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16. Abstract This research will develop a warranty contracting implementation plan. The Texas Department of Transportation (TxDOT) plan will be based on guidelines for warranty contracting developed for the National Cooperative Highway Research Program. These existing guidelines will be modified to fit within the TxDOT design, contracting, and maintenance system. The draft warranty specifications developed for TxDOT Project 0-4498 follow the general format for materials and workmanship warranties. These specifications hold the contractor responsible for correcting defects in work elements during the warranty period resulting from substandard materials and/or workmanship. The draft warranty provisions/specifications were developed following TxDOT procedures/formats. Special Provisions for Item 341, Dense Graded Hot Mix Asphalt (QCQA), Item 316, Surface Treatments, and Item 350, Microsurfacing were developed using TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2004).					
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DRAFT WARRANTY SPECIFICATIONS

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DISCLAIMER

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official view or policies of the Federal Highway Administration (FHWA) or the Texas Department of Transportation (TxDOT). This report does not constitute a standard, specification, or regulation. The engineer in charge was Stuart D. Anderson, P.E. (Texas, # 89556).

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WARRANTY SPECIFICATIONS DESCRIPTION

The warranty specifications developed for TxDOT Project 0-4498 follow the general format for materials and workmanship warranties. These specifications hold the contractor responsible for correcting defects in work elements during the warranty period resulting from substandard materials and/or workmanship. For asphalt concrete pavement (ACP) overlays, seal coats, and microsurfacing, the contractor should be responsible for defects associated with the resurfacing only. The contractor should not be liable for defects associated with the underlying pavement. For rehabilitation, reconstruction, and new construction work, where the contractor has constructed or reconstructed the pavement structure, the contractor should be liable for defects resulting from the failure of any of the pavement components. Where the warranty period includes an extended period and where TxDOT was responsible for the pavement structural design; the contractor should not be liable for the distresses that are attributable to the structural design of the pavement. The basic consideration should be that the contractor be liable only for those elements that he/she can control.

The warranty provisions/specifications were developed following TxDOT procedures/formats. Special Provisions for Item 341, Dense Graded Hot Mix Asphalt (QCQA), Item 316, Surface Treatments, and Item 350, Microsurfacing were developed using *TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (2004)*.

In order to test the warranty provisions/specifications, pilot projects for warranties will be conducted in five TxDOT districts. These pilot projects would be such that factors not covered under the warranty would not impact the performance of the warranted items (e.g., for an asphaltic concrete pavement overlay, a highway with a sound underlying pavement would be selected so that the performance of the overlay would be related to its own quality with minimal, if any, effect from the overlaid pavement).

Included in this report are Special Specification Item 5XXX, Warranted Construction, and Special Provisions for Item 341, Dense Graded Hot Mix Asphalt (QCQA), Item 316, Surface Treatments, and Item 350, Microsurfacing. The Special Specification, Item 5XXX Warranted Construction is a general specification that covers items such as warranty bond, warranty provisions, performance requirement, performance evaluation, remedial action(s), maintenance, emergency work, exceptions, conflict resolution team, traffic control, and payment, which are applicable for any warranted construction product, including asphalt concrete, surface treatments, and microsurfacing. Special Provision for Item 341, Dense Graded Hot Mix Asphalt (QCQA) is Product 4498-P1, Draft Warranty Asphalt Specification. Special Provision for Item 316, Surface Treatments is Product 4498-P2, Draft Warranty Seal Coat Specification. Special Provision for Item 350, Microsurfacing is Product 4498-P3, Draft Warranty Microsurfacing Specification.

SPECIAL SPECIFICATION ITEM 5XXX, WARRANTED CONSTRUCTION

5XXX.1. Description. Warrant the indicated product for the period specified. Perform any required remedial action(s) to correct deficiencies identified in periodic evaluations and, maintain the product during the warranty period, as specified in the plans.

As specified in the plans, the warranty will be guaranteed by a warranty bond, retainage withheld from Contractor's payments, or a combination of a warranty bond and retainage. (Refer to Item 5XXX.2, Warranty Bond)

Develop remedial action(s) for those parts of the warranted product that do not meet specified standards of performance. The remedial action(s) will be subject to the approval of the Engineer. Complete the approved remedial action(s) at no additional cost to the Department. (Refer to Item 5XXX.7, Remedial Action(s))

When specified, maintain the warranted product during the warranty period at no additional cost to the Department. (Refer to Item 5XXX.8, Maintenance)

A Conflict Resolution Team will be formed to resolve any disagreements associated with the warranty. (Refer to Item 5XXX.11, Conflict Resolution Team)

5XXX.2. Warranty Bond. When specified in the plans, provide a warranty bond in the amount specified in the plans that is effective for the period of the warranty, to include time periods required for any remedial action(s) that may extend beyond the end of the warranty period. Submit the executed warranty bond with the performance and the payment bonds in accordance with Item 3.4, "Execution of Contract." For this project, Item 5, "Control of the Work," of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Furnish the warranty bond as a guaranty for the protection of the claimants and the Department for labor and materials and the faithful performance of all maintenance and remedial action(s) required by these warranty requirements.

