

Synthesis Offers Current Practices for Pothole Patching

JARRING POTHOLES can damage vehicles, delay traffic, and frustrate drivers. But that's not all. Pothole repair is also one of the most expensive pavement maintenance activities. Indeed, drivers, maintenance crews, local, state, and federal highway agencies, and public officials all understand the value of effective pothole patching.

It's estimated that agencies spend more than \$1 billion in the United States each year on pothole and spall repair. Maximizing knowledge from research and current practices for pavement patching helps agencies make the most of their funding and increase public satisfaction.

To advance improvements, the Transportation Research Board recently published a National Cooperative Highway Research Program (NCHRP) *Synthesis on Pavement Patching Practices*. The synthesis summarizes current practices for patching both concrete and asphalt pavements.



Patching Technique Primer

SHRP studies helped standardize some of the terms for different patching techniques. Many states have adopted SHRP installation procedures. The synthesis offered the following perspectives on experience and research with these techniques.

Throw-and-Go

The throw-and-go method does not prove cost-effective and generally performs poorly.

Throw-and-Roll

Many agencies use the throw-and-roll placement technique, especially under winter conditions. Throw-and-roll is considered superior to throw-and-go because it leads to a longer lasting patch. In most cases, properly constructed throw-and-roll patches can perform as well as sawed patches on asphalt pavements.

Spray Injection

According to SHRP research, spray injection offers good performance, but it requires a skilled operator to achieve those results. Since SHRP, spray injection use has increased, with mixed performance.



Current Efforts

The synthesis takes a closer look at current state-of-the-practice for small-scale pavement defects or distresses. It examines current programs for repairing and patching; pavement distress factors; and repair and patching materials, design, and construction processes, among other topics.

The synthesis presents the results of a literature review and surveys of state agencies, local U.S. transportation agencies, and selected agencies in the United Kingdom, Ireland, and Canada.

The Strategic Highway Research Program (SHRP) previously conducted a number of research studies to evaluate materials and processes for patching, which led to the development of manuals for patching potholes and partial-depth repair of spalls on concrete pavements. The synthesis also looks at SHRP research implementation and changes since the SHRP recommendations.



Key Findings

The literature review and surveys revealed that each state uses patching on distressed pavement, and most states consider patching a major component of maintenance. The following highlights summarize aspects of synthesis conclusions.

- Patching triggers**
 Agencies report consistent triggers for patching potholes, and the most common factors include deterioration around joints, cracks, or previous patches; rutting; joint failure; delaminations; and spalling. Maintenance workers generally identify the need for patching through visual inspection, public complaints, and emergency safety problems.
- Patching materials**
 Agencies routinely use generic or proprietary cold mix for temporary patching on both asphalt and concrete surfaces, and hot mix remains the preferred patching material for semi-permanent patches in asphalt pavements. For permanent patches on concrete pavements, agencies use a wide range of cementitious patching materials. SHRP research showed good performance of proprietary patching materials in general, and use of those materials has increased, with new products constantly entering the market.
- Patching methods**
 Research and the experience of several states support the importance of “doing it right the first time.” By avoiding the replacement of failed patches, this practice greatly improves the cost-effectiveness and level of service. Knowing the cause of the distress and failure mechanism also helps in selecting the appropriate treatment.
- Guidelines and engineering judgment**
 Agencies rely on engineering judgment as the primary consideration when selecting the type of maintenance activity, including determining when and how to patch. Guidelines help supplement engineering judgment and improve consistency, but guidelines differ from agency to agency.
- Program considerations**
 With rising costs and dwindling budgets, maintenance management programs are growing in importance. For the most part, state maintenance workers primarily are responsible for reactive and planned patching. Maintenance departments use contractors more often if the job requires special equipment or expertise. Some small agencies without equipment or enough staff may hire contractors, but other smaller agencies with staff find it more cost-effective to handle the patching themselves.

Resources

- NCHRP Synthesis 463, *Pavement Patching Practices: A Synthesis of Highway Practice*, Transportation Research Board, 2014
- Materials and Procedures for Repair of Potholes in Asphalt-Surfaced Pavements: Manual of Practice*, FHWA, 1999
- Strategic Highway Research Program Pothole Repair Materials and Procedures*, Transportation Research Board, 1993
- The Transportation Research Board also offers access to a number of SHRP research reports on innovative materials and testing at trb.org.

Links to these resources are on the TERRA website at TerraRoadAlliance.org.

Research: Next Steps

Survey participants helped identify the following areas for additional research:

- Comparison of different materials
- Development of new or innovative patching materials
- Development of new or improved patching procedures
- Comparison of different patching procedures
- Understanding the performance of different patching materials
- Development of new/improved equipment
- Use of bonding agents

Those surveyed also cited the need for improved maintenance management; improved guidance, training, and specifications; better recordkeeping; approaches that increase the speed of patching operations; equipment for using recycled asphalt pavement to patch; safer traffic control methods for short duration patching; ways to determine the true cost of patching; methods for tracking patch locations; and patching materials and techniques to help determine performance and cost-effectiveness.

If funding were available, agencies indicated that high priorities include getting better materials, more and better patching equipment, and more staff.

For More Information

For more information about the research in this fact sheet, please contact:

- **Roger Olson**, PE, Materials and Road Research, MnDOT, 651-366-5517, roger.olson@state.mn.us

More about TERRA, including contact information for program representatives **Stephanie Malinoff** (Center for Transportation Studies) and **Chris Kufner** (Minnesota Department of Transportation), is online at TerraRoadAlliance.org.