



Concrete Overlays – Thin Concrete Overlays of Asphalt

North Carolina Concrete
Pavement Conference
November 28, 2023



Eric Ferrebee, P.E.
Senior Director Technical Services
eferrebee@acpa.org
American Concrete Pavement Association

Why Consider Concrete Overlays?

- Concrete overlays consistently provide cost-effective solutions.
- Concrete overlays can be constructed quickly and conveniently.
- Concrete overlays are easy to maintain.
- Concrete overlays can serve, in and of themselves, as complete preventive maintenance, preservation, or rehabilitation solutions.
- It is an integral component of a comprehensive asset management approach.
- Cost effectively extends pavement life and improves both functional and structural characteristics.
- Concrete overlays are an effective means to enhance pavement **sustainability and resiliency**
 - By improving surface reflectance (albedo),
 - increasing structural longevity,
 - enhancing surface profile stability and maintaining ride quality.

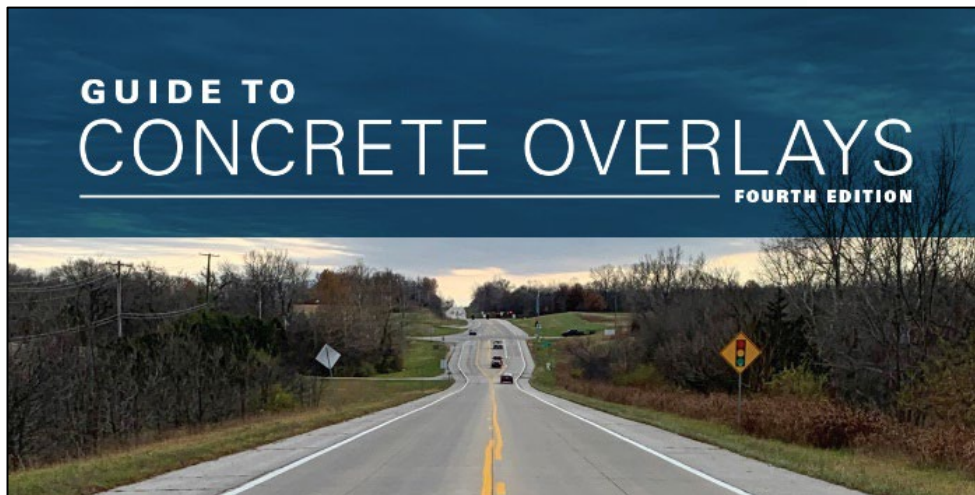
Where do we start...

● CP Tech Center's Overlay Resources

- <https://cptechcenter.org/concrete-overlays/>

● Guide to Concrete Overlays, 4th Ed.

- https://intrans.iastate.edu/app/uploads/2021/11/guide_to_concrete_overlays_4th_Ed_web.pdf



National Concrete Pavement Technology Center



CP TECH CENTER | CONCRETE OVERLAYS

Concrete Overlays



Concrete overlays offer cost-effective, versatile, short- and long-term solutions for the full range of concrete, asphalt, and composite pavement needs. In addition, concrete overlays contribute to more sustainable construction practices by preserving pavement service for several decades beyond its original design life.

The CP Tech Center has developed a [comprehensive guide to concrete overlays](#), a [field application program](#) to help state DOTs successfully construct concrete overlays, a [guide for existing concrete overlay design methodology](#), and a [guide for the development of a concrete overlay project that includes typical construction drawings, specification guidance, cost information, and design lessons learned](#). These and other resources on concrete overlays developed by the CP Tech Center and its partners include the following:

WEBINAR VIDEOS

IOWA STATE UNIVERSITY
Institute for Transportation

National Concrete Pavement
Technology Center



1. [Introduction to Concrete Overlays—Handout](#)
2. [Overview of Concrete Overlays/Existing Pavement Evaluation and Overlay Selection—Handout](#)
3. [Concrete Overlay Design \(Design Functions and Thickness\)—Handout](#)
4. [Concrete Overlay Plans, Maintenance of Traffic, and Construction—Handout](#)
5. [Maintenance of Concrete Overlays and Available Resources—Handout and Concrete Overlays Webinar Q&A—Handout](#)

Fiber Reinforced Concrete Overview for Concrete Pavement

FOR MORE INFORMATION

For more information about CP Tech Center work related to concrete overlays, contact:

Gordon Smith
ASSOCIATE DIRECTOR, CP TECH CENTER
515-296-0911
gsmith@iastate.edu

ADDITIONAL TRAINING BY TOPIC

The CP Tech Center offers a curated list of training resources on the following key concrete pavement topics:

- [Concrete overlays](#) (current page)
- [Concrete recycling \(RCA\)](#)
- [Geotextiles](#)
- [Internal curing](#)
- [Mixture proportioning](#)
- [Pavement preservation](#)
- [Performance-engineered mixtures \(PEM\)](#)
- [Real-time smoothness \(RTS\)](#)

ADDITIONAL TRAINING BY FORMAT

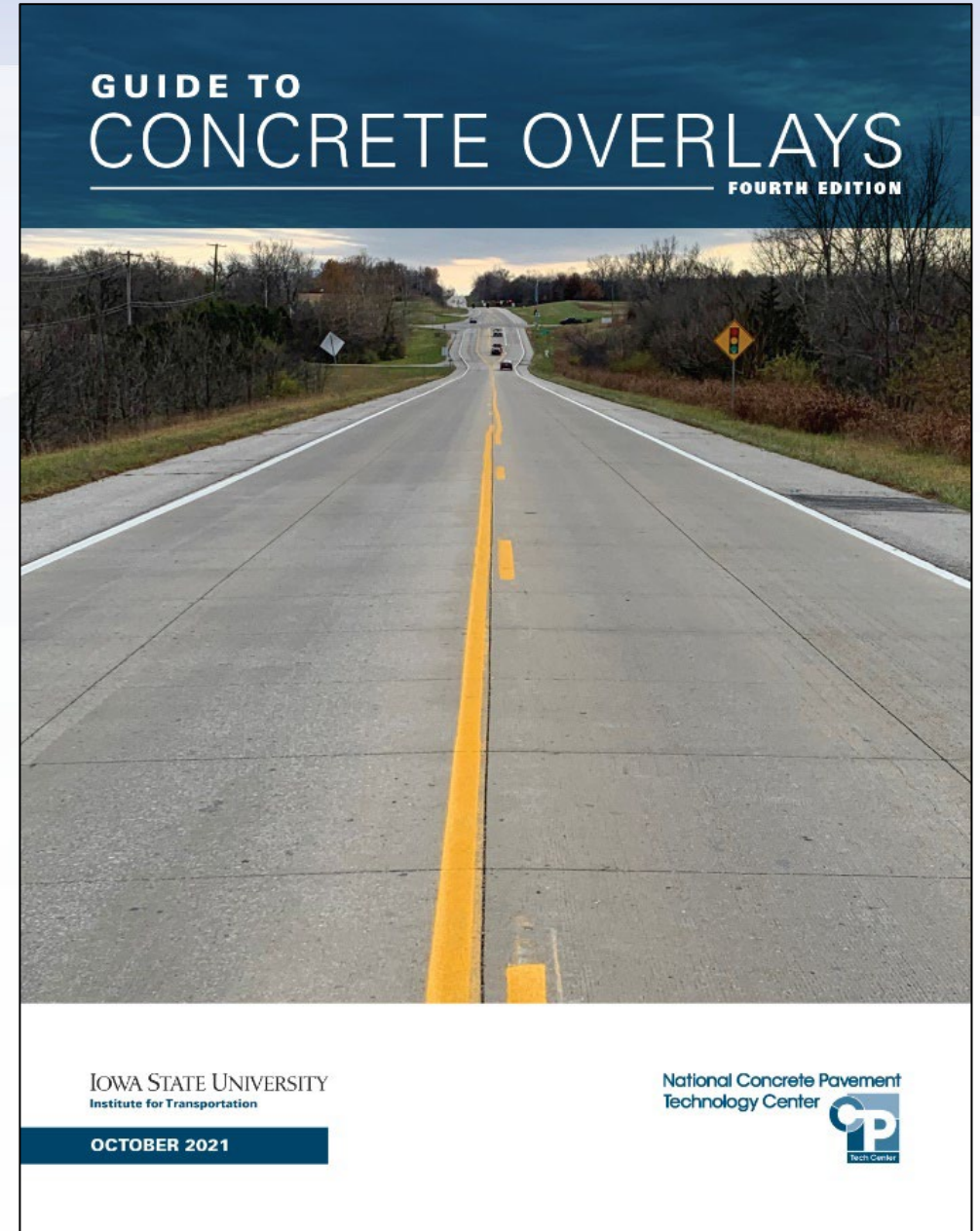
The CP Tech Center provides concrete pavement training promoting best practices (including with new tools/methodologies) as follows:

- [Webinars/videos](#)
- [Guides/manuals](#)
- [NC² MAP tech briefs, etc.](#)
- ["Lunch & Learn" slides](#)
- [NC² States' Q&A Listserv](#)
- [Concrete Infrastructure Research Database of in-progress and recently completed concrete pavement/bridge deck research](#)
- [Research reports](#)
- [External training resources](#)

Guide to Concrete Overlays

- Pavement Evaluation
- Determine Overlay Type
- Determine Design Life and Traffic
- Use Pavement Design Software
- Consider Additional Design Features
- Consider Construction Process
- Create Construction Documents

https://intrans.iastate.edu/app/uploads/2021/11/guide_to_concrete_overlays_4th_Ed_web.pdf



2 Visual Examination

Concrete

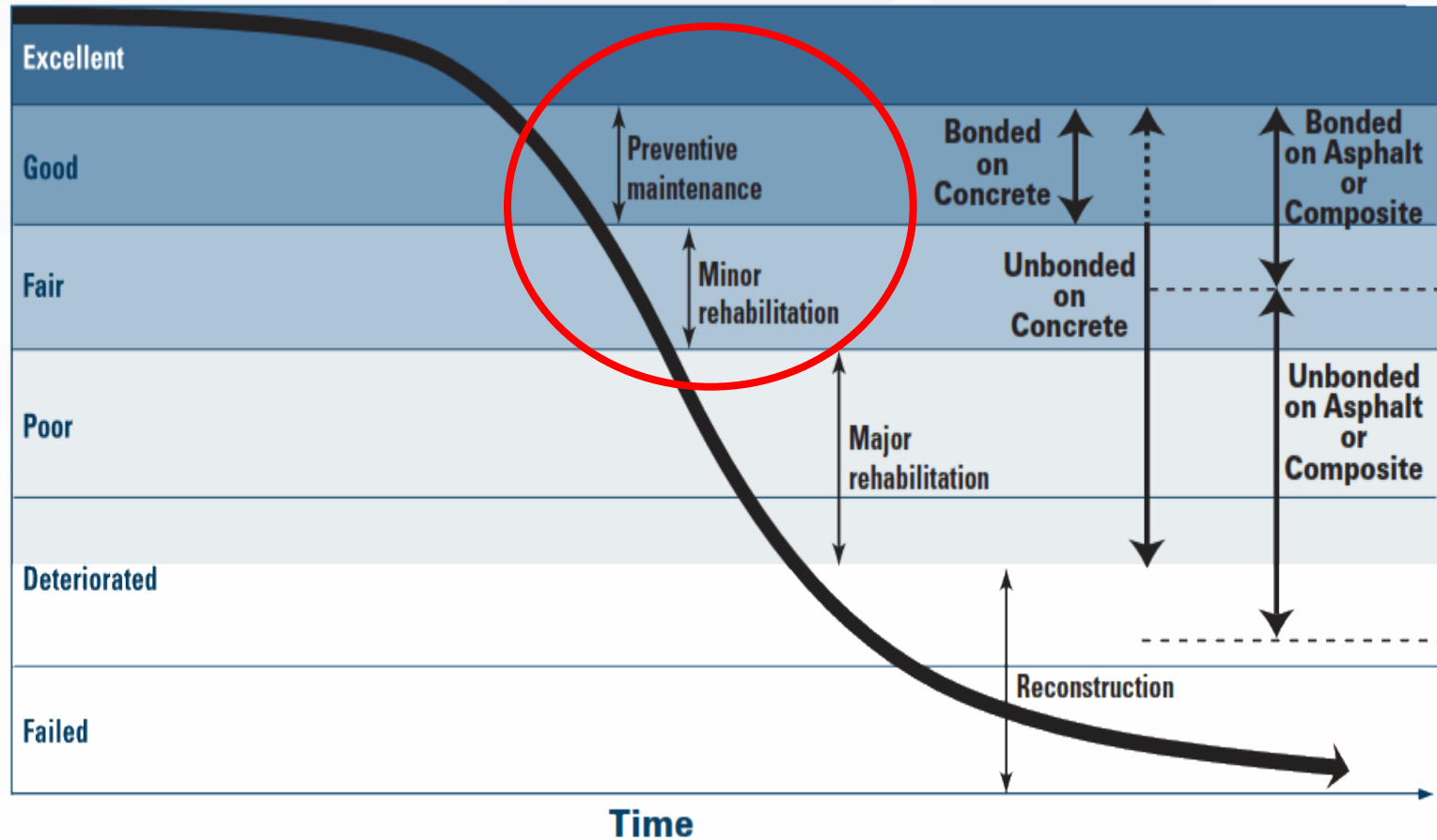
Asphalt / Composite



Evaluation Informs Design



Existing pavement condition before treatment



Evaluation and Survey Information

- Existing Pavement History Evaluation
 - Layer materials, properties, depths, & age
 - Widening material type, depths, widths, & age
 - History of full depth patching by location, type & age
- “As Built” Plan Information
 - Vertical & horizontal alignment
 - Previous test sections in project limits
 - Previous drainage structure remains



**Where are the
problem areas?
What maintenance
has been done?
Are any pre-
overlay repairs
required?**





Concrete Overlays

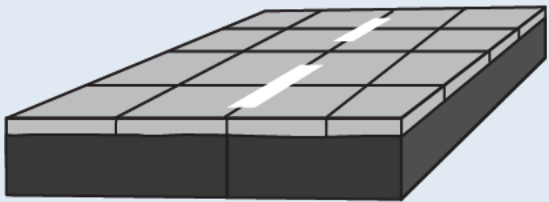
Types of Concrete Overlays

Overlay Type Selection

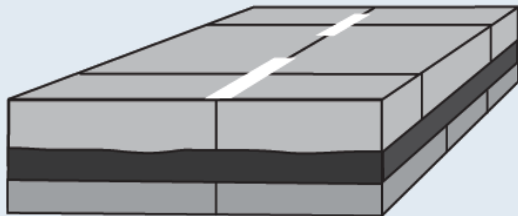
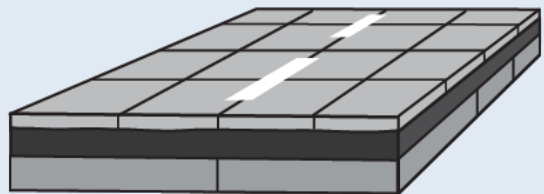
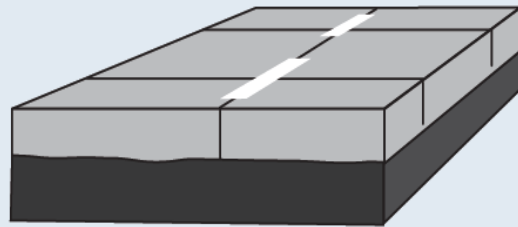
Concrete on Asphalt

Concrete on asphalt (COA) overlays can be designed to address a broad range of existing pavement conditions on both composite and full-depth asphalt pavements. Both bonded (COA-B) and unbonded (COA-U) options enable designs to cost-effectively match the condition of the existing asphalt—from deteriorated to good—as well as geometric parameters.