5XXX.3. Retainage. When specified in the plans, all or part of the retainage as specified in Item 9 will not be released until the Engineer has issued written acceptance of the warranted construction.

5XXX.4. Warranty Period. The warranty period for the warranted product will be as specified in the plans. The beginning date of the warranty period is the date of final acceptance of the construction phase of the project, unless otherwise specified in the plans, or as determined by the Engineer when an earlier beginning date is considered justified.

Written notice of the effective beginning date of the warranty period will be furnished to the Contractor.

5XXX.5. Performance Requirements. The performance indicators used to evaluate the performance of the warranted product are listed in the specification or special provision for the warranted product.

5XXX.6. Performance Evaluation. Each of the listed performance indicators will be measured at least annually. More frequent evaluation may be conducted when considered necessary by the Engineer. The Engineer will conduct these evaluations at no cost to the Contractor.

The Engineer will notify the Contractor of the evaluation date at least seven (7) days prior to the date. The Contractor may have a representative(s) present during the evaluation.

The evaluation results will be provided to the Contractor within fourteen (14) days of the completion of the evaluation.

Provide written notification to the Engineer within thirty (30) days following the receipt of the evaluation results, if the evaluation results are disputed. If the dispute cannot be resolved within the following thirty (30) days, it will be presented to the Conflict Resolution Team. (Refer to Item 5XXX.11, Conflict Resolution Team)

5XXX.7. Remedial Action(s). If the annual evaluation results exceed the established threshold values for one or more of the performance indicators, develop a remedial action(s) that will correct the inadequate condition(s). Within thirty (30) days of the receipt of the evaluation results, or the resolution of a disputed evaluation, whichever is the latter, submit the proposed remedial action(s) for the review and approval of the Engineer. If the Engineer does not approve the proposed action(s), or a mutually agreeable remedial action(s) cannot be negotiated within thirty (30) days following the submission of the proposed remedial action(s), the issue will be referred to the Conflict Resolution Team for disposition.

The Remedial Action(s) will comply with the following:

- A. Remedial Action Requirements.** Use materials and construction methods that conform to the specification requirements included in the contract for which the warranty applies and which correspond to the approved remedial action(s).
- B. Schedule for Remedial Action(s).** Begin the remedial action(s) within thirty (30) days following approval of the remedial action(s) unless a later date is mutually agreed upon with the Engineer.
- C. Warranty on Remedial Action(s).** The warranty period for the remedial action(s) performed will be limited to the period of the original contract warranty.

5XXX.8. Maintenance. When specified in the plans, maintain the warranted product for the warranty period.

- A. Maintenance Responsibilities.** The respective maintenance responsibilities of the Contractor and the Department are specified in the specification and/or the special provision for the warranted product.
- B. Materials and Construction Methods.** Use materials and construction or maintenance methods that conform to the specification requirements included in the *TxDOT Standard Specifications for Construction of Highways, Streets, and Bridges (2004)* and that correspond to the maintenance action employed or as approved by the Engineer. Where there is no corresponding specification, submit appropriate specifications to the Engineer for approval.

5XXX.9. Emergency Work. If, in the opinion of the Engineer, conditions require immediate attention, such as for public safety, perform the required work on a timely basis. If the contractor cannot perform the required work on a timely basis, the Engineer can have the necessary work performed, at the Contractor's expense, with the Department's personnel, or through

outsourcing. Any work thus performed will not alter the requirements, responsibilities, or obligations included in the warranty.

5XXX.10. Exceptions. During the period of the warranty, the Department will be responsible for repairing conditions of the warranted product that are caused by factors that are determined by the Engineer to be beyond the control of the Contractor. Included are conditions resulting from major accidents, major flooding, and other Acts of God.

