

Chapter 5

Patching and Edge Repair

From... Maintenance Technical
Advisory Guide (MTAG)

Managers' Overview

From... Maintenance Technical
Advisory Guide (MTAG)

Patching and Edge Repair

- What is patching and edge repair ?
- Why use patching and edge repair ?
- When to use patching and edge repair ?
- Where to use patching and edge repair ?

What is Patching?

- Patching is placing new material to cover up the distressed area. In a highly distressed area, deteriorated material needs to be removed and replaced with new materials.



Why Use Patching?

- Restores the pavement surface to a state where other preservation treatments can be used with a good chance of success
- Often done in preparation for other forms of corrective maintenance, pavement preservation, or pre-treatment prior to an overlay

When to Use?

- Emergency-temporary patches to reduce likelihood of vehicle damage and/or accidents which they might cause
- Before localized areas of distress become problematic
- Prior to overlays or other pavement treatments

Where to Use?

- Localized areas where even the underlying support materials have disintegrated, contaminated, or lost their load-carrying capacity
- Pavement failure along the edges due to traffic and loss of edge support



Where to Use?



*Localized High Severity
Alligator Cracking*



Pothole

Summary

- Patching is a treatment applied prior to other preservation treatments
- Patching by itself is not a preservation treatment
- Patching is a reactive treatment, not a proactive treatment

Module 5-1

Design, Materials & Specifications

From... Maintenance Technical
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Topics to be Covered

- Project Selection
 - Distress and Other Application Considerations
 - Cost and Performance
- Design Considerations
 - Mobilization
 - Typical Materials Items
 - Quantity Calculations
 - Production Rates
- Materials and Specifications (including SSP's)
- Summary

Project Selection

- Distress and Application Considerations
- Performance

Factors to Consider When Choosing a Maintenance Treatment

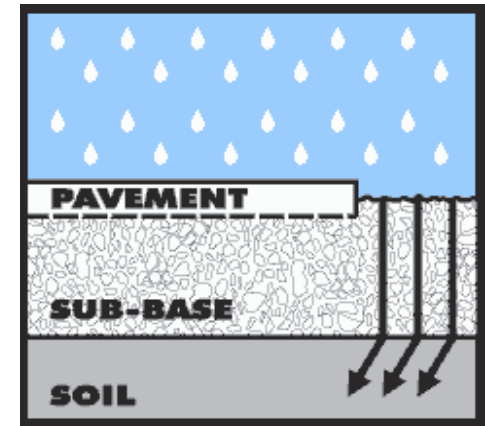
- Will the treatment address the distresses present? (i.e., Will it work?)
- Can the required preparation for the treatment be carried out?
- Is the treatment affordable and cost effective?

DISTRESS AND APPLICATION CONSIDERATIONS

- Patching is a viable application for treating localized distressed areas
- Based on the type of distress and the severity level on of the following types of patching method shall be used to restore the pavement surface
- Types of Patching Methods:
 - Pothole patching
 - Material dig out and replacement
 - Edge repair
 - Surface reinstatement