COA-B (Full Depth and Composite)



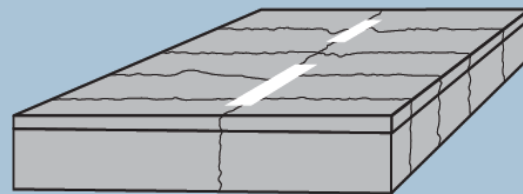
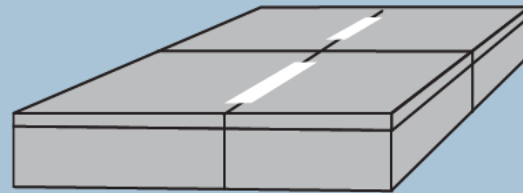
COA-U (Full Depth and Composite)



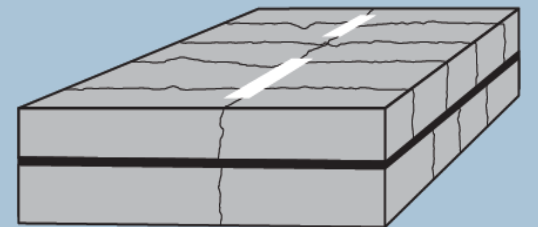
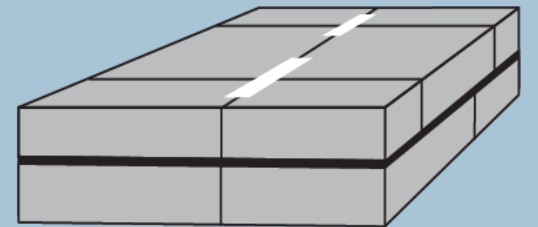
Concrete on Concrete

Concrete on concrete (COC) overlays can be designed for applications on both existing jointed plain concrete pavement (JPCP) and continuously reinforced concrete pavement (CRCP). The predominance of COC overlay designs are unbonded (COC-U) systems; however, bonded (COC-B) applications can be successful, provided the existing pavement is in good condition.

COC-B (JPCP and CRCP)

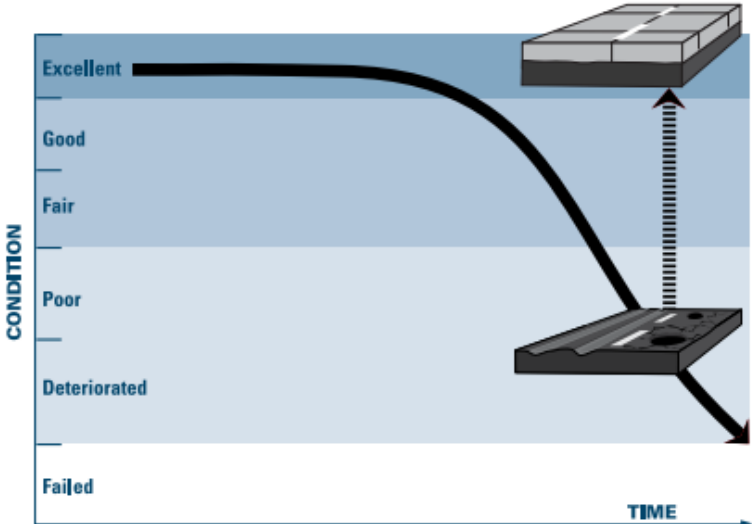


COC-U (JPCP and CRCP)

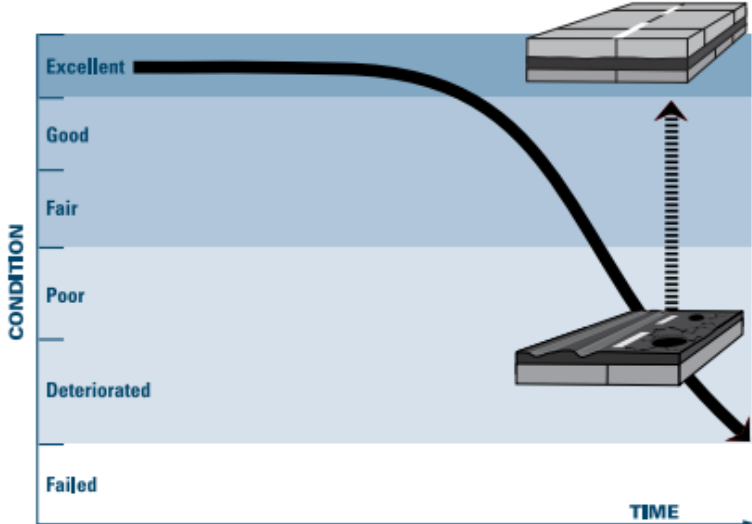


Overlay Type Selection

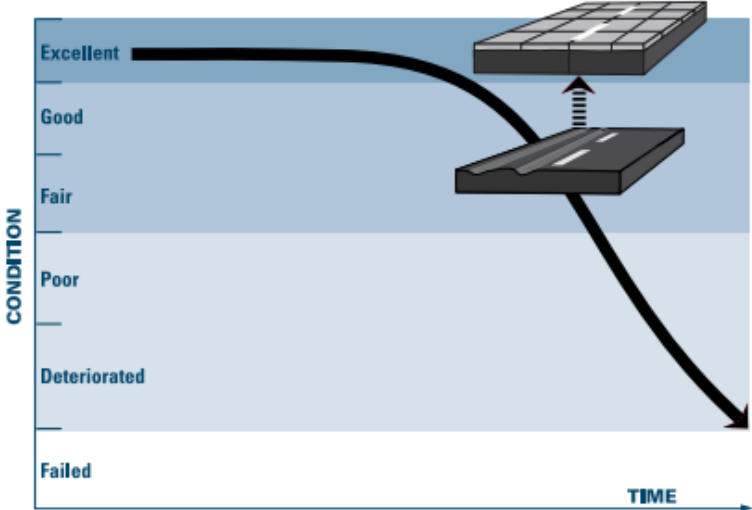
Concrete on Asphalt–Unbonded (full depth)



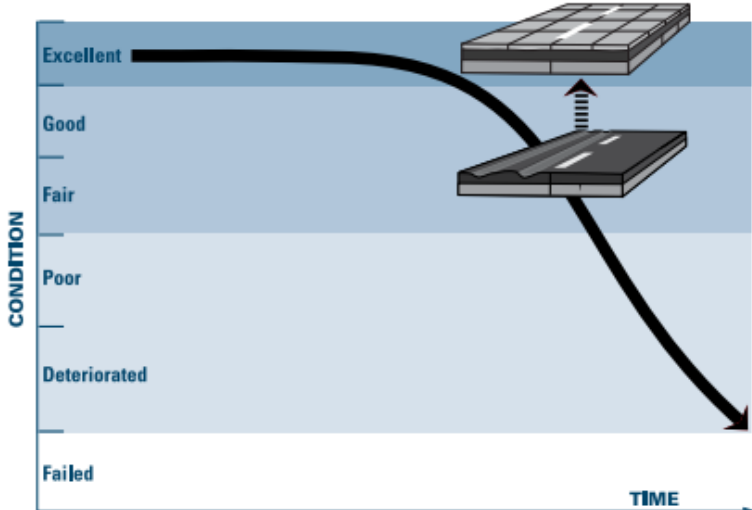
Concrete on Asphalt–Unbonded (composite)



Concrete on Asphalt–Bonded (full depth)

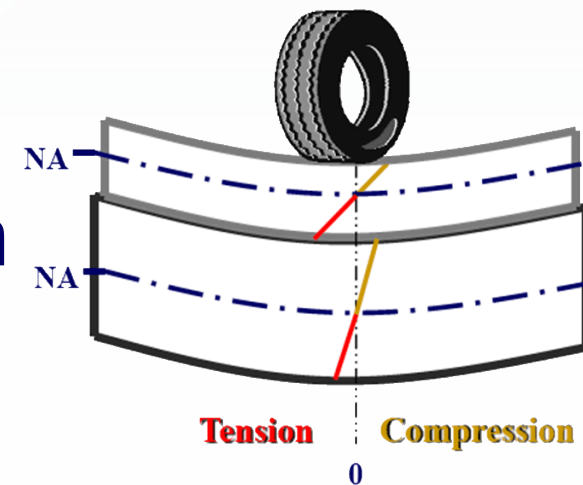
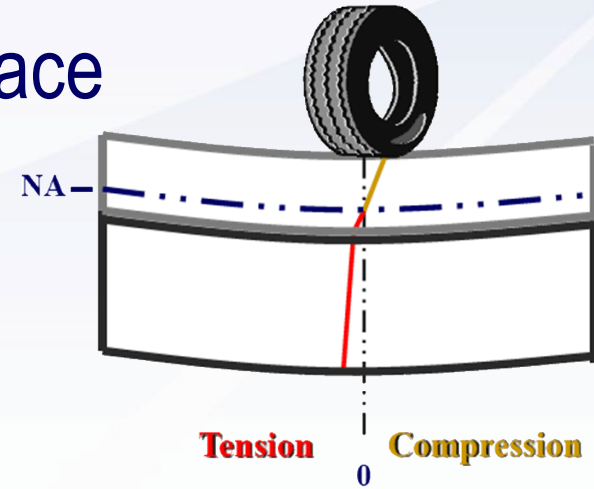


Concrete on Asphalt–Bonded (composite)



Bonded versus Unbonded

- **Bonded:** Use to eliminate surface defects; increase structural capacity; and improve surface friction, noise, and rideability.
- **Unbonded:** Use to restore structural capacity and increase pavement life equivalent to full-depth pavement. Also results in improved surface friction, noise, and rideability.