5XXX.11. Conflict Resolution Team. A Conflict Resolution Team for Warranty Work (CRT) will be established prior to the initiation of the warranty period to resolve any conflicts regarding the warranty requirements. This team will be composed of two representatives appointed by the Contractor, two representatives appointed by the Engineer, and an independent party mutually agreed upon by the Contractor and the Engineer. Decisions of the CRT will be based on a simple majority vote. The expenses of the independent party will be equally shared by the Contractor and the Department. Any disputes involving the warranty provisions will be initially processed through the CRT. If resolution is not achieved, the Department's Contract dispute and claim procedure will be employed.

5XXX.12. Applicability of Standard Specification Items 1 through 9. For the time periods during which maintenance or remedial action(s) required by the warranty specification is being performed, the applicable portions of Standard Specification Items 1-9, including Special Provisions thereto, will remain in effect.

5XXX.13. Traffic Control. Prior to beginning any maintenance or remedial action(s), submit a traffic control plan to the Engineer for approval. Comply with the provisions of the 2003 Texas Manual of Uniform Traffic Control Devices, the TxDOT standard sheets for Traffic Control Plans, and the Traffic Control Plans for the project, as applicable. Implement the approved traffic control plan during maintenance or remedial work.

5XXX.14. Payment. No direct payment will be made for work performed to fulfill these warranty requirements.

CONSIDERATIONS FOR SPECIAL SPECIFICATION 5XXX, WARRANTED CONSTRUCTION

5XXX.2. Warranty Bond.

This specification has been prepared to require warranty bonds for the periods and amounts specified in the plans. This permits flexibility to the designer to tailor the warranty bond to the specific project without reprocessing the special specification for review and approval.

It may be difficult for the Contractor to obtain warranty bonds for long warranty periods. Hence another option for ensuring that the Contractor honor the warranty is to defer the payment of the retainage, in whole or a specified amount, until the warranty has been fulfilled. Use of a special provision to Item 9, Measurement and Payment, would implement this strategy.

A combination of a warranty bond and retainage is another potential strategy.

The bonded amount should be at least equal to the highest probable costs to fulfill the warranty conditions. (Example: One state DOT based the bonded amount for the warranted ACP on the estimated cost to remove and replace 1.5 inches of ACP.)

5XXX.4. Warranty Period.

The beginning of the warranty period may alternately be established as the date when the warranted product has been completed on all or portions of the project. For example, if a project involves completion of a main lane early in the project, it may be considered appropriate for the warranty period for that pavement to begin at that early date. The special specification permits the designer to specify the starting date in the plans, if other than the date of final acceptance of the construction phase of the project.

The term of the warranty must be tailored to the warranted product. It should be sufficiently long to ensure that the product quality is satisfactory. Warranty periods for ACP employed by State Highway Agencies (SHAs) range from one year to ten years.

5XXX.8. Maintenance.

Due to the interrelationship of routine maintenance and potential remedial requirements, it appears desirable to assign pavement-related maintenance responsibilities to the Contractor for the warranty period. However, few contractors are familiar with maintenance activities and many may be geographically located such that subcontracting with a local contractor to address the maintenance requirements may be an appropriate strategy.

5XXX.11. Conflict Resolution Team.

The membership of the Conflict Resolution Team is indicated to be two from TxDOT, two from the Contractor, and one independent member. An alternate membership could consist of one from TxDOT, one from the Contractor, and one independent member. The advantage of designating two reps each from TxDOT and the Contractor is the ability to name one rep from the project level and one rep from the management level.

5.XXX.12. Applicability of Standard Specification Items 1 through 9.

It is essential that those applicable portions of Standard Specification Items 1 through 9 (e.g., Definitions, Maintenance of Traffic, Final Cleaning Up, Environmental Protection, Inspection of Work, Load Restrictions, Legal Relations, Insurance, Indemnity, Responsibility to Public, etc.) must remain in effect for the periods when the Contractor is performing warranty-related work.

It may be desirable to specifically identify the portions for these specifications that remain in effect.

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SPECIAL PROVISION 5---00X, CONTROL OF THE WORK

For this project, Item 5, “Control of the Work,” of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Article 5.9. Project Acceptance for Projects Including Warranted Construction. is added, as follows:

Maintain insurance as required by TxDOT Standard Specification Item 7.4, Insurance and Bonds, for the maintenance and remedial action(s) required by the warranty provisions of the contract through the date of acceptance of the warranted construction.

Notwithstanding the project acceptance provisions of Article 5.8, “Project Acceptance,” the Contractor is relieved of responsibility for the warranted construction upon satisfactory completion of the warranty period and acceptance by the Engineer. The Engineer will provide written acceptance of the warranted construction upon expiration of the warranty period or satisfactory completion of the remedial action(s), whichever is the later.

