

**Concrete Overlays of Existing Asphalt  
Surfaced Streets and Parking Lots...**



**...with a side of  
industrial pavement**

# What is an “overlay”?

Previously known as:

- Whitetopping
- Thin Whitetopping
- UltraThin Whitetopping
- Thin Overlay



An aerial photograph of a large parking lot with several trees and light poles. A solid green horizontal bar is positioned at the top of the image. The text is overlaid on the center of the parking lot.

Let's end the confusion...

*Let's think about "resurfacing"  
with concrete*

# Concrete Overlays: New life for *existing pavements*...



...without reconstruction

# Why Concrete Overlays?

All the benefits of concrete pavement

- Long-term skid resistance
- Reduced Heat Island effect
- Greater visibility.
- Reduced lighting requirements
- Increased safety

Offer an economically sound solution that will out last flexible pavements

- Control maintenance costs
- Free up future maintenance dollars

# Study of FDOT Pavement History





**Concrete over asphalt**

**I didn't know you  
could do that!**

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DURABLE. SUSTAINABLE. **CO**

# How Long Has This Been Done?

## Concrete Resurface on So. Seventh Street, Terre Haute, Indiana

County highway connecting the city limits of Terre Haute, Indiana, with South Seventh Street was, prior to 1918, with a bituminous type of pavement which had a total thickness of 4 to 5 inches. The surface was covered with numerous depressions, which seriously interfered with traffic. The accompanying picture shows the condition of the old pavement in 1918, when the officials decided to rebuild, and after

it was compared to require a layer of concrete from 3 to 4 inches thick, reinforced and proportioned 1 part cement, 1½ parts washed sand and 2½ parts washed pebbles under 1¼ inches maximum size. All of the depressions in the old surface were first filled with concrete and brought to a fairly uniform grade. As it was thought necessary to provide an effective separation between the old and new pavements, the old surface was carefully cleaned, sprinkled with



The old pavement before work of renewing the surface with a layer of concrete was shown in shadow of the barricade on the left shows how the old pavement was worn into waves by traffic.

The investigation decided to use a mixture of portland cement concrete. The methods used on the road in Wayne County in mind, the specifications for resurfacing were pre-

pared to require a layer of concrete from 3 to 4 inches thick, reinforced and proportioned 1 part cement, 1½ parts washed sand and 2½ parts washed pebbles under 1¼ inches maximum size. All of the depressions in the old surface were first filled with concrete and brought to a fairly uniform grade. As it was thought necessary to provide an effective separation between the old and new pavements, the old surface was carefully cleaned, sprinkled with

*THE problem of resurfacing roads and streets, which have substantial foundations but worn-out surfaces, has long interested engineers and property owners. The resurfaced pavement described in this pamphlet points the way to a solution of such problems at moderate cost, and shows how the value in good foundations may be conserved, and a non-skid, rigid, concrete hard-surface provided for the exacting requirements of modern traffic.*

TERRE HAUTE, IND.  
March 26, 1926

Under my direction, as County Supt. of Roads, Vigo County, the portion of the county highway connecting with South Seventh Street in Terre Haute was resurfaced with concrete in 1918, the minimum depth of concrete being 3 inches and varied to as much as 4½ inches at places where the old bituminous pavement had settled.

This pavement is today in excellent condition and has carried through the past years an ever-increasing traffic. It is located on Indiana State Road, No. 10, which is a direct route from Chicago to the South. In addition to this through traffic there has ever been the local traffic which includes heavy trucking of coal, etc., into the city, this being the main gateway from the South.

This pavement today more than fulfills our expectations and except for occasional filling of joints there has been practically no maintenance on it.

(Signed) ERNEST ALTEKRUSE,  
1911 S. 8th St.

## Resurfacing An Old Pavement With Concrete

Data supplied through courtesy of Ernest Altekruze, County Superintendent of Roads, Vigo County, Terre Haute, Ind.



South Seventh Street Road, Terre Haute, Ind., showing condition of concrete pavement after 8 years' service.

This pamphlet with the title above was first printed in 1921. Many miles of old base have been resurfaced with concrete since that date. South Seventh Street in Terre Haute is giving the same good service in 1926 that it did in 1921.

Published by  
Portland Cement Association

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# Who uses concrete overlays today?

Federal Highway Administration (FHWA)

Federal Aviation Administration (FAA)

State DOT

County DOT

Cities

Private Companies

- Interstate Highway, Airport Runway, State Highway, Secondary Roads, Local Roads, Parking and Industrial Lots

Concrete overlays are a method to *resurface or rebuild* existing paving with these advantages.

- Renew the wear surface-black to white
- Increase the load carrying capacity of the pavement by just adding concrete thickness
- Improve lighting-reduce heat island
- Eliminate perpetual asphalt maintenance
- To give owners a *choice*
- Proven alternative to full depth reconstruction

Concrete overlays give support credit to the original construction for base and subgrade support of what is in place.

National Concrete Pavement  
Technology Center



THIRD EDITION

Guide to

# CONCRETE OVERLAYS

Sustainable Solutions for Resurfacing and Rehabilitating Existing Pavements

May 2014



Practical approach to understanding and successfully using concrete overlays, from selection to opening



ACPA publication TB021.03P

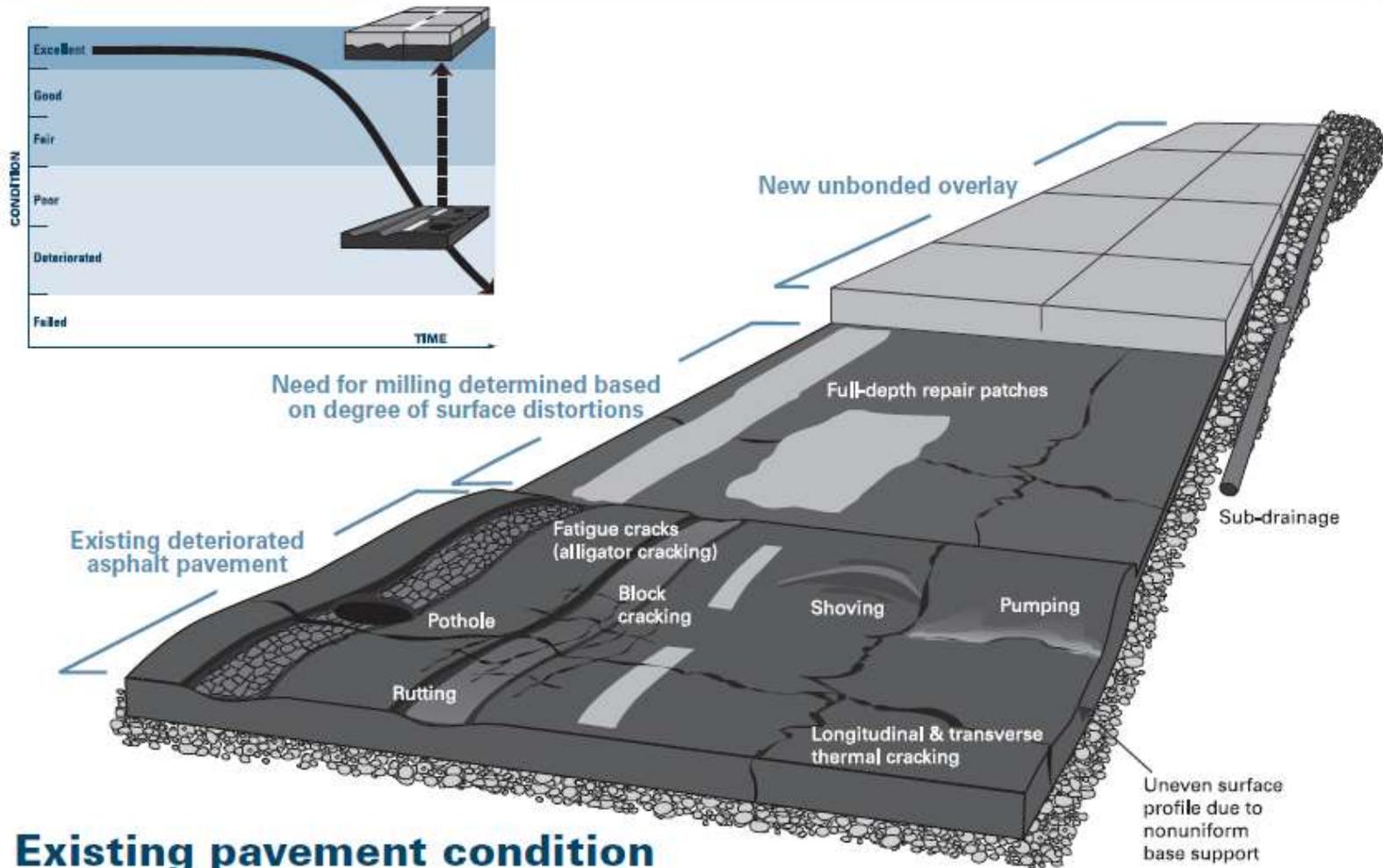
# National Concrete Pavement Technology Center