2 Visual Examination

Concrete

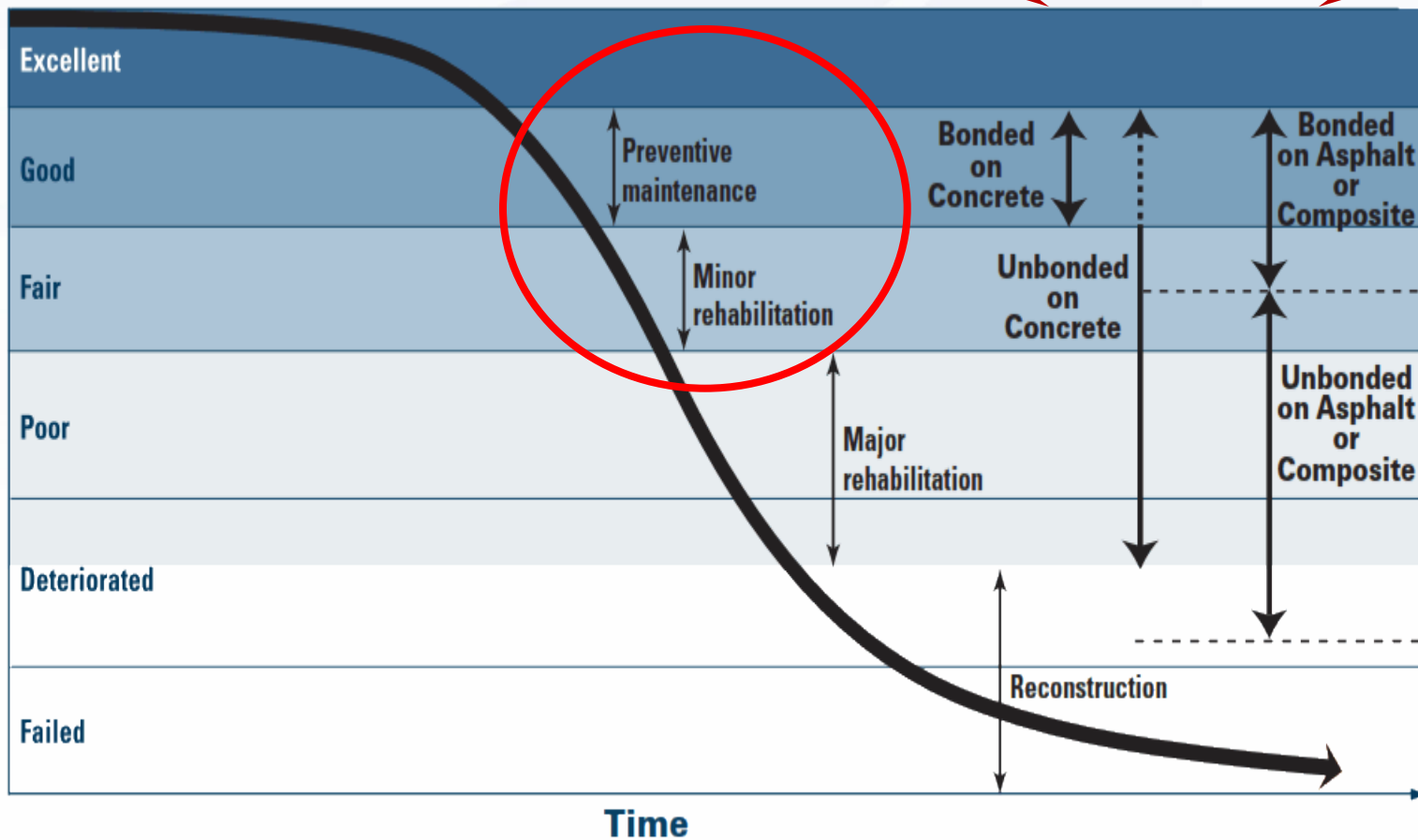
Asphalt / Composite



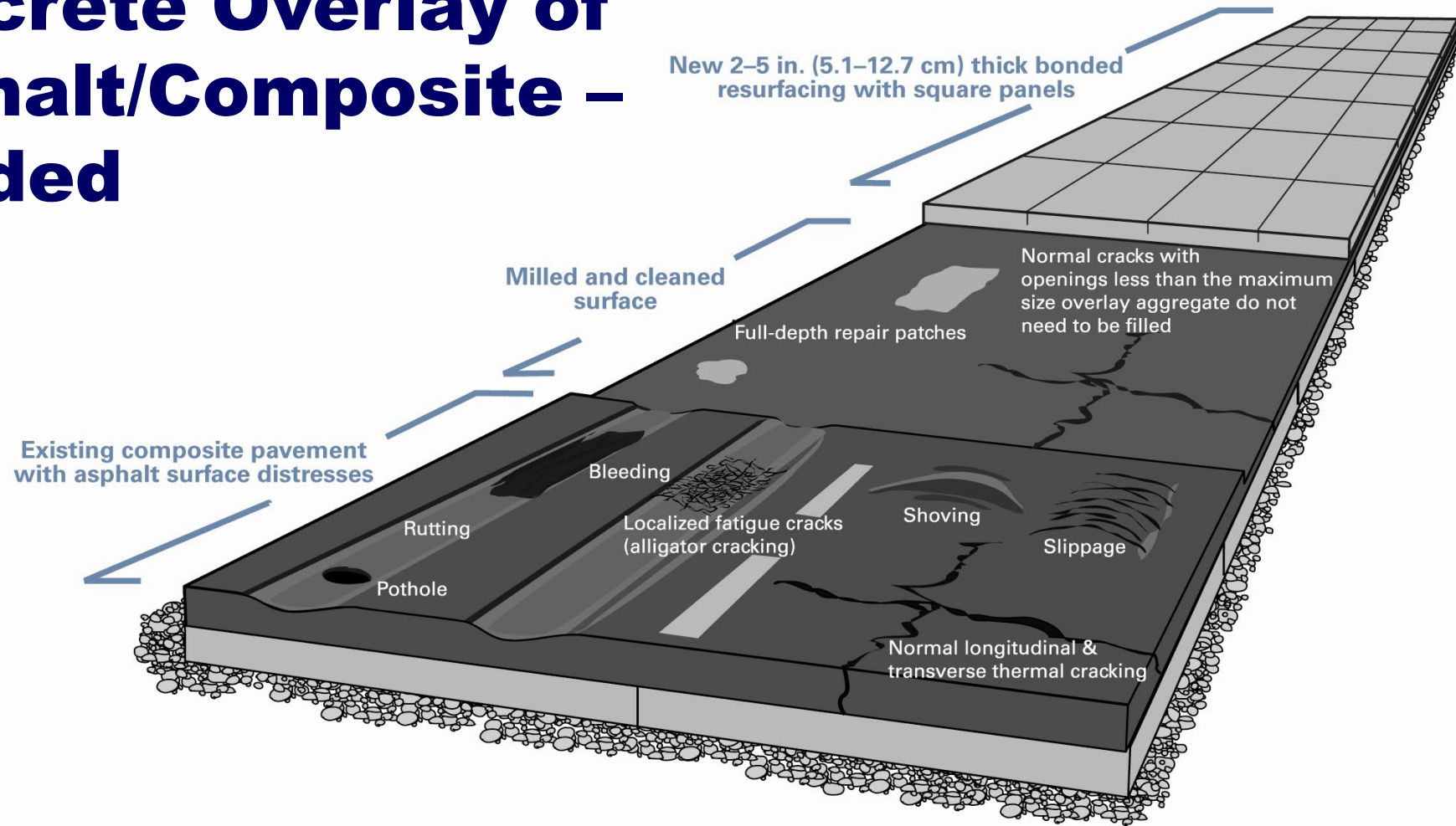
How do we choose?



Existing pavement condition before treatment



Concrete Overlay of Asphalt/Composite – Bonded



- A review of the existing profile grade line should be conducted and areas of significant deviation investigated through analysis of core samples in the laboratory

CONCRETE RESURFACING OF ASPHALT PAVEMENTS

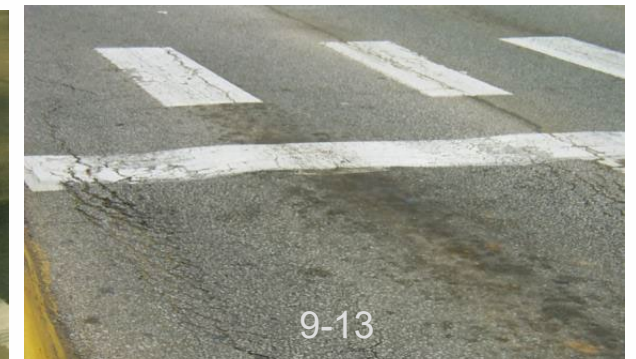
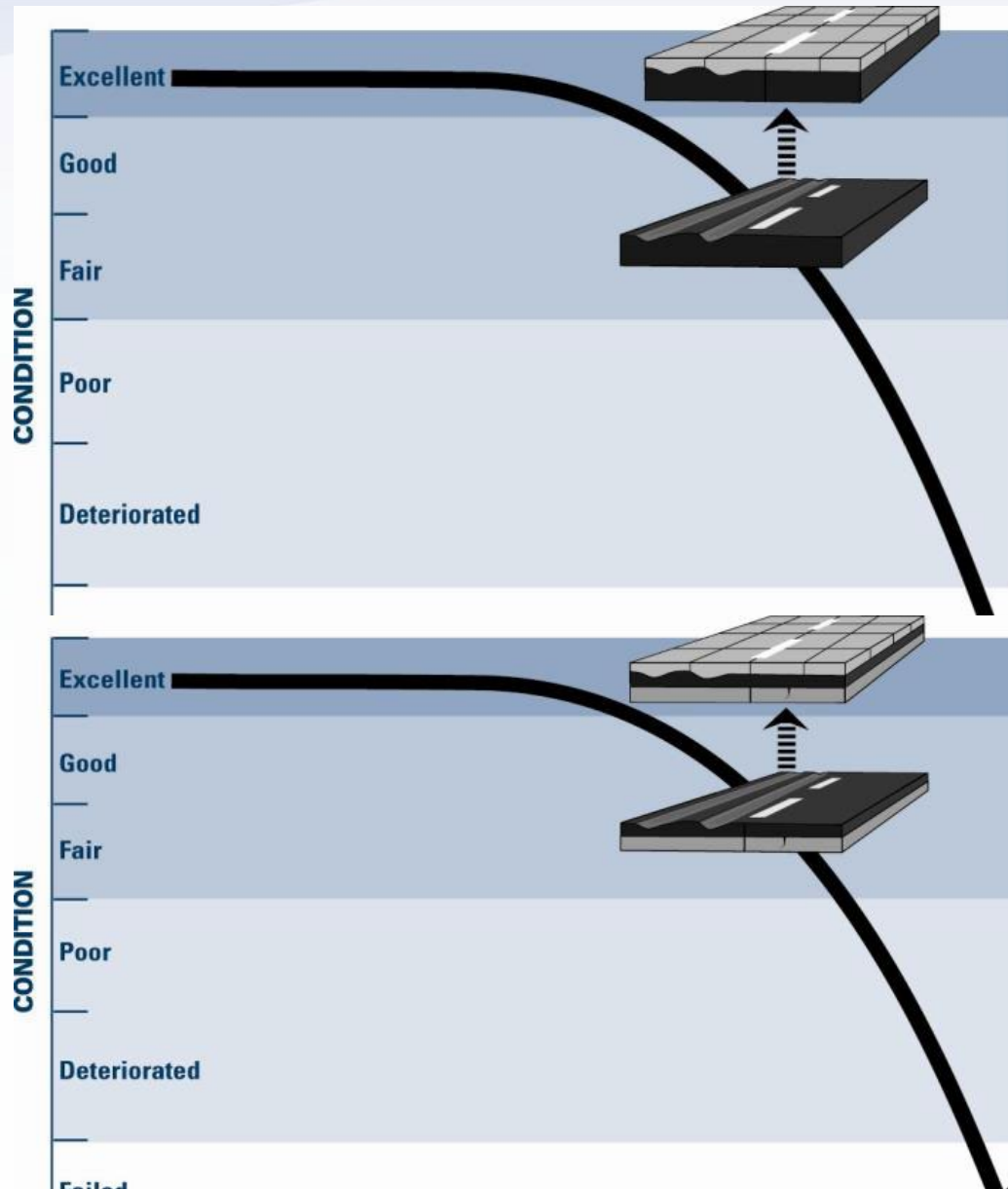
Bonded Overlay Of Asphalt Or Composite Pavements

2"-6" thickness

Existing pavement condition

Fair or better structural condition with surface distress

- HMA pavements with some structural integrity
 - Limited structural (fatigue) cracking
 - No stripping/raveling in HMA layers
 - HMA thickness after milling - 3 in minimum
- Rutting in HMA layers ok
- Non-load associated cracking ok



Stripping

The loss of bond between aggregates and asphalt binder that typically begins at the bottom of the HMA layer and results in loss of structural support

Summary of Possible Causes:

- Water in the HMA causing asphalt binder stripping along the aggregate face
- Bottom-up stripping is difficult to recognize because it manifests itself on the pavement surface as other forms of distress including rutting, shoving/corrugations, raveling, or cracking.
- Asphalt overlays over existing open-graded surface course can result in stripping.



Achieving Bond with Existing Asphalt

Milling

- Remove distortions 2" or more
- Reduce high spots to insure minimum overlay depth
- Match adjacent lanes
- Enhance bond
- Meet vertical elevation requirements
- Restore profile



Achieving Bond with Existing Asphalt Surface Cleaning



Power Sweeping

Air Blasting

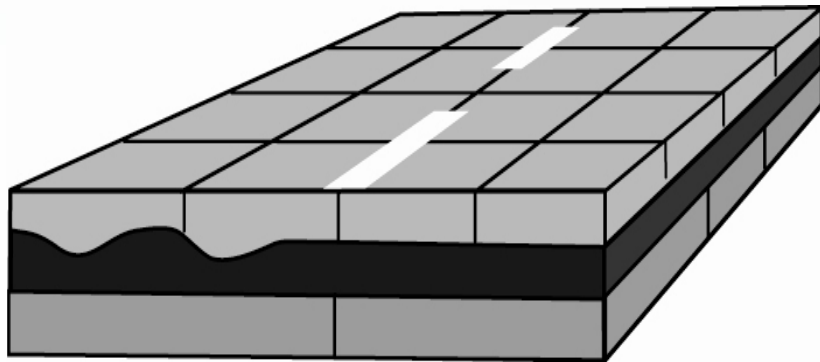
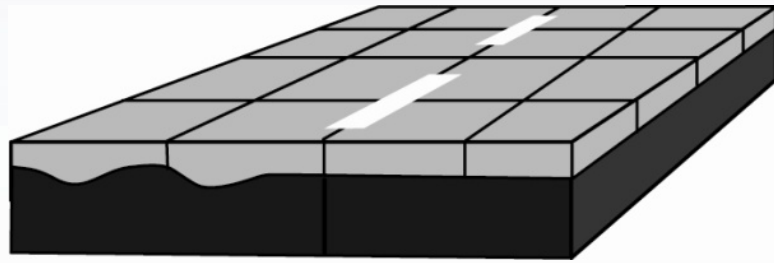


Water Blasting



Bonded over Asphalt/Composite

Keys to Success



- Bonding is critical
- Small square panels reduce curling, warping, & shear stresses in bond (1.5 times thickness).
- Mill to remove surface distresses, or improve bonding.
- Be sure to leave 3" to 4" of HMA after milling.
- HMA surface temperature below 120 F before paving.
- Joints in the overlay should not be placed in wheel paths, if possible
- Application of curing compound is critical

