

GUIDELINES FOR REHABILITATION WITH OVERLAYS



MAY 1992

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REHABILITATION WITH OVERLAYS

Overlays are used to remedy functional or structural deficiencies of existing pavements. It is important that the designer consider the type of deterioration present in determining whether the pavement has a functional or structural deficiency, so that an appropriate overlay type and design can be developed.

Functional deficiency arises from any conditions that adversely affect the highway user. These include poor surface friction and texture, hydroplaning and splash from wheel path rutting, and excess surface distortion.

Structural deficiency arises from any conditions that adversely affect the load-carrying capability of the pavement structure. These include inadequate thickness as well as cracking, distortion, and disintegration. It should be noted that several types of distress (e.g., distresses caused by poor construction techniques, low-temperature cracking) are not initially caused by traffic loads, but do become more severe under traffic to the point that they also detract from the load-carrying capability of the pavement.

If a pavement has only a functional deficiency, it would not be appropriate to develop an overlay design using a structural deficiency design procedure.

Maintenance overlays and surface treatments are sometimes placed to slow the rate of deterioration of pavements which show initial cracking but which do not exhibit any immediate functional or structural deficiency. This type of overlay includes thin AC and various surface treatments which help keep out moisture.

The following abbreviations for pavement and overlay types are used:

AC:	Asphalt concrete
PCC:	Portland cement concrete
JPCP:	Jointed plain concrete pavement
AC/PCC:	AC-overlaid Portland cement concrete (JPCP)

I. OVERLAY TYPE FEASIBILITY

The feasibility of any type of overlay depends on the following major considerations.

(1) **Construction feasibility of the overlay.** This includes several aspects.

- (a) Traffic control
- (b) Materials and equipment availability
- (c) Climatic conditions

- (d) Construction problems such as noise, pollution, subsurface utilities, overhead bridge clearance, shoulder thickness and side slope extensions in the case of limited right-of-way, etc.
- (e) Traffic disruptions

(2) **Required future design life of the overlay.** Many factors will affect the life of an overlay, such as the following.

- (a) Existing pavement deterioration (specific distress types, severities, and quantities)
- (b) Existing pavement design, condition of pavement materials (especially durability problems), and subgrade soil
- (c) Future traffic loadings
- (d) Climate
- (e) Existing subdrainage situation

All of these factors and others specific to the site need to be considered to determine the suitability of an overlay.

IMPORTANT CONSIDERATIONS IN OVERLAY DESIGN

Overlay design requires consideration of many different items, including: preoverlay repair, reflection crack control, traffic loadings, subdrainage, milling the existing AC surface, recycling portions of an existing pavement, structural versus functional overlay needs, overlay materials, shoulders, rutting in an existing AC pavement, durability of PCC slabs, design of joints, reinforcement, and bonding/separation layers for PCC overlays, overlay design reliability level and overall standard deviation, and pavement widening.

These considerations must not be overlooked by the designer. Each of these is briefly described in the following section. They are described in more detail in the sections for each overlay type.

Preoverlay Repair

Deterioration in the existing pavement includes visible distress as well as damage which is not visible at the surface but which may be detected by other means. How much of this distress should be repaired before an overlay is placed? The amount of preoverlay repair needed is related to the type of overlay selected. If distress in the existing pavement is likely to affect the performance of the overlay within a few years, it should be repaired prior to placement of the overlay. Much of the deterioration that occurs in overlays results from deterioration that was not repaired in the existing pavements. The designer should also consider the cost tradeoffs of preoverlay repair and overlay type. If the existing pavement is severely deteriorated, selecting an overlay type which is less sensitive to existing

pavement condition may be more cost-effective than doing extensive preoverlay repair.

Reflection Crack Control

Reflection cracks are a frequent cause of overlay deterioration. Additional steps must be taken to reduce the occurrence and severity of reflection cracking. Some overlays are less susceptible to reflection cracking than others because of their materials and design. Similarly, some reflection crack control measures are more effective with some pavement and overlay types than with others.

Traffic Loadings

The overlay design procedures require the 18-kip equivalent single-axle loads (ESALs) expected over the design life of the overlay in the design lane. The estimated ESALs must be calculated using the appropriate flexible pavement or rigid pavement equivalency factors. The appropriate type of equivalency factors for each overlay type and existing pavement type are given in the following table.

