



**Northwest Pavement Management Association**  
***17<sup>th</sup> Annual Fall Pavement Management Conference***  
***"Shrinking Budgets and Creative Management"***

# **Concrete Overlays for PCC and HMA Pavements**

**Gregory E. Halsted, P.E.**  
**Market Manager, Pavements**  
**Portland Cement Association**

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***Vancouver, Washington***



Portland Cement Association



***Since its founding in 1916, the Portland Cement Association has had the same mission:  
"Improve and expand the uses of portland cement and concrete."***

## **Divisions**

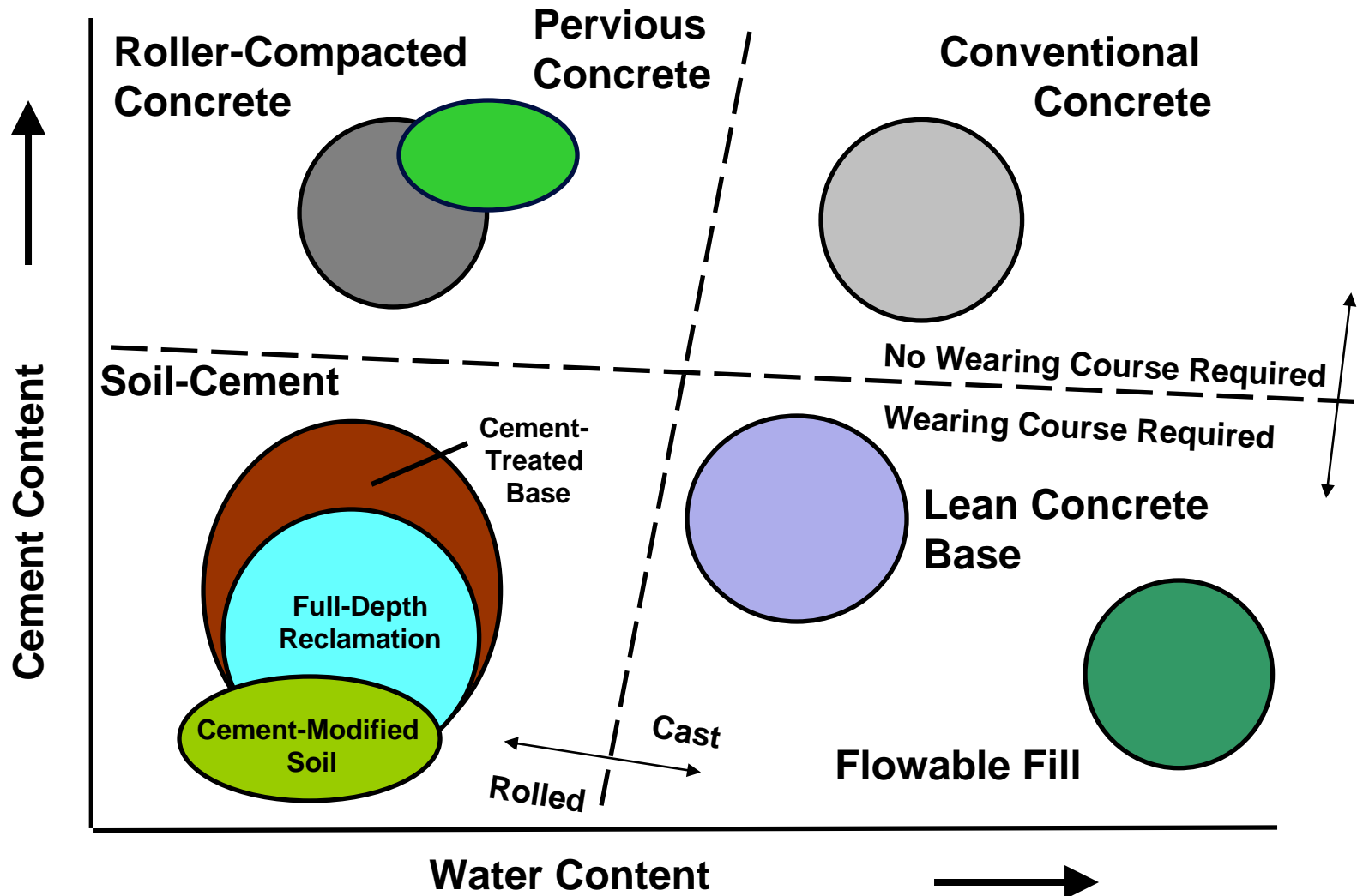
- Market Promotion
- Research
- Technical Services
- Codes and Standards

## **Partners**

- Local/Regional Cement and Concrete Organizations
- American Concrete Pavement Association
- The CTL Group
- Cement Association of Canada

