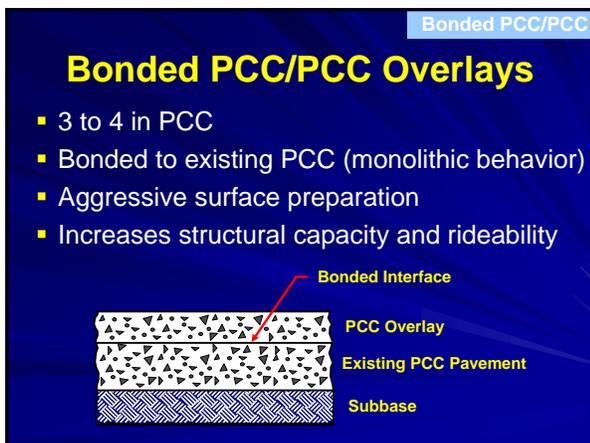


- ### Concrete Overlays in VA (courtesy David Kaulfers)
- 1920s: Virginia's first PCC overlay on existing PCC
 - 1930s thru 1980s: Some unbonded PCC overlays (primarily airports)
 - 1990: Bonded PCC overlay on US-13 in Northhampton County
 - 1995: Bonded PCC overlay on I-295 near Richmond
 - 1995: Bonded PCC overlay on I-85 near Petersburg
 - 1999: UTW on Rt. 29N south of Charlottesville

- ### BONDED OVERLAY FAMILY
- PCC/ PCC
 - Thin and Ultra-Thin Whitetopping



- Bonded PCC/PCC
- ### Feasibility
- Pavements in good condition with need for:
 - Increased structural capacity
 - Improved surface characteristics
 - Unsuitable candidates:
 - Pavements with structural deterioration
 - Pavements with moderate/severe MRD
-

Bonded PCC/PCC

Key Considerations

- Pre-overlay repair (as needed)
- Effective surface preparation
- Overlay joints match those in underlying pavement
- Effective timing and sawing of transverse & longitudinal joints
 - Through entire overlay thickness + ½ inch
- Effective curing

Bonded PCC/PCC

Surface Preparation

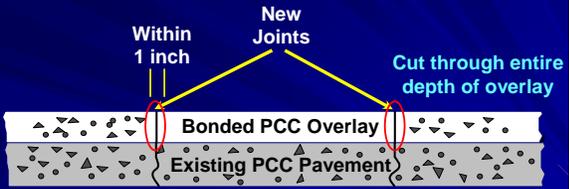
- Needed to ensure monolithic behavior
- Process:
 - Mechanical preparation (generally shotblasting or sandblasting)
 - Surface cleaning (e.g., airblasting)



Shotblasting Equipment

Bonded PCC/PCC

Matching of Joints



New Joints

Within 1 inch

Cut through entire depth of overlay

Bonded PCC Overlay

Existing PCC Pavement

Existing Joints




Bonded PCC/PCC

Performance

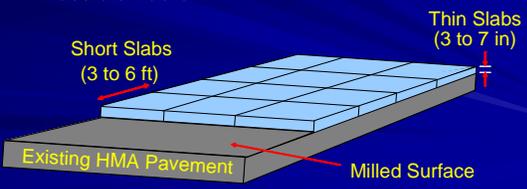
- Mixed performance
- Extensive use in TX and IA
- Performance issues:
 - Inappropriate use (too far deteriorated)
 - Effective bond
 - Joint details
- Virginia projects:
 - US 13: 3.5 in PCC / 8 in JPCP (1990)
 - I-295: 2 in PCC / 8 in CRCP (1995)
 - I-85: 4 in PCC / 8 in CRCP (1995)



TWT/UTW

Thin and Ultra-Thin Whitetopping (TWT/UTW)

- UTW
 - 3 to 4 in
 - 3 to 6 ft slabs
 - Possible fibers
- TWT
 - 4 to 7 in
 - 6 x 6 panels



Short Slabs (3 to 6 ft)

Thin Slabs (3 to 7 in)

Existing HMA Pavement

Milled Surface

TWT/UTW

Feasibility

- TWT (*moderately loaded routes*)
 - State/county hwy's
 - Secondary routes
 - Collectors
- UTW (*lightly loaded routes*)
 - City streets
 - Urban intersections
 - Parking lots




Pavements in relatively good condition and with structural integrity

Key Considerations TWT/UTW

- Pre-overlay repair (as needed)
- Effective surface preparation
- Joint design
 - Maximum panel spacing: 12 to 15 * D
 - Avoid placement in wheel paths
- Effective timing and sawing of joints
- Effective curing