COA-B Construction – Placement and Finishing

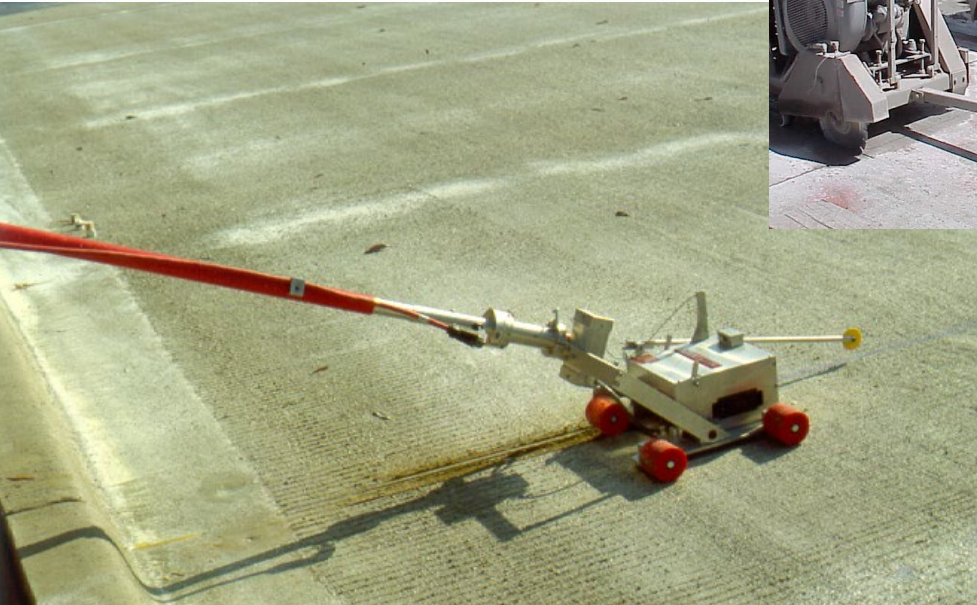
- Same as conventional PCC paving
 - Slipform
 - Fixed form
- Conventional Mixes
 - May Include Fibers
- Avoid surface contamination
- Typically only use tie bars, no dowels



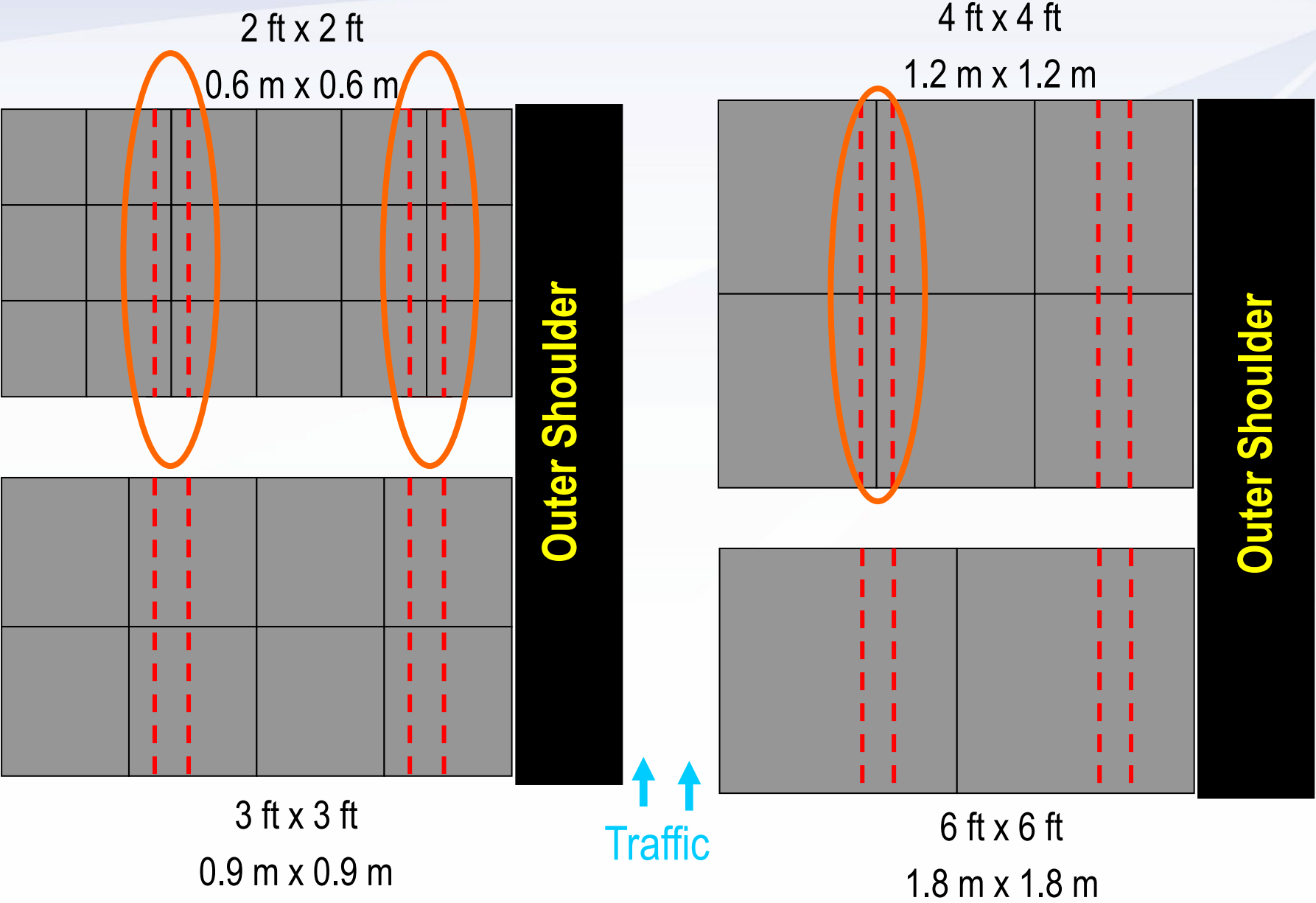
COA-B – Joint Sawing and Curing

CRITICAL

- Effective curing
- Timely joint sawing



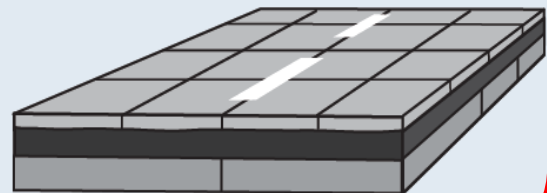
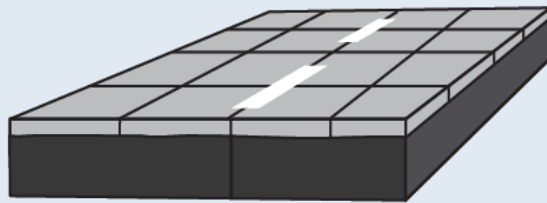
Longitudinal Joint Layout



Selecting a Pavement Design Tool

Best Design Tools for Concrete Overlays on Asphalt – Bonded:

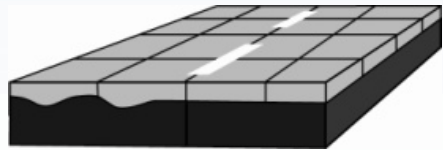
COA-B (Full Depth and Composite)



BCOA – ME



Can Design:



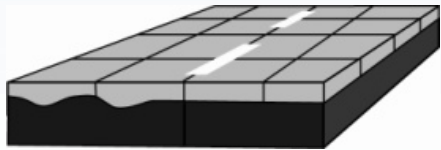
Bonded on Asphalt

- FREE Mechanistic – Empirical design tool specifically for Concrete Overlays of Asphalt
 - Assumes a partially bonded condition
- Developed at University of Pittsburgh under FHWA Pooled Fund TPF-5(165)
- Incorporates climatic loading
- Joint spacing is featured as an input
- Allows for design with macrofibers directly

Google “BCOA ME” or click:

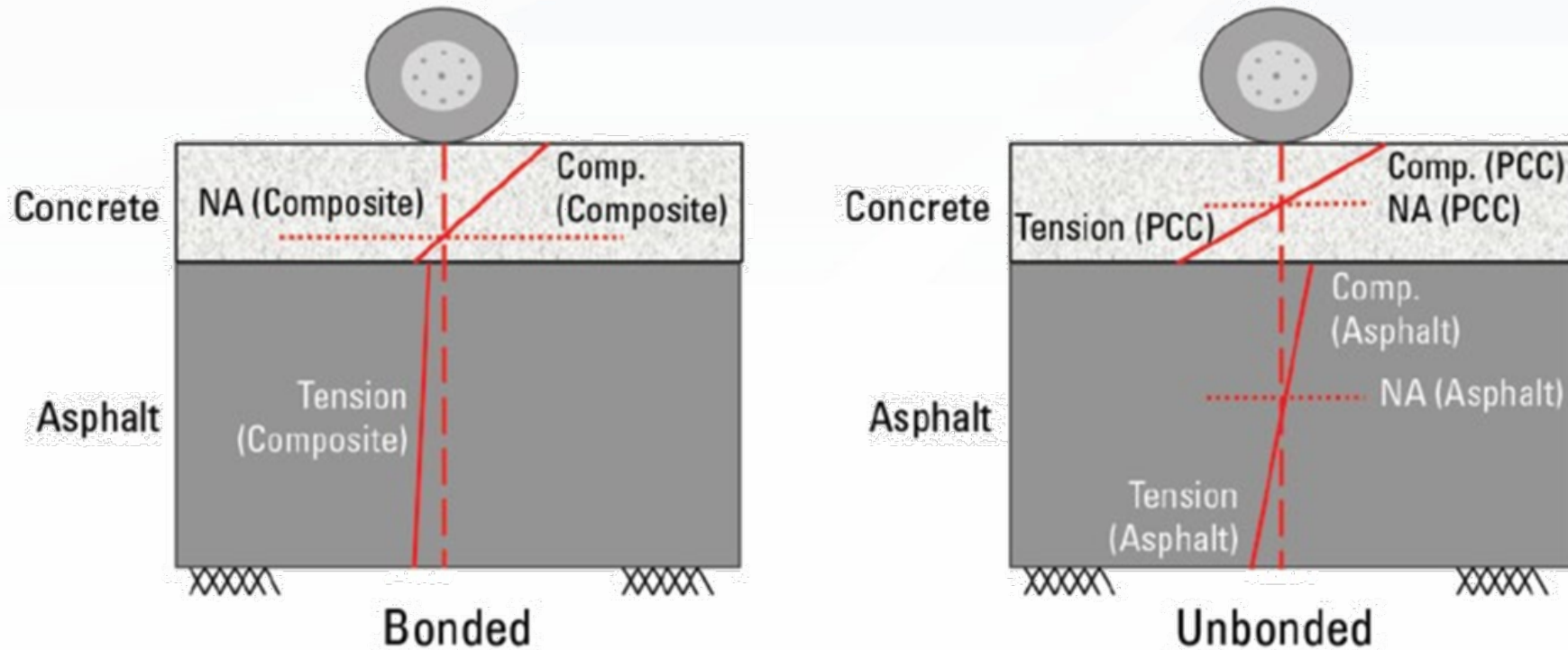
https://www.engineering.pitt.edu/Sub-Sites/Faculty-Subsites/J_Vandenbossche/BCOA-ME/BCOA-ME/

Can Design:



Bonded on Asphalt

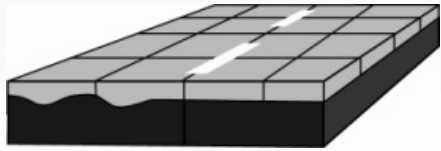
The Impact of Bonding on Asphalt



BCOA – ME

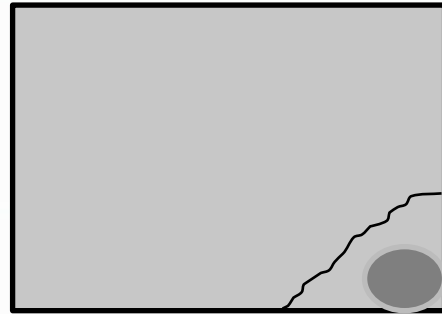


Can Design:

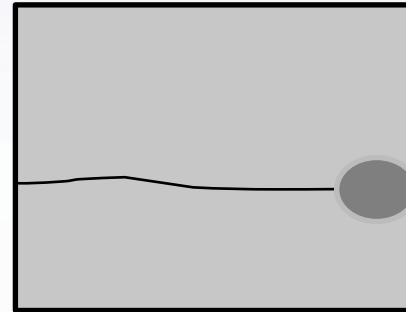


Bonded on Asphalt

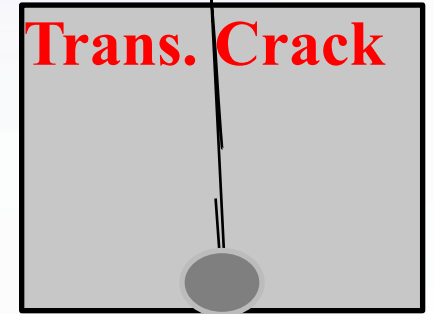
≤ 4.5 ft
**Corner
Break**



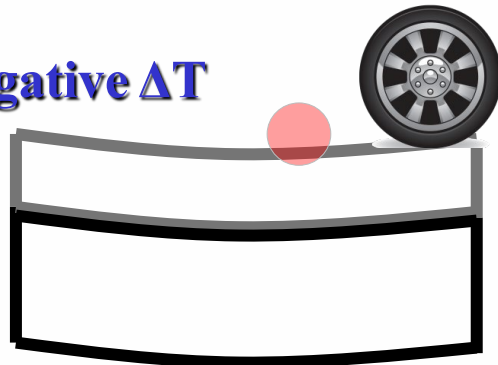
5 to 7 ft
**Long. & Diag
Crack**



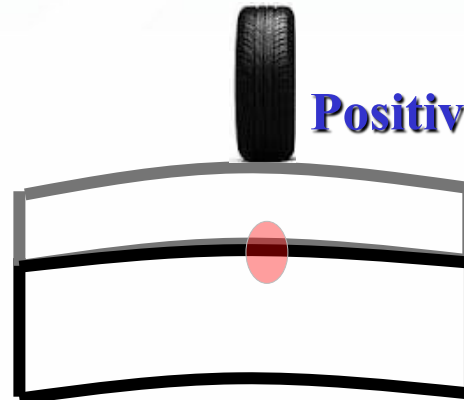
10 x 12 ft
12 x 12 ft
12 x 15 ft
Trans. Crack



Negative ΔT



Positive ΔT



Positive ΔT



BCOA-ME

Search bar



VANDEBOSSCHE

- BACKGROUND
- COURSES
- RESEARCH
- LAB TOUR
- BCOA-ME



(Last site update Jan. 2016/Last guide update April 2015)

The bonded concrete overlay of asphalt mechanistic-empirical design procedure (BCOA-ME) was developed at the University of Pittsburgh under the FHWA Pooled Fund Study TPF 5-165. This pavement structure has been referred to as thin and ultra-thin whitetopping. This site is a repository for all information relating to the BCOA-ME. The information has been sorted based on its intended use and can be retrieved by clicking on the appropriate tab below. The BCOA-ME can be run directly from this site by clicking on the "Design Guide" tab below.

