



Building Your First Concrete Overlay

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For The
ND Association of County Engineers
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Ready Mix & Concrete
Products Assoc.

Retired concrete overlay experts



North Dakota Leadership

- ▶ North Dakota is building concrete overlays every year
- ▶ Thanks to Cass County – Keith, Jason & Tom
- ▶ We have competent engineers with experience
 - Swenson Hagen
 - Ulteig
 - Kadrmas Lee & Jackson
 - SRF
 - Maybe others

What is an “overlay”?

Let's end the confusion.....

- ▶ Formally known as:
 - ~~Whitetopping~~
 - ~~Thin Whitetopping~~
 - ~~Thin Overlay~~

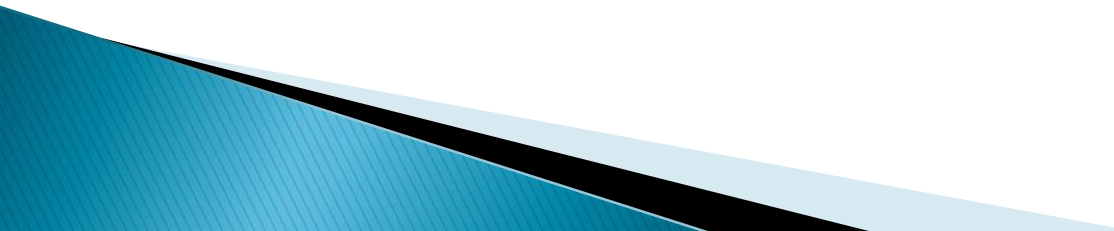
***Let's think about “resurfacing”
with concrete***



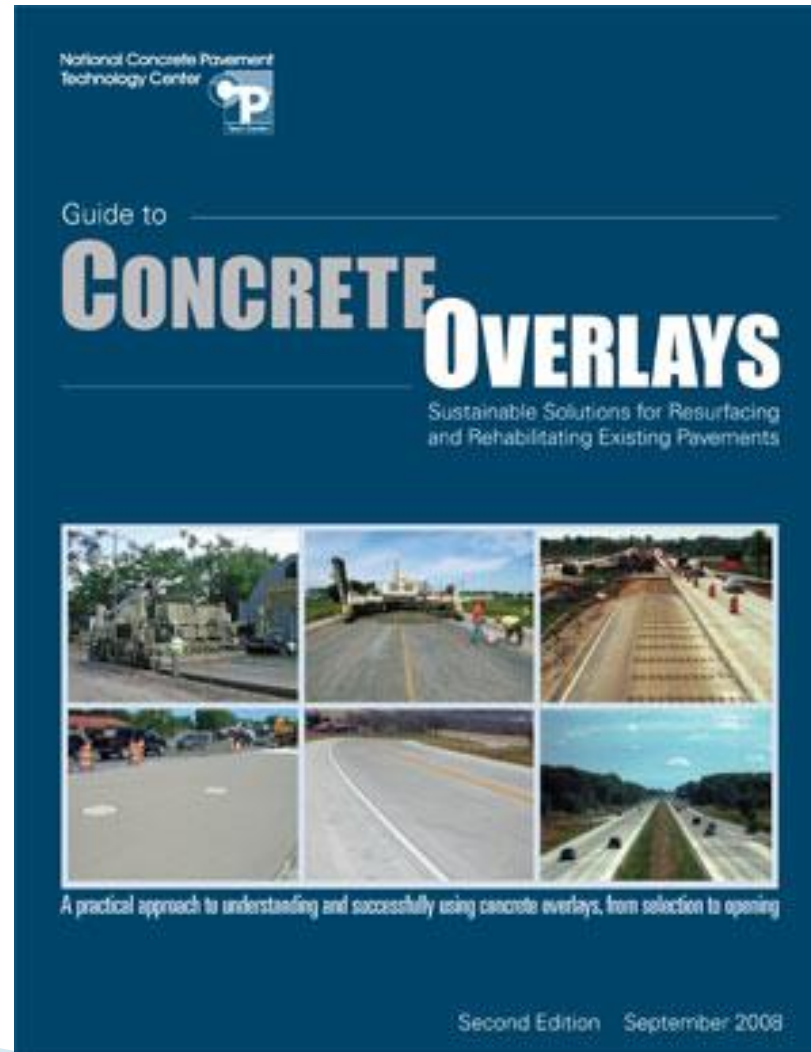
“Points-To-Know “

- ▶ Concrete overlays are a method to *resurface* existing asphalt paving—and then some:
 - Renew the wear surface—black to white
 - Increase the load carrying capacity of the pavement
 - Improve lighting—reduce heat island
 - Eliminate “perpetual asphalt maintenance”
 - To give owners a *choice*
- ▶ Concrete overlays give support credit to the original asphalt construction for base and subgrade.

