller
- Non-vib steel wheel



### Moisture/Density



Nuclear Gauge  
ASTM C1040

### Off-Highway Applications

- Log sort yards and haul roads
- Military applications
  - Tank hardstands
  - Maintenance yards
- Intermodal shipping
- Truck terminals/distribution centers
- Airfield apron areas
- Parking and storage

### Louisiana Pacific Tacoma, WA



## BN Intermodal Yard, Denver 1986



35 Acres,  
Up to 20 in. Thick

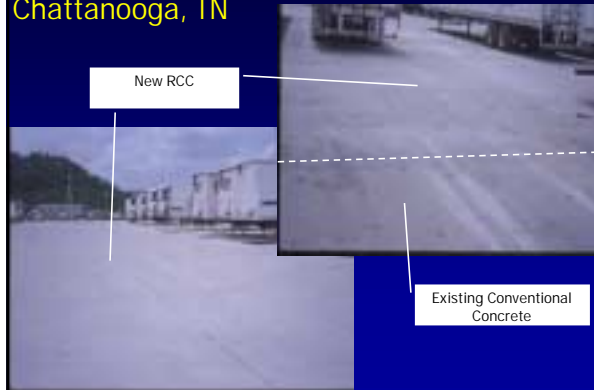


Straddle Carrier

## Norfolk International Terminal



## Covenant Transport Chattanooga, TN



## HONDA AMERICA - ALABAMA



-ALL INTERIOR ROADS--RCC



-30 FT WIDE-7" DEPTH

## Streets and Highways

- Industrial access roads
- Residential streets
- Highway inlays
- Fast-track, high-volume intersections
- Shoulders and turn lanes

## Columbus, Ohio City Streets



## Arterial Roads

- Flexural Strength of 400 psi in 24 – 48 hrs
- Can surface within hours



## Mill & Inlay - Mississippi



Before



During Inlay

## Calgary Intersection



High-Volume Asphalt Intersection Milled and Replaced by RCC in 60-hour Weekend Construction

## Residential Streets: All-Weather Access



Thank You!

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