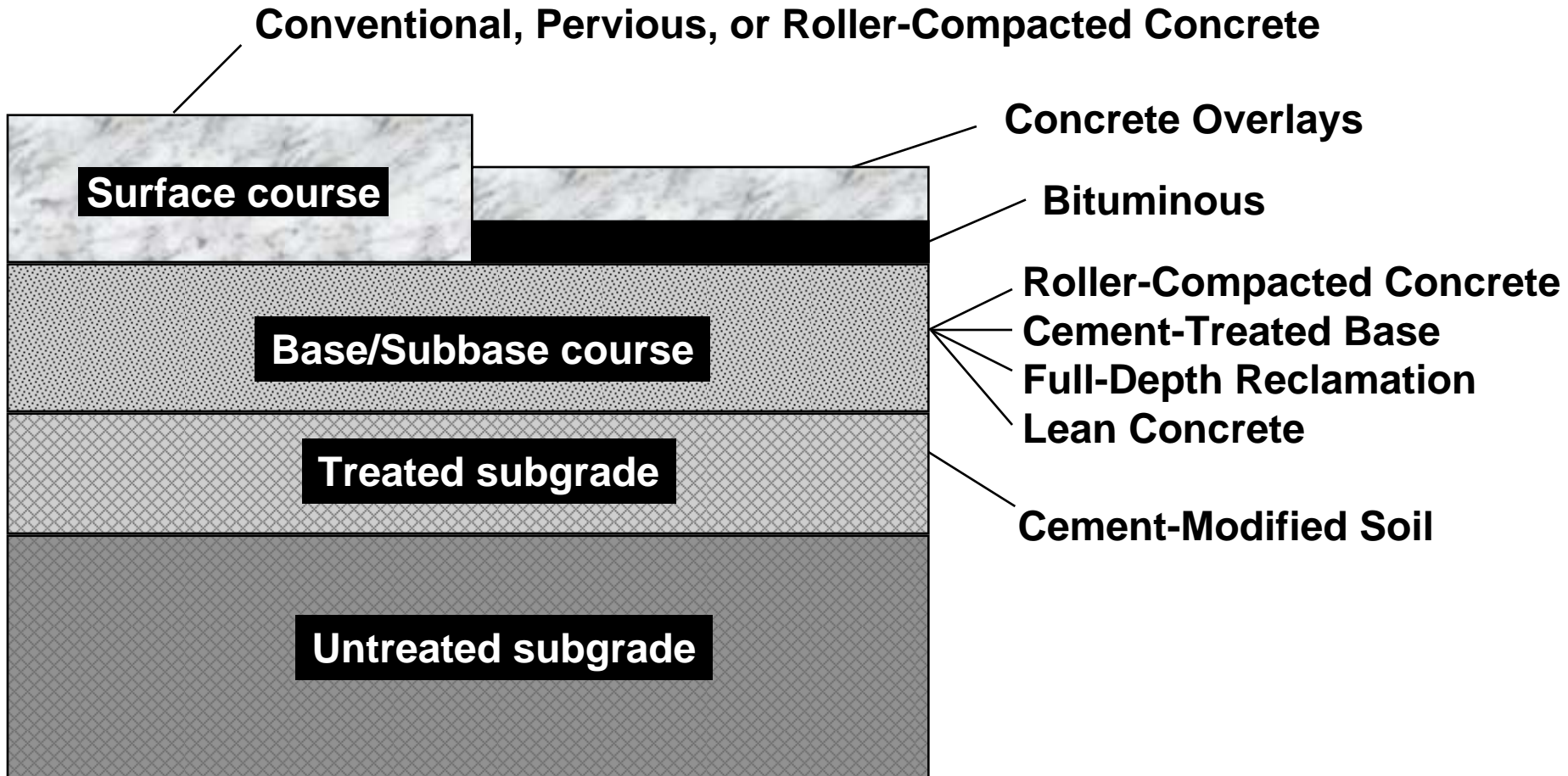
# Cement-Based Pavements

- materials -



# Cement-Based Pavements

*- locations -*



# Why Concrete Overlays?



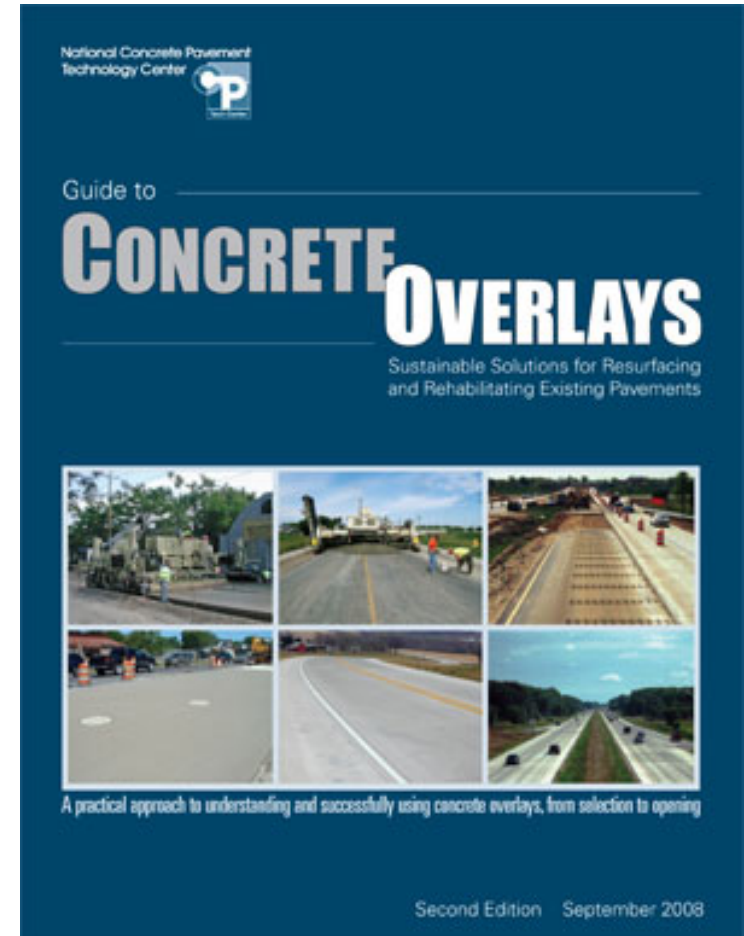
- Concrete overlays are a viable method that provides longer service life to local roadway networks
- Any balanced pavement management program needs to include concrete overlay systems as part of their long-term solutions

*"Shrinking Budgets and Creative Management"*

# ***Guide to Concrete Overlays***

## **Introduction**

“The need has never been greater for engineered strategies to preserve and maintain the nation’s pavements. With shrinking budgets, ever-increasing traffic volumes and loads, and the critical emerging focus on infrastructure sustainability, highway agencies are being asked to do more with less in managing their pavement networks.”



*“Shrinking Budgets and Creative Management”*

# Benefits of Concrete Overlays

1. Concrete overlays consistently provide cost-effective solutions.
2. Concrete overlays can be constructed quickly and conveniently.
3. Concrete overlays are easy to repair.
4. Concrete overlays are a durable rehabilitation tool as well as a cost-effective maintenance tool.

# Benefits of Concrete Overlays

**- continued -**

5. Concrete overlays can serve, in and of themselves, as complete preventive maintenance or rehabilitation solutions, or they can be used in conjunction with spot repairs of isolated distresses.
6. Concrete overlays are an effective means to enhance pavement sustainability by improving surface reflectance (albedo), increasing structural longevity, and enhancing surface profile stability.

# Two Different Types of Concrete Overlay Systems

## 1. Bonded

- Resurfacing/minor rehabilitation
- Used to add structural capacity and/or eliminate surface distress when the existing pavement is in good structural condition

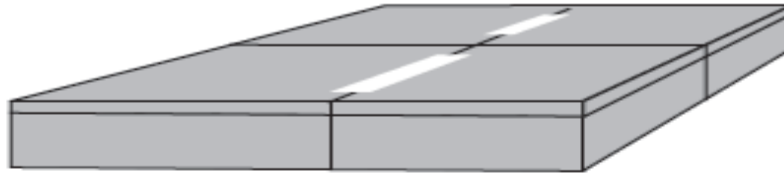
## 2. Unbonded

- Minor/major rehabilitation
- Used to rehabilitate pavements with some structural deterioration

# Bonded Overlay Systems

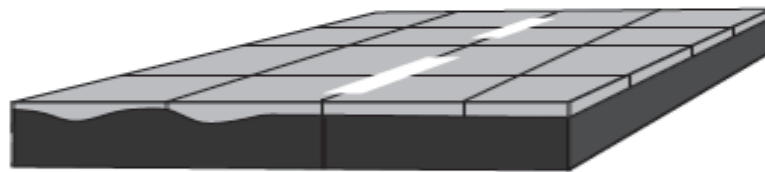
## **Bonded Concrete Overlays of Concrete Pavements**

*—previously called bonded overlays—*

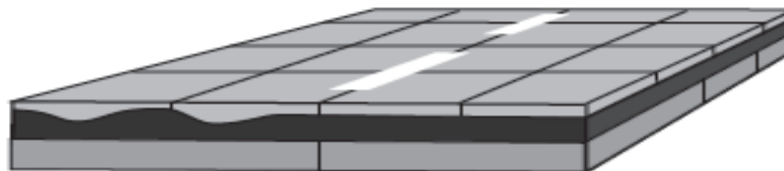


## **Bonded Concrete Overlays of Asphalt Pavements**

*—previously called ultra-thin whitetopping—*



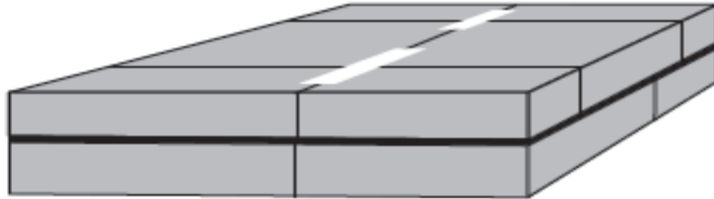
## **Bonded Concrete Overlays of Composite Pavements**