Concrete Overlays





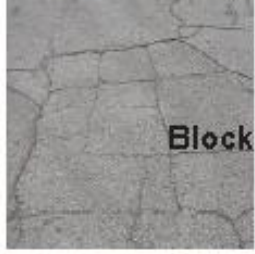











- ▶ Iowa constructed 24 county concrete overlay projects in a recent year – Over 200 miles of highway
 - ▶ Other states such as Kansas, Oklahoma, Illinois, Minnesota, Missouri, Michigan, South Dakota and Pennsylvania are also constructing multiple overlay projects
- 

The “Blue” Overlay Book



Evaluation

Table 2. Thumbnails of Asphalt Pavement Distresses

Low to medium severity	High severity	Low to medium severity	High severity
 <p>Alligator Cracking</p>			
			
			
			

Many concrete overlay options...F.K.A. "Whitetopping"



Summary of Concrete Overlays

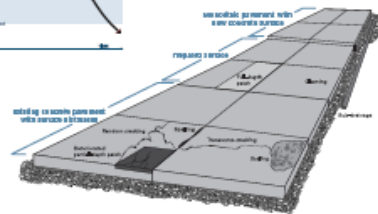
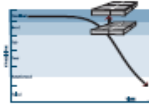


Bonded Family

Thickness: 2-5 in. depending on desired life (15-25+ years), anticipated traffic loading, and condition of underlying pavement

Bonded Concrete Overlays of Concrete Pavements

— Overlay and existing concrete pavement act as one monolithic pavement

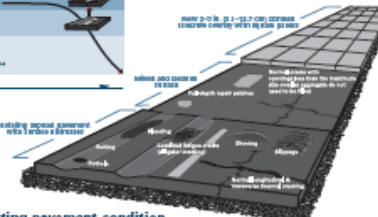


Existing pavement condition
Good structural condition; some surface distress OK

- Applications**
- Where increase in traffic loads requires more structural capacity (related benefit: improve friction, noise, and rideability)
 - To eliminate surface defects such as extensive scaling or surface cracking
 - Where vertical clearances must be met
 - In mill and inlay sections
- Keys to success**
- Existing pavement surface must be prepared to enhance bonding to the overlay
 - Overlay's aggregate thermal properties (coefficient of thermal expansion) must be similar to (or lower than) existing pavement's to minimize shear stress in bond
 - Working cracks in the existing pavement should be repaired (or the overlay should be sawed over the crack) to prevent the crack from reflecting through the overlay
 - Existing joints must be in fair condition or repaired
 - Thinner overlays may shorten sawing window
 - Transverse joints in the overlay must be sawed full depth plus 1/2 in. (1.3 cm); longitudinal joints must be at least T/2
 - Joints in the overlay must align with those of existing pavement because the structure must move monolithically
 - Width of transverse joints in the overlay must be equal to or greater than the underlying crack width at the bottom of the existing transverse joint
 - Application of curing compound or other curing methods must be timely and thorough, especially at edges

Bonded Concrete Overlays of Asphalt Pavements

— Overlay and existing concrete pavement act as one monolithic pavement

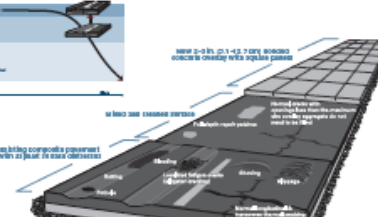


Existing pavement condition
Fair or better structural condition with surface distress

