Continuously Reinforced Concrete Pavement

Course Number: ST-02-208

PDH: 5

Approved for: AK, AL, AR, DE, FL, GA, IA, ID, IL, IN, KS, KY, LA, MD, ME, MI, MN, MO, MS, MT, NC, ND, NE, NH, NJ, NM, NV, NY, OH, OK, OR, PA, SC, SD, TN, TX, UT, VA, VT, WI, WV, and WY

State Board Approvals

Florida Provider # 0009553 License #868
Indiana Continuing Education Provider #CE21800088
Maryland Approved Provider of Continuing Professional Competency
New Jersey Professional Competency Approval #24GP00025600
North Carolina Approved Sponsor #S-0695
NYSED Sponsor #274

How Our Written Courses Work

This document is the course text. You may review this material at your leisure before or after you purchase the course.
After the course has been purchased, review the technical material and then complete the quiz at your convenience.
A Certificate of Completion is available once you pass the exam (70% or greater).
If a passing grade is not obtained, you may take the quiz as many times as necessary until a passing grade is obtained).
If you have any questions or technical difficulties, please call (508) 298-4787 or email us at admin@PDH Pro.com.

Module 1. Introduction

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the core objectives and state-of-the-art references for CRCP rehabilitation.
- **Evaluate** the critical factors beyond engineering that influence the selection of a rehabilitation strategy.
- **Distinguish** between restoration and resurfacing activities based on their functional application and scope.

Executive Summary: Successful CRCP rehabilitation requires a systematic approach to defining structural and functional problems, identifying potential solutions, and selecting preferred alternatives based on technical condition, constructability, and agency funding.

Design Fundamentals

The primary objective of this guide is to deliver best-practice information on rehabilitation strategies designed to extend the service life of **Continuously Reinforced Concrete Pavements (CRCP)**. The methodology focuses on three distinct steps:

1. **Defining** the specific pavement problem.
2. **Identifying** potential engineering solutions.
3. **Selecting** the preferred alternative tailored to project-specific needs.

This guidance integrates pertinent data from established authorities, including **AASHTO**, the **FHWA**, and the **American Concrete Pavement Association**. While engineers should prioritize technical solutions, final selection often hinges on non-engineering criteria such as **traffic management**, **constructability**, **agency policies**, and **available funding**.

Rehabilitation Framework

Rehabilitation strategies are implemented at the **project level** and specify the type, quantity, and timing of treatments. These strategies are categorized into two primary frameworks:

Restoration Activities

Restoration is designed to **preserve** the existing pavement by addressing isolated or localized distress areas.

- **Primary Goal**: Delay or stop the deterioration process and prevent reoccurrence by identifying underlying distress mechanisms.
- **Scope**: Includes preventive maintenance and repair methods.
- **Application**: Can be utilized as a standalone fix or in conjunction with resurfacing.

Resurfacing Activities (Overlays)

Resurfacing is designed to **significantly increase** the structural or functional capacity of the existing pavement.

- **Primary Goal**: Provide a comprehensive upgrade when restoration is no longer cost-effective but reconstruction is not yet necessary.
- **Scope**: Applied over the **entire surface** of the existing pavement rather than localized areas.

💡 **Design Tip**: Use the decision trees in Chapter 4 to systematically match restoration methods to the specific structural and functional condition of the pavement.

Table 1. Framework for rehabilitation activities.

Classification	Function	Treatment Types
Restoration (see chapter 5)	Preventive maintenance, preservative or corrective	Retrofitted edge drains; Joint or crack sealing; Retrofitted concrete shoulders; Cathodic protection
	Repair	Full-depth repair; Partial-depth repair; Diamond grinding and grooving; Pressure relief or expansion joints; Slab stabilization and jacking; Cross stitching
Resurfacing (see chapter 6)	Overlay construction	Hot-mix asphalt overlay; Bonded concrete overlay; Unbonded concrete overlay

Checkpoint Quiz

1. **Which factor is described as a potential "control" that might override the technically optimal engineering solution for CRCP rehabilitation?**
   a) Pavement thickness
   b) Reinforcing steel grade
   c) Agency policies and funding
   d) Soil subgrade classification

Answer: (c). While engineering observations are vital, factors like traffic, constructability, and funding often dictate the final selection.