# Unbonded Overlay Systems

## Unbonded Concrete Overlays of Concrete Pavements

*—previously called unbonded overlays—*

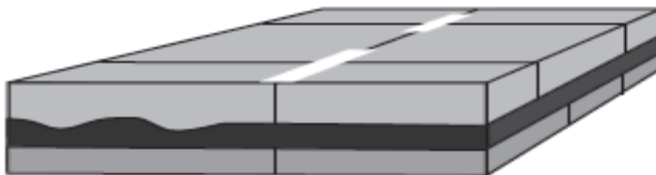


## Unbonded Concrete Overlays of Asphalt Pavements

*—previously called conventional whitetopping—*

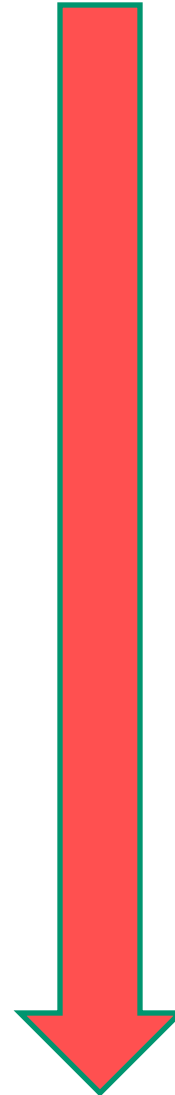


## Unbonded Concrete Overlays of Composite Pavements

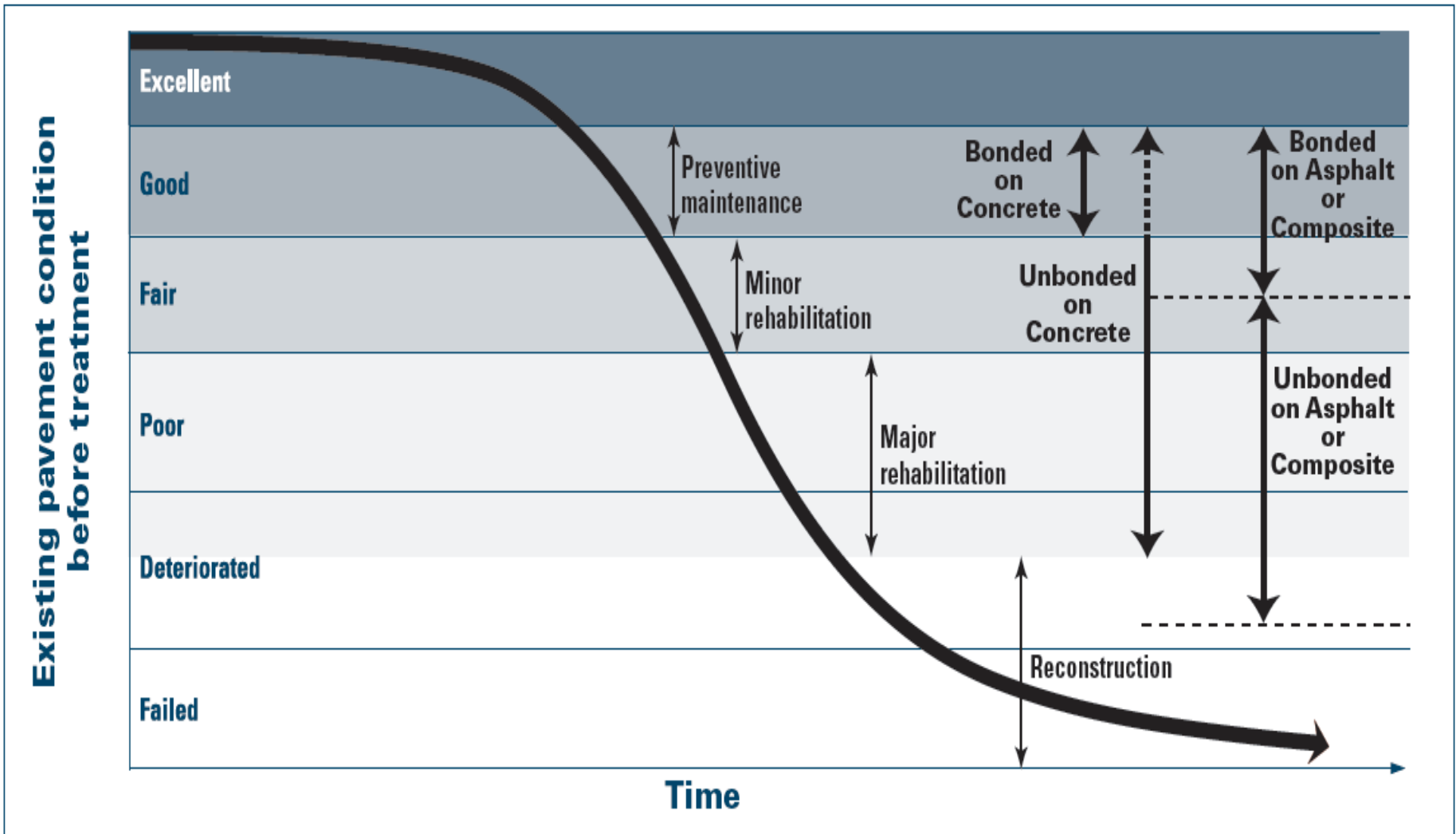


# Practices and Solutions

- ❑ Pavement Preservation
  - routine maintenance
  - preventive maintenance
  - minor rehabilitation
- ❑ Major Rehabilitation
- ❑ Complete Reconstruction



# Maintenance, Rehabilitation, or Reconstruction?

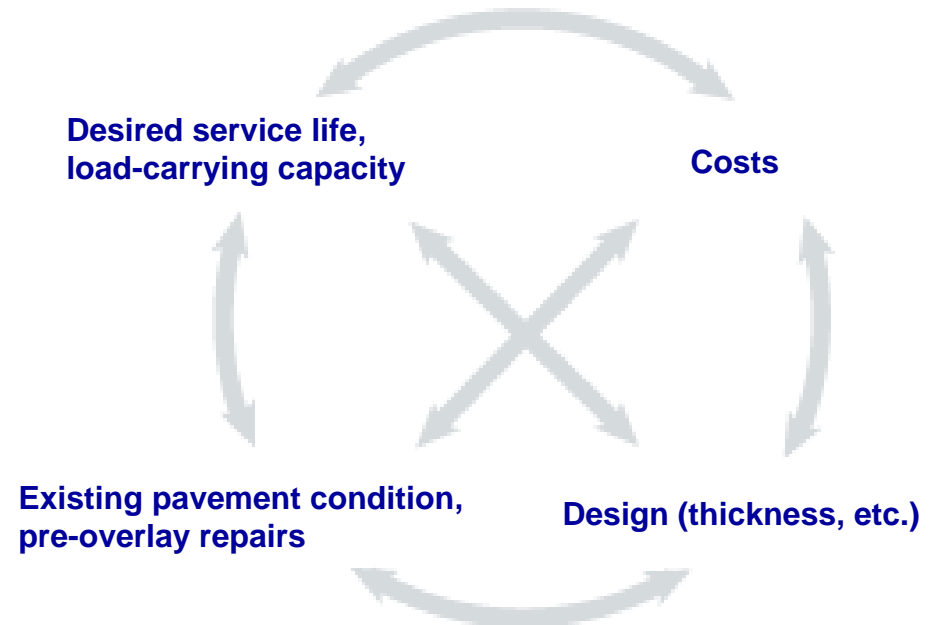


# Evaluating Existing Pavement Conditions

1. Historical data collection, records review, and future projections
2. Visual surface examination
3. Core analysis
4. *Optional* additional tests, including analyses of material-related distresses, drainage, roughness and surface friction, and grade restrictions
5. Condition assessment profile, summarized in condition assessment evaluation report