Existing Pavement	Overlay Type	Equivalency Factors To Use
Flexible	AC	Flexible
Rubblized PCC	AC	Flexible
Jointed PCC	AC or PCC	Rigid
Flexible	PCC	Rigid
Composite (AC/PCC)	AC or PCC	Rigid

An approximate correlation exists between ESALs computed using flexible pavement and rigid pavement equivalency factors. Converting from rigid pavement ESALs to flexible pavement ESALs requires multiplying the rigid pavement ESALs by 0.67. For example, 15 million rigid pavement ESALs equal 10 million flexible pavement ESALs. Five million flexible pavement ESALs equal 7.5 rigid pavement ESALs. Failure to utilize the correct type of ESALs will result in significant errors in the overlay designs. Conversions must be made, for example, when designing an AC overlay of a flexible pavement (flexible ESALs required) and when designing an alternative PCC overlay of the same flexible pavement (rigid ESALs required).

Subdrainage

The subdrainage condition of an existing pavement usually has a great influence on how well the overlay performs. Improving poor subdrainage conditions will have a beneficial effect on the performance of an overlay. Removal of excess water from the pavement cross-section will reduce erosion and increase the

strength of the base and subgrade, which in turn will reduce deflections.

Rutting in AC Pavements

The cause of rutting in an existing AC pavement must be determined before an AC overlay is designed. An overlay may not be appropriate if severe rutting is occurring due to instability in any of the existing pavement layers. Milling is to be used to remove the rutted surface and any underlaying rutted asphalt layers.

Milling AC Surface

The removal of a portion of an existing AC surface frequently improves the performance of an AC overlay due to the removal of cracked and hardened AC material. Significant rutting or other major distortion of any layer should be removed by milling before another overlay is placed; otherwise, it may contribute significantly to rutting of the overlay.

Recycling the Existing Pavement

Recycling a portion of an existing AC layer may be considered as an option in the design of an overlay. This is becoming a common practice. Complete recycling of the AC layer may also be done (sometimes in conjunction with the removal of a deteriorated base course).

II. Structural versus Functional Overlays

The overlay design procedures in this section provide an overlay thickness to correct a structural deficiency. If no structural deficiency exists, an overlay thickness less than or equal to zero will be obtained. This does not mean, however, that the pavement does not need an overlay to correct a functional deficiency. If the deficiency is primarily functional, then a minimal overlay should remedy the functional problem. If the pavement has a structural deficiency as well, a structural overlay thickness which is adequate to carry future traffic over the design period is needed.

Existing PCC Slab Durability

The durability of an existing PCC slab greatly influences the performance of AC overlays. If reactive aggregate exists, the deterioration of the existing slab can be expected to continue after overlay. The overlay must be designed with this progressive deterioration of the underlying slab in mind.

PCC Overlay Joints

Bonded jointed concrete overlays require special joint design

that considers the characteristics (e.g., stiffness) of the underlying pavement. Factors to be considered include joint spacing, depth of saw cut, sealant reservoir shape, and load transfer requirements.

PCC Overlay Bonding/Separation Layers

The bonding or separation of concrete overlays must be fully considered. Bonded overlays must be constructed to insure that the overlay remains bonded to the existing slab. Unbonded overlays must be constructed to insure that the separation layer prevents any reflection cracks in the overlay.

Overlay Design Reliability Level

Reliability level has a large effect on overlay thickness. Varying the reliability level used to determine SN or D between 50 and 95 percent may produce overlay thicknesses varying by 6 inches or more. Based on field testing, it appears that a design reliability level of approximately 95 percent gives overlay thicknesses consistent with those recommended for most projects by State highway agencies. There are, of course, many situations for which it is desirable to design at a higher or lower level of reliability, depending on the consequences of failure of the overlay. The level of reliability to be used for different types of overlays may vary, and should be evaluated for different highway functional classifications (or traffic volumes).

Pavement Widening

Many AC overlays are placed in conjunction with pavement widening (either adding lanes or adding width to a narrow lane). This situation requires coordination between the design of the widened pavement section and the overlay, not only so that the surface will be functionally adequate, but also so that both the existing and widening sections will be structurally adequate. Many lane widening projects have developed serious deterioration along the longitudinal joint due to improper design. The key design recommendations are as follows:

- (1) The design "lives" of both the overlay and the new widening construction should be the same to avoid the need for future rehabilitation at significantly different ages.
- (2) The widened cross section should generally closely match the existing pavement or cross section in material type and thickness.
- (3) With PCC pavements, the widened PCC slab section must be tied with deformed bars to the existing PCC slab face. The tie bars should be securely anchored and consistent

with ties used in new pavement construction.

