

The War Against Potholes: New Tools for Maintenance Forces

Looking for the ideal material to patch potholes? Faced with the wide variety of choices, which product is best suited for a particular application? Many vendors claim their products are the “perfect” fix for potholes in asphalt concrete pavement. But would any of these products meet the Oregon Department of Transportation’s (ODOT) need for cost effective and reliable pothole patching materials (PPMs) that perform in a variety of environmental conditions? In the winter of 2000, ODOT Research worked with highway maintenance personnel to find out.



Bend maintenance crew repairs potholes

Vendors of cold mix patching material donated 9 proprietary products to ODOT for laboratory testing and field evaluation. Each of the patching materials was tested in the ODOT Materials Laboratory for gradation, workability, cohesion, and asphalt coating. Additionally, the materials were field tested on state highways in Districts 3

and 4. Personnel from ODOT Research documented the laboratory testing, installation, and performance of these materials over a 24-month period. The testing and early performance is described in [Asphalt Concrete Patching Material Evaluation: Interim Report](#), available from ODOT Research.

Inspections completed 2 years later in 2002 show that the best performing materials correspond with the recommendations in the previously mentioned report. The final results of these inspections and recommendations are presented here.

Field evaluation

Research staff monitored the performance of the 9 products at regular intervals from their installation in the winter and spring of 2000 to a final inspection in April 2002. The materials evaluated for this research project are listed below.

Product Name	Manufacturer	Binder Type
Bond-X	Seaboard Asphalt Products	Cutback
Elasti-Patch	Koch Materials	Cutback
HFMS-2SP/HFE-300S (control) ¹	Albina Asphalt	Emulsion
Instant Road Repair	International Roadway Research	N/A
King Patch	Pacific Asphalt Marketing	Natural Tar Sands
Optimix Cold Patch	Optimix	Cutback
Perma Patch	National Paving & Contracting	Cutback
QPR (formerly QPR 2000) ²	Quality Pavement Repair	Cutback
Tag 8000	Infratech Polymer	Emulsion
UPM High-Performance ³	United Paving Materials	Cutback

¹ Polypatch is the little used brand by Albina for this product.

² Currently being used by Bend and Lakeview ODOT maintenance crews.

³ Currently being used by Salem and Portland ODOT maintenance crews.

The pothole patching materials were evaluated in the field for performance in both dense and open graded pavements. One of the difficulties of studying pothole patching was finding sections of highway with sufficient concentrations of potholes to make reasonable performance comparisons between products. For this reason, the study included both natural and “manufactured” potholes.

Manufactured holes were constructed with a jackhammer at Century Drive in Albany and at Wallace Road near Salem (Oregon Route 221, Salem-Dayton Highway). In addition, several natural potholes were filled at Century Drive in Albany, near Ona Beach Park south of Newport (U.S. Route 101, Oregon Coast Highway), and between Lyons and Scio on the Albany-Lyons Highway (Oregon Route 226).



A pickup truck drives over the filled pothole for compaction of the mix

Both manufactured and natural potholes were monitored for a period of 24 months. The relative height of the patch to the surrounding pavement and the condition of the material filling the hole were measured. Dishing and crowning were used as indicators of patch performance, as they can affect pavement smoothness. Additionally, visual inspections were made to identify excessive pavement distress such as stripping or raveling of the patching material.

Patches that remained relatively flush with the surrounding pavement surface and showed little signs of pavement distress over time were rated as “Good.” Patches that had minor dishing or crowning and some minor distress were rated “Fair.” Any patches that failed to remain in place or showed significant signs of distress were rated “Poor.” A summary of the field evaluations for each of the pothole patching materials is listed below.



A maintenance worker fills a pothole on Century Drive in Albany with TAG 8000 mix

Product	Number of Patches	1 month evaluation	6 month evaluation	12 month evaluation	24 month evaluation
Bond-X	4	Good	Fair	Fair	Poor
Elasti-Patch	5	Good	Fair	Fair	Fair
HFMS-2SP	14	Good	Fair	Fair	Fair
Instant Road Repair	10	Fair	Fair	Fair	Fair
King Patch	1	Poor	Poor	Overlaid	Overlaid
Optimix	1	Good	Fair	No report	No report
Perma Patch	8	Fair	Fair	Fair	Fair
QPR (formerly QPR 2000)	6	Good	Good	Fair	Fair
Tag 8000	4	Good	Good	Fair	Fair
UPM	7	Good	Fair	Fair	Fair



Photo history of patching performance at a typical site along Albany-Lyons Highway, OR Route 226. After 1 month, this patch is beginning to show signs of distress around edges. The patch shows signs of severe distress and poor performance after 12 months. By 24 months, the original patch had failed and was re-patched with new material, yet new patch is once again showing signs of distress and poor performance.

Conclusion

The recommendations in the interim report were used to develop specifications for patching materials. The Product Evaluation Committee responsible for the Qualified Products List (QPL) will evaluate and maintain a list of approved materials for pothole patching. Pothole patching products on the Qualified Products List are divided into two categories.

Manufacturer produced products come pre-packaged and ready to place. **Customer produced products** are mixed by the end user through a proprietary design process. While they vary in preparation and installation procedures, as well as in costs and performance, products in both categories must meet the following specifications:

1. **Gradation:** Less than 5% of material shall pass the Number 200 sieve.
2. **Workability:** The workability number obtained by AASHTO TP43-94 shall be less than 4.
3. **Coating:** Percent coating as determined by AASHTO TP40-94 shall be no less than 90%.
4. **Application:** Material shall be capable of being placed into a damp hole and remain in place for a minimum of 12 months under normal traffic conditions.
5. **Primer:** Product shall not require any primer or other special preparation prior to placement in hole.
6. **Equipment:** Product shall not require any special equipment for installation.
7. **Compaction:** Product shall not require any special compaction requirements.
8. **Storage:** Product shall have a minimum storage life of 1 year.
9. **Workability in adverse conditions:** Product shall remain workable in adverse weather conditions (prior to placement).
10. **Durability:** Material shall be capable of being used as a permanent fix.

Recommendations

Highway maintenance crews should consider proprietary patching materials for potholes that are difficult to keep patched. These materials

performed similarly in dense and open-graded asphalt concrete pavements, and offer an option for repairs in any type of weather. Of all of the

materials evaluated, only one (King Patch) did not meet the above specifications. Although most of the products tested are included on the Qualified Products List, it is important to note that field experience varied between products.

Pothole patching materials with larger aggregate sizes tended to perform better in the field. Two products, QPR and Tag 8000, retained over 40% of their aggregate on the 6.3 mm sieve in laboratory tests. This translated into good field

performance, as these mixes tended to be less susceptible to pavement distress.

Of particular note is QPR, a customer produced product mixed at the maintenance yard, which has been used by ODOT's Bend and Lakeview maintenance crews for the past several years. The relatively low cost per ton of QPR and its good performance make this product one of the better choices for pothole patching in Oregon.



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