Extending the Life of Asphalt Longitudinal Paving Joints

Sustainable Proactive Paving Joint Preservation
Paving Joint Preservation

TODAY’S TOPICS

Preservation Terminology.

What is liquid asphalt?

What is an asphalt rejuvenator?

Benefits of a rejuvenator.

Pavement preservation source documents

Paving joint overview.

How to preserve paving joints?

Questions

Photos

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Preservation Terminology
Ability to be used without being completely used up or destroyed.

Involving methods that do not completely use up or destroy natural resources.

Ability to last or continue for a long time.
Controlling a situation by making things happen or by preparing for possible future problems.

Serving to prepare for, intervene in, or control an expected occurrence or situation.

Tending to initiate change rather than reacting to events.
Done in response to a problem or situation.

Reacting to problems when they occur instead of taking action to prevent them.
The progressive disintegration of an HMA layer from the surface downward as a result of the dislodgement of aggregate particles.

Raveling occurs when the stone aggregate that was originally part of the pavement begins to break free from its bonds with the asphalt. Typically this tends to occur on older pavements that have already oxidized.

Loss of bond between aggregate particles and the asphalt binder as a result of:

- Dust coating on aggregate particles.
- Aggregate segregation.
- Inadequate compaction during construction.
Examples of Raveling

Segregation Raveling

Low Density Raveling

Snow Plow Raveling
Surface condition is the most vital element in any pavement management system. The asphalt PASER rating system provides agencies with a simplified visual inspection to evaluate pavement surface conditions.

There are four major categories of common asphalt pavement surface distress:

- **Surface defects:** Raveling, flushing, polishing.
- **Surface deformation:** Rutting, distortion – ripping and shoving, settling, frost heave.
- **Cracks:** Transverse, reflection, slippage, longitudinal, block, and alligator cracks.
- **Patches and potholes**
In addition to indicating the surface condition of a road, a given rating also includes a recommendation for needed maintenance or repair. This feature of the rating system facilitates its use and enhances its value as a tool in ongoing road maintenance.

| RATING 10 | Excellent |
| RATING 6 | Good |
| RATING 4 | Fair |
| RATING 2 | Poor |

| PAVEMENT AGE |

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**RATINGS ARE RELATED TO NEEDED MAINTENANCE OR REPAIR**

- **Rating 9 & 10**: No maintenance required
- **Rating 8**: Little or no maintenance
- **Rating 7**: Routine maintenance, cracksealing and minor patching
- **Rating 5 & 6**: Preservative treatments (sealcoating)
- **Rating 3 & 4**: Structural improvement and leveling (overlay or recycling)
- **Rating 1 & 2**: Reconstruction

Courtesy of PASER manual
### PASER manual rating system.

