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16. Abstract

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The indirect tensile test was used under various testing conditions to develop a deterioration curve for stripped pavement layers based on data from three field projects. The procedure will be valuable because it makes possible the evaluation of individual layers of asphalt, whereas for in situ strength tests such as those provided by deflection devices that employ dynamic field measurements, the asphalt layers are evaluated as a whole. Criteria defining minimum strengths necessitating removal are suggested. It is realized that these strength values may have to be changed as experience with the evaluation procedure is gained.

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FINAL REPORT

ASSESSMENT OF STRIPPED ASPHALT PAVEMENT

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(A Cooperative Organization Sponsored Jointly by the
Virginia Department of Transportation and
the University of Virginia)

In Cooperation with the U.S. Department of Transportation
Federal Highway Administration

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ABSTRACT

Many miles of stripped pavement need to be restored to a serviceable condition, but there is no accepted procedure to determine whether the pavement should remain in place or be removed during the rehabilitation process. This report describes the attempt to develop a methodology that employs a quantitative test to evaluate pavement layers.

The indirect tensile test was used under various testing conditions to develop a deterioration curve for stripped pavement layers based on data from three field projects. The procedure will be valuable because it makes possible the evaluation of individual layers of asphalt, whereas for in situ strength tests such as those provided by deflection devices that employ dynamic field measurements, the asphalt layers are evaluated as a whole. Criteria defining minimum strengths necessitating removal are suggested. It is realized that these strength values may have to be changed as experience with the evaluation procedure is gained.

FINAL REPORT

ASSESSMENT OF STRIPPED ASPHALT PAVEMENT

G. W. Maupin, Jr.

INTRODUCTION

Stripping of asphalt pavement, which is the loss of cohesive and/or adhesive strength in the presence of moisture, has been recognized as a major cause of pavement distress (1). Prior to pavement rehabilitation, decisions must be made concerning whether the deteriorated stripped material should be removed to ensure that the new pavement will attain its anticipated life.

Considerable research has been directed toward the prediction and prevention of stripping, but little has been done in the evaluation of stripped pavement. Because of its simplicity, the most common method of evaluation is visual inspection of pavement samples for the degree of stripping; however, the reproducibility of the results is very poor. Although quantitative measurements such as tensile strength and tensile strength ratios have been used with limited success to determine the degree of damage, more thought needs to be directed toward their use and interpretation. There are many stripped pavements that need to be rehabilitated, and there is a definite need for a reliable method of evaluation. The objective of this investigation was to develop a method to evaluate stripped pavement.

METHODS

Indirect tensile strength is the quantitative measure that is used most often to evaluate new asphalt mixtures for potential stripping, and it is a suitable choice for the evaluation of stripped pavements; however, the interpretation of tensile strength measurements is even more critical in the case of rehabilitation assessment, and it needs to be refined.

The relationship between strength and age needs to be understood before a methodology can be developed. As pavements age, they stiffen, primarily because of asphalt hardening, and their strength increases (curve 1 in Figure 1). Lottman (2) found that pavements that strip tend

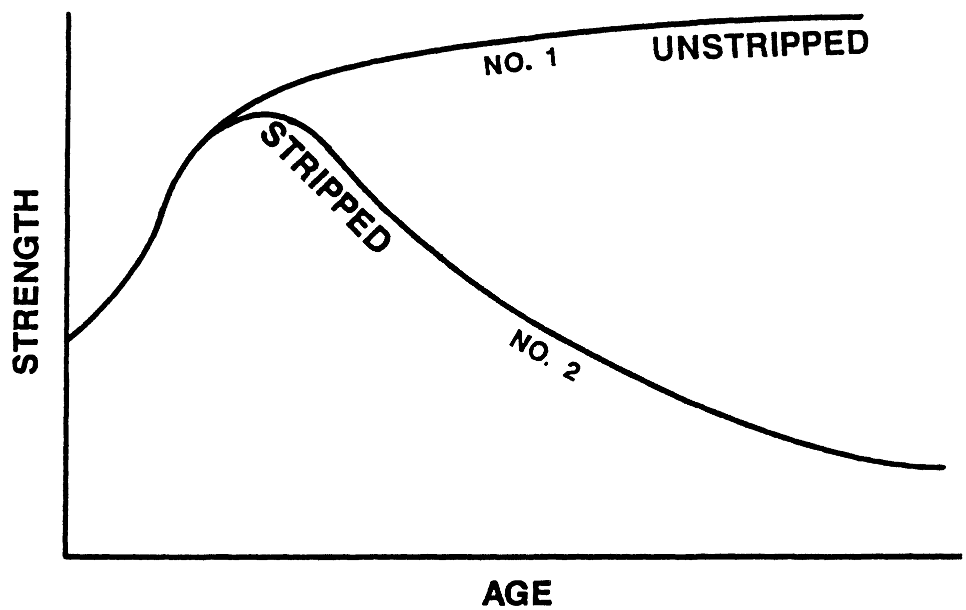

Figure 1. Strength vs. age of pavement.

to strengthen for a short period of time and then to weaken because of stripping (curve 2). In order to measure the degree of damage, it is necessary to measure the present strength and the strength of the material as if stripping had not occurred. The ratio of the present strength to the unstripped strength (tensile strength ratio, TSR) should give a measure of the damage in the pavement attributable to stripping alone. It is not a problem to remove cores and test them immediately to determine the present strength; it is more difficult to determine the unstripped strength of the asphalt concrete. An attempt can be made to duplicate the unstripped strength (1) by drying cores and (2) by reheating cores and remolding them into fresh specimens.

It is also important to know if stripped pavements are expected to continue to deteriorate. The future condition of pavements can be estimated by testing conditioned cores. The conditioning process, which will be explained later, is expected to create the maximum stripping damage that will occur in the future. The conditioned strength and the TSR should indicate the future serviceability of the pavement.

Three field projects containing stripped layers were chosen for the determination of the various strength parameters used to evaluate the layers. The strength parameters were compared to strength measurements made with the Dynaflect device, previous test results, and general observations of the pavement condition to determine the potential usefulness of the procedure. A description of the test method is included in the Appendix A.