- (4) With PCC pavements, a reflection crack relief fabric should be considered along the longitudinal widening joint.
- (5) The overlay should generally be the same thickness over the widening section as over the rest of the traffic lane.
- (6) Longitudinal subdrainage may be placed along the outer edge of the widened section if needed.

III. Potential Errors and Possible Adjustments to Thickness Design Procedure

If the overlay thickness appears to be unreasonable, one or more of the following causes may be responsible:

- (1) The pavement deterioration may be caused primarily by non-loading associated factors. A computed overlay thickness less than zero or close to zero suggests that the pavement does not need a structural improvement. If a functional deficiency exists, a minimum constructable overlay thickness that addresses the problem could be placed.
- (2) Modifications may be needed in the overlay design inputs to customize the procedures to specific conditions. The design should test the overlay design procedures on actual projects to investigate the need for adjustments.
 - (a) Overlay reliability design level. The recommended design reliability levels should be reviewed.
 - (b) Effective slab thickness and structural number adjustment factors. There are many aspects to these that may need adjustment.
 - (c) Design subgrade resilient modulus and effective k-value. Specifically, a resilient modulus which is consistent with that incorporated into the flexible pavement design equation must be used.
 - (d) Other design inputs may be in error. Ranges of typical values for inputs should be reviewed.

IV. PAVEMENT EVALUATION FOR OVERLAY DESIGN

It is important that an evaluation of the existing pavement be conducted to identify any functional and structural deficiencies, and to select appropriate preoverlay repair, reflection crack

treatments and overlay designs to correct these deficiencies. This section provides guidance in pavement evaluation for overlay design.

A. Functional Evaluation of Existing Pavement

Functional deterioration is defined as any condition that adversely affects the highway user. Some recommended overlay solutions to functional problems are provided.

(1) Surface Friction and Hydroplaning

All pavement types: Poor wet-weather friction due to polishing of the surface (inadequate macrotexture and/or microtexture). A thin overlay that is adequate for the traffic level may be used to remedy this problem.

AC-surfaced pavement: Poor friction due to bleeding of the surface. Milling the AC surface may be required to remove the material that is bleeding to prevent further bleeding through the overlay, and to prevent rutting due to instability. After milling, an open-graded friction course or an overlay thickness adequate for the traffic level may be used to remedy this problem.

AC-surfaced pavement: Hydroplaning and splashing due to wheel path rutting. Determining which layer or layers are rutting and taking appropriate corrective action are important.

Cause of Rutting	Layer(s) Causing Rut	Solution
Total pavement thickness inadequate	Subgrade	Thick overlay
Unstable granular layer due to saturation	Base or subbase	Remove unstable layer or thick overlay
Unstable layer due to low shear strength	Base	Remove unstable layer or thick overlay
Unstable AC mix (including stripping)	Surface	Remove unstable layer
Compaction by traffic	Surface, base, subbase	Surface milling and/or leveling overlay
Studded tire wear	Surface	Surface milling leveling overlay

(2) Surface Roughness

All pavement types: Long wavelength surface distortion, including heaves and swells. A level-up overlay with varying thickness (adequate thickness on crests) usually corrects these problems.

AC-surfaced pavement: Roughness from deteriorated transverse cracks, longitudinal cracks, and potholes. A conventional overlay will correct the roughness only temporarily, until the cracks reflect through the overlay. Full-depth repair of deteriorated areas and a thicker AC overlay incorporating a reflection crack control treatment may remedy this problem.

AC-surfaced pavement: Roughness from ravelling of surface. A thin AC overlay could be used to remedy this problem. Milling the existing surface may be required to remove deteriorated material to prevent debonding. If the ravelling is due to stripping, the entire layer should be removed because the stripping will continue and may accelerate under an overlay.

PCC-surfaced pavement: Roughness from spalling (including potholes) and faulting of transverse and longitudinal joints and cracks. Spalling can be repaired by full- or partial-depth repairs consisting of rigid materials. Faulting can be alleviated by an overlay of adequate thickness; however, faulting indicates poor load transfer and poor subdrainage. Poor load transfer will lead to spalling of reflected cracks in an AC overlay. Subdrainage improvement may be needed.