<table>
<thead>
<tr>
<th>Surface rating</th>
<th>Visible distress*</th>
<th>General condition/ treatment measures</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10 Excellent</strong></td>
<td>None.</td>
<td>New construction.</td>
</tr>
<tr>
<td><strong>9 Excellent</strong></td>
<td>None.</td>
<td>Recent overlay. Like new.</td>
</tr>
<tr>
<td><strong>8 Very Good</strong></td>
<td>No longitudinal cracks except reflection of paving joints. Occasional transverse cracks, widely spaced (40') or greater. All cracks sealed or tight (open less than 1/4”).</td>
<td>Recent sealcoat or new cold mix. Little or no maintenance required.</td>
</tr>
<tr>
<td><strong>7 Good</strong></td>
<td>Very slight or no raveling. Surface shows some traffic wear. Longitudinal cracks (open ¼”) due to reflection or paving joints. Transverse cracks (open ¼”) spaced 10’ or more apart. Light or slight crack raveling. No patching or very few patch ins in excellent condition.</td>
<td>First signs of aging. Maintain with routine crack filling.</td>
</tr>
<tr>
<td><strong>6 Good</strong></td>
<td>Slight raveling (loss of fines) and traffic wear. Longitudinal cracks (open ¼” – ½”), some spaced less than 10’. First sign of block cracking. Sight to moderate flushing or polishing. Occasional patching in good condition.</td>
<td>Shows signs of aging. Sound structural condition. Could extend life with sealcoat.</td>
</tr>
<tr>
<td><strong>5 Fair</strong></td>
<td>Moderate to severe raveling (loss of fine and coarse aggregate). Longitudinal and transverse cracks (open ½”) show first signs of slight raveling and secondary cracks. First signs of longitudinal cracks near pavement edge. Block cracking up to 50% of surface. Extensive to severe flushing or polishing. Some patching or edge wedgeing in good condition.</td>
<td>Surface aging. Sound structural condition. Needs sealcoat or thin non-structural overlay (less than 2”).</td>
</tr>
<tr>
<td><strong>4 Fair</strong></td>
<td>Severe surface raveling. Multiple longitudinal and transverse cracking with slight raveling. Longitudinal cracking in wheel path. Block cracking (over 50% of surface). Patching in fair condition. Slight lifting or distortions (1/2” deep or less).</td>
<td>Significant aging and first signs of need for strengthening. Would benefit from a structural overlay (2” or more).</td>
</tr>
<tr>
<td><strong>3 Poor</strong></td>
<td>Closely spaced longitudinal and transverse cracks often showing raveling and crack erosion. Severe block cracking. Some alligator cracking (less than 25% of surface). Patches in fair to poor condition. Moderate lifting or distortion (1” or 2” deep). Occasional potholes.</td>
<td>Needs patching and repair prior to major overlay. Milling and removal of deterioration extends the life of overlay.</td>
</tr>
<tr>
<td><strong>1 Failed</strong></td>
<td>Severe distress with extensive loss of surface integrity.</td>
<td>Failed. Needs total reconstruction.</td>
</tr>
</tbody>
</table>

* Individual pavement will not have all of the types of distress listed for any particular rating. They may have only one or two types.
The La Brea Tar pits in Los Angeles is one of the few natural asphalt places in the world.

Asphalt is a natural substance that has been used since before Roman times. It is sticky and able to bend, stretch and flex without breaking. At air temperature its is very thick, but when heated it becomes thin and easier to use.
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Refined Asphalt

This simplified graphic chart shows the interrelationships of petroleum products, with gasoline, oil, and asphalt flowing from the same oil well.

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Asphalt is a black, cementing material that varies widely in consistency.
asphalts can be separated into two major parts called asphaltene and maltenes.
Asphalt ages, it becomes harder and more brittle and may lose its adhesion or stickiness.
Thus, the secret of ensuring a long service life of asphalt in pavements is to retard the aging process.
Petroleum Asphalt is comprised of two fractional components:

MALTENES and ASPHALTENES.
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94% = Sand & Stone  6% = Liquid Asphalt Binder
An asphalt rejuvenator is a maltene based solution used to prolong the life of asphalt. It restores and preserves the plasticity and durability in asphalt.
Asphalt rejuvenators have the same chemical composition as asphalt minus the asphaltenes.
“It’s important to get the true, maltene-based rejuvenator if a change in binder chemistry is desired.”

Larry Galehouse
Director, National Center for Pavement Preservation
Maltene rejuvenators penetrate the pavement “In-depth” restoring the components lost in production and through the UV action of the sun.
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Benefits of using a Maltene Based Emulsion

- Helps prevent joint deterioration, separation, cracking and raveling.
- Quickly penetrates into the pavement.
- Addresses both lack of density and binder deficiency.
- Treated area becomes less susceptible to water and salt brine intrusion.
- Replaces lost asphalt compounds that are essential for a long service life.
- Is not water soluble and will not flush from the surface.

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An asphalt rejuvenator is much like using a hand cream to keep our skin healthy or using “armor all” to protect your car’s plastic and rubber surfaces.
For a more in-depth look at how an asphalt rejuvenator works please watch the RejuvTec - Schneider Engineering, Shawn Strange, Avon Case Study video on YouTube.

http://www.youtube.com/watch?v=dYIDAA2Ey4k
The U.S. Department of Transportation Federal Highway Administration has a detailed document regarding pavement preservation available on their website.

“Using a rejuvenator on new construction does not seem to be logical at first glance. However, it has been established that the greatest change in composition of an asphalt binder takes place during the manufacture of hot mix asphalt (HMA). Applying a rejuvenator to a new surface a few weeks after it has been laid does several things to the pavement. Besides restoring the original asphalt properties that were lost in the HMA manufacture, the chemical assists in sealing the pavement as well as in improving the durability of the surface course.”

