Indian Health Service
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Asphalt Preservation Solutions

Pavement Deterioration

The three main factors which lead to asphalt deterioration are water, oxidation of the asphalt from sunlight, and traffic. Water is the most common and significant cause of pavement deterioration. Poor drainage and cracks in the asphalt will allow the standing water to penetrate into the subbase. During cold seasons, the freeze/thaw conditions will increase the severity of cracks and ultimately cause pavement/subbase failure.

The types of deterioration that can be observed on pavement are:

- Cracks – separation of the pavement ranging in size from less than ¼-in (low severity) to spalling edges and adjacent cracks (high severity).
- Raveling – loss of aggregate particles due to loss of binding properties of the asphalt from oxidation or wear (traffic, snow removal, etc.).
- Rutting – depression in asphalt from tire wear causing paths of deformation in the subgrade.
- Aggregate polishing – top surface of aggregate particles is polished smooth from traffic creating a slick surface.
- Potholes- severe manifestation of pavement fatigue cracking causing total loss of asphalt surface.

Preservation solutions

The Asphalt Institute identifies five solutions which are readily available to facility managers to maintain and improve the condition of parking lots and roadways as part of a *preventive maintenance program* (Walker, 2013). Depending on the wear of the pavement and severity of deterioration, the facility manager should develop a preventative maintenance schedule using the most appropriate solutions. Solutions should also consider improving site drainage and using sustainable products.

Crack sealing and filling – used on low to medium severity cracks; a hot asphalt mix poured into the crack prevents water and other materials from getting into the cracks and causing further damage to the pavement. Costs can range from $0.90-$18.00/linear foot[1] for full depth crack repair and can extend life for 2-4 years (FP[2], 2013). May need to be scheduled every 1-2 years based on inspection findings.

Fog seals and asphalt rejuvenators – used for minor oxidation, weathering and raveling of asphalt, not appropriate for moderate to severe cracks, raveling, etc. An asphalt emulsion is sprayed onto the surface to prevent further deterioration by sealing micro-cracks preventing water intrusion and improving visual appearance. Costs start around $1.25/square yard. Life maybe extended up to 5 years (FP[2], 2013).

Seal Coats – range from chip seals to slurry seals (mixture of aggregate, filler, water and emulsified asphalt) used on pavement surfaces in good structural condition with low to moderate cracks and raveling, oxidation, and aggregate polishing. Seal coats improve protection from the environment. Costs can range from $2.00 to $6.00/SY. Life may be extended up to 8 years depending on the seal treatment (FP[2], 2013). Seal coats may be

[1] Unit costs based on Portland Area Office estimates

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scheduled every 5-8 years depending on the site conditions and type of seal coat used (FP^2, 2013).

Micro-surfacing – used for medium severity cracking/raveling, minor levelling problems impacting drainage and minor ruts on structurally sound pavements; a mixture of aggregate, filler, water and emulsified asphalt which cures quickly and is spread in a thick layer (up to 1-$^1/_2$"). Costs can range from $3.50 to $6.00/SY. Life can be extended up to 8 years (FP^2, 2013).

Thin hot mix asphalt overlays – used for pavements over 20 years old or low severity rutting, raveling, leveling issues, and loss of friction. A thin layer of asphalt ($^3/_4$" to 1-$^1/_2$") is applied to existing pavement. Overlays add strength, enhance smoothness and friction. Costs start around $18.00/SY. Depending on the pavement condition, life can be extended up to 17 years (FP^2, 2013). Pavement maintenance must still occur at regular intervals.

Table 1 provides a summary of the asphalt preservation solutions discussed.

Resources

There are many resources that are available for identifying pavement issues and asphalt preservation solutions:

- For Pavement Preservation (FP^2) - an organization which promotes preservation practices and techniques across the US. FP^2 offers a comprehensive preservation toolbox online. www.fp2.org
- Pavement Preservation Checklist Series developed by the Federal Highways Administration (FHWA) http://www.fhwa.dot.gov/pavement/preservation/ppcl00.cfm
- Portland Area Asphalt Pavement Maintenance Program 2013 – Area guidance on maintaining pavements. Contact LCDR Krista Pihlaja, P.E., Facilities Management Engineer Consultant at krista.pihlaja@ihs.gov.

Table 1 Summary

Asphalt Preservation Solution	Cycle	Cost
Crack filling, Crack Sealing	Annual	$0.90-$18.00/linear foot
Fog Seals and Rejuvenators	Every 5 years	$1.25/SY +
Seal Coats*	Every 5-8 years	$2.00-$6.00/SY
Micro-surfacing*	Every 5-8 years	$3.50-$6.00/SY
Thin Hot Asphalt Overlay	15-20 years	$18.00/SY+

*Solution selected based on severity of deterioration and repair needs

References:

For Pavement Preservation (FP^2). Pavement life expectancies by technique type. Retrieved December 12, 2013 from http://www.fp2.org/preservation-toolbox/.

Portland Area Office Asphalt Pavement Maintenance Program 2013.

Walker, Dwight (February 27, 2013) "The Importance of Preserving Pavements." Asphalt Magazine. Retrieved December 12, 2013 from http://www.asphaltmagazine.com/news/detail.dot?id=628e8682-610e-4a10-bd09-56d074ca7687.