- Applications**
- Where increase in traffic loads requires more structural capacity
 - To eliminate surface defects such as rutting and shoving
 - To improve friction, noise, and rideability
 - Where vertical clearances must be met
- Keys to success**
- Milling of existing asphalt may be required to eliminate surface distortions of 2 in. (5.1 cm) or more and to help provide good bond; minimal spot repairs may be required
 - Asphalt surface temperature must be maintained below 120°F (48.9°C) when placing overlay
 - Joints in overlay should be sawed in small, square panels
 - Transverse joints must be sawed T3 (with special attention to thickened overlay over asphalt rats)
 - Joints in the overlay should not be placed in wheel paths, if possible
 - Thinner overlays may shorten sawing window; additional saws are likely to be required
 - Application of curing compound or other curing methods must be timely and thorough, especially at edges

Bonded Concrete Overlays of Composite Pavements

— Overlay and existing concrete pavement act as one monolithic pavement



Existing pavement condition
Fair or better structural condition with severe surface distress

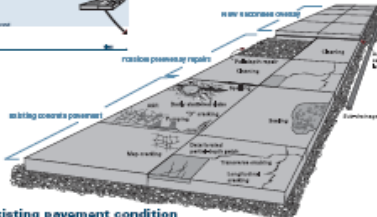
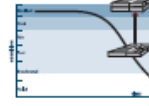
- Applications**
- Where increase in traffic loads requires more structural capacity
 - To eliminate surface defects such as rutting and shoving
 - To improve friction, noise, and rideability
 - Where vertical clearances must be met
- Keys to success**
- If the existing pavement profile indicates isolated areas of vertical distortion in the underlying concrete that could signal movement from drainage or materials-related distresses, repairs may be necessary
 - Milling of existing asphalt may be required to eliminate surface distortions of 2 in. (5.1 cm) or more and to help provide good bond; minimal spot repairs may be required
 - Existing asphalt pavement surface temperature must be maintained below 120°F (48.9°C) when placing overlay
 - Joints in overlay should be sawed in small, square panels
 - Transverse joints must be sawed T3 (with special attention to thickened overlay over asphalt rats)
 - Joints in the overlay should not be placed in wheel paths, if possible
 - Thinner overlays may shorten sawing window; additional saws are likely to be required
 - Application of curing compound or other curing methods must be timely and thorough, especially at edges

Unbonded Family

Thickness: 4-11 in. depending on desired life (15-30+ years), anticipated traffic loading, and condition of underlying pavement

Unbonded Concrete Overlays of Concrete Pavements

— Overlay serves as a new full-depth pavement on a stable base

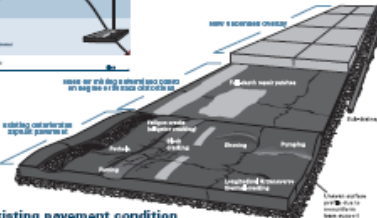
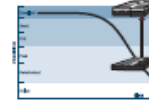


Existing pavement condition
Poor condition, including materials-related distress, but stable and uniform

- Applications**
- To restore or enhance pavement's structural capacity
 - To increase pavement life equivalent to full-depth pavement
 - To improve surface friction, noise, and rideability
- Keys to success**
- Full-depth repairs should be considered only at isolated spots where structural integrity needs restoring
 - A separation layer (typically 1 in. asphalt) is required to separate overlay from the existing concrete and eliminate reflective cracking (to reduce pore pressure and minimize stripping of this separation layer under high truck traffic, provide adequate drainage and a more porous asphalt)
 - Some states are experimenting with geotextile materials for the separation layer
 - Faulting of 3/8 in. (9.5 mm) or less in the existing concrete pavement is generally not a concern when asphalt separation layer is 1 in. (2.5 cm) or more
 - Joints should be sawed in overlay as soon as possible because the sawing window may be short
 - Shorter joint spacing than normal in the overlay can help reduce curling and warping stress
 - It is not critical to mis-match overlay joints to the underlying joints

Unbonded Concrete Overlays of Asphalt Pavements

— Overlay serves as a new full-depth pavement on a stable base

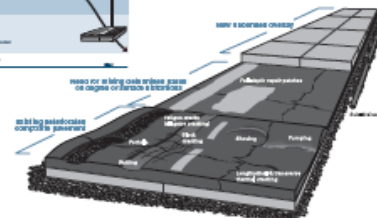
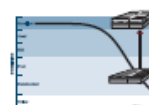