[cptechcenter.org](http://cptechcenter.org)

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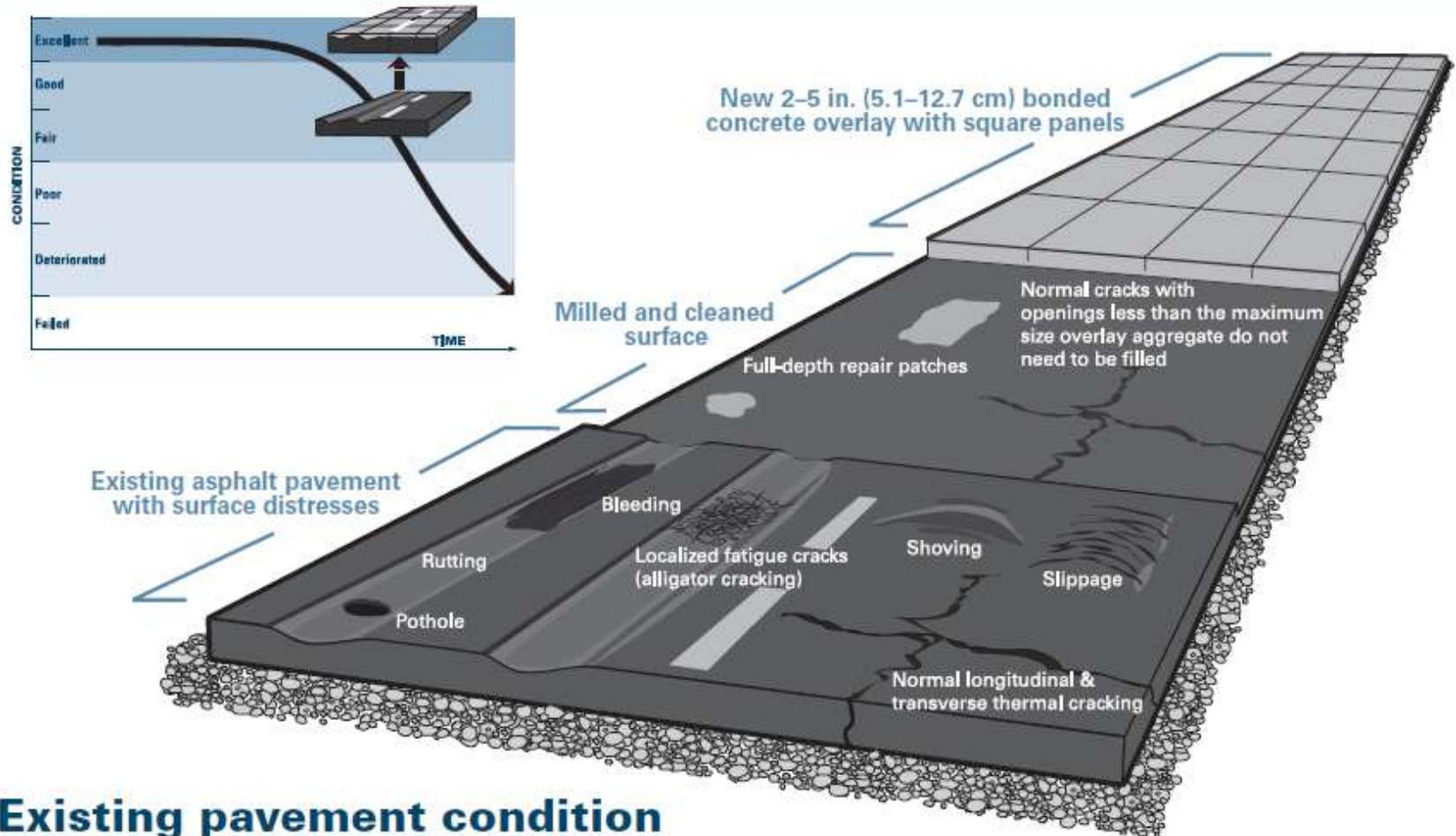
# Unbonded Concrete Overlays of Asphalt Pavements

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



# 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

# Unbonded vs. Bonded Overlays

## Unbonded

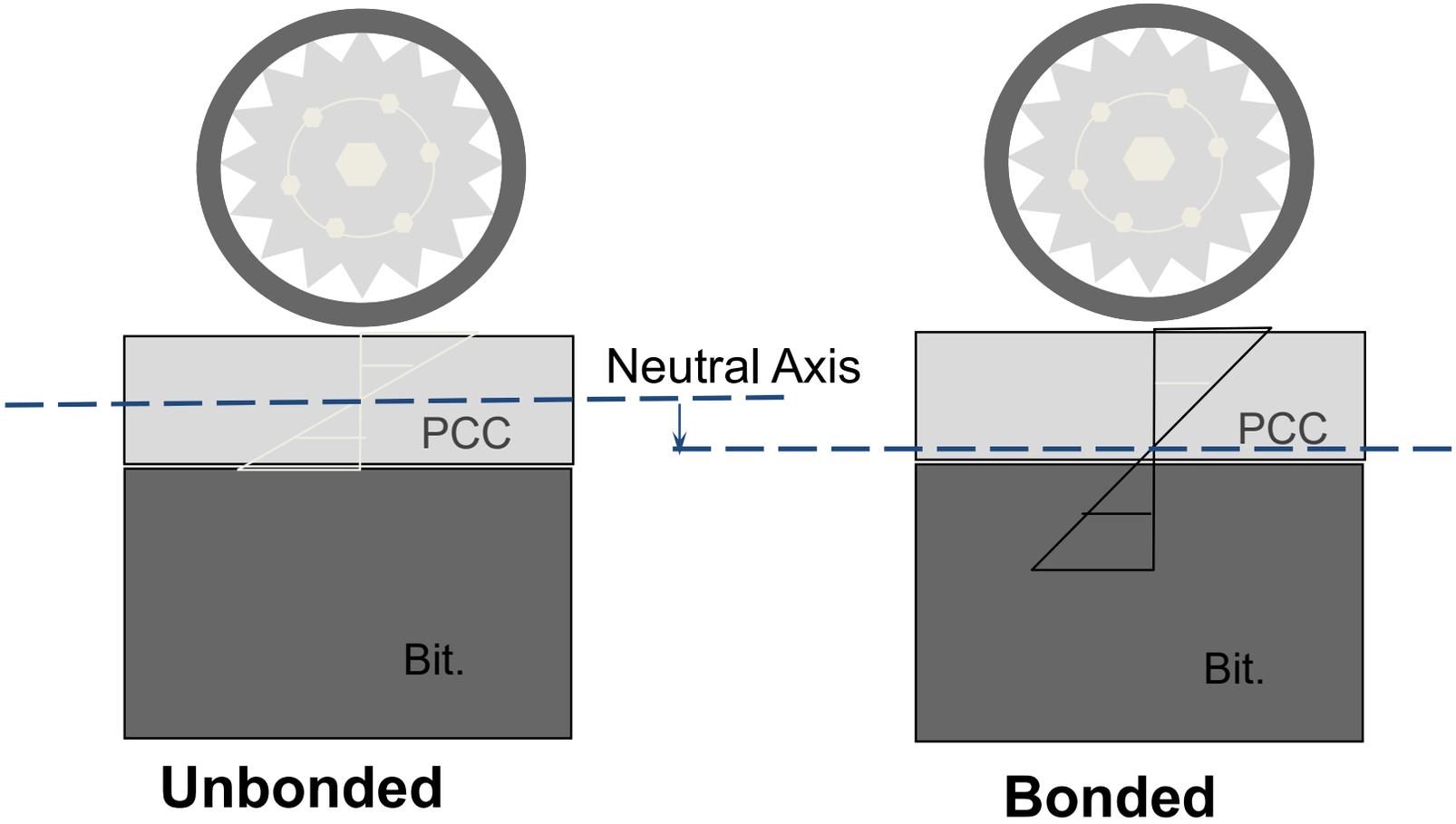
- Typically used for major rehabilitation.
- Existing pavements have structural deterioration.