Pavements Tested

The three field projects on I-81 (Rockbridge County), I-64 (Goochland County), and Greenwood Drive (Portsmouth) are described below.

I-81 (Rockbridge County)

This project was located in the southbound traffic lane (SBTL) from 2 miles north of Route 606 to Route 606. The pavement was composed of 9 in of select material, 6 in of crushed stone base, 7.5 in of asphalt base mixture (B-3), 1.2 in of intermediate mixture (I-2), 0.9 in of surface mixture (S-5), and an overlay of 0.75 in of porous friction course (S-8) (Table 1).

Table 1

Mixture Design Gradations: Percentage Passing Sieve*

	Mixture Type			
Sieve	Surface (S-5)	Intermediate (I-2)	Base (B-3)	Porous Friction Course (S-8)
1 1/2			100	
1		100		
3/4			73-85	
1/2	100			100
3/8		63-77		85-100
4	53-67	43-57	38-48	15-32
8			28-35	0-7
30	19-27			
50		6-14		
200	4-8	2-6	2-6	0-0.5

*S-5, I-2, B-3, and S-8 are surface, intermediate, base, and porous friction course mixtures, respectively.

General deterioration necessitated that rehabilitation be undertaken. Approximately 4.5 in of asphalt concrete was milled, and then Dynaflect tests were performed under the direction of K. H. McGhee of the Virginia Transportation Research Council to determine if additional material needed to be removed and replaced to achieve the necessary structural strength. This was an excellent project for the subject investigation because the structural strength of the asphalt concrete as determined by Dynaflect tests could be compared to the strength as determined by the indirect tensile tests.

I-64 (Goochland County)

In this project, the tests were performed on the eastbound (EBTL) and westbound traffic lanes (WBTL) of a 12-mile section between Routes 605 and 522. The structural cross section was composed of 6 in of soil cement, 8 in of stone base, 7.5 in of asphalt base (B-3), 1.2 in of intermediate mixture (I-2), and 0.9 in of surface mixture (S-5) (Table 1). A slurry seal and various combinations of fabric and overlays ranging from 160 to 250 lb/yd^2 had been added.

A similar study had been performed on this section of pavement in 1978 prior to overlaying (3); therefore, previous strength data from indirect tensile tests and Dynaflect data were useful for the present investigation.

Greenwood Drive (Portsmouth)

This 1,000-ft project was in the WBTL near the commuter parking lot at the intersection of I-264. The project was a former test section used in NCHRP Project 4-8(3) to evaluate a stripping test developed by Lottman (4); therefore, a great deal of useful test information was available. The structural cross section was composed of 6 in of cement-stabilized subgrade, 6 in of crushed stone, 5.5 in of intermediate mixture (I-2), and 1.5 in of surface mixture (S-5) (Table 1).

Core Preparation

Fifty to sixty 4-in cores were removed from each section, grouped as follows, and tested:

1. dried (dried until moisture loss ceased)

2. remolded

3. present (as soon after removal as practical)

4. conditioned (Root-Tunnicliff procedure) (5).

Approximately 10 cores were selected randomly for each group. Additional cores were also taken to test for moisture content and maximum specific gravity.

After removal from the roadway, the cores were immediately wrapped in plastic wrap and secured with tape to prevent the escape of moisture. It was important that the cores, particularly the group representing the present condition, remain wrapped to prevent the loss of moisture, which could result in healing and a gain in strength.

Dried Cores (Unstripped Condition)

The group of cores that were tested in a dry condition were dried in the laboratory until the moisture loss ceased, and then they were tested; however, it was evident that considerable moisture remained in some cores. The lack of the complete removal of moisture probably affected the strength results.

Remolded Cores (Unstripped Condition)

The cores that were to be remolded were heated to 275°F, remixed, and compacted with a Marshall hammer using a compactive effort to duplicate the VTM of the pavement cores. The compactive effort was established by using several compactive efforts to compact several trial specimens. The average thickness of the layer under investigation was the desired thickness of the remolded specimens. It was not possible to remold the base mixtures into 4-in specimens because of the large aggregate they contained.

Conditioned Cores (Future Condition)

The set of cores that were used to predict the future strength were conditioned according to the stripping procedure described in NCHRP Report No. 274 (5). The first step of the procedure consisted of applying a vacuum to the specimens while they were immersed in water until water occupied 55 to 80 percent of the air voids (voids total mix, VTM). The quantity of water determined to be in the cores after the application of the vacuum was corrected by the value of the original average moisture content of the cores, which was calculated from a specified separate group of cores. Then the cores were soaked in a 140°F water bath for 24 hr before the indirect tensile test was performed.

Tests

The test results yielded strength and TSR values, which were used to assess and refine the test method. Dynaflect tests were also performed on two of the sections, I-81 and I-64, to help verify that TSR is a relative measure of the stripping damage present in pavements.

Indirect Tensile Test

The indirect tensile test was performed according to the procedure described in NCHRP Report No. 274 (5). The specimens were loaded diametrally at a deformation rate of 2 in per min at a temperature of 77°F. The tensile strength was computed from the formula:

$$\sigma = \frac{2P}{\pi t D}$$

where: σ = indirect tensile strength (psi)

P = maximum applied load (lb)

t = thickness of specimens (in)

D = diameter of specimen (in).

Dynaflect Test

Pavement deflection measurements were made with a Dynaflect device, which applies a steady-state harmonic load to the pavement through two 4-in wide steel wheels with a 16-in diameter spaced 20 in apart. The peak-to-peak deflections were measured by using five geophones located midway between the two steel wheels and at four other locations 1 ft apart. The results were used to determine the strength equivalent, a relative measure of pavement strength in terms of new undamaged asphalt concrete. It was assumed that the strength equivalent of newly constructed asphalt concrete, soil cement, select material, and stone base was 1.0, 0.4, 0.2, and 0.35, respectively (6). The average strength equivalent of each section was computed from measurements taken at 100-ft intervals.