Existing pavement condition
Deteriorated (severe rutting, potholes, alligator cracking, shoving, and pumping) but stable and uniform

- Applications**
- To restore or enhance pavement's structural capacity
 - To increase pavement life equivalent to full-depth pavement
 - To eliminate rutting and shoving problems
 - To improve surface friction, noise, and rideability
- Keys to success**
- Milling of existing asphalt may be required to eliminate surface distortions of 2 in. (5.1 cm) or more
 - Full-depth repairs should be considered only at isolated spots where structural integrity needs restoring
 - Concrete patches in the existing pavement should be separated from the overlay with a thin layer of sealant, fabric, or other bond breaker; or joints should be sawed in the overlay around the concrete patch perimeter
 - Joints should be sawed in overlay as soon as possible because the sawing window may be short
 - Surface temperature of existing asphalt pavement should be maintained below 120°F (48.9°C) when placing overlay
 - Partial bonding between the overlay and the existing asphalt pavement is acceptable and may even improve load-carrying capacity

Unbonded Concrete Overlays of Composite Pavements

— Overlay serves as a new full-depth pavement on a stable base



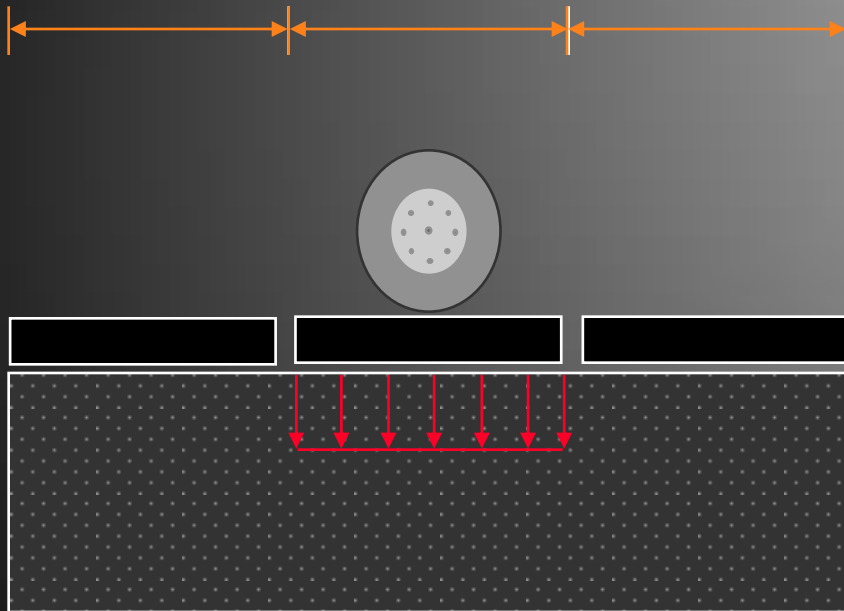
Existing pavement condition
Deteriorated (severe rutting, potholes, alligator cracking, shoving, pumping, and past materials-related distress) but stable and uniform

- Applications**
- To restore or enhance pavement's structural capacity
 - To increase pavement life equivalent to full-depth pavement
 - To eliminate rutting and shoving problems
 - To improve surface friction, noise, and rideability
- Keys to success**
- Milling of existing asphalt may be required to eliminate surface distortions of 2 in. (5.1 cm) or more
 - If the existing pavement profile indicates isolated areas of vertical distortion in the underlying concrete that could signal movement from drainage or materials-related distresses, repairs may be necessary
 - Full-depth repairs should be considered only at isolated spots where structural integrity needs restoring
 - Concrete patches in the existing asphalt pavement surface should be separated from the overlay with a thin layer of sealant, fabric, or other bond breaker; or joints should be sawed in the overlay around the concrete patch perimeter
 - Joints should be sawed in overlay as soon as possible because the sawing window may be short
 - Surface temperature of the asphalt layer of the existing composite pavement should be maintained below 120°F (48.9°C) when placing overlay
 - Partial bonding between the overlay and the asphalt layer of the existing composite pavement is acceptable and may even improve load-carrying capacity