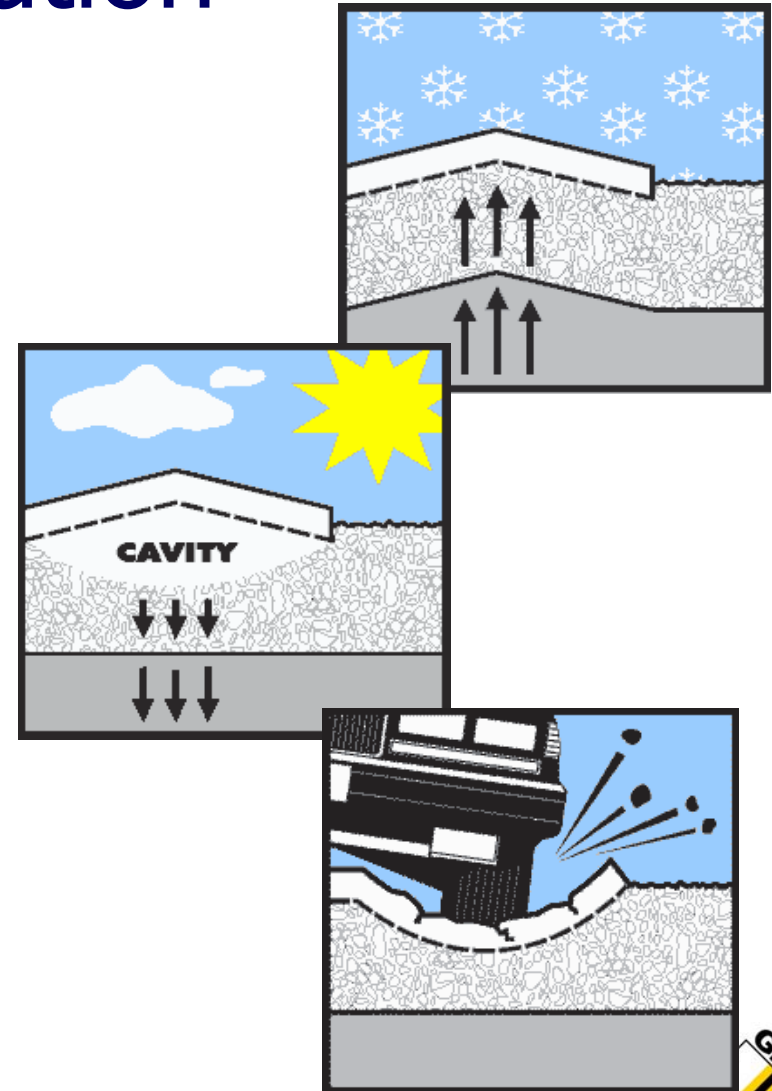
Mechanisms for Pothole Formation

1. Raveling due to low compaction, stripping, or cracking in the pavement surface.
2. Softening of the underlying pavement layers due to water penetration increasing deflections.



Mechanisms for Pothole Formation

3. Ice formation and heaving accelerate the process
4. Loss of fines from the underlying pavement layers
5. Once a hole is formed, it will continue to grow until it is repaired



Other Selection Considerations

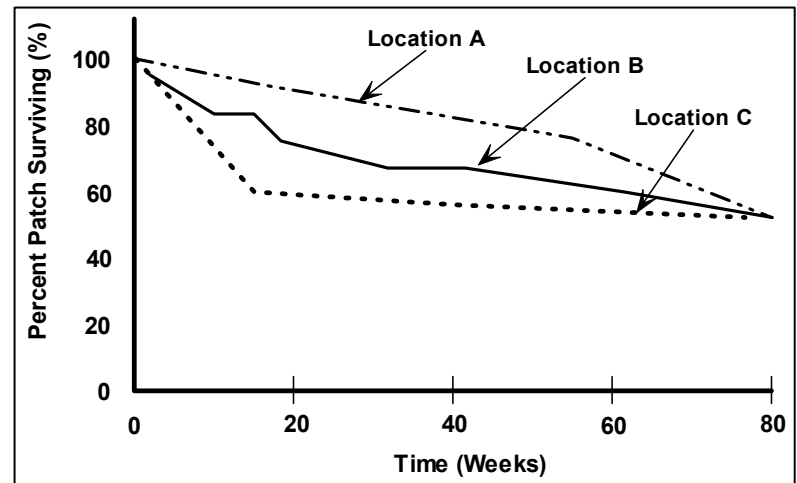
- Traffic level and type of traffic
- Time of the year during which the repair is carried out
- Time until scheduled rehabilitation
- Availability of equipment, personnel, and materials

Cost and Performance

Main costs associated with patching include:

- Labor
- Materials
- Equipment
- Traffic Delays

Cost effectiveness is determined by the patch survival rate



Design Considerations

- Mobilization
- Typical Materials Items
- Quantity Calculations
- Production Rates

Mobilization

- Depends on patching material to be used.
 - HMA – Requires an Asphalt Paving plant close to project site.
- Special Permitting - None

Typical Materials Items

- Hot-Mix Asphalt
- Cold-Mix Asphalt (temporary fix)
- Aggregate / asphalt emulsion (injection patching)
- Asphalt emulsions tack coat
- Granular aggregate base
- Specialty products

Quantity Calculations

- Σ length x width x depth

Production Rates

- Production Rate
 - Type of patching method
 - Quantity of patches
 - Traffic
 - Work windows

Material Specifications

Based on procedures of application and the use of appropriate materials

- Generally HMA materials are specified based on Caltrans Dense-Graded Asphalt Concrete (DGAC) specifications as presented in Standard Specifications Section 39
- Cold-mixes for patching. These are generally proprietary products and should be handled according to the manufacturer's specifications

Module 5-2

Construction & Inspection

From... Maintenance Technical
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Topics to be covered

- **Understand/Review Specifications**
- **Safety and Traffic Control**
- **Sampling and Testing**
- **Type of Patching Methods**
 - **Patching**
 - **Throw and Roll**
 - **Semi-permanent patches**
 - **Injection patches**
 - **Dig Outs**
 - **Edge Repairs**
 - **Surface Reinstatement**
 - **HMA application**
 - **Spray injection systems**
 - **Cold mix**
- **Application Problems and Solutions**

Understand/Review Specifications

- Review Construction Manual Chapter 4
 - Section 94 emulsion
 - Section 39 Hot Asphalt Mix (mix and placement)
- Project special provisions

Safety and Traffic Control

- Traffic control is required both for the safety of the traveling public and the personnel performing the work.
- Traffic control includes placing construction signs, construction cones and/or barricades, flag personnel, and pilot cars required to direct traffic clear of the maintenance operation.

Sampling and Testing Required

- Comply with Specifications

Types of Patching Methods

- Patching
 - Throw and Roll
 - Semi-permanent patches
 - Injection patches
- Dig Outs
- Edge Repairs
- Surface Reinstatement
 - HMA application
 - Injection seal coats
 - Cold mix

Patching

Throw and Roll

- used for temporary patches
- most inexpensive and least labor-intensive method



Steps:

1. Placed patching material into the hole, with or without cleaning and/or drying of the hole.
2. Compact material using the maintenance truck tires.
3. The finished patch should have 1/8 to 1/4 in of crown to help avoid water ponding.
4. Clean up is generally not required.

Patching

Semi-Permanent Patches

- effective patching method (second only to complete removal and replacement of the failed area)

Steps:

1. Mark the boundaries of the distressed area.
2. Cut the boundaries of the patch square.
3. Square up the sides of the hole until the edges of the hole are sound pavement.
4. Remove water and debris from the hole.
5. Apply a tack coat of asphalt emulsion to the sides and bottom of the hole (rate: 0.2 gal/yd²)

Patching

Semi-Permanent Patches

Steps:

6. Place the patch material in the hole.
7. Compact the patch material with a hand device or a small vibratory roller.
8. The finished patch should have a 0.1 to 0.2 in crown
9. Seam the patch area with a crack sealant and fog seal (after 1-2 weeks).

Patching

Injection patching

- rapid and effective method of patching
- requires specialized equipment
- not currently used by Caltrans
- used for lower trafficked roads
- alternative to the throw and roll method

Steps:

1. Blow debris and water from the hole
2. Spray a tack coat of emulsion on the sides and bottom of the hole (rate: 0.2 gal/yd²)
3. Fill the hole to the top with asphalt/aggregate mixture
4. Apply of a finish coat of dry aggregate to minimize pick up

Dig Outs

- Required when edge of the pavement has broken away or the base has failed due to severe alligator cracking
- Permanent patches
- most expensive and labor-intensive method

Steps:

1. Mark the boundaries of the distressed area to be replaced.
2. Cut out the perimeter of the area with a diamond saw or cold milling machine.
3. Break up and remove the failed pavement to the subgrade material.
4. Clean and dry the dig out area.
5. Sweep up loose aggregate.