# Overlay System Design Inputs

- ❑ Existing Pavement Characterization
  - surface considerations
  - structural considerations
- ❑ Traffic Characterization
- ❑ Material Properties
- ❑ Climatic Factors
- ❑ Constraints
- ❑ Distress Mode



# Concrete Overlay Materials

- ❑ **Type of Mixture**
  - conventional or expedited
- ❑ **Concrete Materials**
  - cementitious materials, aggregates, w/cm ratio, or admixtures
- ❑ **Fiber-Reinforced Concrete**
  - synthetic, steel, or blended
- ❑ **Separation Layer Materials**
- ❑ **Incidental Materials**
  - dowels, tie-bars, sealants, or curing compounds



# Construction Considerations

1. Mixture design
2. Grade control
3. Pre-overlay repairs
4. Surface preparation
5. Concrete placement
6. Curing
7. Joints



# Elements of Bonded Overlay Systems

- Thin sections (2 to 5 inches)
- New and existing layers perform as one monolithic pavement
- Bonding is essential!
- Typical design life from 15 to 25+ years



# Pre-Overlay Repair (bonded)

concrete

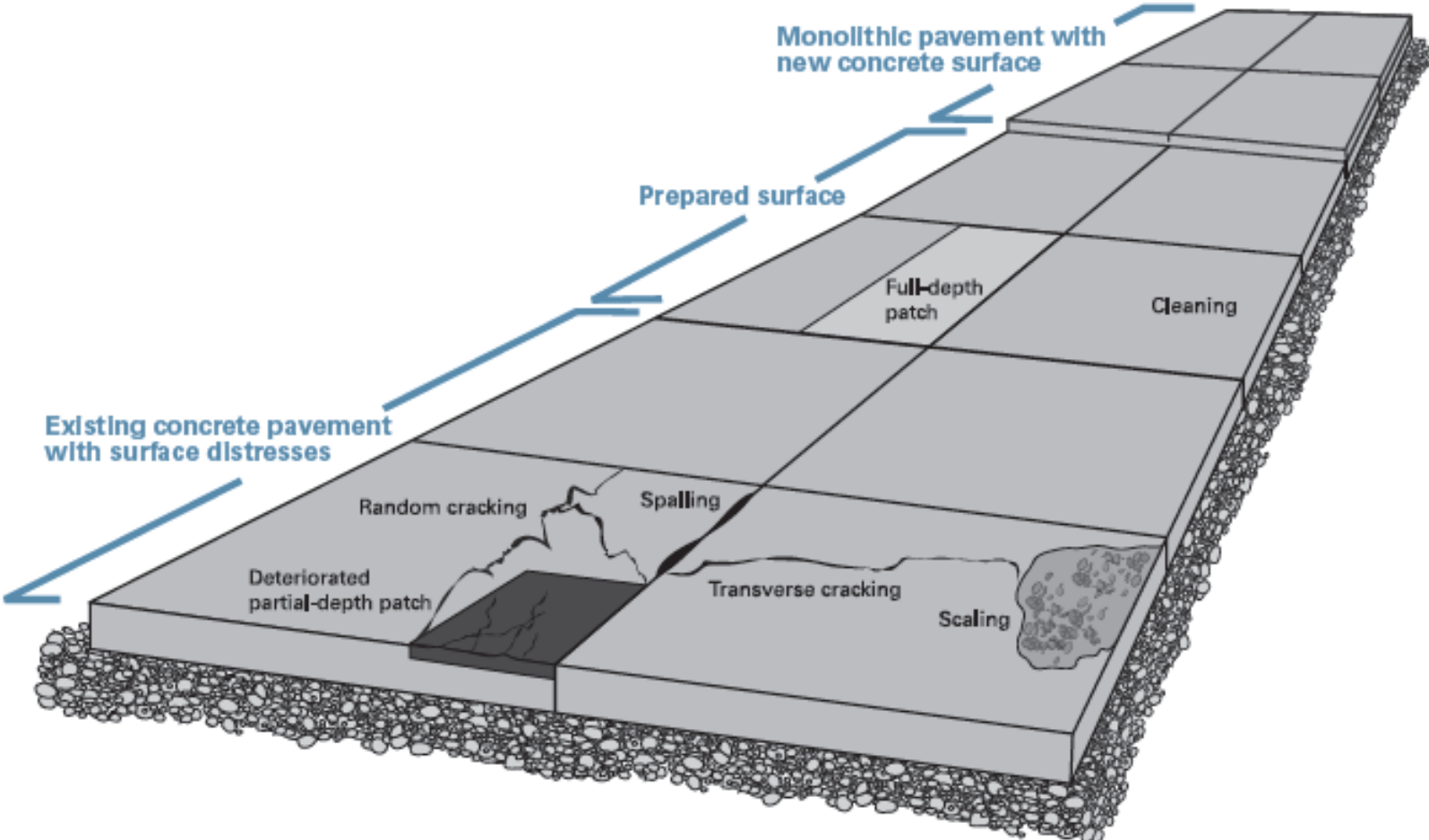
asphalt

Existing Pavement Distress	Spot Repairs to Consider
Random cracks	Reflective cracking is likely if no repairs are made; use crack cages or full-depth repairs for severe cracks
Faulting	Slab stabilization
Pumping	Slab stabilization
Asphalt patch	Replace with concrete patch to ensure bonding
Joint spalling	Partial-depth repair
Scaling	Remove with cleaning