Surface Preparation TWT/UTW

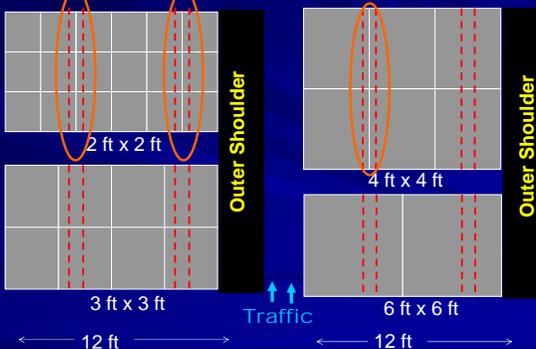
- Milling HMA surface
 - Remove rutting
 - Restore profile
 - Enhance bond
- Minimum HMA thickness remaining after milling: 3 to 5 in
- Surface cleaning (e.g., airblasting)



Milled Surface TWT/UTW



Longitudinal Joint Layout TWT/UTW



Performance TWT/UTW

- TWT: Good performance
 - CO and IL
- UTW: Fair-to-good performance
 - TN, KS, KY
- Performance issues:
 - Proper application
 - Effective bond
 - Effective joint design (layout)
- Virginia Project (1995)
 - Experimental UTW on Rt. 29N
 - Various thicknesses and fiber usage

Colorado TWT Experience TWT/UTW

- Early 1990s
- 6 x 6 x 6 design
- Conventional concrete mixture
- Milled and cleaned HMA surface
- No dowels
- Deformed tie bars across longitudinal joints
- Single cut, sealed joints (silicone)



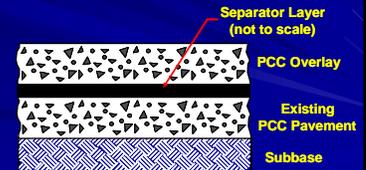
UNBONDED OVERLAY FAMILY

- PCC/ PCC
- Conventional Whitetopping

Unbonded PCC/PCC

Unbonded PCC Overlays

- 8 to 12 in PCC
- Separated from underlying PCC
- Minimal surface preparation
- Virtually any PCC pavement type and condition



Feasibility

- PCC pavements in poor to fair condition
- Any traffic level
- Any existing PCC pavement type
- Site factor considerations
 - Lane-closure time
 - Overhead clearances
 - Shoulders



Unbonded PCC/PCC

Key Considerations

- Limited pre-overlay repair required
- Placement of separator layer
- Joint design
 - Spacing <math> < 21 * D </math> (max 15 ft)
 - No need to match joints (offset if practical)
 - Dowel as for conventional pavements

Unbonded PCC/PCC

Separator Layer

- Isolates overlay from existing pavement
 - Prevents reflection cracking
 - Prevents mechanical interlocking
- Provides level surface for overlay construction
- Recommended interlayer material:
 - 1-2 inch dense-graded HMA



Unbonded PCC/PCC

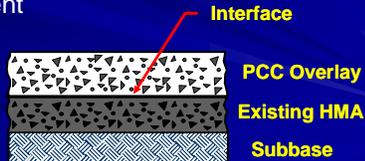
Performance

- Generally good performance
- Extensive use by many highway agencies (e.g., IA, MI, MN, CO)
- Performance issues:
 - Adequate separator layer
 - Adequate structural design
 - Effective joint design
- Virginia: No recent experience



Conventional Whitetopping

- Slabs ≥ 6 in thick
- Placed directly on HMA pavement (little preoverlay repair)
- Designed as a new PCC pavement (assuming no bonding)



Feasibility

- Badly deteriorated HMA pavements
- Any traffic level
- Site factor considerations
 - Lane-closure time
 - Overhead clearances
 - Shoulders



Key Considerations

- Localized pre-overlay repair
- Limited surface preparation
 - Milling if significant distortions
- Joint design
 - Spacing $< 21 * D$ (max 15 ft)
 - Dowel as for conventional pavements

Performance

- Good to excellent performance
- Extensive use in Iowa, Nevada, California, Texas
- Performance issues
 - Uniform support
 - Effective joint design
- Virginia: no recent experience



Summary

- PCC overlays offer a long-lasting, low maintenance rehabilitation solution
 - Bonded Solutions:
 - On existing PCC
 - On existing HMA (TWT/UTW)
 - Unbonded Solutions
 - On existing PCC
 - On existing HMA (whitotopping)
- Each a unique structure with specific applications and design/construction considerations