The Right Way to do a Pothole Repair

Ohio Asphalt Paving Conference – February 5, 2020
45th Annual Conference

Presented by James A. Marszal, P.E.
Pavements, Materials and Field Applications Engineer
Flexible Pavements of Ohio
Presentation Outline

1) Brief Introduction & Background
2) Temporary & Permanent Pavement Patching
3) Surface Patch
4) Full Depth Patch
5) Pavement fundamentals important to minimize potholes and ensure long life and service of your asphalt pavement
It is estimated there are 55 million potholes in the United States - Harpers Magazine, 1985

From 2010-15, it was estimated that 16 million drivers in the US suffered vehicle damage with a cost of $3 Billion a year - American Automobile Association (AAA)
Pothole — Localized distress in an asphalt-surfaced pavement resulting from the breakup of the asphalt surface and possibly the asphalt base course. Pieces of asphalt pavement created by the action of climate and traffic on the weakened pavement are then removed under the action of traffic, leaving a pothole.

- Report No. FHWA-RD-99-168
  Strategic Highway Research Program
  National Research Council
Potholes are created due to the combined effects of:

- **Fatigue from loads**
  - pavement age
  - top down & bottom up

- **Climate**
  - temperature change
  - sunlight
  - air
  - moisture/poor drainage
  - freeze and thaw
Pavement Subgrade Drainage
Not A New Concept:

“... experience has shown that if water passes through a road and fills the native soil, the road, whatever may be its thickness, loses support and goes to pieces.”

-- John MacAdam (1820)
Patching

Methods and Materials
Patching done right --- SHRP research

1) Make **permanent patches** whenever possible, temporary patches only when necessary

2) Use **best available methods and materials**
   - cost of materials and labor tend to be insignificant compared to user costs
Temporary Patching Methods

Goal: Restore rideability and safety as quickly as possible, even under adverse weather conditions

Procedure: **Throw and Roll**

- Use **Proprietary Cold Mix**, (SHRP Research indicates proprietary mixes last 2 to 4 times longer in cold and wet conditions than conventional cold mixes and dry holes significantly improve patch life)

- Compact it, with best means available
  - Roller, tamper, plate tamper, **truck tires**
Permanent Patching Methods

- Correct **drainage** problems; surface and subsurface
- Cut area back to sound pavement
- Straight, vertical edges (irregular, variable thickness can’t be adequately compacted)
- Place **structurally adequate thickness** of patch (at least the same thickness as surrounding sound pavement)
- Tacked edges; bond patch to existing
- **Thorough compaction**, optimum density, impermeable surface
- Smooth, flush finished surface
  - two or more lifts
  - final lift 25% of lift thickness above existing surface
  - seal perimeter of repair
Permanent Patch

- Identify area affected
- Mark boundaries of patch
- Vertically cut boundaries
- Clean and repair foundation
- Apply tack coat to edges
- Fill with patching material
  - Placing in small piles
  - Fill in 2-3 inch lifts
  - Surface lift 2 inches or less
- Compact each lift
- Straight Edge
  - Compacted properly
  - No rolldown under traffic
- Clean up
- Open to traffic
  - Temp < 175°F
Patching
Permanent Patch

Avoid irregular patches
• Getting proper compaction will be difficult

Nice straight lines
• No distress visible outside perimeter
Surface Patch

Partial Depth Repair

- Delamination
- Raveling
- Top down cracks
- Slippage cracks
- Poor joints
- Potholes
Surface Patch

- Mill
- Clean
  - Remove RAP
  - 100% recyclable
  - Broom out fines
  - Clean corners
- Tack
  - Bottom
  - Edges
- Use surface mix
Surface Patch

- Layout with straight lines?
- 1 foot into sound pavement?
- Cut with vertical faces?
- Proper clean out of loose material?
- Failure means re-patching!
Other Patching Techniques – Spray Patching

Spray Patching can be very cost effective
Infrared Surface Patch

- Thermostatically controlled
- Heat patch area
- Careful not to overheat
- Add new material
- Compact
Other Patching Techniques – Heat Welding

Heat welding can produce very smooth patches
Patching Equipment, all-in-one
Full Depth Patching
Full Depth Patching