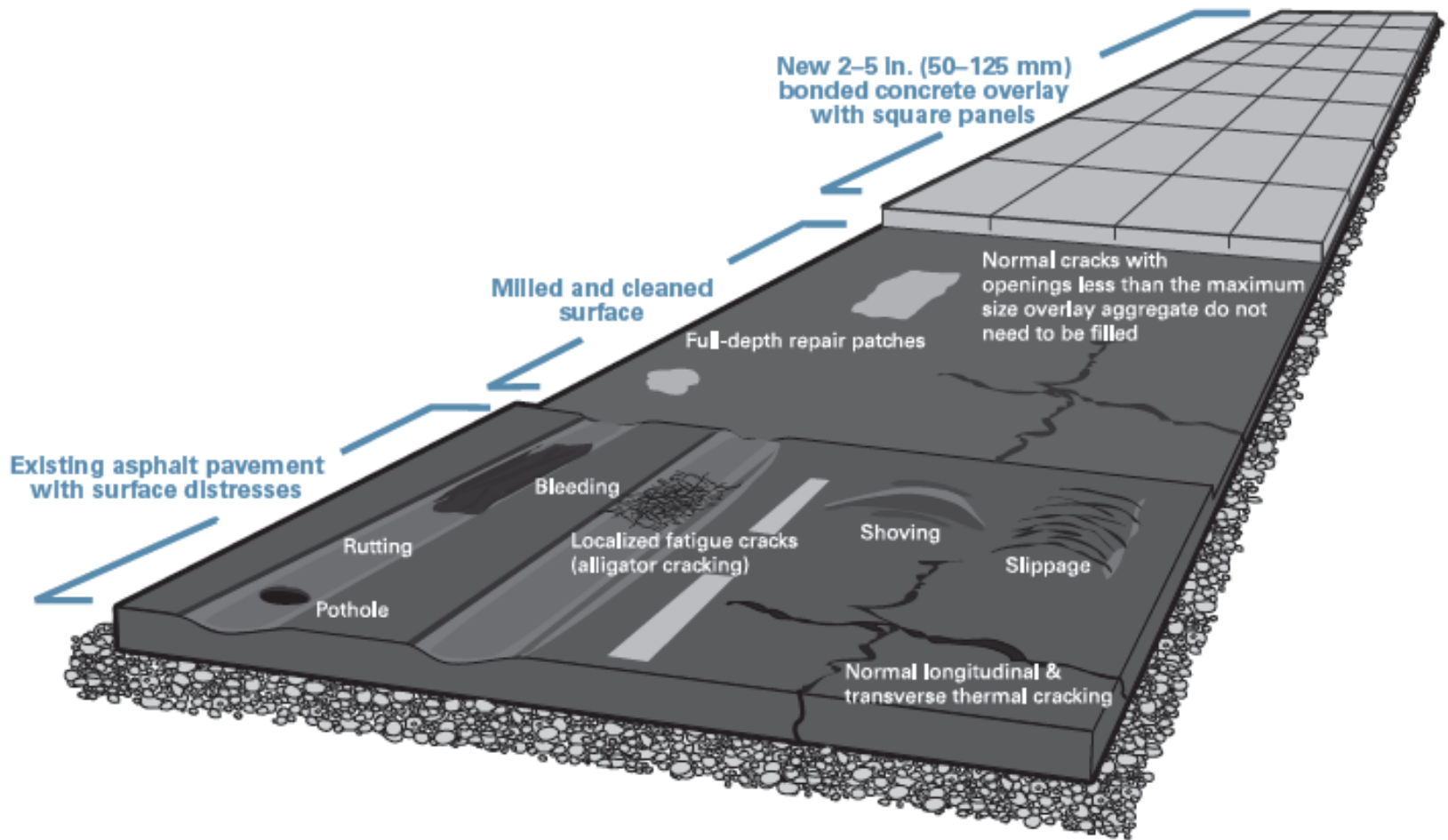
Existing Pavement Distress	Spot Repairs to Consider
Deep rutting	Milling
Shoving, slippage	Milling
Thermal cracking	Fill crack when opening is greater than maximum size aggregate in the overlay
Fatigue cracking	Full-depth concrete patch
Pothole	Full-depth concrete patch

- make an effort to ensure bonding
- air blast or power broom
- allow to dry thoroughly

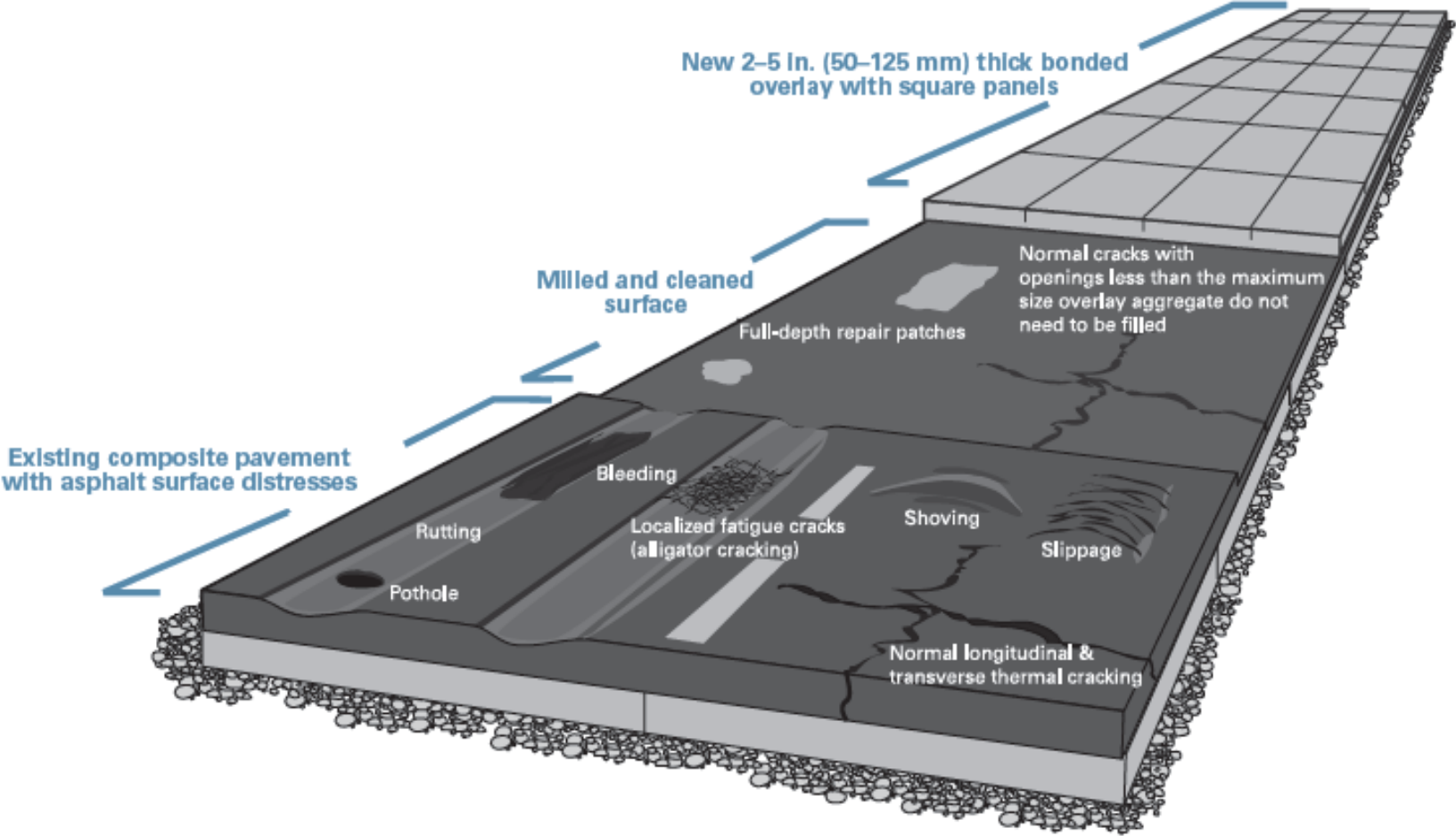
# Bonded Concrete Overlays of Concrete Pavements



# Bonded Concrete Overlays of Asphalt Pavements



# Bonded Concrete Overlays of Composite Pavements



# Elements of Unbonded Overlay Systems

- Thicker sections (4 to 11 inches)
- New layer acts as a new pavement with the old providing a stable base
- A separation layer is required between concrete layers
- Typical design life from 15 to 30+ years



# Pre-Overlay Repair (unbonded)

## concrete

Existing Pavement Condition	Possible Repairs to Consider
Faulting 0.25–0.38 in. (6–10 mm)	None
Faulting > 0.38 in. (10 mm)	Thicker separation layer
Significant tenting	Full-depth repair
Badly shattered slabs	Full-depth repair
Significant pumping	Full-depth spot repair and drainage improvements
Severe joint spalling	Clean
CRCP with punchouts or other severe damage	Full-depth repair