## Bonded

- Typically used for resurfacing & minor rehabilitation.
- Used to add structural capacity and/or eliminate surface distress when the existing pavement is in good structural condition.



# Mechanics of Composite Section



Source: Illinois Ready Mixed Concrete Association

# Ultra-thin Whitetopping (UTW)

- Bonded, fiber-reinforced concrete overlay
- 2 to 4 inch thickness
- Bonded to milled asphalt subbase
- Existing asphalt serves as base for concrete
- Can provide Fast-Track pavement repair
- The answer to high traffic intersection pavement problems!



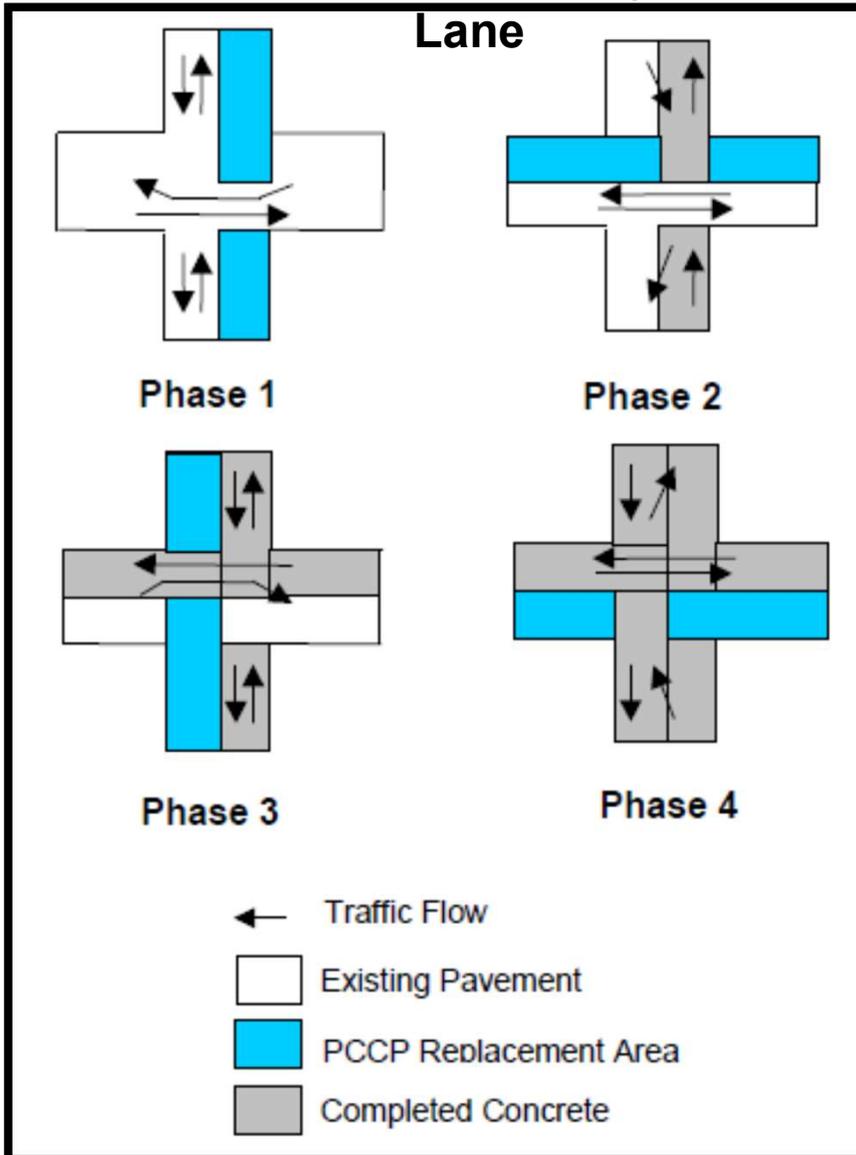
# Typical Construction Sequence



# Staging: Intersection Under Traffic

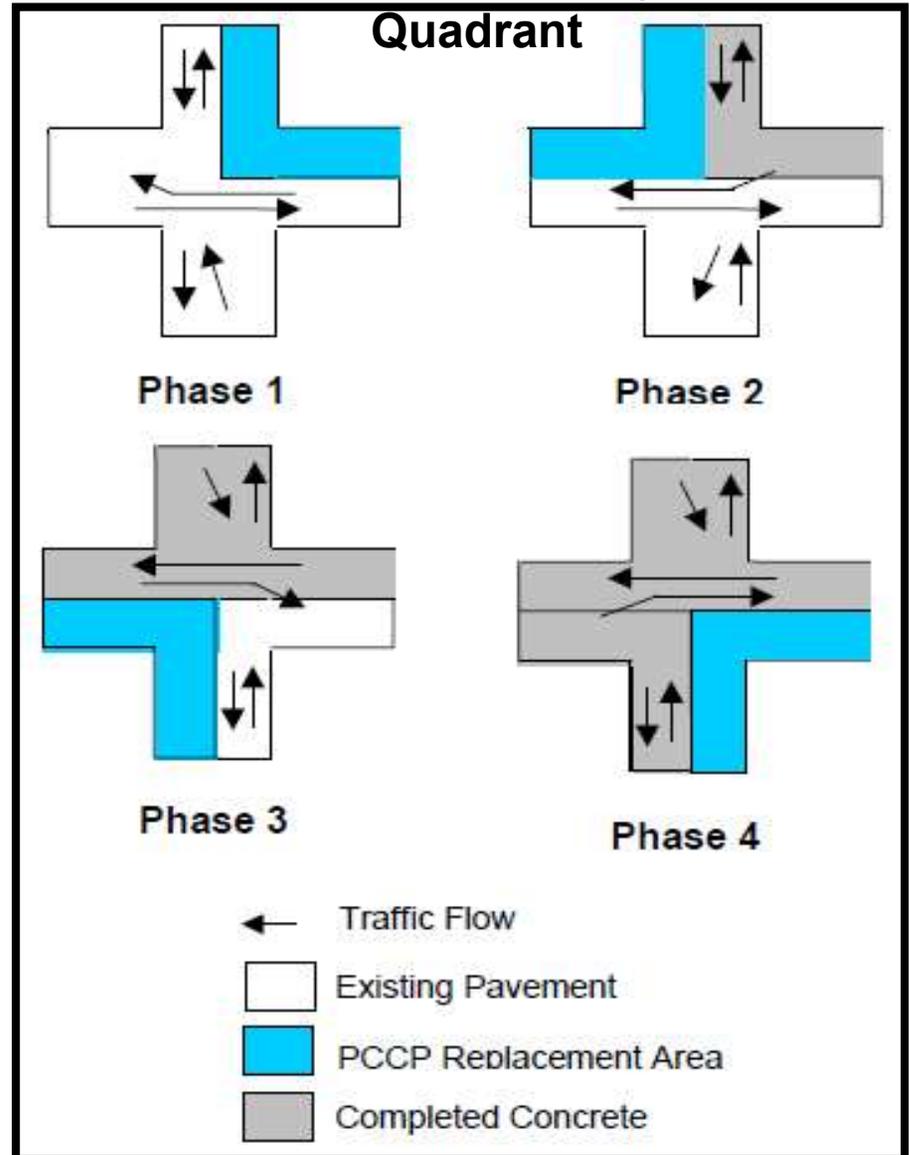
Construction By

Lane



Construction By

Quadrant