DESIGN GUIDE

PRACTITIONER'S INFO TRAINING TOOLS TECHNICAL DOCS SPONSORING AGENCIES

USER FEEDBACK

BCOA-ME DESIGN GUIDE



VANDEBOSSCHE

- BACKGROUND
- COURSES
- RESEARCH
- LAB TOUR
- BCOA-ME
 - BCOA-ME Home
 - Design Guide
 - Practitioner's Information
 - Training
 - Technical Documents
 - Sponsors



(Last updated: 4/21/2015)

GENERAL INFORMATION

Latitude (degree):	<input type="text" value="44.53"/>	Geographic Information
Longitude (degree):	<input type="text" value="-93.14"/>	
Elevation (ft):	<input type="text" value="874"/>	
Estimated Design Lane ESALs:	<input type="text" value="1000000"/>	ESALs Calculator
Maximum Allowable Percent Slabs Cracked (%):	<input type="text" value="25"/>	
Desired Reliability against Slab Cracking (%):	<input type="text" value="85"/>	

CLIMATE

AMDAT Region ID

Map of Sunshine Zone

EXISTING STRUCTURE

Post-milling HMA Thickness (in):

HMA Fatigue [Fatigue Cracking Example](#)

Composite Modulus of Subgrade Reaction, k-value (psi/in): [k-Value Calculator](#)

Does the existing HMA pavement have transverse cracks? Yes No [Transverse Cracking](#)

PCC OVERLAY PROPERTIES

Average 28-day Flexural Strength (three-point ben)

Estimated PCC Elastic Modulus (psi): [Epcc Calculator](#)

Coefficient of Thermal Expansion (10-6 in/°F/in) [CTE Calculator](#)

Fiber Type:

JOINT DESIGN

Joint Spacing (ft):

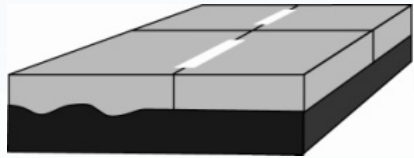
[CALCULATE DESIGN](#)

PERFORMANCE ANALYSIS

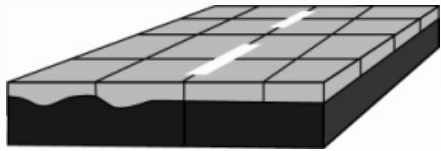
Pavement ME A.K.A. MEPDG



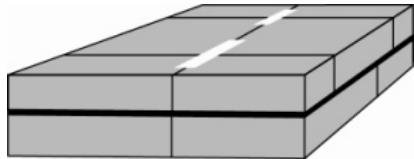
Can Design:



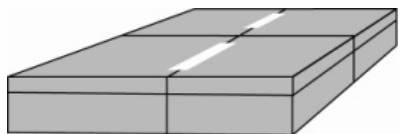
Unbonded on
Asphalt



Bonded on Asphalt
“SJPCP”



Unbonded on
Concrete



Bonded on
Concrete

- AASHTO’s current design/analysis tool
 - Current version is v3
- License is yearly-based subscription
- Incorporates climate data
- Allows most control of all design tools
- Features joint spacing as an input
 - Down to 5’ x 5’
- SJPCP failure mechanism is longitudinal cracking

• <https://me-design.com/MEDesign/>

AASHTO Pavement ME: SJPCP

- Short Jointed Plain Concrete Pavement (SJPCP) Bonded Overlay of AC Pavement
- Uses AASHTO ME's traffic axle spectrum
- Uses existing HMA layered damage modulus procedure with modification
 - BCOA-ME procedure uses simplified method for calculating damaged dynamic modulus of existing HMA



Explorer

- Projects
 - Project 1
 - Traffic
 - Single Axle Distribution
 - Tandem Axle Distribution
 - Tridem Axle Distribution
 - Quad Axle Distribution
 - Climate
 - SJPCP Design Properties
 - AC Layer Properties
 - Pavement Structure
 - Backcalculation
 - Project Specific Calibration Factors
 - New Flexible
 - Rehabilitation Flexible
 - New Rigid
 - Restore Rigid
 - Bonded Rigid
 - Unbonded Rigid
 - Sensitivity
 - Optimization
 - PDF Output Report
 - Multiple Project Summary
 - Batch Run
 - Tools
 - ME Design Calibration Factors

Menu

Recent Files

New Open SaveAs Save SaveAll Close Exit Run Batch Import Export Undo Redo Help

Project1:Project

General Information

Design type: Overlay

Pavement type: SJPCP over AC

Design life (years): 20

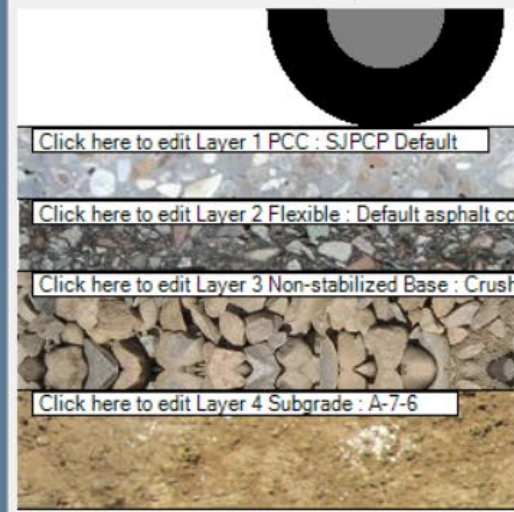
Existing construction: May 2018

Pavement construction: June 2019

Traffic opening: September 2019

Special traffic loading for flexible pavements

+ Add Layer - Remove Layer



Performance Criteria

	Limit	Reliability
Initial IRI (in/mile)	N/A	
SJPCP longitudinal cracking (percent slabs)	15	50

Layer 2 Asphalt Concrete: Default asphalt concrete

Asphalt Layer	
Thickness (in)	6
Mixture Volumetrics	
Air voids (%)	7
Effective binder content (%)	11.6
Poisson's ratio	0.35
Unit weight (pcf)	150
Mechanical Properties	
Asphalt binder	SuperPave:64-22
Creep compliance (1/psi)	Input level:3
Dynamic modulus	Input level:3
Select HMA Estar predictive model	Use Viscosity based model (nationally calibrated).
Reference temperature (deg F)	70

Asphalt binder
 Input the binder grade for level 3 or conventional/Superpave test data for levels 1 and 2. The Superpave test data uses complex shear moduli and phase angles, while the conventional grading test data uses viscosity and penetration values at different temperatures.

Error List

Project	Object	Property	Description

Progress

Stop All Analysis

Design Inputs

Design Life: 20 years Existing construction: May, 2008 Climate Data: 41.986, -87.914
 Design Type: SJPCP_ACC Pavement construction: June, 2019 Sources (Lat/Lon)
 Traffic opening: September, 2019

Design Structure

Layer type	Material Type	Thickness (in)
PCC	SJPCP Default	4.0
Flexible (existing)	Default asphalt concrete	5.5
NonStabilized	Crushed gravel	6.0
Subgrade	A-7-8	Semi-infinite

Joint Design:	
Joint spacing (ft, sq)	6

Traffic

Age (year)	Heavy Trucks (cumulative)
2019 (initial)	6,000
2029 (10 years)	11,814,900
2039 (20 years)	26,752,700

Design Outputs

Distress Prediction Summary

Distress Type	Distress @ Specified Reliability		Reliability (%)	Criterion
	Target	Predicted		
SJPCP longitudinal cracking (percent slabs)	10.00	3.79		

Distress Charts



— Threshold Value @ Specified Reliability --- @ 50% Reliability

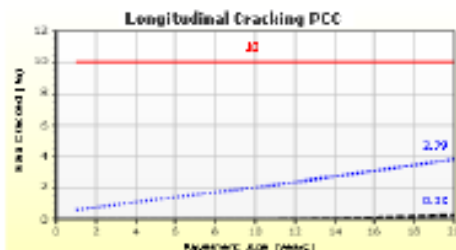
- 4" SJPCP on 5.5" of HMA
- 6x6 Joint Spacing
- 6,000 Trucks

Design Outputs

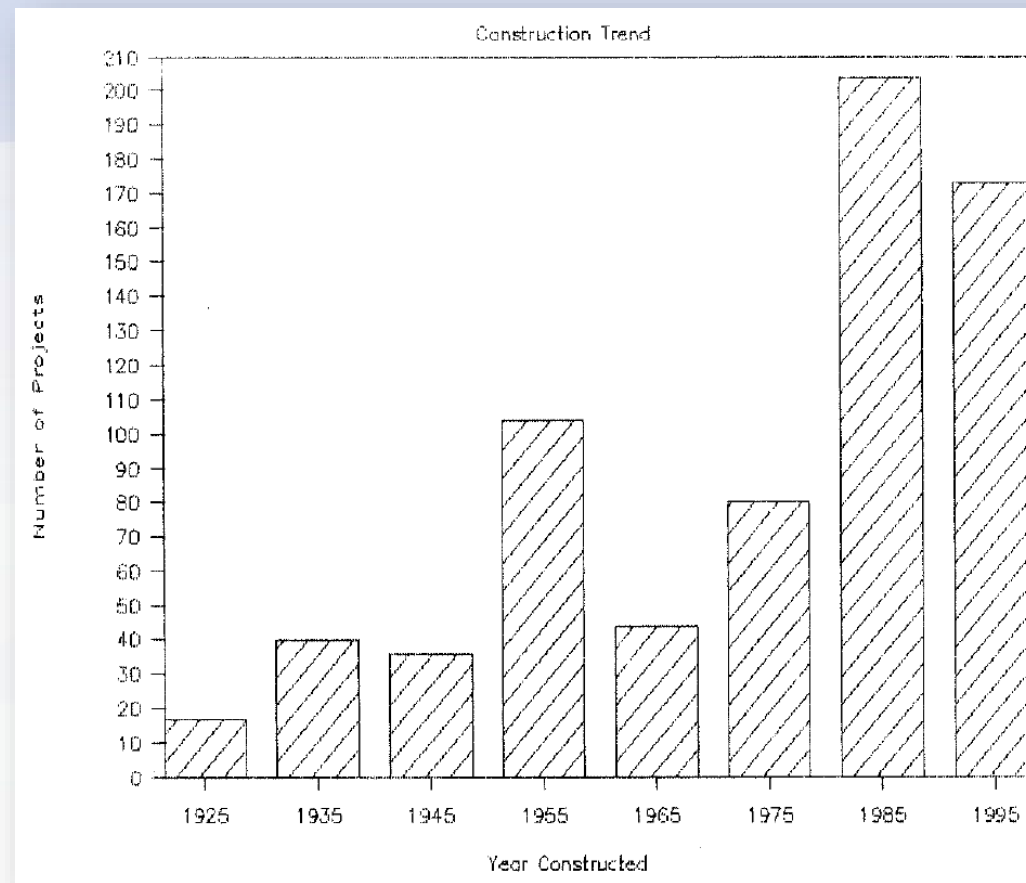
Distress Prediction Summary

Distress Type	Distress @ Specified Reliability		Reliability (%)		Criterion Satisfied?
	Target	Predicted	Target	Achieved	
SJPCP longitudinal cracking (percent slabs)	10.00	3.79	90.00	99.98	Pass