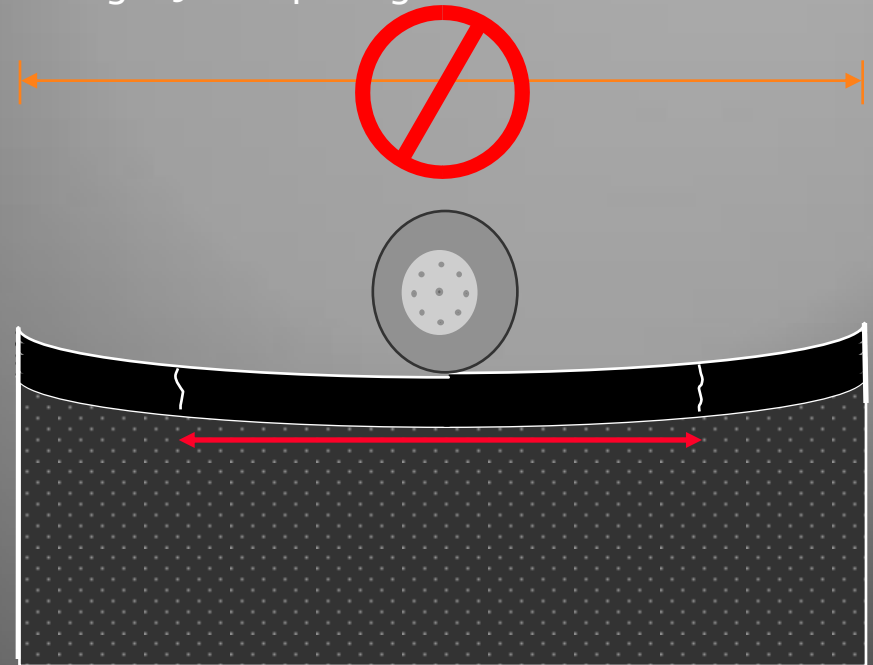


How and Why Thinner Concrete Overlays Work

Sawn Control Joints with Shorter Spacing



Larger Joint Spacing—More Random Cracks

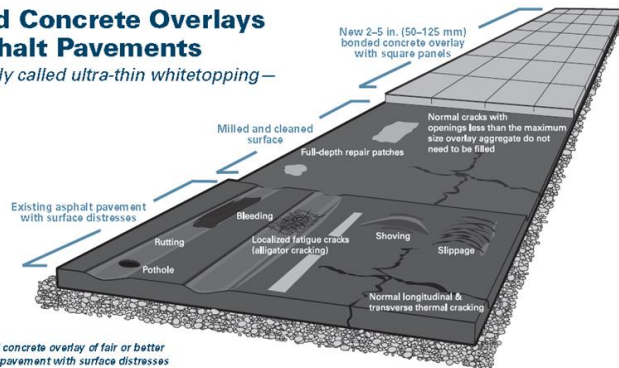


Short joint spacing allows the slabs to deflect instead of bend. This reduces slab stresses to reasonable values.

Concrete Overlays: New life for *“existing streets and highways”* without reconstruction



Bonded Concrete Overlays of Asphalt Pavements —previously called ultra-thin whitetopping—



Concrete over asphalt–Open to traffic during construction.



Concrete Over Brick



Clay County (Moorhead), MN

- ▶ Constructed first concrete overlay project on the county system this year –
 - 8 miles of 6” thick on County 52
 - Sabin south to near Barnesville

4 Inch Concrete Overlay



- ▶ ND Army National Guard – Camp Grafton Main Entrance Road
 - Existing 5 to 6” Asphalt
 - Mill off 1” for grade control
 - Expected to handle heavy equipment trucks

What's New?

- ▶ The new national ACPA Concrete Overlay Database
 - <http://www.overlays.acpa.org>
 - View information on over 500 overlays throughout the U.S.
 - The list is growing

Concrete Pavement Tech Center

- ▶ The Center team has returned to North Dakota
 - Oil Field Roads
 - Concrete overlays can meet needs
 - Fast Construction
 - Head-to-Head Traffic
 - Reuse of existing asphalt infrastructure
 - Short pilot car operations (3.5 miles)
- ▶ Have generated a 12 page report on implementation of concrete overlay technology in oil fields