# Rte. 26, Pleasant Gap, PA

**Existing asphalt pavement was only 2-3 years old. Severe rutting, in excess of 5 inches, was a continual problem.**

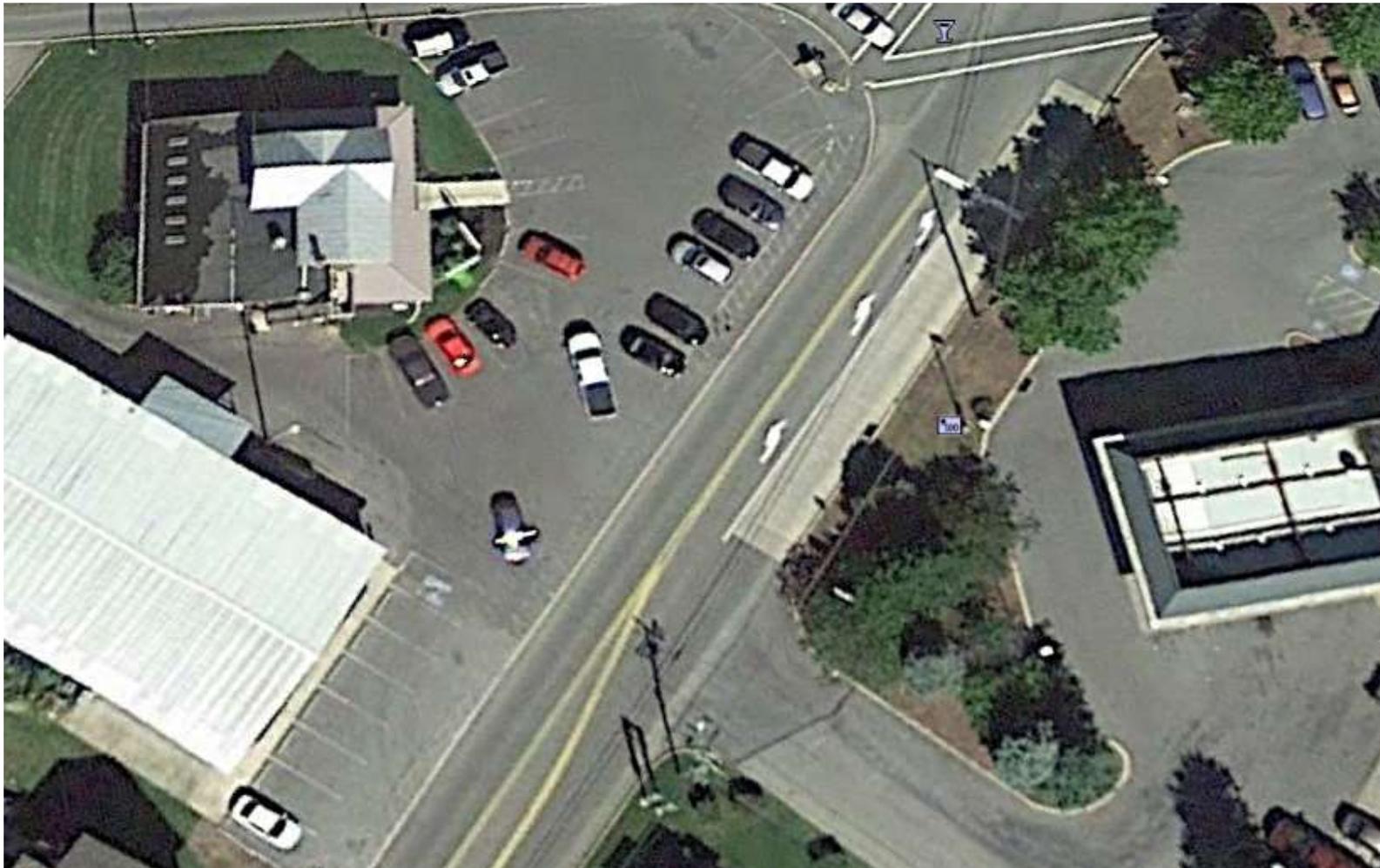


**Smaller vehicles actually  
“bottomed out” on ridge of asphalt!**

# Rte. 26, Pleasant Gap, PA



# Rte. 26, Pleasant Gap, PA



# SR 113 & SR 100, Lionville, PA



# SR 113 & SR 100, Lionville, PA



# Rte 3 Crofton, MD



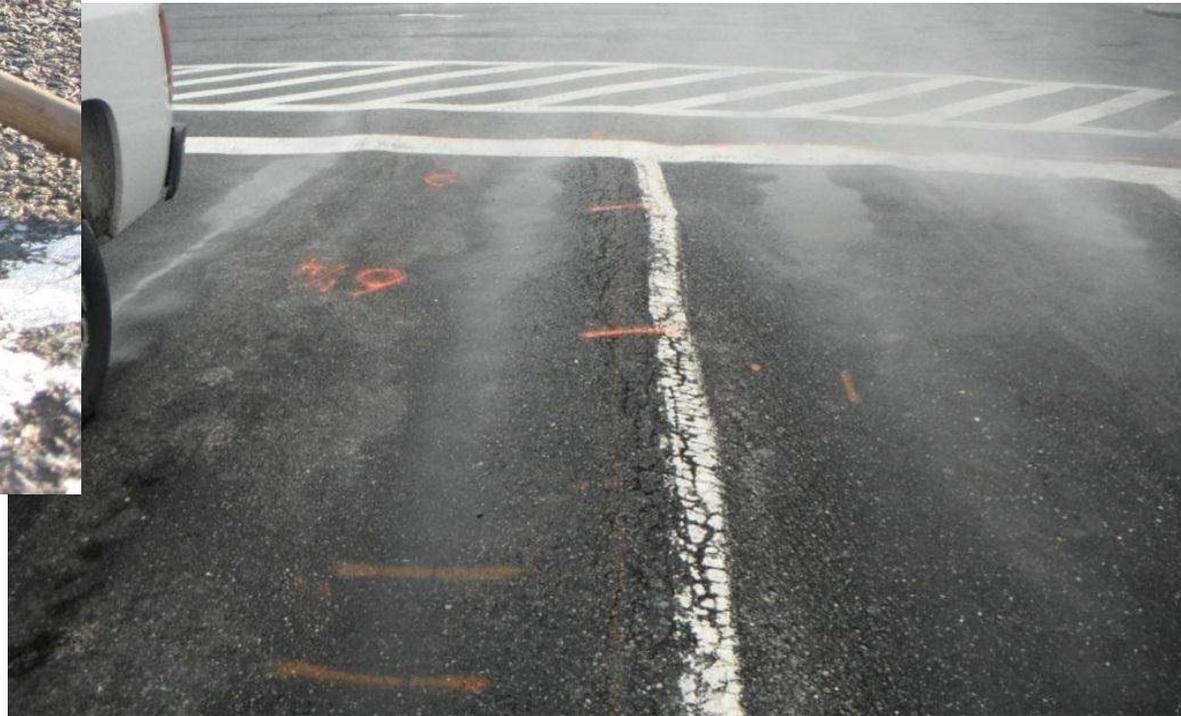
# Rosemont Ave – Frederick, MD



# MD 27 at MD 355 – Gaithersburg, MD



# MD 27 at MD 355 – Gaithersburg, MD



# MD 27 at MD 355 – Gaithersburg, MD



# I-595 (MD 50 at MD 301)



# MD 210 at Farmington Rd



# I-68 Friendsville, MD



# MD 2 at MD 214 Edgewater, MD



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May 2014



A practical approach to understanding and successfully using concrete overlays, from selection to opening