RESULTS

One of the methods used to examine the existing and potential future damage to a pavement layer was to plot an estimated deterioration curve using the measured strength values. At the time of coring (see curve 1 in Figure 2a), the unstripped strength was estimated using dried or remolded cores. The unstripped strength includes the effects of aging and traffic compaction; therefore, it is much higher than the strength immediately after construction. The present strength, which was obtained by testing cores in the same condition as upon removal from the pavement, was represented by a corresponding point on curve 2 in Figure 2a. The minimum strength the pavement layer will reach in the future was estimated by the accelerated conditioning (see Figure 2b). The development of these three strengths--unstripped, present, and future--into a deterioration curve (see Figure 2c) allows the investigator to visualize the deterioration the pavement has undergone and what it may undergo in the future. In the following discussion, the terms unstripped, present, and future refer to the points on the applicable deterioration curve.

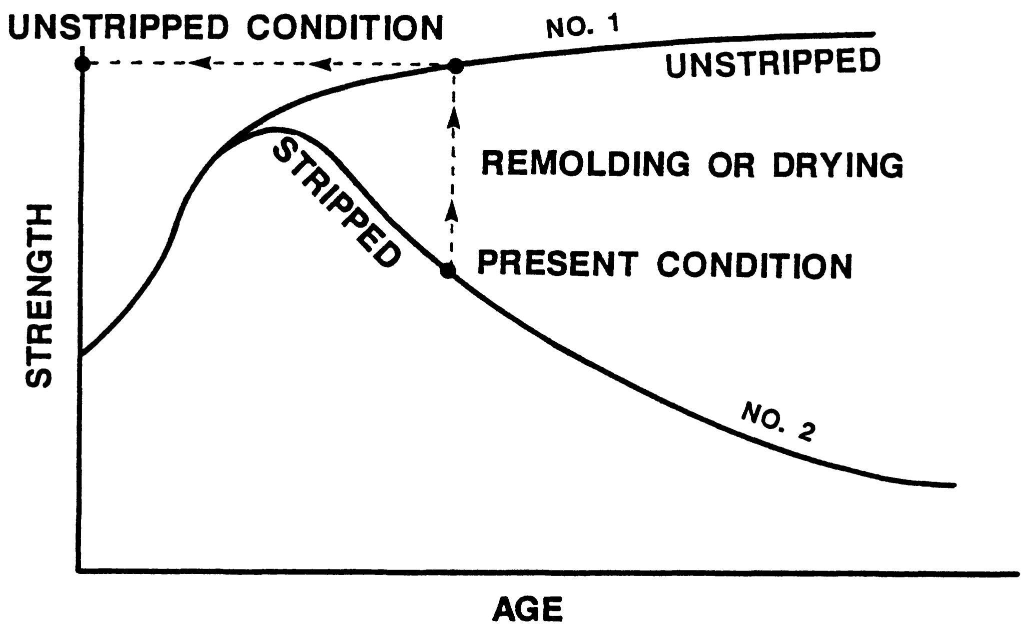

Figure 2a. Development of deterioration curve (present and unstripped conditions).

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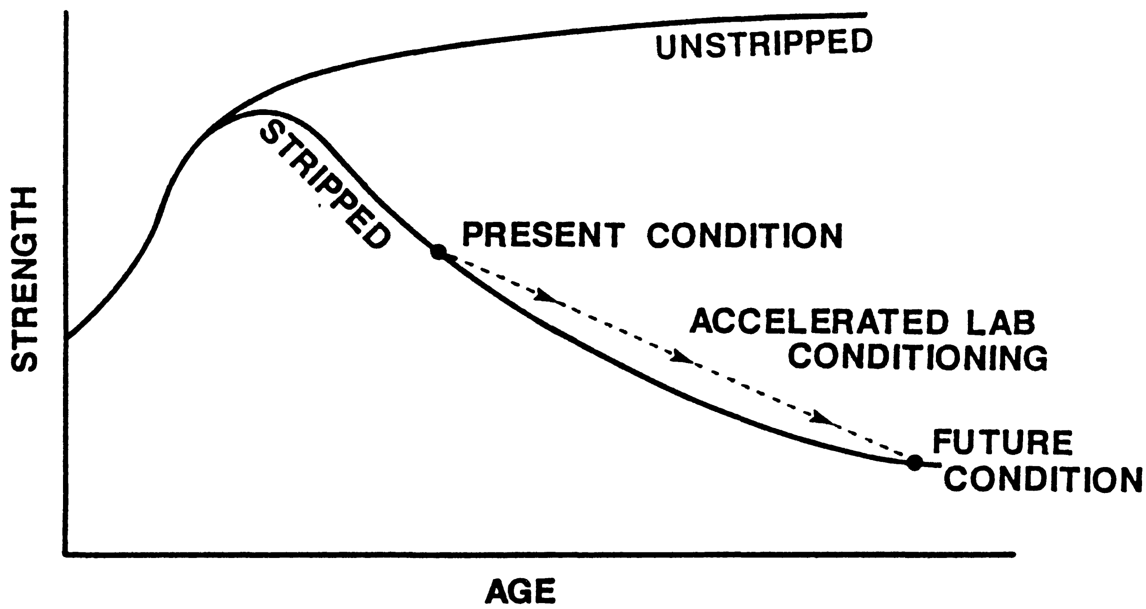

Figure 2b. Development of deterioration curve (present and future conditions).

