

ESTIMATED RANGE OF BASES & ASPHALT THICKNESSES USED IN NEW ENGLAND

Introduction

○ The following discussion attempts to quantify and estimate the life of the various treatments used to maintain roads.

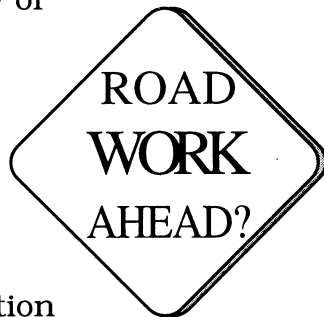
○ For a more specific description of what the seal coats involve in terms of construction procedure and materials used, refer to the list of standard definitions for seal coats attached.

○ Only the seal coats commonly used in New England are discussed here. Unique application practice common only to a smaller geographical area does exist but space limits their description.

Estimating Service Life

The service of maintenance treatments are difficult to estimate, as there are several variable factors that significantly affect their durability or performance.

Space limits comprehensive discussion on all these factors, but the primary ones must be taken into consideration when choosing these treatments. They are: TRAFFIC, DRAINAGE, CONDITION OF EXISTING ROAD AND STRUCTURAL TREATMENT, and of course ENVIRONMENTAL FACTORS (degree of frost and winter elements). The service lives estimated below, therefore, reflect these conditions. It would not be uncommon, however, for an application to fall outside these ranges and yield a longer or shorter life depending on how favorable or unfavorable the conditions described above sum up.



Selecting Most Economical Treatment



It is unfortunate that more precise, quantified cost vs. service life data does not exist for easy reference. The variables described above make such attempts difficult.

The generalities of the cost for anything hold true, however, in that the most costly treatments do provide better service performance and are more durable.

One characteristic, however, that greatly affects the service life and performance is loss of crown and/or extensive rutting in the wheel paths, in short anything that ponds water on the surface. Liquid asphalt seal coats are generally thin uniform layers and do not correct this without preleveling that restores the crown and provides good drainage characteristic of the surface. Traffic is probably the next most significant factor to consider in evaluating which is the most cost effective treatment.

Pavement Rehabilitation Treatments

Treatment	Conditions For Use	Performance	Expected Life
.....			
Crack sealing	<ul style="list-style-type: none"> * Low-severity distresses & cracks * Infrequent cracks or ravelling failed seals 	<ul style="list-style-type: none"> * Seals out water * Retards development of cracks and potholes 	2 -5 years
Surface treating	<ul style="list-style-type: none"> * Low-severity distresses & cracks * Infrequent cracks or ravelling 	<ul style="list-style-type: none"> * Seals out water * Retards development of cracks and potholes 	3 -5 years with crack sealing
Slurry seal	<ul style="list-style-type: none"> * Low-severity distresses & cracks * Infrequent cracks or ravelling 	<ul style="list-style-type: none"> * Seals out water * Retards development of cracks and potholes 	3 -5 years with crack sealing
Micropave	<ul style="list-style-type: none"> * Low-severity distresses & cracks * Infrequent cracks or ravelling * Medium severity wheelpath rutting 	<ul style="list-style-type: none"> * Seals out water * Retards development of cracks and potholes * Restores cross-section * Requires crack sealing maintenance 	4 -7 years with crack sealing
Single-course overlay (1 - 1 1/2")	<ul style="list-style-type: none"> * Low-severity cracking * Infrequent cracks, heaves, ravelling * Medium severity wheelpath rutting 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Require early crack sealing maintenance 	8 years with crack sealing
Cold Mill and replacement (1 1/2")	<ul style="list-style-type: none"> * Low-severity cracking * Infrequent cracks, heaves, ravelling * Medium severity wheelpath rutting 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Requires early crack sealing and maintenance 	8 years with crack sealing
Two-course overlay (3")	<ul style="list-style-type: none"> * Medium-severity cracking * Infrequent cracks, heaves, ravelling * High-severity wheelpath rutting 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Adds structural capacity * Requires early crack sealing and maintenance 	15 years with crack sealing
Cold recycle with seal or single overlay (3 1/2 - 4 1/2")	<ul style="list-style-type: none"> * Medium-severity cracking * Infrequent cracks, heaves, ravelling * High-severity wheelpath rutting * Acceptable mix and depth to recycle 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Adds structural capacity * Requires early crack sealing and maintenance * Surface treated surfaces should be resealed every 3 to 5 years 	10 -15 years with sealing and crack sealing