ACPA publication TB021.03P

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parts for 3 zones of lot:  
Zone 1-Light Duty  
Zone 2-Medium Duty  
Zone 3-Heavy Duty

parts for 3 geographic areas:  
Avg Mean Temp 45° – 50°  
Avg Mean Temp 55° – 60°  
Avg Mean Temp 65° – 70°

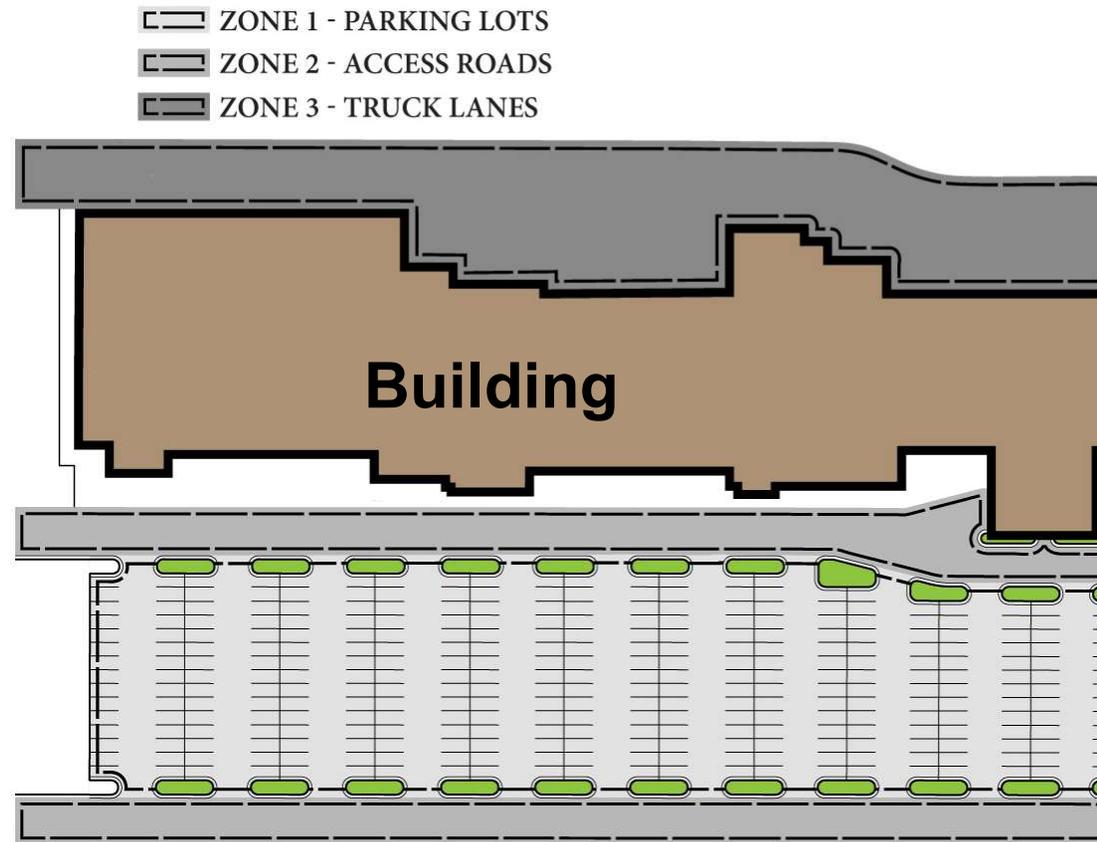




Table 6: Typical Bonded Concrete Overlay Thickness over Asphalt where Mean Annual Daily Temperatures are 45° – 50° F

<b>Zone 2: Access Road</b>		$\leq 1,000$ Light Vehicles/Day and $\leq 10$ Trucks (0.35 ESAL/truck)/Day					
Existing Asphalt Thickness (in.)	Concrete Compressive Strength (psi) / Flexural Strength (psi) (third point)	4-ft Joint Spacing	5-ft Joint Spacing	6-ft Joint Spacing	4-ft Joint Spacing	5-ft Joint Spacing	6-ft Joint Spacing
		Thickness (in.) (no fiber)			Thickness (in.) (with fiber)		
2.0	4,000 / 630	5.0	5.5	6.0	3.5	4.0	4.5
2.0	4,500 / 670	4.5	5.0	5.5	3.5	4.0	4.5
3.0	4,000 / 630	4.5	5.0	5.5	3.5	4.0	4.0
3.0	4,500 / 670	4.0	4.5	5.0	3.0	3.5	4.0
4.0	4,000 / 630	3.5	4.5	5.0	3.0	3.0	3.5
4.0	4,500 / 670	3.5	4.0	4.5	3.0	3.0	3.5
6.0	4,000 / 630	3.0*	3.0*	3.0*	3.0	3.0	3.0
6.0	4,500 / 670	3.0*	3.0*	3.0*	3.0	3.0	3.0

Table 6: Typical Bonded Concrete Overlay Thickness over Asphalt where Mean Annual Daily Temperatures are 45° – 50° F

<b>Zone 3: Truck Lane</b>		≤ 1,000 Light Vehicles/Day and ≤ 25 Trucks (0.60 ESAL/truck)/Day					
Existing Asphalt Thickness (in.)	Concrete Compressive Strength (psi) / Flexural Strength (psi) (third point)	4-ft Joint Spacing	5-ft Joint Spacing	6-ft Joint Spacing	4-ft Joint Spacing	5-ft Joint Spacing	6-ft Joint Spacing
		Thickness (in.) (no fiber)			Thickness (in.) (with fiber)		
2.0	4,000 / 630	5.5	6.0	6.0	4.0	4.5	5.0
2.0	4,500 / 670	5.0	5.5	6.0	4.0	4.0	4.5
3.0	4,000 / 630	5.0	6.0	6.0	3.5	4.0	4.5
3.0	4,500 / 670	4.5	5.0	6.0	3.5	4.0	4.0
4.0	4,000 / 630	4.0	5.0	6.0	3.0	3.5	4.0
4.0	4,500 / 670	4.0	4.5	5.0	3.0	3.0	3.5
6.0	4,000 / 630	3.0*	3.0*	4.0	3.0	3.0	3.0
6.0	4,500 / 670	3.0*	3.0*	3.0*	3.0	3.0	3.0

# Determining existing asphalt condition

## Photos to help identify current pavement condition

Table 2. Thumbnails of Asphalt Pavement Distresses

Low to medium severity	High severity	Low to medium severity	High severity
 <p>Alligator Cracking</p>		 <p>Thermal Cracking</p>	
 <p>Block Cracking</p>		 <p>Random Cracking</p>	
 <p>Potholes, Popouts</p>		 <p>Access/Truck Lane Rutting</p>	
 <p>Raveling</p>		 <p>Access/Truck Lane Shoving (Slippage)</p>	

# How Bad Can It Be?





# Investigation

## Visual inspection-Walk Around

1. Elevations
2. Drainage
3. Working with fixed objects

## Determining asphalt thickness

### Core analyses

Pavement cores provide more details about the condition of the slab and subsurface. A 1-in. hammer drill can be used to quickly determine the depth of the existing asphalt in several locations and, together with visual inspection results, identify locations of potential subsurface problems where cores should be taken; see Figure 6.

Generally, 2-in. to 4-in. cores are taken from the asphalt and subbase, as shown in Figure 7. Note the lift layers in the asphalt.



Figure 6. Hammer drilling to check pavement thickness (Photo courtesy of David White, Iowa State University)



Figure 7. Typical core of asphalt parking lot with granular subbase

Cores can reveal the depth of distress(es), the support value, and the kinds/thicknesses/core (or layer) materials. Cores that penetrate into may show evidence of unstable conditions, the beginning of fine soil migration into open-grained layers that can lead to plugging and instability. Cores also provide samples for further laboratory analysis.