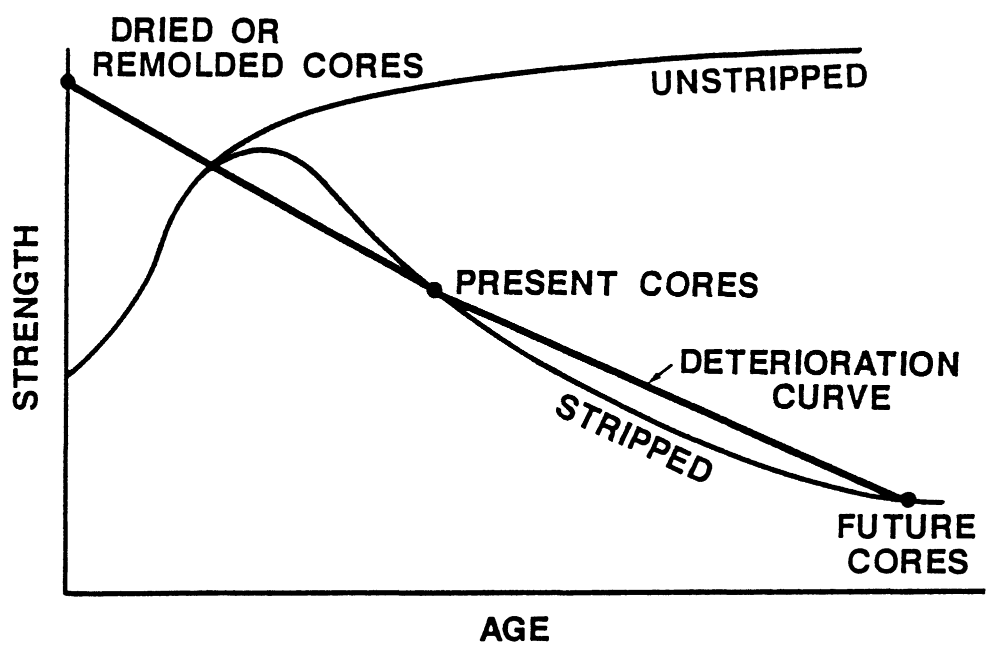

Figure 2c. Deterioration curve.

The TSR gives the investigator an indication of the relative strength of the asphalt concrete when it is compared to undamaged asphalt concrete. It was compared to the strength equivalent of the pavement layer computed from Dynaflect data. The individual test results for tensile strength and the TSR of the three projects are listed in Table 2.

Table 2

Indirect Tensile Test Results*

		Tensile Strength (psi)					
		Unstripped			Future	TSR**	
Route	Mixture	Remolded	Dried	Present	Conditioned	Present	Future
I-81	S-5	229	184	85	77	0.37	0.34
	I-2 Limestone	175	106	88	72	0.50	0.41
	I-2 Quartzite	187	84	82	83	0.44	0.44
	B-3	-	106	48	33	0.45	0.31
I-64 (EBTL)	I-2	224	125	39	30	0.17	0.13
	B-3	-	110	62	42	0.56	0.38
I-64 (WBTL)	I-2	195	227	61	41	0.31	0.21
	B-3	-	121	78	44	0.64	0.36
Greenwood Drive	I-2	134	85	74	52	0.55	0.39

*TSR = Present or future strength/remolded strength; S-5, I-2, and B-3 are surface, intermediate, and base mixtures, respectively; EBTL = eastbound traffic lane; WBTL = westbound traffic lane.

**Based on remolded strength except for base mixture, which is based on dried strength.

I-81 (Rockbridge County)

The four layers of asphalt that were analyzed were (1) surface (S-5), (2) base (B-3), and (3 & 4) two distinct layers of intermediate mixture (I-2): one contained limestone aggregate and the other contained quartzite aggregate.

Figures 3 and 4 illustrate the estimated deterioration of the various layers. In all cases the remolded strength was higher than the dry strength, as anticipated. Past experience indicates that it is difficult to heal the stripping damage completely by a simple drying process. Although the remolding process produces a higher strength, one disadvantage of the process is the increase in the fracture of the aggregate by the compaction process.

The layers of S-5 and I-2 had similar estimates of deterioration. Although the unstripped strength of the S-5 was slightly higher than that of either I-2 layer, the present and future strengths were not significantly different. According to the predicted future strengths, the expected deterioration will not progress significantly in the future for these layers. The present strengths are higher than 80 psi, which is usually considered adequate. The Georgia DOT considers pavements with strengths less than 40 psi to warrant consideration for removal (7). The present strength of the S-5 mix was 37 percent of its original strength, i.e., TSR = 0.37, which does indicate a considerable loss of its original strength. The past experience of the author indicates that removal of pavements with a TSR of less than 0.3 should be considered.

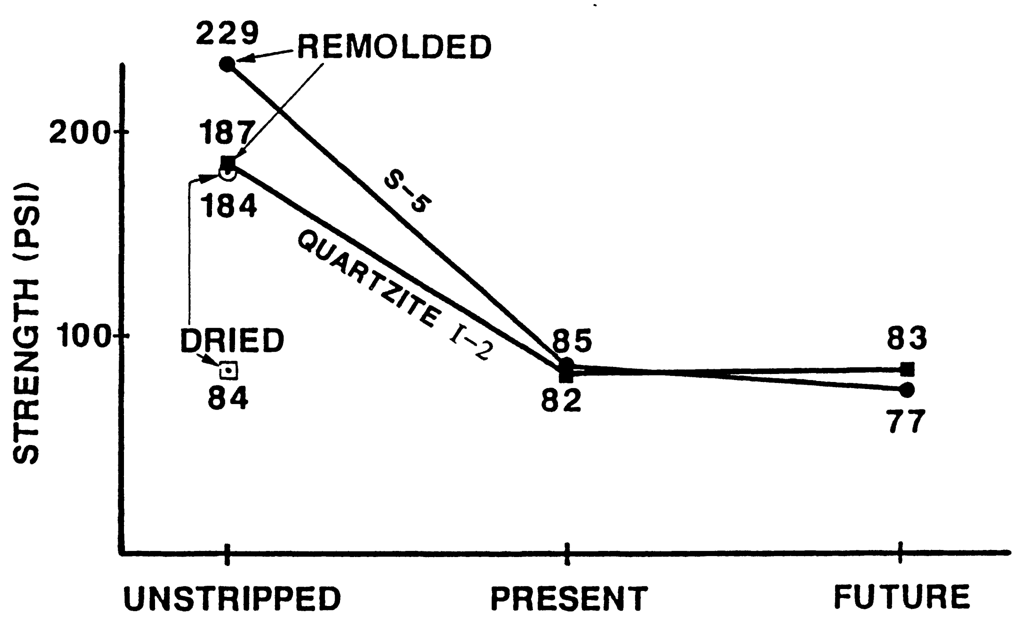

Figure 3. Deterioration curves for I-81.