Distress Charts



— Threshold Value @ Specified Reliability --- @ 50% Reliability

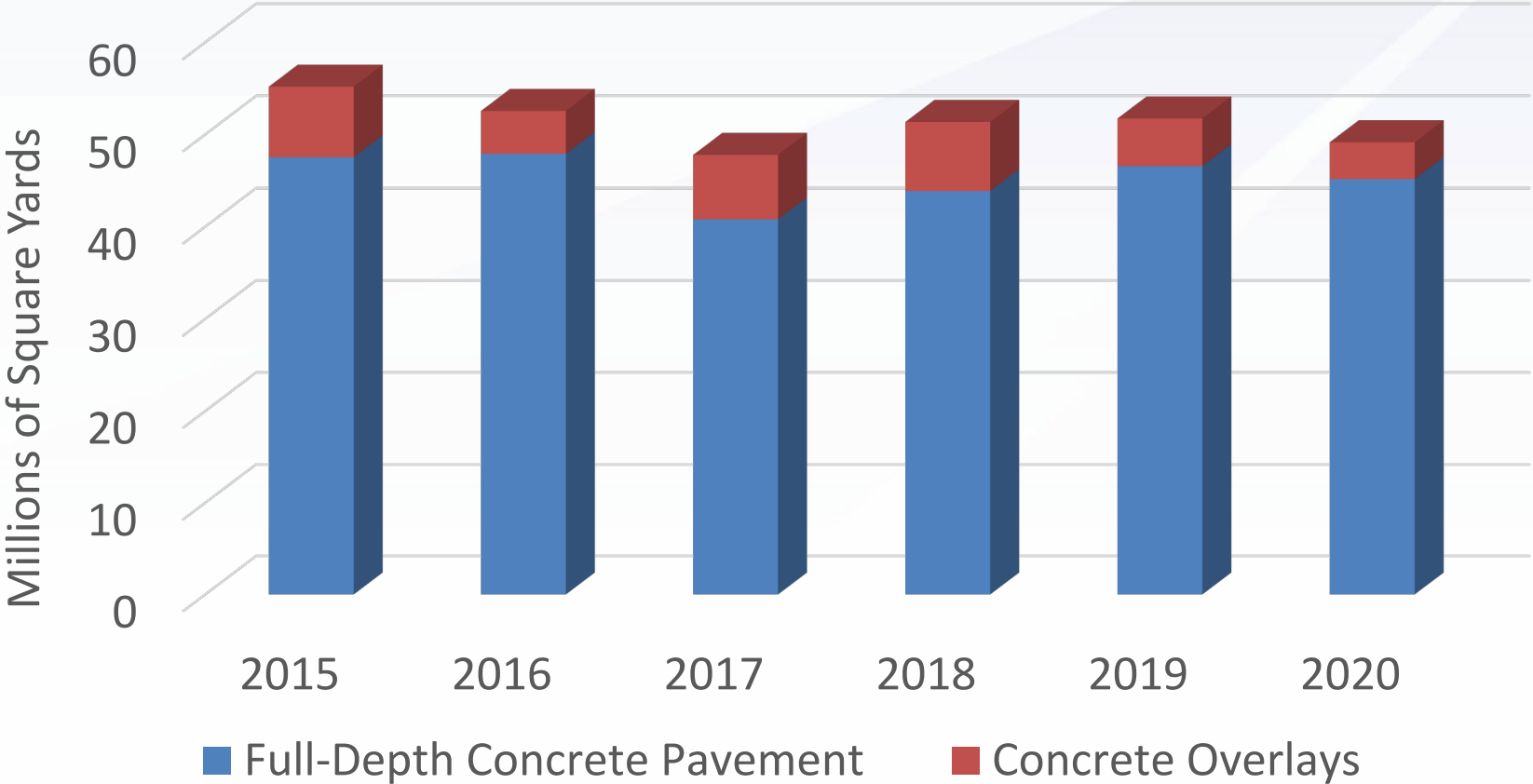


Concrete Overlays

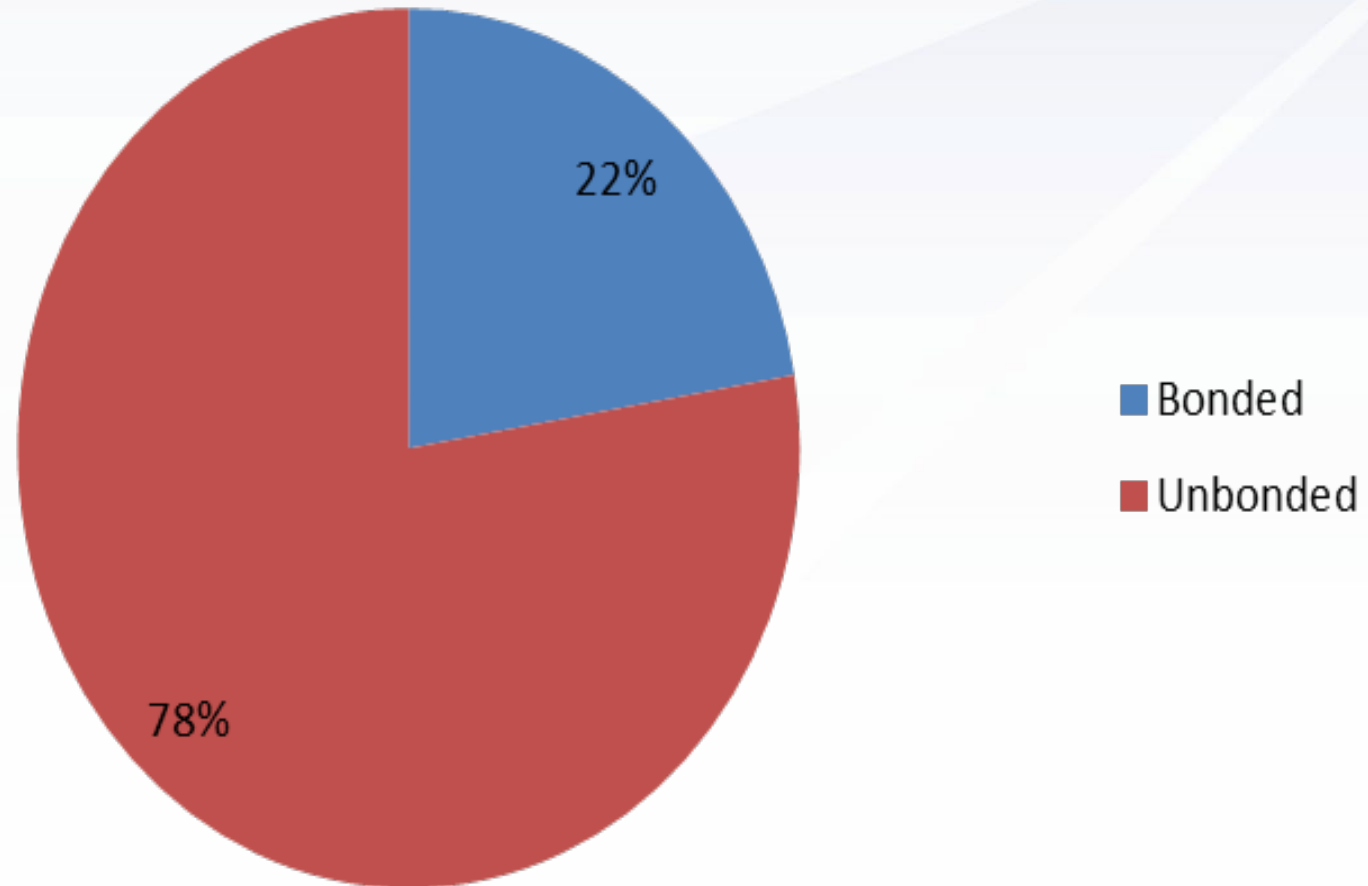
**A VERY LONG History of Performance
and Cost Effectiveness**

U.S. Concrete Pavement Market Regularly Averages 50 M SY

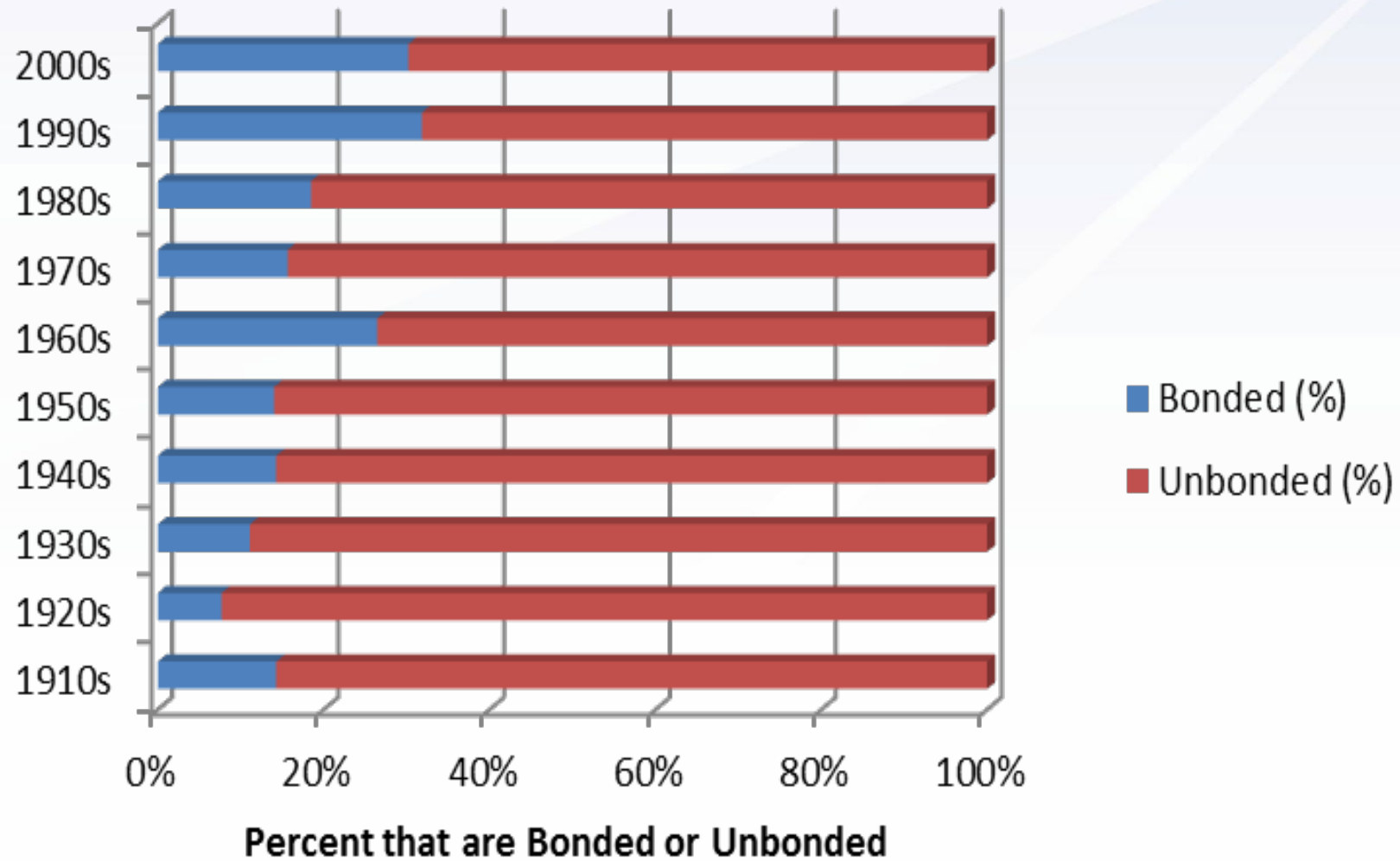
U.S. Concrete Pavement Market



We Engineers are Conservative!

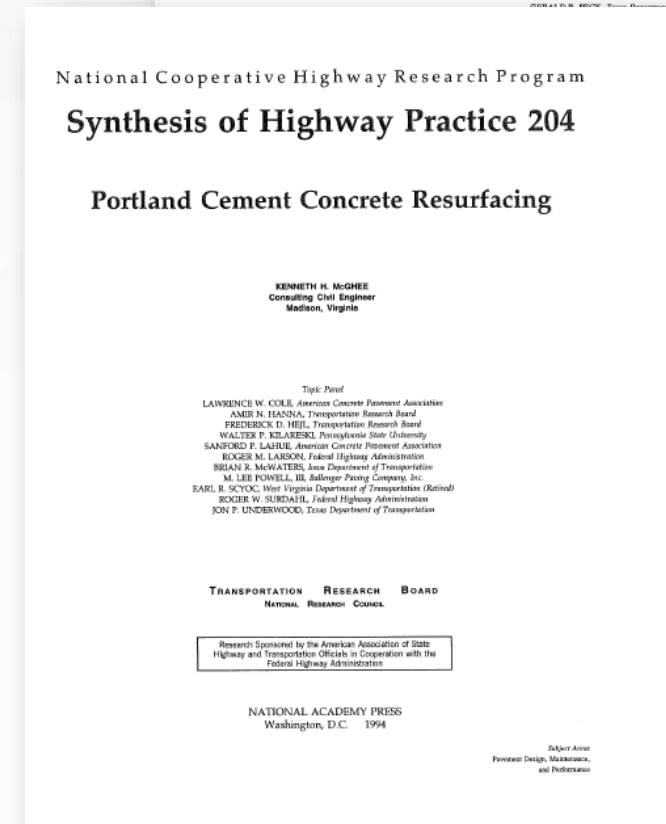
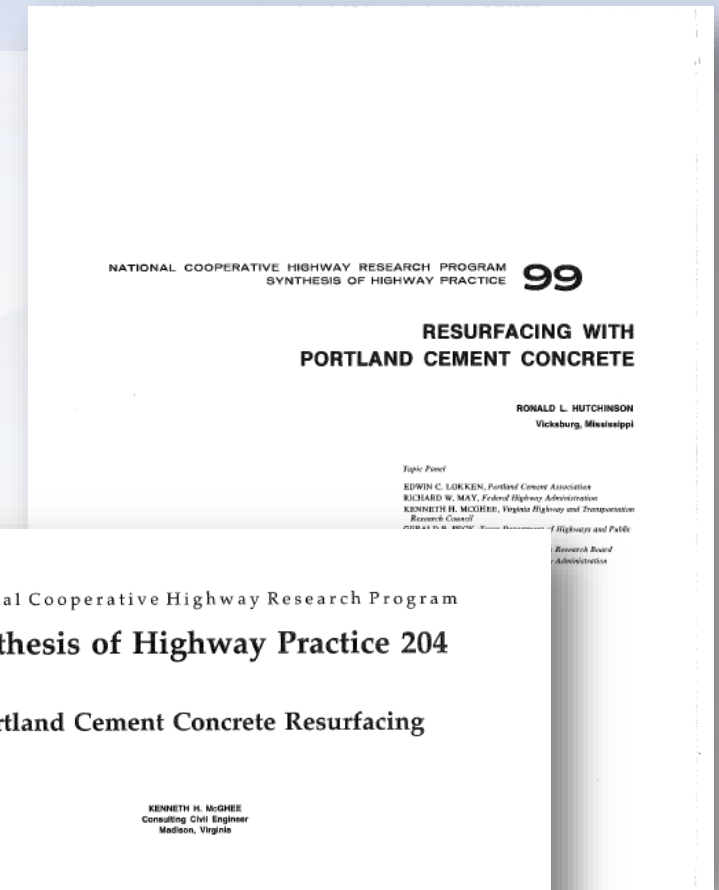


... but Bonded is Increasingly Common!



Concrete Overlays in the U.S.