Support conditions—the ability of the subgrade to support loads uniformly through the pavement—both the design thickness of the concrete overlay and the performance of the concrete overlay will be diminished. It is important, therefore, to try to obtain cores that reveal the condition of the subgrade/subbase support (relative bearing capacity) under the asphalt.

Without the detailed information provided by core samples, problems can develop, such as those in Figure 8. As the historical records, the existing asphalt in the parking lot was 6-in. thick. However, when 3 in. of the surface was milled off to accommodate a 3-in. concrete overlay, in some locations the granular subbase was exposed. After completion of the concrete overlay, some locations failed under the weight of trucks that drove through the parking area.



Figure 8. Failure of concrete overlay sections in location where existing asphalt pavement surface was entirely removed because of lack of core information.



It is recommended that the length and width of joint squares in feet be limited to 1.5 times the overlay slab thickness in inches.”

(12-18x thickness range)

Page 27, Guide to Concrete Overlays-3<sup>rd</sup> Edition

Depth of cut: T/3 typ.

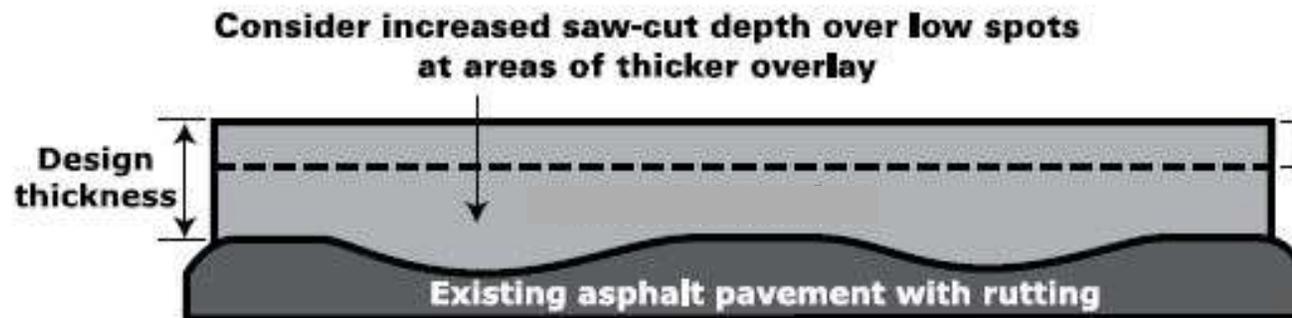


Figure 36. Consider asphalt rut depth when determining saw-cut depth (ACPA)

# Potholes

## Summary of Possible Causes

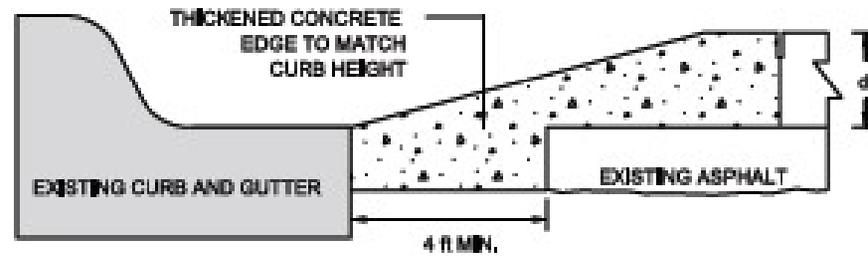
A possible progression of alligator fatigue cracking

May require pre-overlay repairs

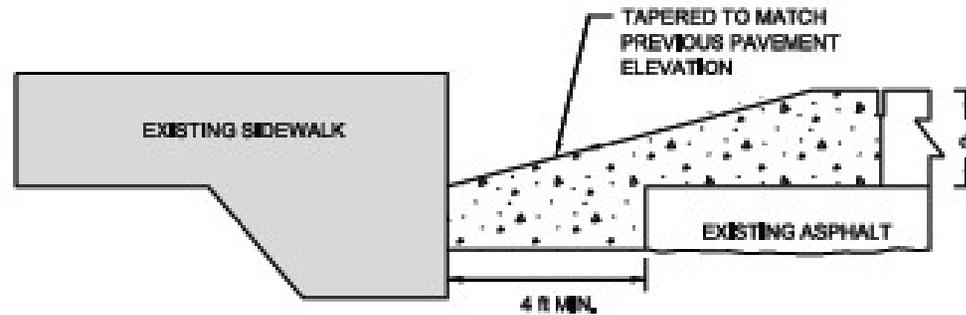
Consider constructing a new pavement, repairing the subbase/subgrade where necessary



# Curb Details

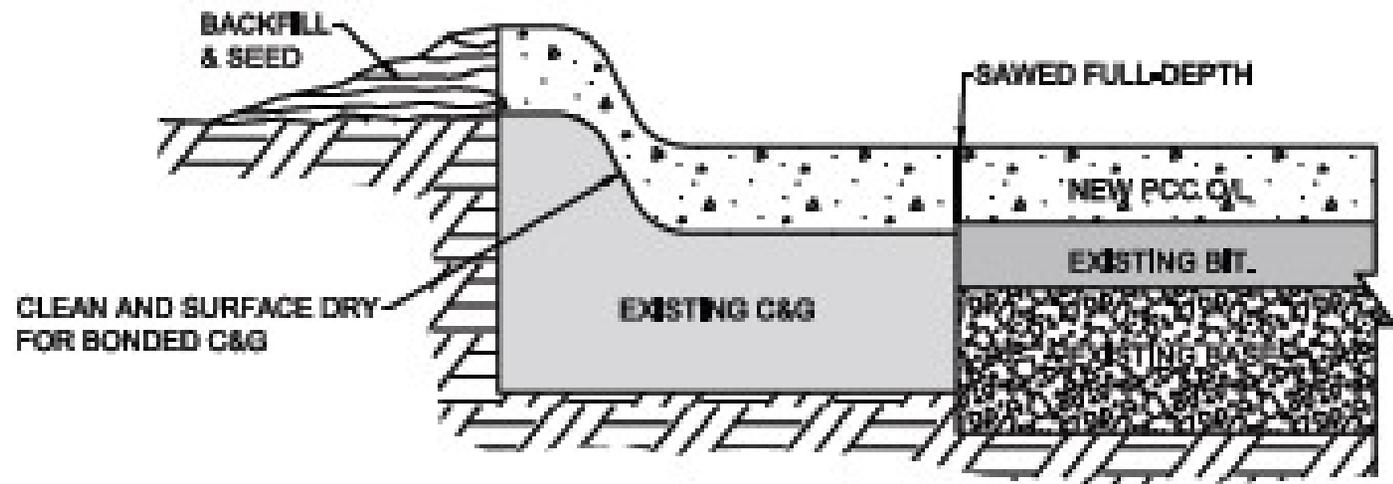


TRANSITION SECTION  
(AT EXISTING CURB AND GUTTER)