Pavement Rehabilitation Treatments

Treatment	Conditions For Use	Performance	Expected Life
.....			
Multiple-course overlay (≥4")	<ul style="list-style-type: none"> * High severity distresses * Infrequent settlements and heaves * High severity cracking and wheelpath rutting 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Adds structural capacity * Requires early crack seal and maintenance 	15 years with crack sealing
<hr/>			
Cold mill with multiple course overlay (≥4")	<ul style="list-style-type: none"> * <i>High severity distresses</i> * <i>Infrequent settlements and heaves</i> * <i>High severity cracking and wheelpath rutting</i> 	<ul style="list-style-type: none"> * <i>Restores ride and cross-slope</i> * <i>Adds structural capacity</i> * <i>Requires early crack seal and maintenance</i> 	15 years with crack sealing
<hr/>			
Cold recycle with multiple course overlay (6")	<ul style="list-style-type: none"> * High severity distresses * Infrequent settlements and heaves * High severity cracking and wheelpath rutting * Acceptable mix and depth to recycle 	<ul style="list-style-type: none"> * Restores ride and cross-slope * Adds structural capacity * Requires early crack seal and maintenance 	15 years with crack sealing
<hr/>			
Full depth reclamation with overlay (≥8")	<ul style="list-style-type: none"> * <i>High severity distresses</i> * <i>Infrequent settlements and heaves</i> * <i>High severity cracking and wheelpath rutting</i> 	<ul style="list-style-type: none"> * <i>Restores ride and cross-slope</i> * <i>Adds structural capacity</i> * <i>Requires early crack seal and maintenance</i> 	15 years with crack sealing
<hr/>			
Removal and reconstruction	<ul style="list-style-type: none"> * High severity distresses * Existing pavement has poor grade, rutting, frost heaves, and drainage problems 	<ul style="list-style-type: none"> * Ride and structural capacity of new pavement * Improved drainage and mitigation of frost problems * Must crack fill to achieve service life 	15 years with crack sealing

LOW/LIGHT

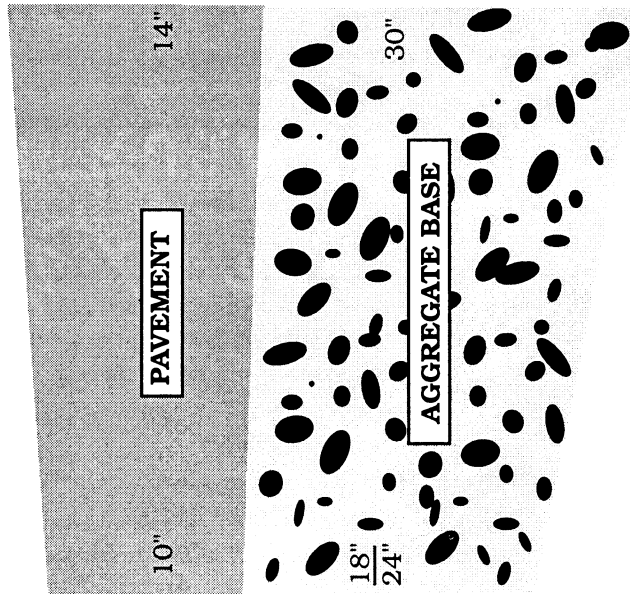
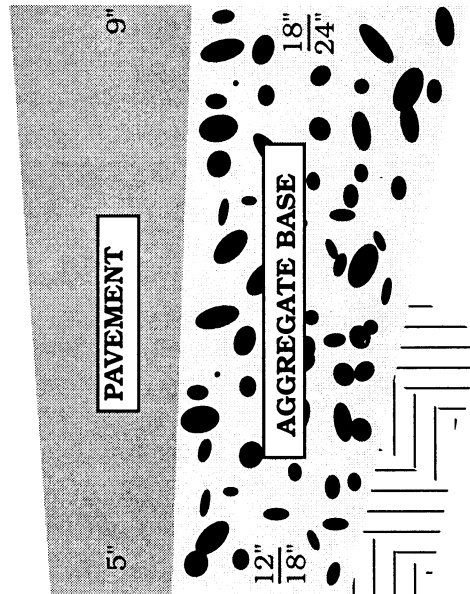
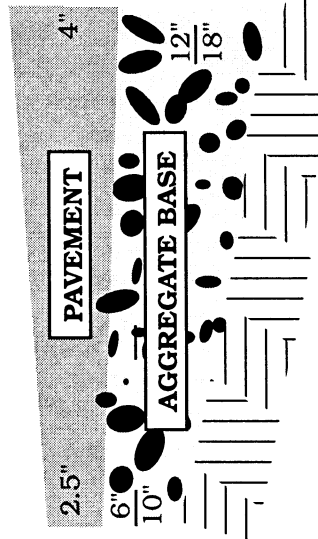
TRAFFIC VOL./WT.

HIGH/HEAVY

Light Duty
Residential
Several Trucks

Medium Duty
Busy Residential-Arterials
Moderate Truck Volume
Busy City Streets
Secondary Highways

Heavy Duty
Interstate-Primary
Industrial Roads
Many Trucks



SUBGRADE
OR NATIVE SOIL

LOW FROST
STRONGER

HIGH FROST
WEAKER

Application Description

(including total quantity of asphalt and aggregate material)

Sand Seal

Yields a thickness about 3/16" thick or 18 to 25 lb/yd²

Slurry Seal Coat

Single 1/8" thick = 12 lb/yd²
Double 1/4" thick = 25 lb/yd²

(A speciality contractor must apply it)

Aggregate or Chip Seals

3/8" thick
3/8" chips
1/4" thick uses 3/16" to 5/16" chips, 25 to 35 lb/yd²

Comments on Performance

(advantages and disadvantages)

Generally this is the **lowest initial cost** type of seal coating application. It seals only and does not add structural strength, does not level, smooth or correct crown significantly unless preleveling is done first. The **average service life is 3 - 6 years**. The main advantage is that it can be done with local labor and sometimes aggregate. Castings are not generally adjusted. Application is dusty and best restricted to low volume/low speed roads.