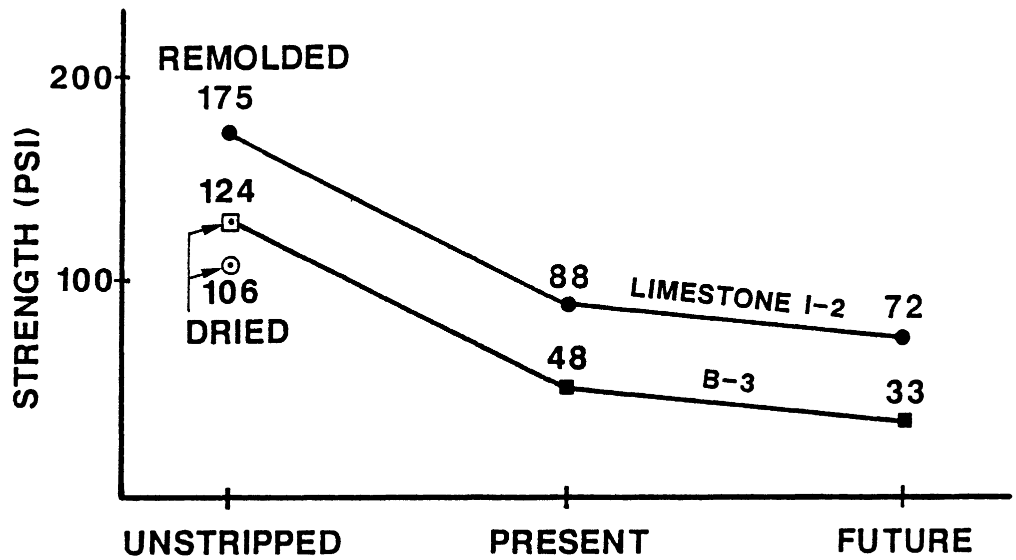

Figure 4. Deterioration curves for I-81.

The present strength of the B-3 layer was less than that of the other layers, and the future predicted strength was only 27 psi, which was considerably below the 40 psi minimum suggested by the Georgia DOT.

Dynaflect measurements indicated a strength equivalent of 0.29 for the combined layers of asphalt concrete, i.e., the asphalt was contributing only 29 percent of the strength of undamaged asphalt concrete. The weighted average present tensile strength ratio of the asphalt layers was 0.44, which was higher but compares favorably with the Dynaflect strength equivalent.

An independent decision by McGhee based on Dynaflect data and current traffic loads was to remove at least 6.5 in of asphalt, which included approximately 2.0 in of the B-3 layer. Although tensile strength data indicated that the entire B-3 layer was weak, the removal and replacement of only 2.0 in of the B-3 layer strengthened the pavement structure sufficiently for the designed traffic load. The indirect tensile strength data did confirm that it was advisable to remove some of the weak B-3 and replace it rather than pave on top of it.

I-64 (Goochland County)

The intermediate mixture layer (I-2) and base layer (B-3) were tested on this project in both the EBTL and WBTL.

The estimated deterioration, illustrated in Figures 5 and 6, indicates that the strength of the EBTL was less than the strength of the WBTL, and similar measurements performed in 1978 demonstrated the same trend. It will be shown that the Dynaflect measurements substantiated the same trend. The present strength of the I-2 mix from the EBTL was only 17 percent of its unstripped (remolded) strength, and the present and future strengths were less than the suggested 40 psi; therefore, the I-2 mixture layer should be removed in the rehabilitation. Although the strength of the I-2 in the WBTL may be questionable, it appears that neither it nor the strength of any of the other mixtures will drop below the suggested 40 psi level.

Dynaflect measurements indicated that the strength equivalents of the combined layers of asphalt in the EBTL and WBTL were 0.30 and 0.46, respectively. There were no strength data for the S-5 and I-2 overlay; therefore, a weighted TSR could not be computed for the total asphalt thickness; however, when values were estimated by visual assessment for the S-5 and I-2 layers, it appeared that the present TSR based on remolded cores was slightly higher than the comparable value of the strength equivalent calculated from Dynaflect measurements (see Table 3). This trend is similar to the trend found for the I-81 project.

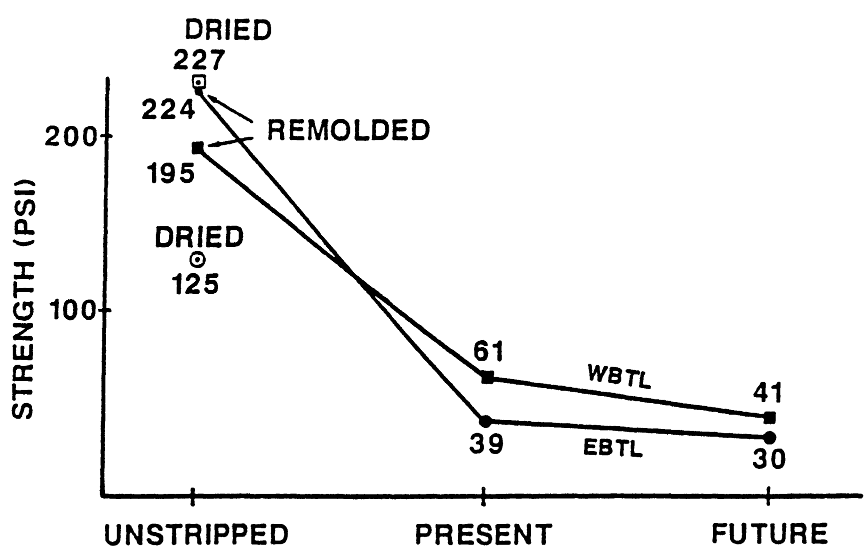

Figure 5. Deterioration curves for I-2 mix on I-64.