Overlay designs (including thickness, preoverlay repairs and reflection crack treatments) must address the causes of functional problems and prevent their recurrence. This can only be done through sound engineering, and requires experience in solving the specific problems involved. The overlay design required to correct functional problems should be coordinated with that required to correct any structural deficiencies.

B. Structural Evaluation of Existing Pavement

Structural deterioration is defined as any condition that reduces the load-carrying capacity of the pavement. The overlay design procedures presented here are based on the concept that time and traffic loadings reduce a pavement's ability to carry loads and an overlay can be designed to increase the pavement's ability to carry loads over a future design period.

The required overlay structural capacity can be correct only if the evaluation of existing structural capacity is correct. The primary objective of the structural evaluation is to determine the effective structural capacity of the existing pavement.

The evaluation of effective structural capacity must consider the current condition of the existing pavement materials, and also consider how those materials will behave in the future. Three alternative evaluation methods are recommended to determine effective structural capacity.

- (1) Structural capacity based on visual survey and materials testing. This involves the assessment of current conditions based on distress and drainage surveys, and usually some coring and testing of materials.
- (2) Structural capacity based on nondestructive deflection testing (NDT). This is a direct evaluation of in situ subgrade and pavement stiffness along the project.
- (3) Structural capacity based on fatigue damage from traffic. Knowledge of past traffic is used to assess the existing fatigue damage in the pavement. The pavement's future remaining fatigue life can then be estimated. The remaining life procedure is most applicable to pavements which have very little visible deterioration.

Because of the uncertainties associated with the determination of effective structural capacity, the three methods cannot be expected to provide equivalent estimates. The designer should use all three methods whenever possible and select the "best" estimate based on judgment. There is no substitute for solid experience and judgment in this selection.

(1) Structural Capacity Based on Visual Survey and Materials Testing

Visual Survey: A key component in the determination of effective structural capacity is the observation of existing pavement conditions. The observation should begin with a review of all information available regarding the design, construction, and maintenance history of the pavement. This should be followed by a detailed survey to identify the type, amount, severity, and location of surface distresses.

Some of the key distress types that are indicators of structural deficiencies are listed below. Some of these are not initially caused by loading, but their severity is increased by loading and thus load-carrying capacity is reduced.

(a) AC-surfaced pavements

Fatigue or alligator cracking in the wheel paths. Patching and a structural overlay are required to prevent this distress from recurring.

Rutting in the wheel paths.

Transverse or longitudinal cracks that develop into potholes.

Localized failing areas where the underlying layers are disintegrating and causing a collapse of the AC surface (e.g., major shear failure of base course/subgrade, stripping of AC base course). This is a very difficult problem to repair and an investigation should be carried out to determine its extent. If it is not extensive, full-depth PCC repair (when a PCC slab exists), and a structural overlay should remedy the problem. If the problem is too extensive for full-depth repair, reconstruction or a structural overlay designed for the weakest area is required.

Depending on the types and amounts of deterioration present, the layer coefficient values assigned to materials in in-service pavement should in most cases be less than the values that would be assigned to the same materials for new construction.

Limited guidance is presently available for the selection of layer coefficients for in-service pavement materials. Some suggested layer coefficients for existing materials are provided.

The following notes apply to the suggested layer coefficients:

- (1) All of the distress is as observed at the pavement surface.
- (2) Patching all high-severity alligator cracking is recommended. The AC surface and stabilized base layer coefficients selected should reflect the amount of high-severity cracking remaining after patching.
- (3) In addition to evidence of pumping noted during condition survey, samples of base material should be obtained and examined for evidence of erosion, degradation and contamination by fines, as well as evaluated for drainability, and layer coefficients reduced accordingly.
- (4) The percentage of transverse cracking is determined as (linear feet of cracking/square feet of pavement) * 100.
- (5) Coring and testing are recommended for evaluation of all materials and are strongly recommended for evaluation of stabilized layers.
- (6) There may be other types of distress that, in the opinion of the engineer, would detract from the performance of an overlay. These should be considered through an

appropriate decrease of the structural coefficient of the layer exhibiting the distress (e.g., surface raveling of the AC, stripping of an AC layer, freeze-thaw damage to a cement-treated base).

Suggested layer coefficients for existing AC pavement layer materials.