2. **How does the scope of Resurfacing differ from Restoration?**
   a) Resurfacing is always performed before restoration.
   b) Resurfacing is applied over the entire pavement surface, whereas restoration is localized.
   c) Restoration increases structural capacity, while resurfacing only preserves the surface.
   d) There is no difference in scope; the terms are interchangeable.

Answer: (b). Restoration addresses specific distress areas to preserve the pavement, while resurfacing (overlays) covers the entire project length to increase capacity.

3. According to the Framework for Rehabilitation Activities, which of the following is classified as a "Repair" restoration technique?

a) Cathodic protection
b) Retrofitted edge drains
c) Bonded concrete overlay
d) Slab stabilization and jacking

Answer: (d). Table 1 explicitly categorizes slab stabilization and jacking under "Repair" within the Restoration classification.

Module 2: Evaluating CRCP

Learning Objectives

By the end of this section, you will be able to:

- **Identify** the essential data categories required for a comprehensive CRCP structural and functional evaluation.
- **Evaluate** pavement distresses and drainage conditions to determine the appropriate sampling and testing plan.
- **Analyze** deflection measurement data to assess load transfer efficiency (LTE) and detect subsurface voids.

Executive Summary: Developing an optimal rehabilitation strategy for CRCP requires a thorough investigation of pavement condition, materials, and variability through visual surveys, destructive core sampling, and non-destructive deflection testing.

Evaluation Data Requirements

To select the correct rehabilitation strategy, engineers must analyze the mechanisms causing deterioration. Data collection is divided into the following categories:

- **Pavement Condition**: Assessment of both structural and functional integrity.
- **Material Properties**: Analysis of the surface, subbase, and subgrade soils.
- **Design and Geometrics**: Review of original pavement design, safety factors, and geometric constraints.
- **Environmental and Loading**: Evaluation of drainage systems, climatic conditions, and current traffic volumes/loading.

Visual Condition Survey

The visual survey provides the baseline for understanding a pavement's current state. Results are often presented graphically using strip charts or historical performance charts to detail conditions along the project length.

Distress Survey

A **distress** is any visible defect on the pavement surface. For CRCP, primary distresses include **punchouts**, wide transverse cracks, longitudinal cracks, and crack spalling.

- **Documentation**: Record the type, severity, and extent (relative area) of each distress.
- **Uniformity**: Use the *Distress Identification Manual for the Long-Term Pavement Performance Program* for standardized definitions.

- **Materials-Related Distresses (MRD)**: Identify indicators of D-cracking, alkali-silica reactivity (ASR), and corrosion.

Drainage Survey

Excess moisture accelerates structural failure. Drainage surveys must:

- Identify signs of moisture-related distress or pumping.
- Document topography, cross slopes, ditches, and the condition of inlets and outlets.

Field Sampling and Testing

Destructive core sampling validates non-destructive results and allows for detailed laboratory analysis.

Feature	Sampling Action
Punchouts/Wide Cracks	Take cores at the distress to determine pavement thickness and concrete strength.
Joints	Core through deteriorated joints to check for tie bar corrosion or loss of bond.
MRDs	Perform petrographic examination on samples for ASR or D-cracking.
Subbase/Subgrade	Test samples for permeability, gradation, and resistance to load deformation.

Variability Assessment

Engineers must divide projects into segments (units) with similar design features.

- **Between-unit variability**: Differences in performance between intersections, bridge approaches, or cut-and-fill sections.
- **Within-unit variability**: Inherent diversity of response within a single segment.

⚠️ **Safety Constraint**: On high-traffic-volume roads, more comprehensive evaluation is required as premature failures have more serious consequences, but field sampling must be balanced with personnel safety issues.

Deflection Measurement

Deflection testing indicates vertical pavement response to traffic loads. Large deflections signify a weak pavement structure.

Load Transfer Efficiency (LTE)

Non-destructive testing (NDT), typically using a **Falling Weight Deflectometer (FWD)**, measures LTE across cracks.

🧮 **Calculation Note**: To measure LTE at a CRCP crack, place the FWD load in the outer wheel path roughly 2 ft (0.6 m) from the edge, near but not on the crack.