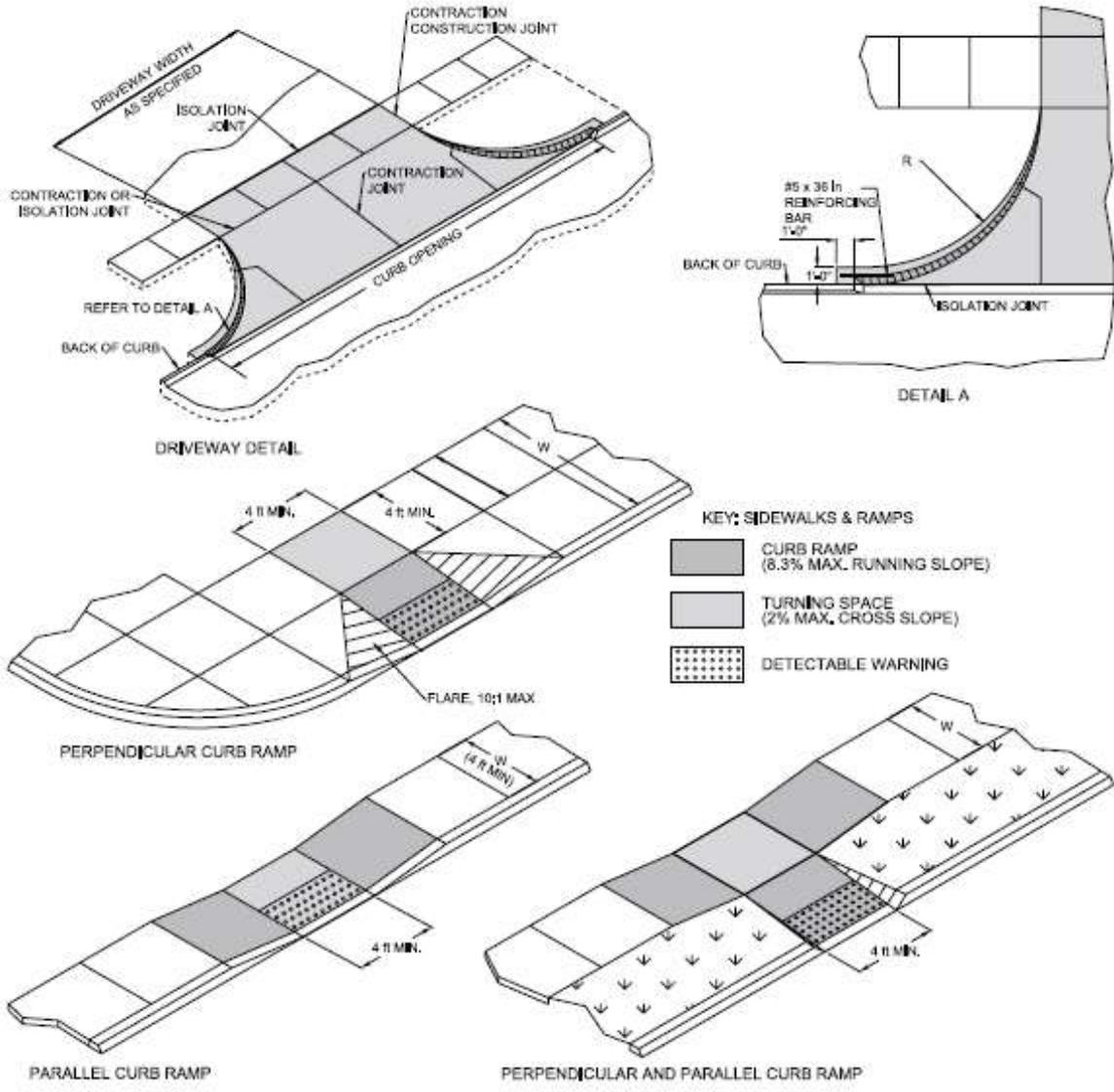
TRANSITION SECTION  
(AT EXISTING SIDEWALK)

# Curb Details



RAISING CURB & GUTTER DETAIL

# Sidewalk Ramp Details



Asphalt surface must be clean and dry

Avoid recently seal coated surfaces

Abrade the surface

Thoroughly clean (vacuum sweep)



# ***Surface temperature should not exceed 120° F at time of placing concrete on top of asphalt***

Measure surface temperature with an infrared temp gun. If temp exceeds 120° F, cool surface by fogging or delay paving until cooler time of day. DO NOT place concrete on saturated asphalt surface or ponded water.



# Concrete Results

How a concrete overlay saved a school district \$73,000.

### The Challenge

The parking lot of Glen Westlake Middle School in Lombard, IL, was badly in need of repair. They sought bids to remove all 40,000 ft<sup>2</sup> of asphalt pavement and subbase, and replace it with a heavy duty asphalt pavement. A concrete paving alternate called for 8" concrete over a 10" aggregate base.

### The Solution

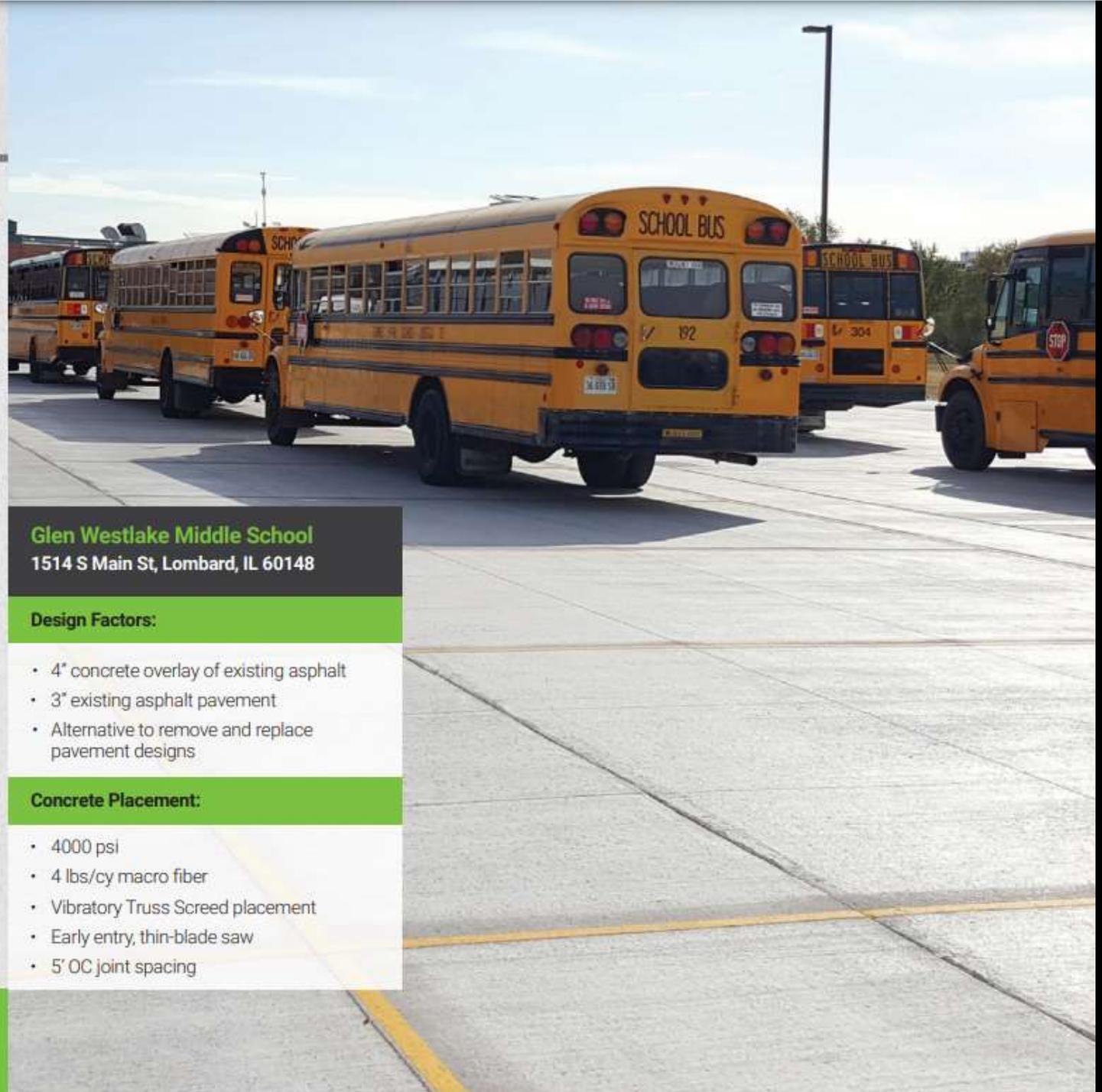
A proposal from the Illinois Ready Mixed Concrete Association recommended leaving the existing 3" asphalt in place and overlaying with 4" fiber-reinforced concrete. A Lamp Concrete, a contractor in Schaumburg, IL, and ready mix producer Elmhurst-Chicago Stone Co, of Elmhurst IL, installed the overlay in August 2017.

### The Results

The overlay saved the district \$73,000 over the proposed asphalt replacement.