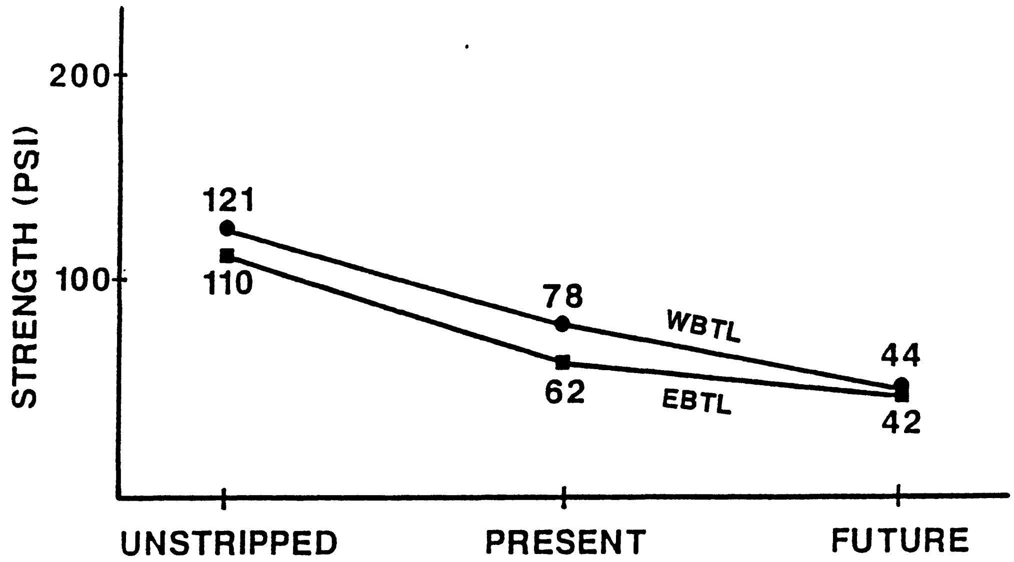

Figure 6. Deterioration curves for B-3 mix on I-64.

Table 3

Strength Equivalent vs. TSR*

Route	Mixture	Strength Equivalent	TSR
I-81	All asphalt concrete layers	0.29	0.44**
	S-5	-	0.37
	I-2 (Limestone)	-	0.50
	I-2 (Quartzite)	-	0.44
	B-3	-	0.45
I-64 (EBTL)	All asphalt concrete layers	0.30	0.46**
	I-2 Overlay	-	0.30***
	S-5	-	0.30***
	I-2	-	0.17
	B-3	-	0.56
I-64 (WBTL)	All asphalt concrete layers	0.46	0.53**
	I-2 Overlay	-	0.30***
	S-5	-	0.30***
	I-2	-	0.31
	B-3	-	0.64

*TSR = Present strength/remolded or dried strength; S-5, I-2, and B-3 are surface, intermediate, and base mixtures, respectively; EBTL = eastbound traffic lane; WBTL = westbound traffic lane.

**Calculated weighted average of individual layers.

***Assumed values based on visual assessment.

The deterioration curve not only points out that the EBTL was weaker than the WBTL, but it indicates that the weakest layer is the I-2 layer. The Dynaflect device also determined that the EBTL was weaker than the WBTL, but it could not specify the layers that were weak.

Greenwood Drive (Portsmouth)

The bottom half of the 5.5-in layer of I-2 was tested because the same layer was tested in the previous NCHRP study (3).

The estimated deterioration curve is shown in Figure 7. The present and future strengths are greater than the 40 psi minimum value suggested by the Georgia DOT. The predicted TSR of the cores shortly after construction was 0.51, which compares favorably with the present TSR based on remolded strength, which was 0.55 (Figure 8). The future TSR is predicted to decrease to 0.39; however, this decrease may not occur because the traffic volume is low.

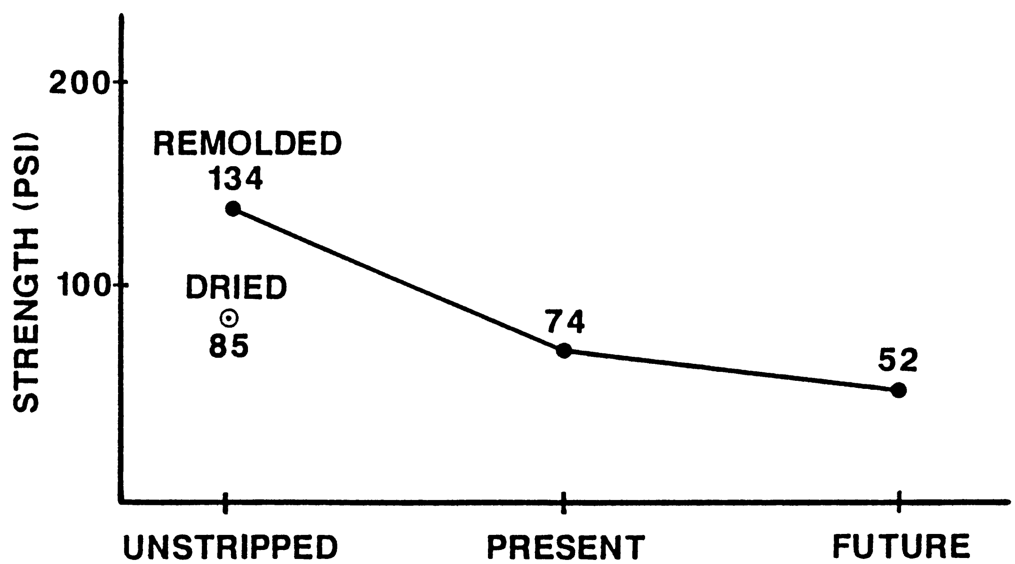

Figure 7. Deterioration curve for Greenwood Drive.