Paving Operations

Cass County Highway 11 Concrete Overlay
June 2009



The Candidate



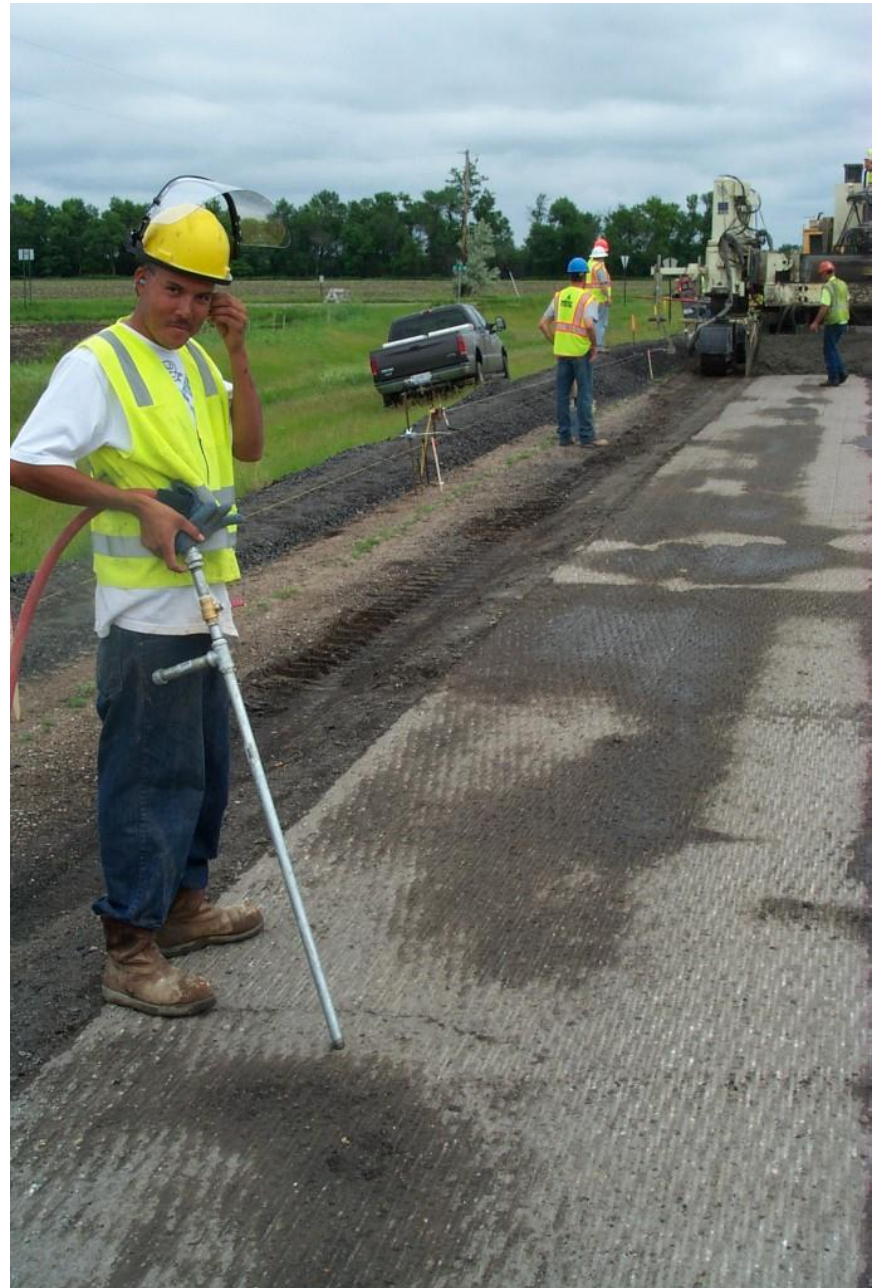




Making the Header

Air Blasting

Air Blast Excess Water and
Miscellaneous Debris





Water for Asphalt Temp. Mgmt.



Protecting the String Line



Setting Up Curing



Double String Line



Dumping the Mix



Millings for Shoulder



Qc & Qa



Dumping Efficiency



Jose & Chili



More Qc & Qa



Saturated Surface Dry



Managing Cracks?



Manage Truck Traffic



Superior Sawing – Subcontractor



7' by 6' panels

»» Questions or
Comments