Moderate to higher initial cost application due to full contract required. Main advantage quicker, neater application, castings generally do not need adjustment and should be applied in good low humid weather. Average life, **single application life 3-5 years. Double application 5-8 years**, provides smooth tight surface similar to hot mix. Good for low and moderate volume roads; not recommended for high volume roads.

Low to moderate initial cost depending on how much local labor and aggregate sources are used. Castings generally are not adjusted, a good chip seal provides excellent skid resistance and can provide attractive color by choice of stones. The **average life is 5-8 years**. Exceptionally good ones have gone much longer. The 3/8" - 1/2" chip seal is the most common seal coat treatment used in New England.

Hot Mix
Defined:

(Hot Mix Or Asphalt Concrete) - High quality, thoroughly controlled hot mixture of asphalt cement and well-graded, high quality aggregate, thoroughly compacted into a uniform dense mass.

Thin Hot Mix Overlay

1/2" to 3/4" considered sealing and ride improvement. Little structural improvement under 1", 55 to 110/yd² is general coverage for 1/2" to 1" thickness.

The **higher cost** thin hot mix overlays (less than 1" thick) are also considered as sealing treatments primarily and not structural improvements. They also smooth the surface quite a bit; very rough surfaces need to be pre-leveled or mix will apply poorly and mat will have to be thickened. Thinner treatments used on lower volume roads in better shape, thick treatments on higher volume roads and rougher surfaces. Multiple treatments, if applied in timely stages, can add strength. Care must be taken that these relatively stiff treatments are not put on roads that are in need of significant structural upgrading as larger deflections will cause the surface to crack. The **average life is 6-12 years**.

Application Description

Thick Hot Mix

1 1/2" - 2" thick =

Structural overlay and also seals.

Probably the most common rehabilitation treatment used in New England.

1 1/2" to 2" of Hot mix =

165 lbs/yd² to 220 lbs/yd².

Comments on Performance

The 1 1/2" to 2" overlay not only seals but adds significant structural capacity **often doubling or tripling capacity** (depending on existing thickness). It seals, smooths the ride and corrects crown and drainage features substantially. Extra rough roads may require pre-leveling in applying an 1 1/2" overlay. It is the highest form of maintenance and upgrading of treatments listed here, **average life 15 - 20 years on high volume roads, longer on lower volume roads.**

Cold Mix Defined:

Asphalt mixes that use liquidified cutbacks and emulsified asphalts so they can be mixed cold, either through a plant or in the grade using graders or travel mixers are often called maintenance mix, stockpile mix, cold-mix or a combination of all three. Cold mix is less costly than hot mix as local labor and aggregate can be used. *Requires substantial material knowledge and handling expertise to use successfully.*

Cold Mix Overlays and Maintenance Applications

Usage and quantity applications similar to hot mix applications noted above, except it is not recommended to use cold mix in thin layers as an exposed surface coat.

Due to the fact that cold-mixes use cutbacks or emulsions, they are not considered as high a type pavement material as hot-mix asphalt concrete for a surface course. Cold-mix durability, in particular its ability to seal, (most cold-mix can be used to level and strengthen) is difficult to predict as precisely as hot-mix. Most cold-mix is sealed with a seal coat before or immediately following in winter. Exceptions exist and local experience and practice must be consulted.

This Tech Note was provided by Robert Joubert of The Asphalt Institute. Appreciation is also extended to Robert Christman, Vanasse Hangen Brustlin, for his editorial help.

Page 6

Summer 1996

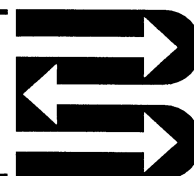
Baystate Roads Program
Department of Civil & Environmental Engineering
University of Massachusetts
214 Marston Hall
Amherst, MA 01003-5205

Non-Profit Organization
U.S. Postage Paid
Permit No. 2
Amherst, MA 01002

Here is your copy of Tech Notes for your Resource Notebook!



Massachusetts Highway Department
Federal Highway Administration
University of Massachusetts/Amherst



UPDATE ON TECH NOTE NO. 10
Estimated Range of Bases & Asphalt Thicknesses Used in New England

Our apologies for not crediting the Cornell Local Roads Program for its contribution to the recent Tech Note - it was an oversight on our part.

We've had some discussion on the expected life values mentioned on pp. 2-3 of Tech Note No. 10. Several experts in the field believe the expected life of pavement numbers given in the tech note may be overly conservative. Please understand when using figures that pavement life will vary (often greatly) depending upon the volume of traffic, quality of work, maintenance, weather, and other factors. The pavement life on your roadways can be longer than our estimates.