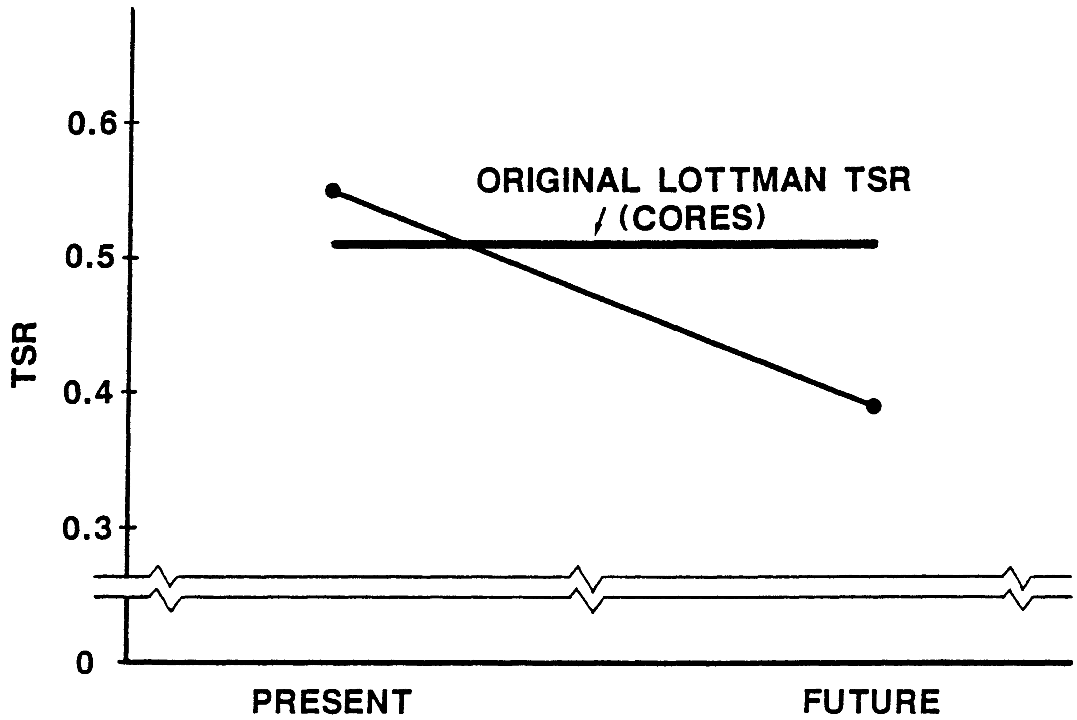

Figure 8. Tensile strength ratio - Greenwood Drive.

The pavement is performing satisfactorily, which substantiates the reasonably high strength and TSR values that were obtained.

No Dynaflect tests were performed because the author felt that the poor and variable soil support would make the calculations of the strength equivalent of the asphalt layer doubtful.

Visual Assessment

There was no correlation between the amount of visible stripping on the coarse and fine aggregate and the TSR for any project. A correlation might have been found if a wider range of values had been available, and it is also possible that cohesion failures, which are not visible, had a significant effect on the TSR values.

CONCLUSIONS

The use of a deterioration curve, minimum values of strength, and TSR appears to be a logical means of evaluating stripped pavement. The TSR should provide a reasonable estimate of the strength equivalent as measured by the Dynaflect device; however, a structural evaluation with the Dynaflect device is still desirable. Strength and TSR results can be used to analyze each layer of asphalt, whereas the Dynaflect results indicate the overall strength of the combined layers of asphalt. Based on the past experience of the author and the Georgia DOT and the observed pavement condition and test results of the pavements that were investigated, it appears reasonable that values lower than 40 psi for strength and 0.3 for TSR should necessitate pavement removal. Visual evaluation can be used to supplement other data, but it should not be the sole technique used to determine stripping damage.

RECOMMENDATIONS

The following recommendations are offered:

1. Use remolded cores to determine the original strength because dried cores seldom, if ever, completely heal. Dried cores may be used only where large aggregate makes remolding impractical.

2. Use 40 psi as the minimum allowable value for present and future strengths on the deterioration curve.

3. Use a TSR of 0.3 (based on the ratios of present and future strength to the original [remolded] strength) as the minimum allowable TSR.

As experience is gained through testing and observing the effectiveness of rehabilitation, the recommended criteria may have to be modified.

The author believes that the method of stripping evaluation that has been described will provide the engineer with a tool to make sound, defensible decisions regarding pavement rehabilitation.

ACKNOWLEDGMENTS

The author thanks the Virginia Department of Transportation personnel in the Staunton, Richmond, and Suffolk districts that were responsible for facilitating the acquisition of cores and the necessary field testing. Appreciation is expressed to L. E. Wood, Jr., for a well-controlled testing program and Ann McDaniel for the typing of the manuscript. Thanks are also extended to C. S. Hughes III and K. H. McGhee for advice and interpretation of Dynaflect data, respectively.

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APPENDIX A

Investigation of Pavement Suspected To Be Stripped

-1304

The following procedure can be used to help determine whether layers of asphalt that have stripped need to be removed during rehabilitation.

Typical types of distress that may be indications of stripping are cracks, potholes, a washboard type of deformation, and flushed spots followed by rutting. Rapid deterioration may also be a sign of stripping. If stripping is suspected, the preliminary step is to determine whether stripping is a problem and if so, which layers need to be assessed in more detail. Several cores can be taken, split open immediately (not allowed to dry and heal), and examined visually to determine which layers need to be investigated more thoroughly. It is preferable to perform the investigation when the pavement is in the weakest condition, such as in late winter or early spring. Most pavements tend to heal partially during warm, dry weather, which may result in misleadingly high strength readings.

In the detailed investigation, cores are obtained and tested under various conditions to develop a deterioration curve for each pavement layer (see Figure A-1). The cores are tested in three groups: (1) "unstripped," (2) "present," and (3) "future." The unstripped cores exemplify the condition of the pavement as if no stripping had occurred, the present cores exemplify the present condition of the pavement, and the future cores exemplify the weakest condition that is predicted to occur. The cores designated "unstripped" are actually samples that are heated and remolded before testing, the present cores are tested as soon after coring as practical, and the future cores are vacuum saturated to a specified level and soaked for 24 hr at $140^{o}F$ before testing. Several cores are also obtained for a moisture content determination, which is used to correct for moisture when the void contents (VTM) of the other cores are computed. Several more cores are necessary for the determination of the maximum specific gravity.

The methods for sampling, testing, and interpreting the data are as follows.

