

Bituminous Pavement Preventive Maintenance Combination Treatment Guidance

MnDOT has been expanding the toolbox of pavement preservation preventive maintenance treatment options in recent years as a result of related research. In consideration of this and maintaining bituminous pavements in good condition at the lowest cost, cape seals (chip or scrub seal topped with microsurfacing) and other combination treatments have been added to the toolbox. Therefore, combination treatments should be considered for bituminous pavements to help extend pavement life and preventive maintenance dollars before performing more expensive pavement minor rehabilitation options such as a thin mill and overlay. These treatments are best suited for pavements mid-range down the deterioration curve. Pavement preservation research has also shown micromilling prior to applying thin bituminous surface treatments and combination treatments is very effective in correcting surface defects, improving ride and extending pavement life at a reasonable cost.

Following is a cost comparison including annualized costs of combination treatments along with traditional mill and overlay. These costs are based on **2022 construction season average bid prices for the treatments only**. It does not include other items such as mobilization, traffic control, pavement markings, or ADA improvements.

Annualized Costs for Preventive Maintenance Bituminous Pavement Treatments

Treatment	Expected Life*	Average Cost/Lane Mile	Average Cost/SY	Average Annualized Cost/Lane Mile
2" Mill and 2" Overlay	8-10	\$56,500	\$8.03	\$6,375
2" Mill and 3" Overlay	10-14	\$80,500	\$11.37	\$6,710
Chip Seal + Slurry Seal	8-10	\$27,000	\$3.84	\$3,000
Scrub Seal + Slurry Seal	8-10	\$27,200	\$3.86	\$3,025
Chip Seal + 1-Lift Micro	8-10	\$27,000	\$3.83	\$3,000
Scrub Seal + 1-Lift Micro	8-10	\$27,200	\$3.86	\$3,025
Chip Seal + 2-Lift Micro	9-11	\$ 40,150	\$5.70	\$4,015
Scrub Seal + 2-Lift Micro	9-11	\$40,350	\$5.73	\$4,035
Chip Seal + 1" Thinlay	9-11	\$47,550	\$6.76	\$4,755
Scrub Seal + 1" Thinlay	9-11	\$47,750	\$6.78	\$4,775
UTBWC	10-14	\$46,465	\$6.60	\$3,875
Micromilling + UTBWC	10-14	\$59,900	\$8.51	\$4,990

Note: * Expected Life – Typical life expectancy of treatment based on experience and research publications.

If ride quality is fair (IRI \geq 95 inches per mile), micromilling would be beneficial to improve both ride quality and performance of the surface treatment by providing a better bonding surface. Micromilling $\frac{3}{4}$ " to 1" at 12 feet wide costs about \$1.93/SY or \$13,600 per lane mile.

ADA Requirements:

Pavement preventive maintenance activities do not require accessibility improvements. However, cape seals and combination treatments are considered alterations by FHWA guidelines that trigger ADA requirements.

When to use what combination treatment:

General:

A cape seal or combination surface treatment should be considered for bituminous pavements lower down on the deterioration curve that are structurally sound but in need of attention. A good candidate pavement for a combination treatment would have an RQI ≤ 2.8 and may exhibit some or all of the following characteristics; low to moderate raveling, low to moderate rutting, moderate to high severity cracking and high surface oxidation.

Chip Seal vs Scrub Seal:

To decide whether it is best to use a chip seal or a scrub seal, look at cracking and surface oxidation. If there is low to moderate severity cracking and pavement is low to moderately oxidized, a chip seal will suffice. The pavement should be crack sealed prior to chip sealing. If there is moderate to high severity cracking or the pavement is highly oxidized, it is best to scrub seal. A scrub seal is intended to treat highly oxidized and cracked pavements that cannot be cost effectively crack filled. Cracks greater than one inch wide should be appropriately pretreated.

Micro-surfacing, Thinlay or UTBWC:

Micro-surfacing – If the bituminous pavement has low to moderate severity cracking with $\leq \frac{1}{4}$ inch rutting and RQI ≤ 2.8 , a cape seal consisting of a chip seal with 1-lift micro-surfacing should perform well. If rutting is $> \frac{1}{4}$ inch or there is higher traffic volumes, then a 2-lift microsurfacing treatment following the chip seal is recommended.

Thinlay – If the bituminous pavement has low to moderate severity cracking with $\leq \frac{1}{4}$ inch rutting and RQI ≤ 2.8 , a chip seal with a one inch thick thinlay should perform well. If rutting is $> \frac{1}{4}$ inch and ride quality is fair (IRI ≥ 95 inches per mile) micro-milling is recommended.

UTBWC – This treatment would be a good option regardless of severity of cracking given the cracks are less than half inch wide and the pavement is structurally sound. The heavy membrane placed with the spray paver should sufficiently fill and seal the pavement cracks while providing a good bond for the UTBWC. If the pavement is highly oxidized, rutting is $> \frac{1}{4}$ inch or ride quality is fair (IRI ≥ 95 inches per mile) micro-milling is recommended.

Pavement Marking Considerations:

In general, a combination treatment would not create any unusual conditions impacting the placement of pavement markings. The final surface of a combination treatment would be a slurry seal, micro surfacing, thinlay or UTBWC. These surfaces don't typically have issues of gumming up the grinding head for ground-in markings like chip or scrub seals. It is also possible to put down latex stripping and follow up with a District striping contract at a later date or following year.

This document may be found on both the MnDOT [Bituminous Engineering](#) and [Pavement Preservation](#) web pages.

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