- Identify area affected, mark limits so that removal extends 1 ft. (0.3 m) beyond distressed area in all directions

- Outline of repair should be rectangular with two faces perpendicular to traffic

- Cut pavement with full depth sawcut

- Faces should be vertical, straight and solid

- Remove material in failed area:
  - Old pavement
  - Aggregate base, if required
  - Subgrade, if required
Full Depth Patching

• Address drainage or soft areas, if required
• Remove materials down to firm support
• Trim face vertical below saw cut depth, if necessary
• Re-grade and re-compact replacing subgrade and/or aggregate base if soft and wet conditions are encountered
Full Depth Patching

Removal of Materials
When planning a full depth patch consider:

- Size of the patch & amount of material needed
- Laydown and compaction equipment
- Volume of material per truck load
- Replacing materials
  - Apply tack coat to vertical edges
  - Fill area with asphalt mixture
Full Depth Patching

Tack the Edges
Full Depth Patching

• Spread mixture carefully
  • Avoid segregation
  • Place materials on edges first
  • Avoid pulling material from middle to edges
  • Over 5-in deep, use multiple lifts
  • Surface lift, max 2-in compacted
  • 301 or Type 2 materials typically used

• Thoroughly compact each lift

• Finished patch even with surrounding surface
Full Depth Patching

Size of patch determines equipment required (handwork vs. paver)

- Compact each lift thoroughly
  - Vibratory plate compactor – small patches, ends & corners
  - Vibratory roller - large patches, thick lifts

- Compact perimeter first from cold side
  - Overlap roller 6-in. onto patch material
  - Compact low side to high side, same overlap

- Straight edge the patch when completed
- No anticipated rolldown under traffic needed
- Seal perimeter
Full Depth Patching
Full Depth Patching
Full Depth Patching
ODOT CMS Pavement Repairs

Partial Depth Pavement Repair (SY or CY)

• Item 251 – Partial Depth Pavement Repair (441)
• Item 251 – Partial Depth Pavement Repair (442)
  ▪ Plans must designate depth and replacement material, i.e. plan detail and/or plan note

Full Depth Pavement Repair (SY)

• Item 252 – Full Depth Rigid Pavement Removal and Flexible Replacement
  ▪ Specification allows 301, 441-Type 2 or 442-19mm
  ▪ Include Item 252 – Full Depth Pavement Sawing (Foot)
• Item 255 – Full Depth Pavement Removal and Rigid Replacement, Class ___ (SY)
  ▪ Specify Material – Class QC 1, QC MS, QC FS or RRCM
FDPR’s continued

• Item 253 – Pavement Repair (SY or CY)
  ▪ Includes removal of asphalt, pc concrete, brick or aggregate
  ▪ Plans must show details about the repair and replacement material

Patching Items

• Item 256 – Bonded Patching of Portland Cement Concrete Pavement
  ▪ Uncommon item

• Item 254 – Patching Planed Surfaces
  ▪ Used on some projects by some agencies
  ▪ Check with your Construction Dept. to see if they use this item
What pavement fundamentals contribute to long life and service of asphalt pavements?

1) Good drainage is critical
   • design & maintain surface and subsurface drainage

2) Adequate thickness of asphalt pavement
   • to carry the anticipated loads for the desired design period
   • for the existing soil conditions
   • to resist environmental stresses

3) Select mixes appropriate for the traffic/truck demands of your roadway
   • Consider polymer modified binders
   • Choose finer graded mixes if/when appropriate
What pavement fundamentals contribute to long life and service of asphalt pavements?

3) Adequate preventative maintenance to retard deterioration due to climate and traffic, e.g. crack sealing
   • Rule of Thumb – year 3 typ.; could be year 4-5 with polymer surfaces

4) Adequate corrective (reactive) maintenance to restore lost serviceability
Questions?

Thank you!

James A. Marszal, P.E.
Pavements, Materials and Field Applications Engineer
Flexible Pavements of Ohio
james.marszal@flexiblepavements.org
info@flexiblepavements.org
www.flexiblepavements.org
p 888.4HOTMIX