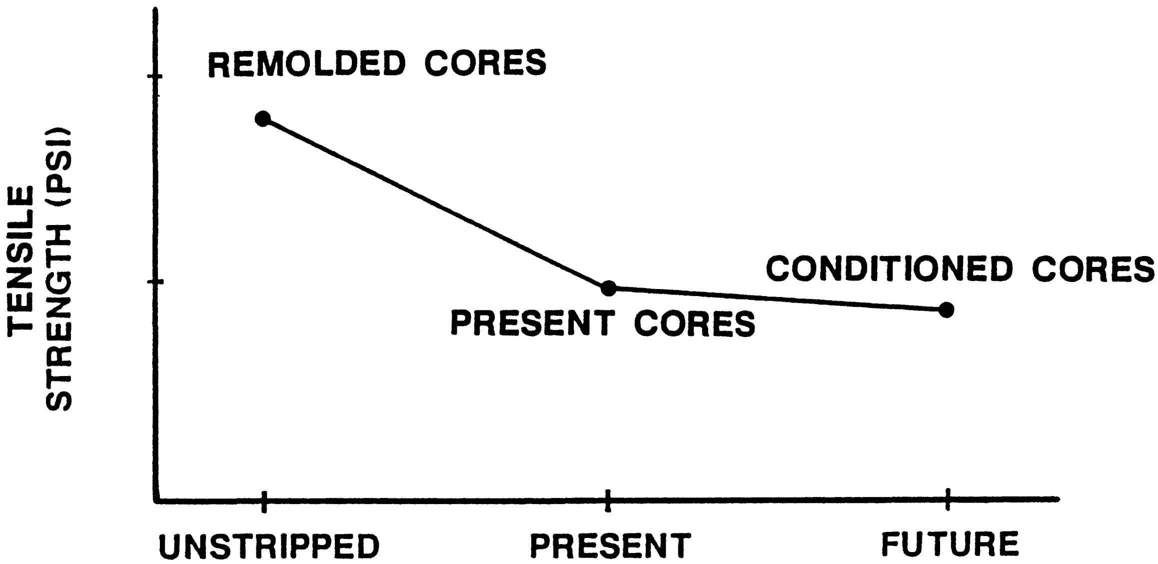

Figure A-1. Typical deterioration curve.

SAMPLING

1. Take cores at stratified locations along the length of the pavement section to be evaluated. For instance, if 50 cores are needed along a 10,000-ft section, the locations should be approximately 200 ft apart and alternated between the left and right wheel paths.

2. Immediately after removal, number the cores, wrap with plastic wrap, and secure with tape to prevent the loss of moisture before testing.

3. Assign the cores to specific testing groups using a stratified random method; i.e., select each group randomly along the full length of the test section. The following quantity of cores will be required:

   - unstripped (remolded): 10 specimens may require 15 to 18 cores

   - present: 10 cores

   - future (conditioned): 10 cores

- o moisture content: 4 cores
- o maximum specific gravity: 4 cores.

LABORATORY PREPARATION AND TESTING

1. Separate the layers of asphalt by sawing. In some cases, the layers can be separated satisfactorily by using a chisel. Do not perform the indirect tensile test on cores less than 1 in thick. Keep the present and future groups wrapped except when it is necessary to remove the wrapping, i.e., for sawing, weighing, and testing.

2. Determine the moisture content of the cores that are selected specifically for moisture content. Blot them with a towel, weigh them, and record the weight as the blotted weight. Then place them in a preweighed pan and put it into a 240°F oven. When the cores are sufficiently soft, separate the particles, and then weigh them approximately every 20 min. When the weight loss ceases, record the weight as the "dry" weight. Calculate the moisture content as follows:

$$\% \text{ Moisture} = \frac{(\text{Blotted weight} - \text{Dry weight}) \times 100}{\text{Dry weight}}$$

3. Determine the bulk specific gravity of cores according to AASHTO T 166 (1). Unwrap the cores, blot them with a towel, and weigh them. Correct the dry weight, A, for moisture by using the moisture content determined in step 2.

$$\text{Corrected dry weight} = \frac{\text{Weight of blotted core in air}}{1 + \% \text{ Moisture}/100.}$$

For example: If a blotted core weighs 542.2 g and the moisture content from step 2 was determined to be 1.6 percent, the corrected dry weight will be 542.2/(1 + 1.6/100) = 533.7 g.

4. By using the designated set of cores, determine the average maximum specific gravity according to AASHTO T 209 (1).

5. Determine the void content of cores according to AASHTO T 269 (1):

   % Air voids = 100 [1 - (Bulk sp. gr./Maximum sp. gr.)].

6. Perform all indirect tensile tests at 77°F and at a deformation rate of 2 in/min (see VTM 62 [2]). Test the present group as soon after coring as possible to prevent moisture loss and possible healing.

7. Vacuum saturate the future (conditioned) group of cores between 55 and 80 percent (see VTM 62), soak them in a 140°F water bath for 24 hr, and place them in a 77°F water bath for 1 hr before testing. (Be sure to use the corrected dry weight in the saturation calculations.)

8. Remold the unstripped group of cores to the approximate average height of the present and future core groups. Heat the cores to 275°F, break them up, mix them, and compact them with a Marshall hammer by using the number of blows that duplicates the average void content of the other cores. The day after compaction, perform specific gravity and indirect tensile tests.

   Note: If the maximum size of the aggregate is greater than 1 in, do not remold the cores. The unstripped condition is approximated by drying the cores in an oven at 140°F until the moisture loss ceases.

RESULTS

1. Record the following results.

   - average unstripped (remolded) strength
   - average present strength
   - average future (conditioned) strength
   - TSRs: Present TSR = Average present strength/Average unstripped strength; Future TSR = Average future strength/Average unstripped strength.

2. Plot a deterioration curve for each layer by using the strength results of the three groups.

3. Compare the present and future strengths with the recommended minimum strength of 40 psi.

4. Compare the present and future TSR with the recommended minimum TSR of 0.3.

5. Visually assess the degree of stripping on the split surface of the present cores. The fines matrix is generally considered to be more important than the coarse aggregate. Generally, pavements will not be as serviceable if the fines are stripped, although the stripping of the coarse aggregate may be more apparent. The degree of stripping is gauged as 0 to 5, where 0 is no stripping and 5 is very severe stripping.

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REFERENCES

1. American Association of State Highway and Transportation Officials. 1986. Standard specifications for transportation materials and methods of sampling and testing: Part II. Methods of sampling and testing. 14th ed. Washington, D.C.

2. Virginia test methods manual. 1984. Richmond, Va.: Virginia Department of Transportation, Materials Division.

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