## asphalt

Existing Pavement Condition	Possible Repairs to Consider
Area of subgrade/subbase failure	Remove and replace with stable material; correct water problems
Severe distress that results in variation in strength of asphalt	Remove and replace with stable material; correct water problems
Potholes	Fill with asphalt
Shoving	Mill
Rutting $\geq$ 2 in. (50 mm)	Mill
Rutting < 2 in. (50 mm)	None or mill
Crack width $\geq$ 4 in. (100 mm)	Fill with asphalt
Crack width < 4 in. (100 mm)	None

- existing surface swept clean of loose material

# Separation Layer (concrete)

- Allows layers to act independently
- Prevents distresses from reflecting into the overlay
- Materials that work:
  - asphalt concrete
  - surface treatments
- Materials that do not:
  - polyethylene
  - roofing paper
  - curing compound

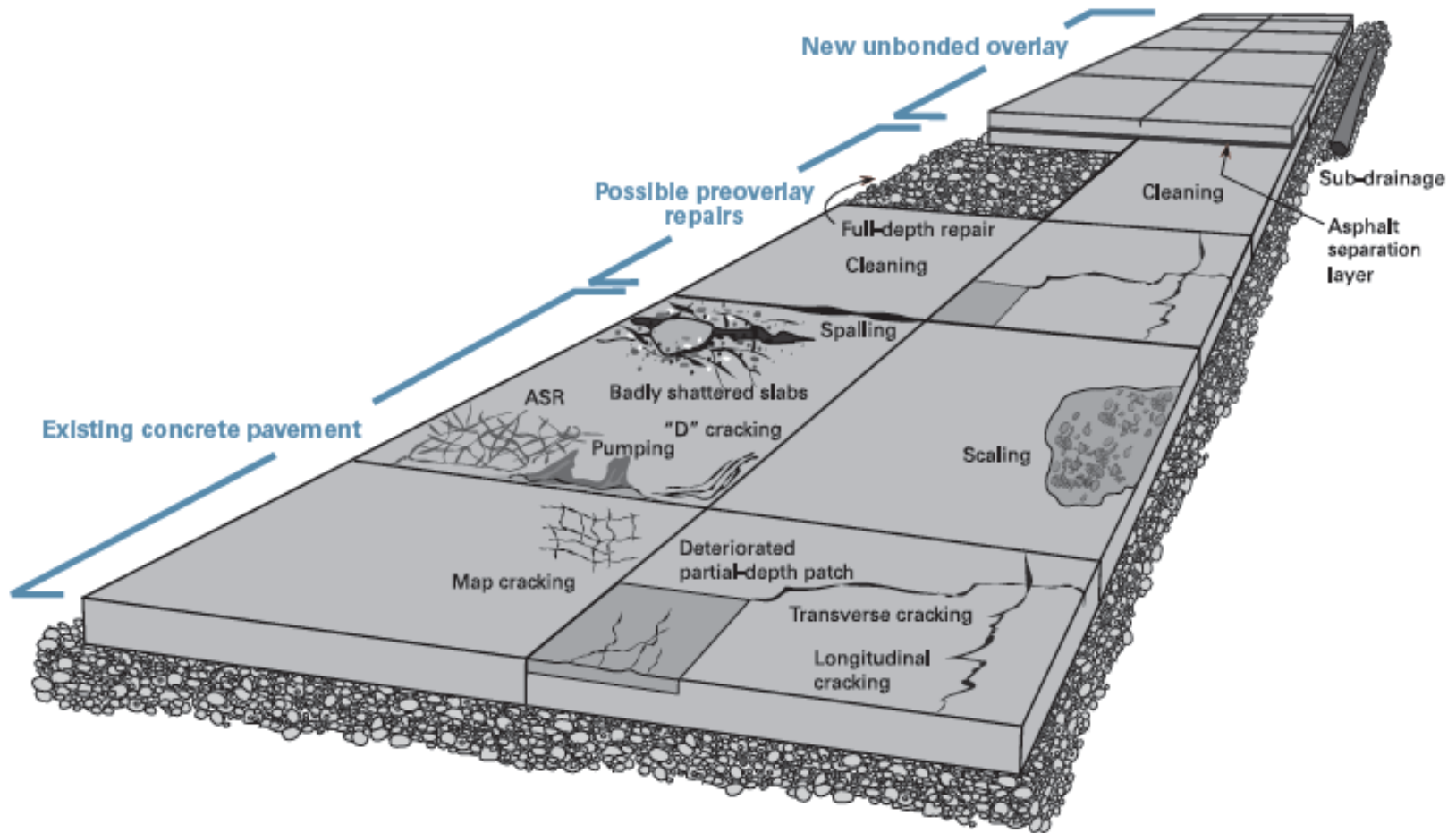


# Load Transfer

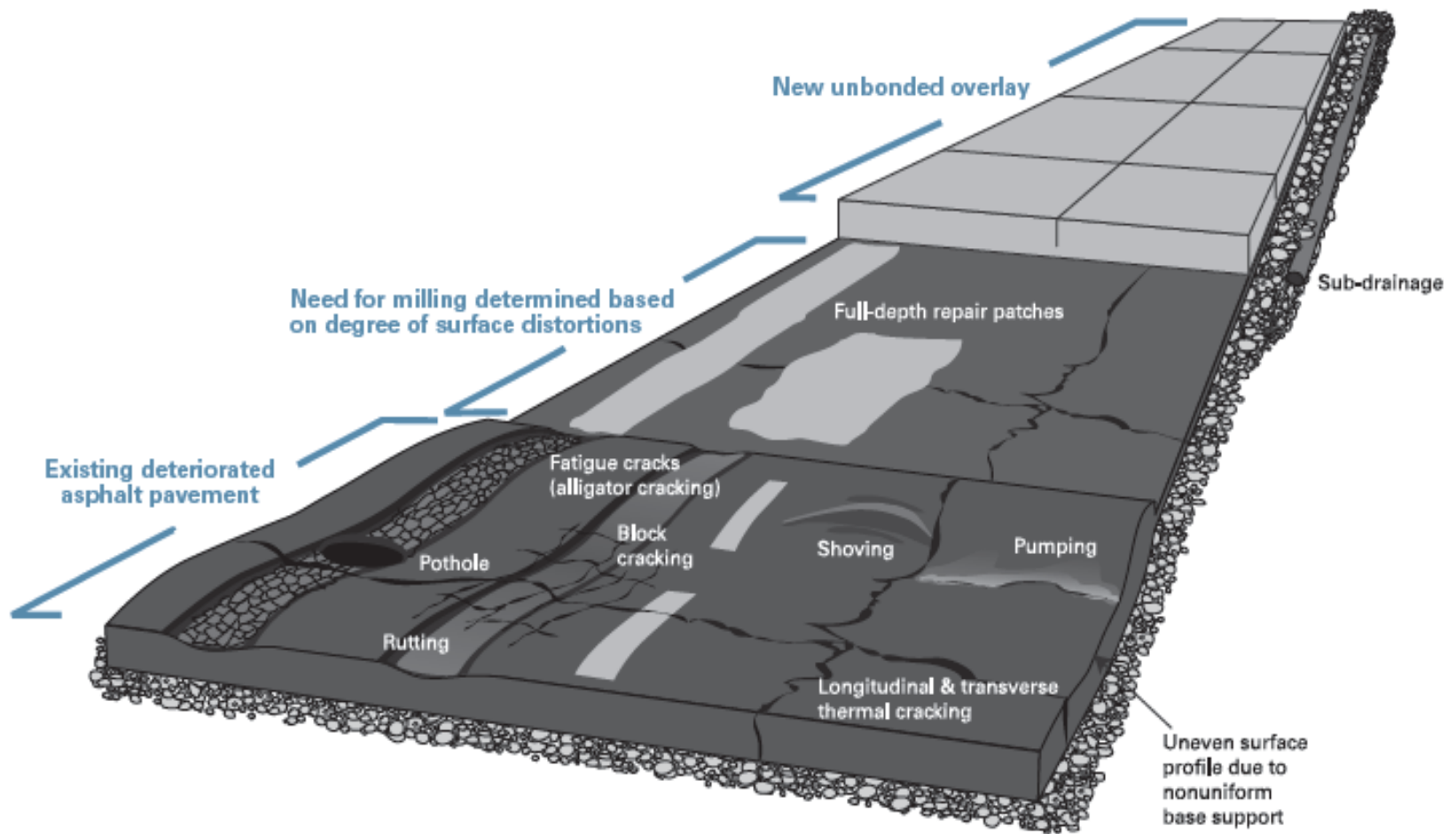


- Truck traffic controls unbonded overlay thickness
- Use dowels if overlay thickness is 8 inches or more

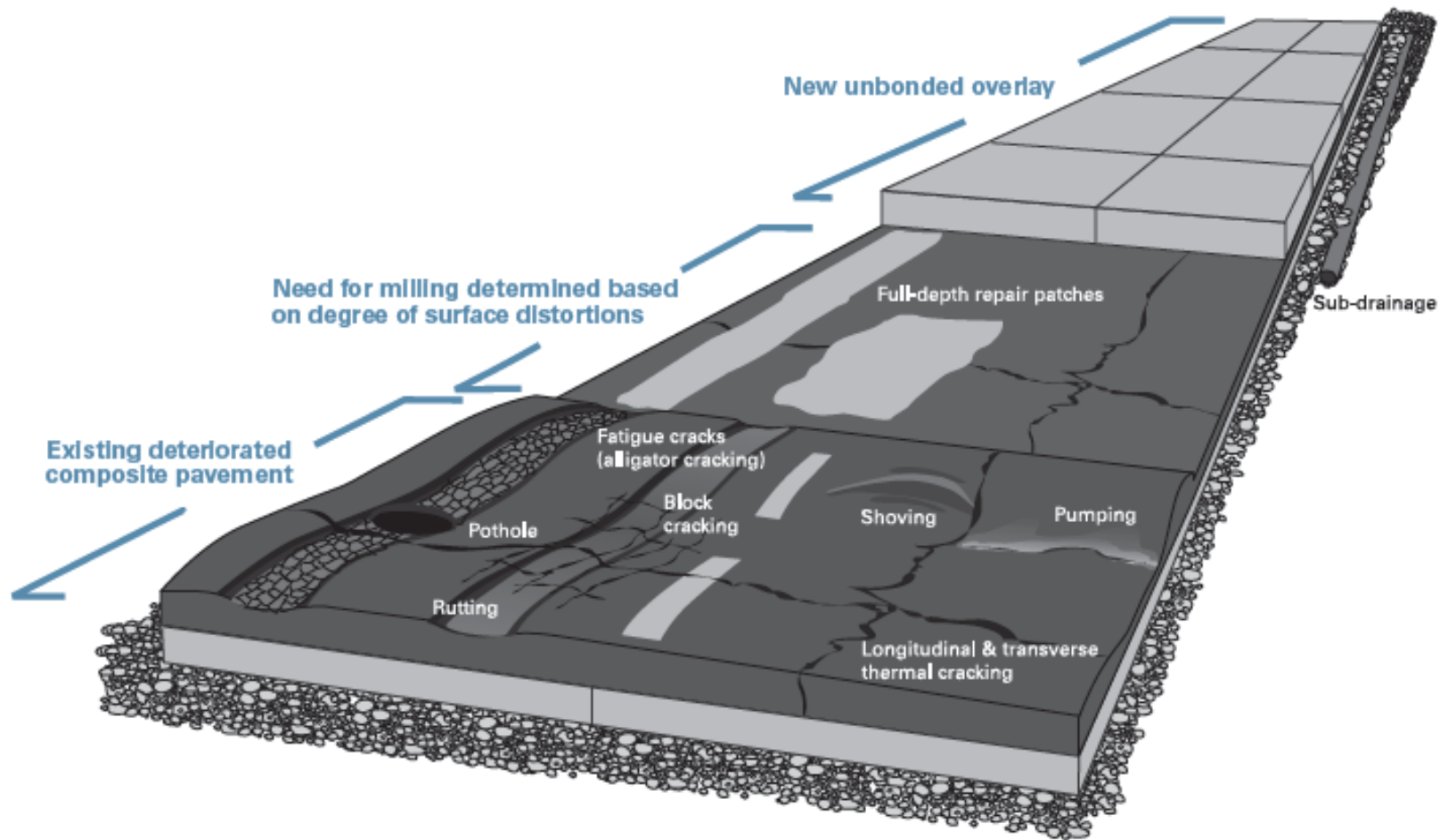
# Unbonded Concrete Overlays of Concrete Pavements