Robert E. Boyer, PhD, PE
What is a Paving Joint?

What causes a Paving Joint deterioration?

Why should we preserve our Paving Joints?

How do we preserve our Paving Joints?
What is a Paving Joint?

A paving joint is the interface between two adjacent and parallel hot-mix asphalt (HMA) mats.

A paving joint is either longitudinal or transverse.
A longitudinal paving joint runs parallel to the roads’ centerline.
A transverse paving joint runs perpendicular to the pavement's centerline or laydown direction.

A transverse paving joint is used when the placement of the asphalt mix is to be suspended for a period of time.
“In recent years, it has become evident how critical longitudinal joint construction is to the life of the pavement structure... Many pavements have been or are in the process of being resurfaced as a direct or indirect result of longitudinal joint deterioration.”

- Kentucky Transportation Center
  College of Engineering, 2002
What causes Paving Joint deterioration?

Air, water and the sun’s UV rays cause the road to oxidize.

Oxidization causes the asphalt to lose the oily resinous of fraction of the hydrocarbon molecules known as bitumen. Thus increasing the viscosity and decreasing the ductility of the asphalt.

Prolonged untreated exposure to these conditions creates small cracks that will eventually lead to larger cracks and potholes. Ultimately resulting in high re-paving costs.
The progressive disintegration of an HMA layer from the surface downward as a result of the dislodgement of aggregate particles.

Raveling occurs when the stone aggregate that was originally part of the pavement begins to break free from its bonds with the asphalt. Typically this tends to occur on older pavements that have already oxidized.

Loss of bond between aggregate particles and the asphalt binder as a result of:
• Dust coating on aggregate particles.
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Why should we preserve our Paving Joints?

- Without proper preservation longitudinal paving joints will crack.
- Over time the small crack will expand to a larger crack.
- The larger crack will form a pothole and thus requiring more repair and more money.

Prevent the pothole, preserve your paving joints.
Benefits of preserving our Paving Joints

Paving joint preservation is the PROACTIVE approach to maintaining our roads.

Timely preservation provides the public with longer lasting smoother pavements.

It reduces costly, time consuming reconstruction and traffic disruptions.
“The agencies that have pursued the traditional ‘worst first’ strategy, giving priority to rebuilding bad pavements, are feeling the budget shortfalls most acutely. Agencies that have given priority to prevention – to keep good pavements in good condition – are in much better shape.”

– Larry Galehouse, Director, National Center for Pavement Preservation
Any agency can afford to implement a pavement preservation program by simply deferring the resurfacing of one or more street and then use that money to fund a pavement preservation program.
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“Top of the Curve” Pavement Preservation

- Very Good
- Good
- Poor
- Very Poor

PCI

Years 1 to 5 then every 4-6 yrs.

Fog Seal REJUVENATORS

Fog Seal COATINGS
- Scrubb Seals
- Sand Seals

Surface Treatments
- Slurry Seals
- Micro-Surfacing
- Chip Seals

Conventional Approach
- Overlay
- Mill & Overlay

Reconstruct/Rebuild

Years 8-12

Yrs. 10-14

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WE CANNOT SOLVE OUR PROBLEMS WITH THE SAME THINKING WE USED WHEN WE CREATED THEM

- Albert Einstein
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Asphalt Preservation Services

Preserving Roads. Conserving Budgets.

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The following photos show treated and untreated surfaces. Note the results of fluxing and consolidation of the surfaces.
Tippecanoe County treated in 2010. Photo taken in 2012.
This picture is proof pavement preservation works. The top lane was treated on 3-1-72 and the picture was taken almost 3 years later. Courtesy of Robert Boyer, PhD, PE
Asphalt rejuvenators can also be used to preserve a road’s rumble strips.
Untreated area shows loss of aggregate and cracking.

Reclamite treated area shows retention of aggregate with surface contact.
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Frank Lloyd Wright, Scottsdale

Osborn Road, Scottsdale, AZ
Paving joint preservation in British Columbia.
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City of Angola
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Greensburg Road, Johnson County

Blue Bluff Road, Morgan County
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Daviess County
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