- Existing compilations of project details:
 - NCHRP Synthesis 99, “Resurfacing with Portland Cement Concrete” (1982) – **375 projects back to the 1910s!**
 - NCHRP Synthesis 204, “Portland Cement Concrete Resurfacing: A Synthesis of Highway Practice” (1994) – **708 projects**



Performance History of Concrete Overlays in the United States

- Overview of Concrete Overlays in the US
- 12 Detailed Case Histories for each type of overlay in all roadway functional classifications including:
 - Design details
 - Performance history

National Concrete Pavement
Technology Center



November 2014

PERFORMANCE HISTORY OF CONCRETE OVERLAYS IN THE UNITED STATES



IOWA STATE UNIVERSITY
Institute for Transportation

Concrete Overlays for All Applications

Intersections



Rural secondary roads



Urban freeway/interstate



Urban arterial



Rural primary/interstate



Concrete Overlay Performance on Iowa's Roadways

Field Data Report
July 2017



IOWA STATE UNIVERSITY
Institute for Transportation

Sponsored by
Iowa Highway Research Board
(IHRB Project TR-698)
Iowa Department of Transportation
(InTrans Project 15-559)

Performance History of Iowa's Overlays

- Nearly 2,000 miles of concrete overlays evaluated
- How long do they last
 - Approximately 470/506 overlay projects are still in service today
 - Includes 68/96 constructed before 1990
- Over 175 BCOA projects included in evaluation



Southeast's Experience with Concrete Overlays

Case Studies

North Carolina – E. Morehead St. in Burlington

- Built in 1996
- First BCOA in Carolinas
- Still in service as of 2018



CAROLINAS READY MIXED CONCRETE ASSOCIATION
INCORPORATED

1515 MOCKINGBIRD LN., SUITE 711
CHARLOTTE, NC 28209-3213
704/ 525-2180 or 704/ 525-0502
Fax – 704/ 525-2300

FORREST E. NELSON, P.E.
EXECUTIVE VICE PRESIDENT
EXECUTIVE DIRECTOR

WILLIAM L. ARENT, P.E.
ASSISTANT EXECUTIVE DIRECTOR
CAROL H. YODER
ADMINISTRATIVE EXECUTIVE

THE CAROLINAS FIRST ULTRA-THIN WHITETOPPING INTERSECTION PROJECT

Wednesday, August 7, 1996

11:00 a.m. - 3:00 p.m.

Alamance County Chamber of Commerce Parking Lot
610 South Lexington Ave. @ Intersection Morehead Street
Burlington, North Carolina

Conventional whitetopping is the construction practice of placing concrete over an existing, deteriorated surface, such as asphalt, to provide a new riding surface. Two



North Carolina – E. Morehead St. in Burlington

8/7/1996



North Carolina – E. Morehead St. in Burlington

8/7/1996



North Carolina – E. Morehead St. in Burlington

9/25/2018



North Carolina – E. Morehead St. in Burlington

9/25/2018



7-in Concrete Overlay (C2010) over 8" Binder Base Course, B-25

G
A
S
T
O
N
I
A

N
C



Bonded Overlay of Asphalt (BCOA)
NCDOT to Review and Report

I-85 at EXIT 22

7500 ADT, 10% Trucks



PavementDesigner.org links to BCOA-ME

Trucks/day	ESALs	BCOA-ME
Up to 1000 Trucks	7.8M	5.5-inches
Up to 2500 Trucks	19.6M	6-inches
Up to 2500 Trucks	19.6M	5-inches w/ fibers

20-year design, 10% max cracking,
85% Reliability, 7x7 max panel size
650 Flex Concrete
3-in Minimum of Asphalt after milling



Georgia – US-82 and US-84 in Waycross



- Built in 2003
- 4" Thick
- Thin COA-B



Georgia

SR-196/SR-119

Hinesville



SR-25 at Brampton Rd
Garden City



Bonded Concrete Overlays of Asphalt

Case Studies Across the Country



Logan Co. '09



Clay Co. '08



Richland Co. '10



Clay Co. '10

**Recent IL
COA-B
Projects < 6"**



Shelbyville, '13



Henderson Co. 2013



Henderson Co '10



Shelby Co. '10

Illinois COA-B Intersection

**Oakland & Eldorado
Built 1998
Still in service as of
2020**

**16,025 ADT
1,125 ADTT (2011)**



Oklahoma – US-69 in Pittsburg County

- Built in 2001
- Still in Service
- ~1.5 miles long
- 4" and 6" BCOA
- 2011 Two Way ADT = 16,000
 - 30% Trucks
- Joint spacing 6' x 6'
- 3 lb/cy synthetic macrofibers



I-70 Western Kansas

6' X 6' X 6" Concrete Overlay
2 projects constructed in 2010
and 2 in 2011



October 2017
Bus Trip



I-70 Western Kansas



30 Miles of 6' x 6' x 6" Overlay

I-70 Western Kansas



I-70 Western Kansas



Iowa – SH-13 Near Manchester



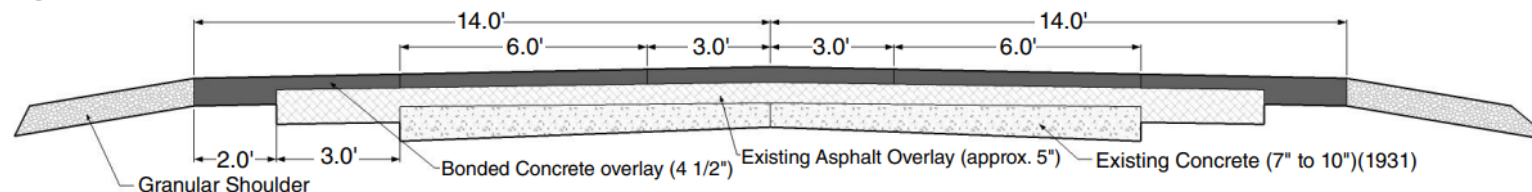
SH-13 Prior to Milling in 2002



SH-13 Bonded Overlay 6'x6' Joint Spacing (2014)

- Built in 2002
- Still in service
- ~9.5 miles long
- 4" COA-B
- 2002 Two Way ADT = 2,930
 - 11% Trucks
- Monolithically widened with thickened edges

Typical Section



Iowa – Highway 3 in LeMars



- Built in 2022
- 9+ miles long
- 6" COA-B
- Monolithically widened with thickened edge
- Paving completed and opened to traffic in 25 days
 - Conventional HMA or PCC overlay would be 90 calendar days (60 working days)



Concrete Overlays

Resources to Make it Happen

Lots of Guidance Available...

Whitopping State of the Practice

Whitopping is an application of a thin layer of concrete (2 to 3 inches thick) over an existing asphalt pavement. It is used to improve the surface condition, reduce noise, and extend the life of the pavement. This document provides a comprehensive overview of the practice, including design considerations, construction methods, and performance expectations.

CONCRETE INFORMATION

Construction Specifier for Ultra-Thin Whitetoppin

Ultra-Thin Whitetopping (UTW) is a process where a thin layer of concrete (2 to 3 inches thick) is placed over an existing asphalt pavement. It is used to improve the surface condition, reduce noise, and extend the life of the pavement. This document provides a comprehensive overview of the practice, including design considerations, construction methods, and performance expectations.

Technical Brief

Unbonded Portland Cement Concrete Overlays

This technical brief discusses the design and construction of unbonded portland cement concrete overlays. It covers various aspects such as subgrade preparation, reinforcement, and curing. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

R&T UPDATE

Concrete Pavement Research & Technology

UTW SCORES A MILLION

The use of ultra-thin whitetopping (UTW) in the United States is continuing to steadily increase since its beginning in Madisonville, Kentucky in 1995. The American Concrete Pavement Association (ACPA) has long been involved in promoting the use of UTW projects throughout the U.S. Based on survey reports from ACPA's Chapter/State Planning Associates, state Ready Mixed Concrete Associations, Concrete Chapter Groups, and ACAs, the following information is provided:

The chart shows the number of UTW projects in various states, with a significant increase in recent years. The states listed include Kentucky, Tennessee, Missouri, and others.

Design and Construct Concrete Overlay and W Paveme

Final Report September

This report provides detailed guidance on the design and construction of concrete overlays and pavement structures. It includes design examples, material specifications, and construction details. The report is a valuable resource for engineers and contractors working on pavement rehabilitation projects.

ACI 325.13R-06

Concrete Overlays for Pavement Rehabilitation

Reported by ACI Committee 325

This document provides comprehensive information on concrete overlays for pavement rehabilitation. It covers design, construction, and performance aspects. The report is a key reference for professionals in the field of pavement rehabilitation.

Whitopping

Whitopping - State of the Practice

This document provides a comprehensive overview of the practice of whitetopping. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Technical

Conventional Whitetoppings

This technical document discusses the design and construction of conventional whitetoppings. It covers various aspects such as subgrade preparation, reinforcement, and curing. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

NCHRI SYNTHESIS 3

Whitopping

This synthesis report provides a comprehensive overview of the practice of whitetopping. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

NCHRI SYNTHESIS 3

Whitopping

This synthesis report provides a comprehensive overview of the practice of whitetopping. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Evaluati Unbond

National Concrete Pavement Technology Center

This document provides a comprehensive overview of the practice of evaluating unbonded concrete overlays. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Thin Unbonded Overlay Performance on Composite Pavement

This document provides a comprehensive overview of the practice of thin unbonded overlays on composite pavements. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Concrete Overlays

The increased use of concrete overlays might have you asking some questions. Here are some facts about concrete overlay trends and a list of useful resources.

This document provides a comprehensive overview of the practice of concrete overlays. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

DESIGN AND CONCRETE MATERIAL REQUIREMENTS FOR ULTRA THIN WHITETOPPING

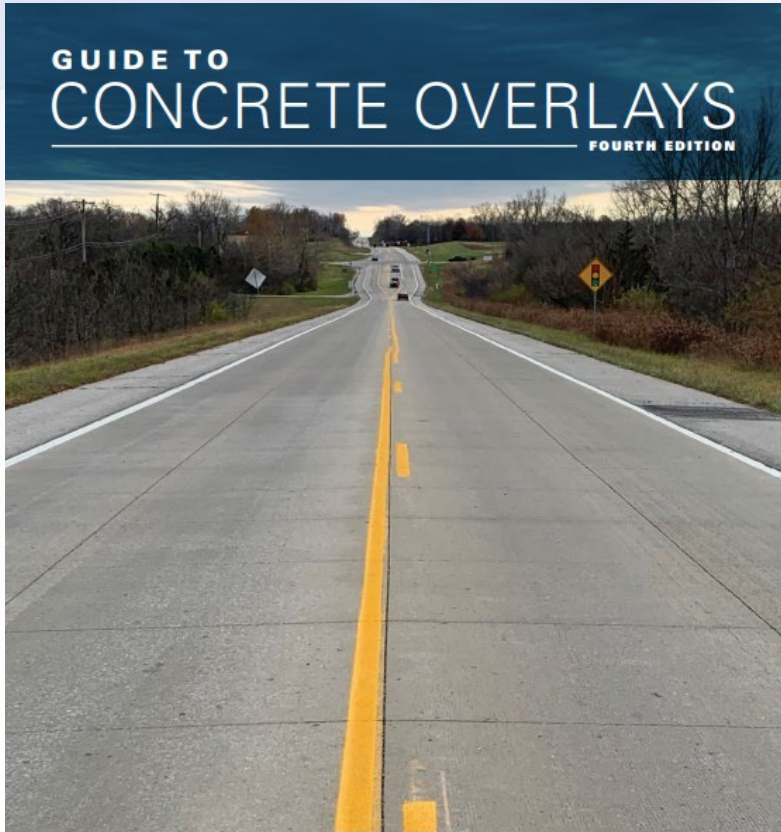
This document provides a comprehensive overview of the practice of ultra-thin whitetopping. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Improving Construction

National Concrete Pavement Technology Center

This document provides a comprehensive overview of the practice of improving construction. It includes design considerations, construction methods, and performance expectations. The document is intended for engineers and construction professionals involved in pavement rehabilitation projects.

Sustainable Concrete Overlays



IOWA STATE UNIVERSITY
Institute for Transportation

NOVEMBER 2021

National Concrete Pavement
Technology Center



https://intrans.iastate.edu/app/uploads/2021/11/guide_to_concrete_overlays_4th_Ed_web.pdf

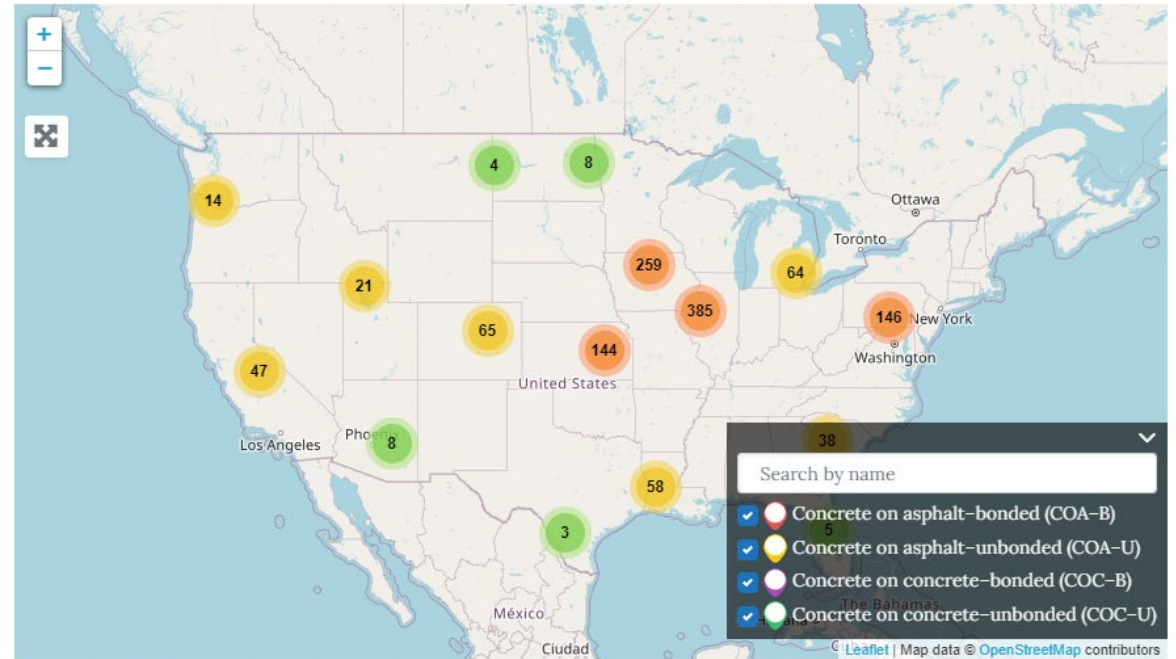
<https://cptechcenter.org/concrete-overlays/>