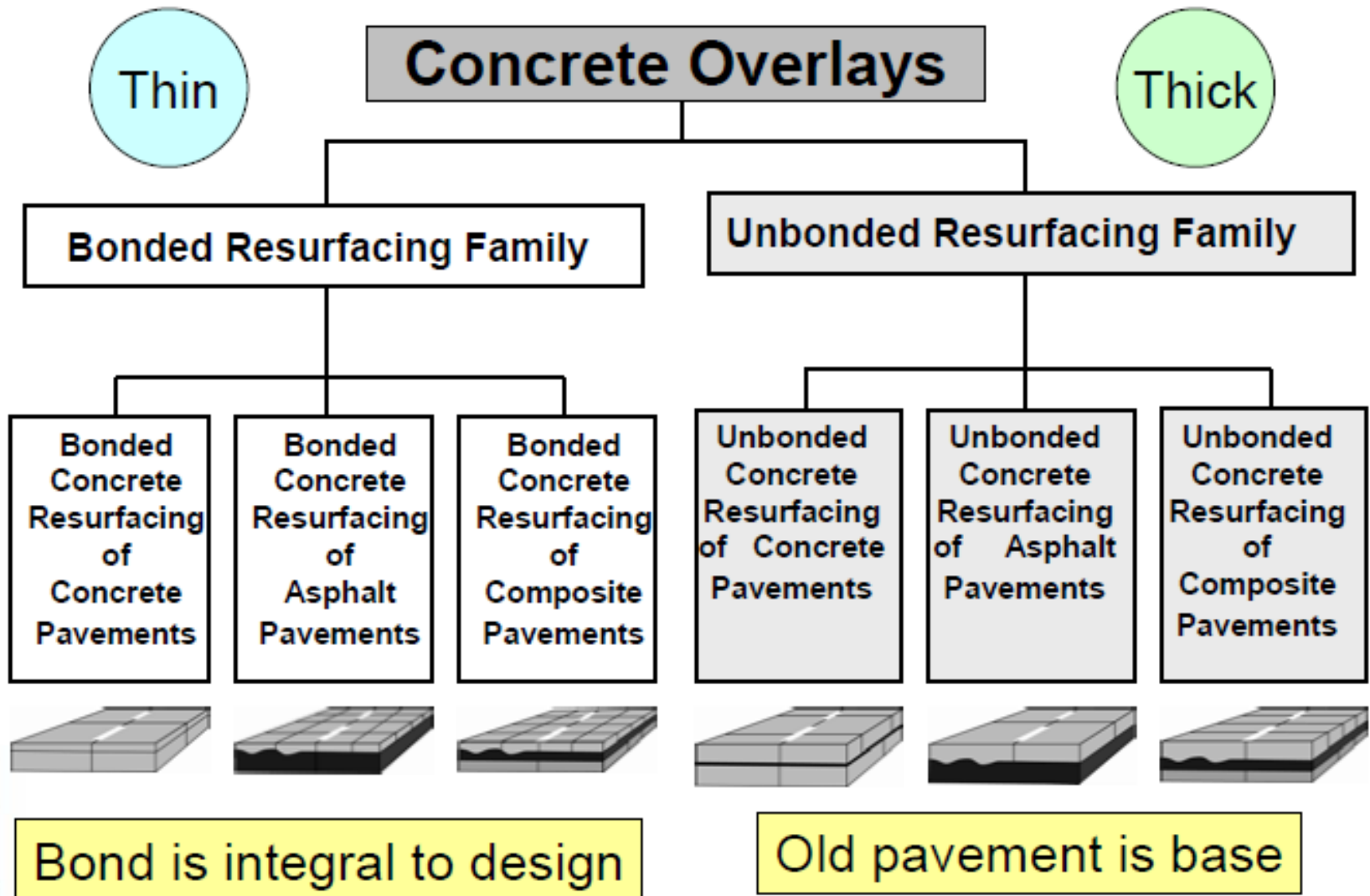
# Unbonded Concrete Overlays of Asphalt Pavements



# Unbonded Concrete Overlays of Composite Pavements

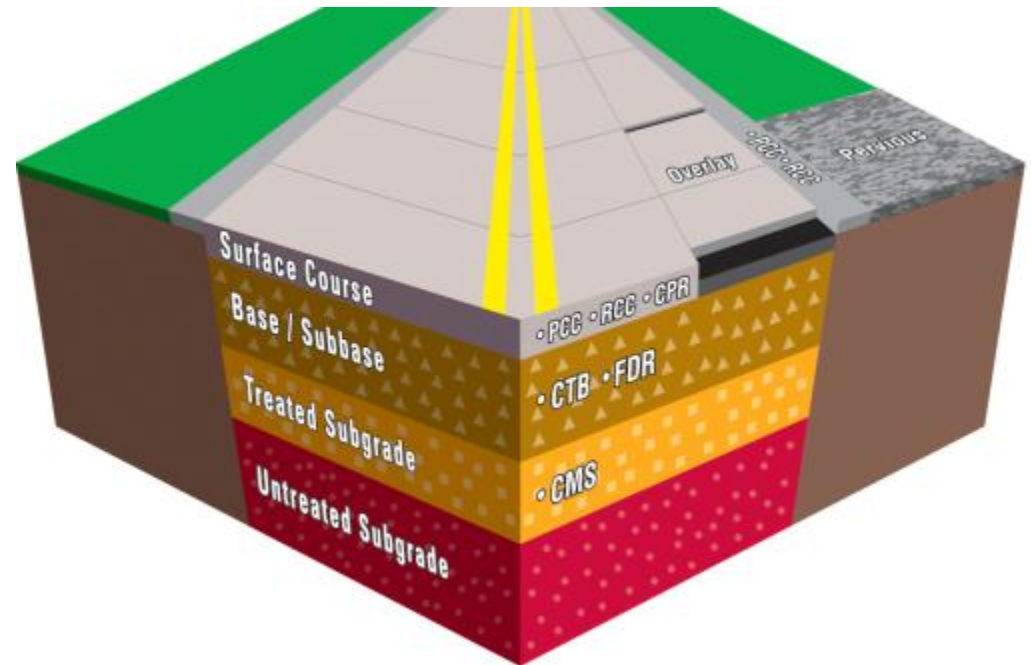


# Summary: Concrete Overlays



# Integrated Pavement Solutions

- Conventional Concrete
- Roller-Compacted Concrete
- Pervious Concrete
- Full-Depth Reclamation
- Cement-Treated Base
- Cement-Modified Soil



*There is a sustainable cement-based solution for every pavement project!*

*"Shrinking Budgets and Creative Management"*

for additional information, please visit the PCA website at  
**www.cement.org/pavements**

The screenshot shows a Microsoft Internet Explorer browser window displaying the Portland Cement Association (PCA) website. The address bar shows the URL <http://www.cement.org/pavements/>. The page title is "Soil-Cement and Roller-Compacted Concrete Pavements | Portland Cement Association (PCA) - Microsoft Internet Explorer".

The website header includes the PCA logo and navigation links: [PCA Home](#), [Bookstore](#), [Cement & Concrete Basics](#), [Newsroom](#), [Government Affairs](#), [Member Sign In](#), and [About PCA](#). A search bar is powered by Google, and there is a shopping cart icon.

# Pavements

**PAVEMENTS OVERVIEW**

- SOIL-CEMENT
- ROLLER-COMPACTED CONCRETE
- CONCRETE PAVEMENTS

**RESOURCES**

- TECHNICAL SUPPORT
- STAY INFORMED
- FIND A CEMENT SUPPLIER
- FIND HELP NEAR YOU
- CONFERENCES AND TRAINING


Portland Cement Association  
5420 Old Orchard Road • Skokie, IL 60077  
847.956.6200 PH • 847.956.6389 FX

1130 Connecticut Ave., Suite 1250  
Washington, D.C. 20036  
202.404.8494 PH • 202.408.0877 FX  
[info@cement.org](mailto:info@cement.org)

## Pavements

A variety of cement-based products can be used in pavement applications. They are all similar, in that they all contain the components of portland cement, aggregates and soils, and water. [Click here](#) for more info.


### Soil-Cement

 Soil-cement pavements have many uses from city streets, county roads, state routes, and interstate highways, to parking lots, industrial storage facilities, and airports. The "family" of soil-cement pavement products include:

- Cement-Modified Soils (CMS)
- Cement-Treated Base (CTB)
- Full-Depth Reclamation (FDR)

[Click here for more info.](#)

### Roller-Compacted Concrete


 RCC, a durable paving material that carries heavy loads, is now developing as a fast, economical construction method for off-highway applications.

### Pavements E-Newsletter

E-mailed 4 times a year, *Pavements* contains the latest information on soil-cement and RCC pavement projects, FDR case studies, training and events, FAQs, new resources, and more. [View current issue.](#) [Access back issues.](#) Sign-up for future issues and occasional relevant news and information:

Email:

### Focus on FDR

 Full-Depth Reclamation (FDR) coupled with cement stabilization is an innovative and cost effective method of rebuilding failed asphalt pavements. For more information about FDR [click here.](#)

### Survey Results

# Thank



[ghalsted@cement.org](mailto:ghalsted@cement.org)

think  
harder.  
concrete™

PCA