

# 十一、 Full- and Partial- Depth Repairs

參考資料：

1. Darter, M. I. “Techniques for Pavement Rehabilitation,” Training Course, FHWA, 1987. (Block 3 Restoration, Module A-D)

## BLOCK 5 - RESTORATION

### A.1 剛性路面損壞與維修

資料來源：

1. 李英豪、李英明，“剛性路面損壞與維修：損壞型態與原因、損壞維修，”道路工程設計與維修實務班講義，台灣省建築師公會建築研修中心，民國八十四年一月十四日。

- a. 交通技術標準規範「公路養護手冊」
- b. SHRP/LTPP「鋪面調查手冊」
- c. FHWA「鋪面維修技術」講義

#### 「公路養護手冊」

##### 瀝青路面損壞之分類及原因

1. 損壞之分類及主要原因(表3-1)
2. 需養護之研判值參考表(表3-2)

##### 瀝青路面修護方法之選擇(表3-3)

[路面損壞種類 修護方法]

##### 混凝土路面損壞之分類及原因

1. 損壞之分類及主要原因(表3-7)
2. 填縫材料之破損種類及現象(表3-8)
3. 需養護之研判值參考表(表3-9)

##### 混凝土路面養護方法(表3-10)

## SHRP/LTPP 「鋪面調查手冊」

[FHWA/LTPP]

1. Distress Map Symbols for AC (Figure 4)
2. Distress Map Symbols for JCP (Figure 6)
3. Distress Map Symbols for CRCP (Figure 8)

## FHWA 「鋪面維修技術」講義

Full-Depth Repairs (for JCP & CRCP)

Partial-Depth Repairs (for Spalling)

## Full-Depth Repair for JCP

### Introduction

1. Required to repair deteriorated joints and cracks
2. Use of AC patches for JCP is not recommended
3. Major considerations:
  - a. Joint design
  - b. Selection of repair locations and boundaries
  - c. Preparation of repair area
  - d. Concrete placement and finishing
  - e. Joint sealing
  - f. Curing and opening to traffic

### Joint design

1. Types of Sawed Joints
  - Rough- and smooth-faced joints (Fig. 1)
2. Load Transfer Methods

- a. Tie bars, dowel bars, undercutting, aggregate interlock
  - b. Repair undercutting is not recommended (Figure 2)
3. Determination of Required Load Transfer
    - a. Mechanical load transfer devices are *strongly recommended*
    - b. Costs (Figure 3), Types (Figure 4), and Dowel Bar Spacing (Figure 5)

#### Selection of repair locations and boundaries

1. Repair specific distresses (Figure 6)
2. Boundaries and Joint Type
  - a. Potential underlying deterioration (Figure 7)
  - b. 6 ft minimum length, and full-lane-width recommended
  - c. Extend 1-foot to include the existing doweled joint
  - d. JPCP: Typical Distresses (Figure 8), Full-Lane Repair (Figure 9), Midslab Cracking (Figure 10)
  - e. JRCP: Typical Distresses (Figure 11), Full-Lane Repair (Figure 12), Midslab Cracking (Figure 13)
3. Large Area Removal and Replacement
4. Repairs on Multiple-Lane Highways

#### Preparation of repair area

1. Sawing Boundaries:

- a. Partial-depth saw cut (Figure 14)
    - b. Full-depth saw cut (Figure 15, 16)
  - 2. Removal Concrete: (Figure 17)
    - a. Breakup and cleanout method
    - b. Lift-out method[Advantages/Disadvantages]
  - 3. Repair Foundation
  - 4. Dowel Bar and Rebar Placement
    - a. Quick-setting, non-shrinking mortar or epoxy resin (Figure 18)
  - 5. Longitudinal Joint Considerations
- Concrete placement and finishing
- Joint sealing
- Curing and opening to traffic
- 1. Minimum Strength Requirements:
    - a. Compressive strength: 2000 psi
    - b. Modulus of rupture:
      - Center-point-loading: 300 psi
      - Third-point-loading: 250 psi
  - 2. Minimum Time Requirements:

# Full-Depth Repair of CRCP

## Introduction

1. Use of AC patches for CRCP is not recommended

## Joint Load Transfer

1. Longitudinal reinforcing steel is extended into the repair and tied, or welded
2. Subbase is not seriously deteriorated beneath the transverse joint
3. Joint face is nearly vertical and rough beneath the reinforcement and not spalled underneath

## Selection of repair locations and boundaries

1. Repair specific distresses (Figure 1)
2. Boundaries and Joint Type
  - a. Potential underlying deterioration (Figure 2)
  - b. Minimum length: 6 ft for repairs containing tied steel, and 4 ft for repairs containing welded steel
  - c. Minimum width: 6 ft; full-lane-width recommended
3. Large Area Removal and Replacement
4. Multiple-Lane Repairs

## Preparation of Repair Area

1. Partial-Depth Sawing of Boundaries
2. Full-Depth Sawing: a specified distance in from the partial depth cuts (Figure 4)
3. Removal Concrete:
  - a. Breakup and cleanout method
  - b. Lift-out method[Advantages/Disadvantages(Figure 5)]
4. Removal of Concrete in the Lap End Section (using jackhammers, prying bars, picks, shovels, and other hand tools) (The reinforcement must not be bent up.)
5. Repairing the Foundation
6. Placement of Reinforcement (Figure 6)

Concrete placement and finishing

Curing and opening to traffic

# Partial-Depth Spall Repair

## Introduction

## Approximate Uses and Locations of Partial-Depth Repairs

## Partial-Depth Repair Materials

1. Repair materials
2. Bonding agents
  - sand/cement grouts (curing 24-72 hours)
  - epoxy bonding agents (curing 6 hours)

## Preparation of the Repair Area

1. Location of Repair Boundaries
2. Sawing Repair Boundaries (Figure 1a)
3. Removal of Deteriorated Concrete
4. Joint Preparations (Figure 1c and Figure 2)
5. Cleaning the Repair Area
6. Application of Bonding Agent

## Repair Placement and Finishing

1. Repair Material Mixing
2. Placement and Consolidation of Material
3. Screeding and Finishing

## Curing

## Limitations and Other Considerations

1. Placement Temperature
2. Use of Proprietary Materials
3. Concurrent Work

## Performance of Partial-Depth Repairs