Concrete Overlays

<https://projects.acpa.org/concrete-overlays/>

List View



Search for

Near

Application	Decade Constructed	Thickness Range	Joint Spacing (Range)
<input type="checkbox"/> Highway	<input type="checkbox"/> 2020-2010	<input type="checkbox"/> Ultrathin (1-4")	<input type="checkbox"/> Short (<5')
<input type="checkbox"/> Street	<input type="checkbox"/> 2009-2000	<input type="checkbox"/> Thin (4-7")	<input type="checkbox"/> Intermediate(5' - 8')
<input type="checkbox"/> Airport	<input type="checkbox"/> 1999-1990	<input type="checkbox"/> Conventional (7"+)	<input type="checkbox"/> Conventional (9'-15')
<input type="checkbox"/> Parking Lot	<input type="checkbox"/> 1989-1980		<input type="checkbox"/> Long(16'+)
<input type="checkbox"/> Industrial Pavement- Trucking Facility	<input type="checkbox"/> 1979-1970		
<input type="checkbox"/> Other	<input type="checkbox"/> 1969-1960		
	<input type="checkbox"/> 1959-1950		
	<input type="checkbox"/> Pre-1950		

Concrete Overlay Staging

- Can be successfully and cost-effectively constructed without closing the roadway to traffic
- A common misperception is that concrete overlay construction on two-lane roadways requires road closures
- Concrete overlays may be constructed on four-lane divided roadways without crossovers and head-to-head traffic

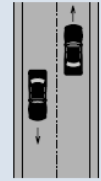


Construction Staging & MOT Examples

COMPLETED OVERLAY (Two-Lane Roadway with Granular Shoulders, Conventional Paver)

Applied to:

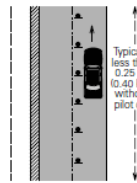
- Bonded concrete overlay of concrete pavements
- Bonded concrete overlay of asphalt pavements
- Bonded concrete overlay of composite pavements
- Unbonded concrete overlay of concrete pavements
- Unbonded concrete overlay of asphalt pavements
- Unbonded concrete overlay of composite pavements



STAGE 1. Repair surface, prepare for overlay, and construct left shoulder and separation layer

- Install traffic control and close the left lane. Follow jurisdictional requirements for traffic control. Check with jurisdiction regarding allowable lane closure length. If surface repair and preparation for the overlay are minimal, then slow-moving traffic control may be appropriate. Closing the lane may require additional traffic control (e.g., signals, flaggers, and/or pilot cars).
- Repair the surface as appropriate. Prepare the surface for the overlay (or, in the case of concrete overlay on concrete, the separation layer) as described in the contract document.
- Prepare shoulder widening by trenching the existing shoulder and trimming to the specified width. The

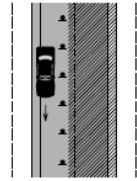
- trench should be rolled and compacted as necessary to obtain a firm and stable platform. Compact shoulder material as specified in the contract documents. A continuous progression approach with the shoulder trencher and placement of the base shoulder widening is encouraged.
- Construct calcium chloride treated granular shoulder as outlined in contract documents. The treated shoulder shall be firm and stable to support vehicular traffic at low speeds.
- Construct separation layer (only for unbonded overlay on concrete).



STAGE 2. Construct right shoulder and concrete overlay

- Shift the traffic control to the left lane and close the right lane to traffic. The length of the closure will depend on the jurisdiction's maximum closure length with pilot car. Traffic controls and traffic control signals will be based on jurisdictional requirements.
- Repair and prepare the surface for the overlay or the separation layer and subsequent overlay as described in the contract documents. Construct separation layer (for unbonded overlay on concrete).
- Normal space for the paver stringline is 1–1.5 ft (0.3–0.5 m) and the paver track is a minimum of 2.5–3 ft (0.8–0.9 m). 1 ft (0.3 m) incremental encroachment reduction up to 2 ft (0.6 m) total is common through typical machine adjustment. Speeds should be restricted adjacent to

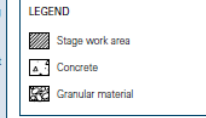
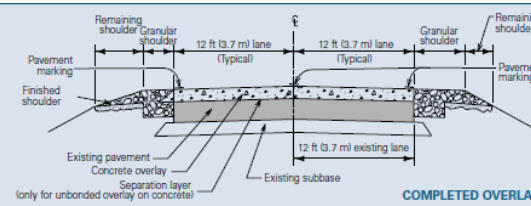
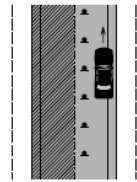
- paver when clearance between the paver and vehicle traffic is limited.
- Construct concrete overlay on the existing pavement. Construct right shoulder base with 6 in. (150 mm) thick granular shoulder. Built float work shall operate from the outside shoulder only.
- Place 6 in. (150 mm) minimum thickness calcium chloride treated granular shoulder to help stabilize shoulder and minimize heavy dust that can impair vision.
- The "X" dimension between the roadway centerline and vertical panel is for the paving machine track and stringline.



STAGE 3. Construct left lane concrete overlay

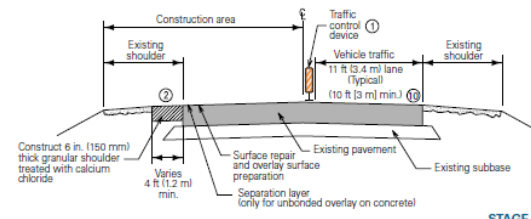
- Close the opposite lane to traffic and place the concrete overlay according to contract documents, using the same procedures as described in stage 2. Stringline may not be necessary for the right edge of the paving when the paved overlay constructed in stage 2 is used as the paver control in this stage. If the right stringline is not used, the "X" dimension could possibly be reduced to 3 ft (0.9 m).

- If the outside edge dropoffs at the shoulder exceeds the jurisdictional allowance for a 1:1 fillet, then construct the granular shoulders in this stage.
- Complete shoudering. Complete pavement marking and regulatory signing in accordance with contract documents.

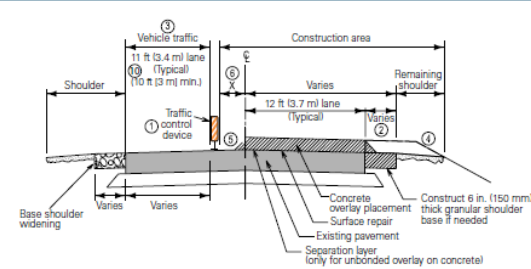


NOTES:

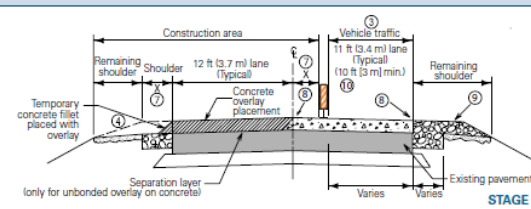
- Follow jurisdictional requirements for traffic control devices.
- When the existing shoulder is less than 4 ft (1.2 m), adjustment to the slipform paver and/or paver control may be necessary to accommodate the reduced space for paver control and paver track.
- Minimum lane width next to the paver may be reduced for short-term, stationary work on low-volume, low-speed roadways when vehicular traffic does not include longer and wider heavy commercial vehicles.
- If the completed overlay in this stage opens to traffic and the final shoulder backfill is delayed, place fillet as shown. If overlay creates a dropoff greater than jurisdictional allowance, place granular shoulder in lieu of concrete fillet.
- See canterline fillet illustration and subsequent removal on figure 103.
- For "X" less than 4 ft (1.2 m), adjustments to paver may be necessary to accommodate paver control and paver track.
- The "X" dimension can be reduced to 3 ft (0.9 m) minimum when the right lane is used as paver control.
- Mark edgelines and centerlines per MUTCD (FHWA 2009) section 6F.77 (mark both lanes).
- Use calcium chloride for dust control.
- For low-volume roads only



STAGE 1



STAGE 2



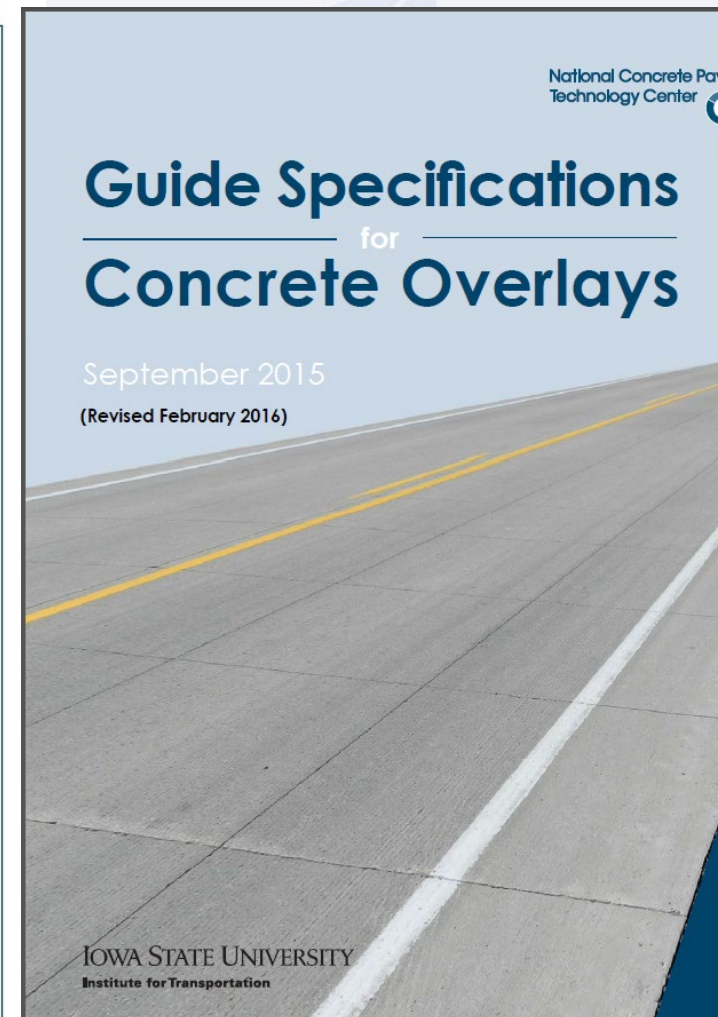
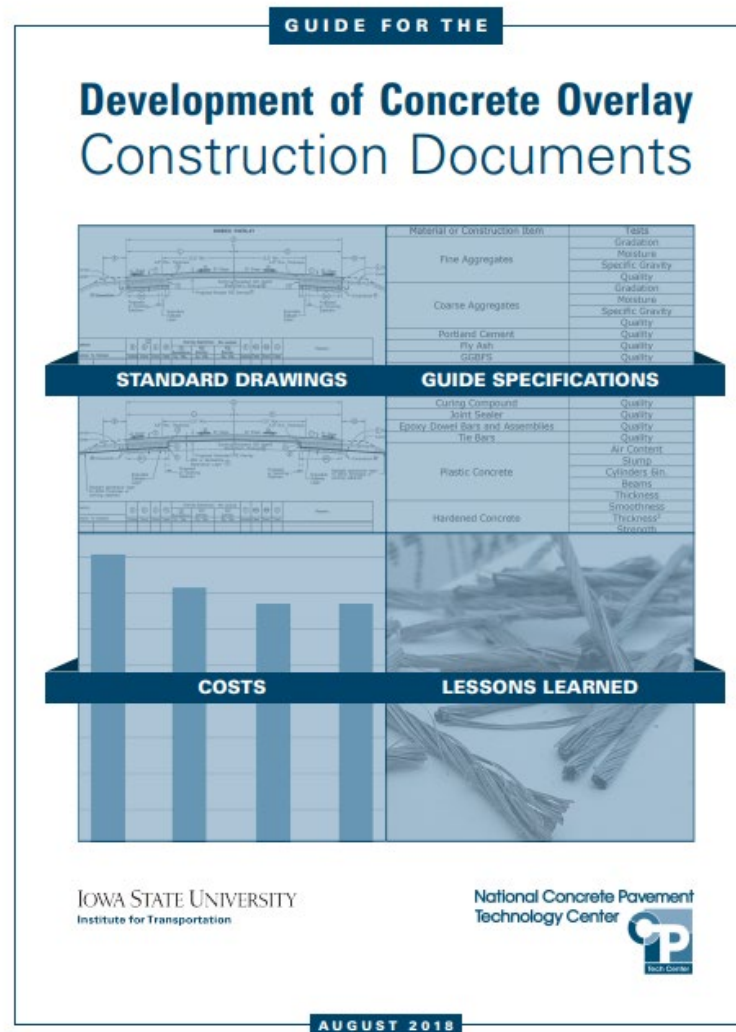
STAGE 3

Overlay of Two-Lane Roadway with Granular Shoulders (Conventional Paver)

Figure 105. Overlay of two-lane roadway with granular shoulders (conventional paver)

Specifications and Construction Documents

- Guide specifications and standard drawings and design details available in CP Tech Center Resources
- Plans can be simple
 - Typical Section



<https://cptechcenter.org/concrete-overlays/>

https://intrans.iastate.edu/app/uploads/2018/09/overlay_construction_doc_dev_guide_w_cvr.pdf

Thank You!

Any Questions?

Eric Ferrebee, P.E.

Director of Technical Services

American Concrete Pavement Association

eferrebee@acpa.org | 847.423.8709



Main Website | acpa.org

Concrete Wiki | wiki.acpa.org

App Library | apps.acpa.org

Desktop Software | software.acpa.org

Resources | resources.acpa.org

On-Demand Training | ondemand.acpa.org

Live Online Training | webinars.acpa.org

Your Local Contact | local.acpa.org