MATERIAL	SURFACE CONDITION	COEFFICIENT
AC Surface	Little or no alligator cracking and low-severity transverse cracking	0.35 to 0.40
	< 10 percent low-severity alligator cracking and/or	0.25 to 0.35
	< 5 percent medium- and high-severity transverse cracking	
	> 10 percent low-severity alligator cracking and/or	0.20 to 0.30
	< 10 percent medium-severity alligator cracking and/or	
	> 5-10 percent medium- and high-severity transverse cracking	
	> 10 percent medium-severity alligator cracking and/or	0.14 to 0.20
	< 10 percent high-severity alligator cracking and/or	
	> 10 percent medium- and high-severity transverse cracking	
	> 10 percent high-severity alligator cracking and/or	0.08 to 0.15
> 10 percent high-severity transverse cracking		
Stabilized Base	Little or no alligator cracking and/or only low-severity transverse cracking	0.20 to 0.35
	< 10 percent low-severity alligator cracking and/or	0.15 to 0.25
	< 5 percent medium- and high-severity transverse cracking	
	> 10 percent low-severity alligator cracking and/or	0.15 to 0.20
	< 10 percent medium-severity alligator cracking and/or	
> 5-10 percent medium- and high-severity transverse cracking		

	> 10 percent medium-severity alligator cracking and/or	0.10 to 0.20
	< 10 percent high-severity alligator cracking and/or	
	> 10 percent medium- and high-severity transverse cracking	
	> 10 percent high-severity alligator cracking and/or	0.08 to 0.15
	> 10 percent high-severity transverse cracking	
Granular Base or Subbase	No evidence of pumping, degradation, or contamination by fines	0.10 to 0.14
	Some evidence of pumping, degradation, or contamination by fines	0.00 to 0.10

(b) PCC-surfaced pavements

Deteriorating (spalling or faulting) transverse or longitudinal cracks. These cracks usually must be full-depth repaired, or they will reflect through the overlay. This does not apply to unbonded JPCP overlays.

Corner breaks at transverse joints or cracks. Must be full-depth repaired with a full-lane-width repair.

Localized failing areas where the PCC slab is disintegrating and causing spalls and potholes (e.g., reactive aggregate, or other durability problems). Overlay thickness and preoverlay repair requirements may be prohibitive for some types of overlays.

Subdrainage Survey: A drainage survey should be coupled with the distress survey. The objective of the drainage survey is to identify moisture-related pavement problems and locations where drainage improvements might be effective in improving the existing structure or reducing the influence of moisture on the performance of the pavement following the overlay.

Coring and Materials Testing Program: In addition to a survey of the surface distress, a coring and testing program is recommended to verify or identify the cause of the observed surface distress. The locations for coring should be selected following the distress survey to assure that all significant pavement conditions are represented. If NDT is used, the data from that testing should also be used to help select the appropriate sites for coring.

The objective of the coring is to determine material thicknesses and conditions. A great deal of information will be gained simply by a visual inspection of the cored material. However, it should be

kept in mind that the coring operation causes a disturbance of the material especially along the cut face of AC material.

For example, in some cases coring has been known to disguise the presence of stripping. Consequently, at least some of the asphalt cores should be split apart to check for stripping.

The testing program should be directed toward determining how the existing materials compare with similar materials that would be used in a new pavement, how the materials may have changed since the pavement was constructed, and whether or not the materials are functioning as expected. The types of tests to be performed will depend on the material types and the types of distress observed. A typical testing program might include strength tests for AC and PCC cores, gradation tests to look for evidence of degradation and/or contamination of granular materials, and extraction tests to determine binder contents and gradations of AC mixes. PCC cores exhibiting durability problems may be examined by a petrographer to identify the cause of the problem.

Specific recommendations on estimating the effective structural capacity from the distress survey information are given in the sections for each overlay type.

(2) Structural Capacity Based on Nondestructive Deflection Testing

Nondestructive deflection testing is an extremely valuable and rapidly developing technology. When properly applied, NDT can provide a vast amount of information and analysis at a very reasonable expenditure of time, money, and effort. The analyses, however, can be quite sensitive to unknown conditions and must be performed by knowledgeable, experienced personnel.

NDT structural evaluation differs depending on the type of pavement. For rigid pavement evaluation, NDT serves three analysis functions: (1) to examine load transfer efficiency at joints and cracks, (2) to estimate the effective modulus of subgrade reaction (effective k-value), and (3) to estimate the modulus of elasticity of the concrete (which provides an estimate of strength). For flexible pavement evaluation, NDT serves two functions: (1) to estimate the roadbed soil resilient modulus, and (2) to provide a direct estimate of SN of the pavement structure.