Additionally, the district expects to save on maintenance costs for the next 20-30 years.

Since completion, the district is now considering concrete overlays for a number of other sites.



**Glen Westlake Middle School**  
1514 S Main St, Lombard, IL 60148

#### Design Factors:

- 4" concrete overlay of existing asphalt
- 3" existing asphalt pavement
- Alternative to remove and replace pavement designs

#### Concrete Placement:

- 4000 psi
- 4 lbs/cy macro fiber
- Vibratory Truss Screed placement
- Early entry, thin-blade saw
- 5' OC joint spacing

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# Concrete Results

## Concrete Overlays

### The Challenge

After 20 years of continuous service, the Pikes Peak Shuttle Lot, operated by Denver International Airport (DEN), had reached the end of its service life and needed to be replaced. DEN Landside Engineering considered removal and replacement of the existing 5" to 7" asphalt pavement, which was supported by a 12" lime treated base. Additionally, they considered a 5" unreinforced concrete overlay, placed directly on the existing asphalt.

### The Solution

DEN Landside Engineering prepared a Life-Cycle Cost Analysis (LCCA) comparing the two options. The LCCA demonstrated the concrete overlay option would provide substantial savings over a 40-year service life. When coupled with the fact that the concrete overlay was also about 30% less expensive in initial cost compared to the remove and replace option, DEN made the decision to build the largest concrete overlay parking lot project in the US.

### The Results

Due to the COVID-19 pandemic, only about 55% of the project was built initially. Following the construction of initial test strips, the nominal thickness was reduced to 4.5" and tie bars at the construction joints were eliminated. The only tie bars constructed were in the lanes along the perimeter of the lot, providing a ring of concrete to hold the lot together. Work on Phase One was completed in time for the 2020 holiday season. The start date for Phase Two is unknown at the time of this writing.

## Pikes Peak Shuttle Lot Denver International Airport

### Design Factors:

- 4.5" concrete overlay
- Existing curb overlaid with new curb
- Tie bars eliminated at construction joints. Used only in perimeter lanes

### Concrete Placement:

- 650 psi flexural strength
- Slipform concrete paver placement
- 6 feet O.C. joint spacing
- Joints sealed with silicon-based sealant



# Warehousing and Distribution



# Warehousing and Distribution

Deep Dive Opinion Data Library Events Topics

## Demand for warehouse space rises alongside e-commerce



### Brief:

Shift from brick-and-mortar to e-commerce operations is expected to intensify as a result of the coronavirus pandemic, which will likely cause further investment in warehouse space because e-commerce requires three times the logistics space of traditional storefronts, according to a new

June 2020

MARKETS BUSINESS INVESTING TECH POLITICS CNBC TV

RETAIL



## U.S. may need another 1 billion square feet of warehouse space by 2025 as e-commerce booms

PUBLISHED THU, JUL 9 2020 8:00 AM EDT | UPDATED THU, JUL 9 2020 12:51 PM EDT

 Lauren Thomas @LAURENTHOMAS

SHARE    

**KEY POINTS**

- With more people clicking "buy" online, demand for industrial real estate could reach an additional 1 billion square feet by 2025, according to commercial real estate services firm JLL.
- The boom for fulfillment centers comes as the traditional retail real estate industry is suffering with store closures piling up and rents plummeting, as companies look to negotiate new leases.



An Optoro warehouse in Tennessee that handles returns for retailers.  
Source: Matt Adams / Optoro

July 2020

## THE WALL STREET JOURNAL

LOGISTICS REPORT

## Demand for Big-Box Warehouse Soars Under E-Commerce Surge, Report Says

Amazon is leading a pack of companies rushing to fill industrial sites in the U.S., says real-estate brokerage



An Amazon fulfillment center under construction in Albuquerque, N.M. Amazon plans to expand its fulfillment and logistics square footage by about 50% in 2020.

PHOTO: JIM THOMPSON/ZUMA PRESS

By [Jennifer Smith](#)

Oct. 1, 2020 6:00 am ET

PAVE THE WAY

October 2020

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# Warehousing and Distribution

**CONCRETE  
CONSTRUCTION**

PRODUCTS PROJECTS BUSINESS **HOW TO** CONCRETE SURFACES RES

CONSTRUCTION

[Home](#) > [How To](#) > [Construction](#) > Perfect Industrial Pavements

Posted on: October 08, 2019

PAVEMENT

## PERFECT INDUSTRIAL PAVEMENTS

Concrete is becoming the preferred alternative for heavy-duty pavement.

By [Jon Hansen](#), [Bill Palmer](#)



Merlo Construction

The FedEx facility in Pontiac, Michigan, after completion.

Asphalt pavement! It's everywhere you look. But what if you could have concrete for the same price? That's the question that concrete pavement contractors are asking owners today, and often the answer is: "I'll go with concrete." This changing attitude marks the beginnings of a huge new market for concrete.

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# Warehousing and Distribution

Shortage of available facilities

9-month lease lead time now as short as 30 days

One solution: converting closed malls to e-commerce distribution centers

Most likely will require upgrade of existing pavement

# Warehousing and Distribution

Concrete overlay will increase load carrying capacity of existing flexible pavement

Utilizes existing pavement for support

Saves time/money

Facility opens sooner



# Concrete Overlays

**A solid solution for your  
pavement maintenance**

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# Resource





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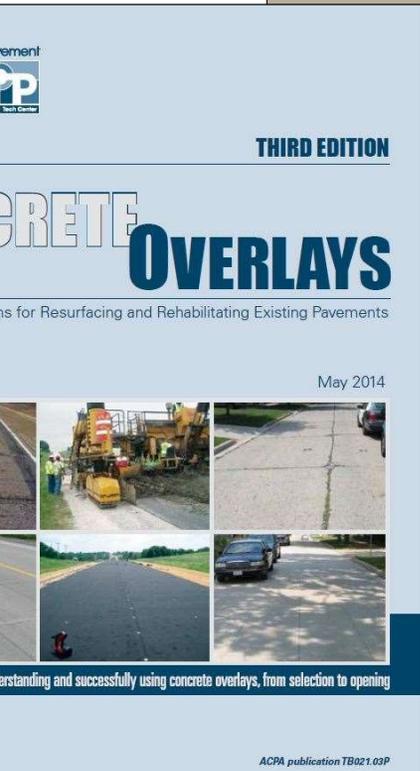
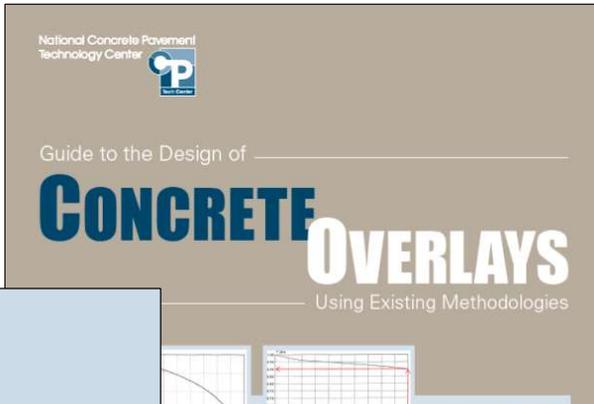
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# Guides to Concrete Overlay

Available through the  
National Concrete Pavement  
Technology Center

[www.cptechcenter.org](http://www.cptechcenter.org)

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TECHNICAL NOTE



**Guidelines for Bonded Concrete Overlays of Asphalt:  
Beginning with Project Selection and Ending with  
Construction**

Authors:  
J. M. Vandebossche  
S. Sachs

August 2013

Bonded Concrete Overlays of Asphalt Pavements (BCOAME)

# Guidelines for Bonded Concrete Overlays of Asphalt

American Concrete Pavement Association (ACPA)

Construction Specification Guideline for Ultra-thin  
Whitening”

Traffic Management for Concrete Reconstruction and  
Rehabilitation”

[www.pavement.com](http://www.pavement.com)



# NRMCA Design Assistance Program



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