Dig Outs (cont.)

Steps:

5. Place and compact new (virgin) base course material.
6. Apply a tack coat of emulsion to the sides of the repair area (rate: 0.2 gal/yd²).
7. Place the patch material in the prepared dig out area. The thickness of any lift should not exceed 4 in.
8. Compact each lift using equipment similar to that typically used in hot-mix asphalt compaction operations.
9. The finished patched area should have a crown of 1/8 to 1/4 in.

Edge Repairs

Intent: provide improved lateral support along the pavement's edge.

- If the distress is confined mainly to the HMA surface, then regular patching operation should be employed.
- If the deterioration extends well below the surface, then a dig out is more appropriate.

Achieving adequate compaction and maintaining good drainage at the interface with the shoulder

Surface Reinstatement

Method A – HMA Application

Steps:

1. Clean the area to be patched of debris.
2. Apply a diluted tack coat emulsion (rate: 0.1 gal/yd²)
3. Lay the HMA over the surface and spread. The HMA should be spread to a minimum of three times the thickness of the largest aggregate size.
4. Compact the HMA using a pneumatic tired roller and possibly a steel wheel finish roller.

Surface Reinstatement

Method B – Emulsion Seal Tack Coat

Steps:

1. Clean the area to be patched of debris.
2. Apply a diluted tack coat emulsion (rate: 0.2 gal/yd²)
3. Lay a layer of sand or fine aggregate, typically 0.1 to 0.2 inch in depth.
4. Roll the patched area with a pneumatic tired roller.

Surface Reinstatement

Method C – Cold Mix (Temporary Fix)

Steps:

1. Clean the area to be patched of debris.
2. Apply a diluted tack coat emulsion (rate: 0.1 gal/yd²)
3. Spread mix over area to be repaired to a depth of 1 in.
4. Compact mix using a pneumatic tire roller (or haul trucks) and finish with a steel wheel roller.
5. Follow up before winter with a fog seal.

Application Problems and Solutions

PROBLEM	SOLUTION
Patching Material Picks Up	<ul style="list-style-type: none">• Ensure the hole is cleaned properly and not too wet.• Ensure sufficient tack coat is applied.• Use a self-setting cold-mix when holes cannot be dried properly.• Ensure the patch is solid before trafficking.• Dust patch surface with sand or small aggregate.• Wait for better weather.• Do not use cutback based cold-mix (unless a temporary repair is being done).• For HMA patches, allow to cool before traffic is allowed over the patch.• Ensure required compaction is achieved.
Flush Surface	<ul style="list-style-type: none">• Reduce asphalt or emulsion content in the mix.• Reduce tack coat application.• Allow longer time before trafficking.• Ensure the gradation of the aggregate is appropriate.

Application Problems and Solutions

Uneven Surface	<ul style="list-style-type: none">• Ensure cold-mix is workable.• Ensure HMA is at the right temperature for placement and compaction.• Ensure adequate compaction is achieved.
Loss of Cover Rock in Seal Coat Patches	<ul style="list-style-type: none">• Ensure surface is clean.• Ensure correct emulsion content is sprayed.• Ensure aggregate is spread while the emulsion is still brown.• Ensure emulsion is broken before traffic is allowed.• Allow longer cure time before traffic.
Traffic Compacts Mix to Below Edge of Hole	<ul style="list-style-type: none">• Ensure finished hole is overfilled 0.1 to 0.2 in (3 to 6 mm).• Ensure adequate compaction is achieved.• Ensure mix is workable at application temperatures.• Allow longer time before trafficking.

Thank You

Questions?