V. AC OVERLAY OF AC PAVEMENT

This section covers the design of AC overlays of AC pavements. The following construction tasks are involved in the placement of an AC overlay on an existing AC pavement:

- (1) Repairing deteriorated areas and making subdrainage improvements (if needed).
- (2) Correcting surface rutting by milling or placing a

- leveling course.
- (3) Constructing widening (if needed).
- (4) Applying a tack coat.
- (5) Placing the AC overlay (including a reflective crack control treatment if needed).

Feasibility

An AC overlay is a feasible rehabilitation alternative for an AC pavement except when the condition of the existing pavement dictates substantial removal and replacement. Conditions under which an AC overlay would not be feasible include the following:

- (1) The amount of high-severity alligator cracking is so great that complete removal and replacement of the existing surface is dictated.
- (2) Excessive surface rutting indicates that the existing materials lack sufficient stability to prevent recurrence of severe rutting.
- (3) An existing stabilized base shows signs of serious deterioration and would require an inordinate amount of repair to provide uniform support for the overlay.
- (4) An existing granular base must be removed and replaced due to infiltration of and contamination by a soft subgrade.
- (5) Stripping in the existing AC surface dictates that it should be removed and replaced.

Preoverlay Repair

The following types of distress should be repaired prior to overlay of AC pavements. If they are not repaired, the service life of the overlay will be greatly reduced.

Distress Type	Required Repair
Alligator Cracking	All areas of high-severity alligator cracking must be patched. Localized areas of medium-severity alligator cracking should be patched unless a paving fabric or other means of reflective crack control is used. The patching must include removal of any soft subsurface material.
Linear Cracks	High-severity linear cracks should be patched. Linear cracks that are open greater than 0.25 inch should be filled with a sand-asphalt mixture or other suitable crack

Rutting

filler. Some method of reflective crack control is recommended for transverse cracks that experience significant opening and closing.

Remove ruts by milling or placement of a leveling course. If rutting is severe, an investigation into which layer is causing the rutting should be conducted to determine whether or not an overlay is feasible.

Surface Irregularities

Depressions, humps, and corrugations require investigation and treatment of their cause. In most cases, removal and replacement will be required.

Reflection Crack Control

The basic mechanism of reflection cracking is strain concentration in the overlay due to movement in the vicinity of cracks in the existing surface. This movement may be bending or shear induced by loads, or may be horizontal contraction induced by temperature changes. Load-induced movements are influenced by the thickness of the overlay and the thickness and stiffness of the existing pavement. Temperature-induced movements are influenced by daily and seasonal temperature variations, the coefficient of thermal expansion of the existing pavement, and the spacing of cracks.

Preoverlay repair (patching and crack filling) may help delay the occurrence and deterioration of reflection cracks. Additional reflection crack control measures which have been beneficial in some cases include the following:

- (1) Synthetic fabrics have been effective in controlling reflection of low- and medium-severity alligator cracking. They may also be useful for controlling reflection of low-severity temperature cracks, particularly when used in combination with crack filling. They generally do little, however, to retard reflection of cracks subject to significant horizontal or vertical movements.
- (2) Crack relief layers greater than 3 inches thick have been effective in controlling reflection of cracks subject to larger movements. These crack relief layers can be achieved with cold recycling techniques.
- (3) Increased AC overlay thickness reduces bending and vertical shear under loads and also reduces temperature variation in the existing pavement. Thus, thicker AC

overlays are more effective in delaying the occurrence and deterioration of reflection cracks that are thinner overlays. However, increasing the AC overlay thickness is a costly approach to reflection crack control.

Reflection cracking can have a considerable (often controlling) influence on the life of an AC overlay. Deteriorated reflection cracks detract from a pavement's serviceability and also require frequent maintenance, such as sealing and patching. Reflection cracks also permit water to enter the pavement structure, which may result in loss of bond between the AC overlay and existing AC surface, stripping in either layer, and softening of the granular layers and subgrade. For this reason, reflection cracks should be sealed as soon as they appear and resealed periodically throughout the life of the overlay. Sealing low-severity reflection cracks is effective in retarding their progression to medium- and high-severity levels.

Thickness Design

If the overlay is being placed for the purpose of structural improvement, the required thickness of the overlay is a function of the structural capacity required to meet future traffic demands and the structural capacity of the existing pavement.