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SPECIAL PROVISION 9---00X, MEASUREMENT AND PAYMENT

For this project, Item 9, "Measurement and Payment," of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Article 9.6. Progress Payments. Subarticle A. Retainage, Section 2. Construction Contracts. is modified by adding the following:

e. Retainage Release for Contracts including Warranted Construction. For Contracts that provide for warranted construction, and when shown on the plans, all or part of the retainage, as shown on the plans, will not be released until the Engineer has issued written acceptance of the warranted construction.

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PRODUCT 4498-P1, SPECIAL PROVISION 341---00X, DENSE GRADED HOT MIX ASPHALT (QCQA)

For this project, Item 341, “Dense Graded Hot Mix Asphalt (QCQA)” of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Article 341.1. Description. is voided and replaced by the following:

Construct and warrant a pavement layer composed of a compacted, dense graded mixture of aggregate and asphalt binder as specified in the plans. Comply with the provisions of Special Specification Item 5XXX. “Warranted Construction.” Perform any required remedial action(s) to correct deficiencies identified in periodic evaluations and, when shown on the plans, maintain the warranted pavement layer. Repair any deficiencies in underlying base material resulting from inadequacies in the warranted layer.

Article 341.4. Construction, Subarticle D, Mixture Design, 1. Design Requirements. First paragraph is voided and replaced by the following:

Unless otherwise shown on the plans, use Test Method Tex-204-F, Part I, to design a mixture meeting the requirements listed in Tables 1,2,3,6, 7, and 8. At any time during the project, the Contractor may submit a new mixture design. Begin production after the mixture design is approved by the Engineer.

Article 341.6. Payment. First paragraph is voided and replaced with the following:

The work performed and materials furnished in accordance with this Item and measured as provided under “Measurement” will be paid for at the unit bid price for “Warranted QCQA Dense Graded Hot Mix Asphalt Concrete Pavement” of the types specified. Pay adjustments for bonuses and penalties will be applied as determined in this Item. These prices are full compensation for surface preparation, materials, equipment, labor, tools, incidentals, including trial batches; and for any maintenance and remedial action(s) required by the warranty provisions.

No direct payment will be made for work associated with fulfilling the specified warranty requirements, including materials, equipment, labor, tools, and incidentals. Also included are the replacement of pavement markers and stripping obliterated by warranty-related work.

Article 341.7. Maintenance Requirements. is added as follows:

A. Contractor Responsibility. When shown in the plans, perform all required pavement-related maintenance during the warranty period, except that listed in subsection B, “Department Responsibility.” Pavement-related maintenance includes, but is not limited to crack sealing, pothole repair, correction of bleeding areas, and isolated level-ups. It also includes repair of base failures that result from inadequacies of the warranted layer. May initiate pavement-related maintenance activities. Perform all required pavement-related maintenance work

within ten (10) calendar days of Engineer’s notification unless a later date is mutually agreed upon with the Engineer.

B. Department Responsibility. The Department will perform routine maintenance during the warranty period, such as snow and ice removal, including application of de-icing chemicals; repairs to safety appurtenances; pavement markings; mowing, and sign maintenance. The Department will not perform any routine pavement surface maintenance activities, such as crack sealing, pothole repair, correction of bleeding areas and isolated level-ups during the warranty period, except for emergency conditions in accordance with Item 5XXX.9, “Emergency Work.” The Engineer will advise the Contractor when pavement-related maintenance work is required.

Article 341.8. Performance Requirements. is added as follows:

A. Performance Indicators. The indicators used to measure performance of the pavement are listed in Section C, “Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.”

B. Evaluation Parameters and Methods. The Engineer will conduct the pavement evaluation in accordance with the standard methods adopted by the Department and described in the “Pavement Management Information System Rater’s Manual,” “Skid Resistance Determination Manual,” and “Ride Quality Manual.”

Annual pavement evaluation surveys will be conducted by dividing the warranted pavement into nominal half-mile sections. Performance results for each nominal half-mile section will be determined.

Additional surveys may be performed at additional times during the warranty period if the Engineer has reason to suspect that threshold levels are exceeded.

The results of the pavement evaluation survey and the identification of sections where threshold levels have been exceeded, together with the identification of the deficiencies, will be reported to the Contractor within fourteen (14) days of completing the survey.

C. Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.

PERFORMANCE INDICATOR	THRESHOLD LEVELS	GUIDE TO REMEDIAL ACTION
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined

Article 341.9. Remedial Action(s). is added as follows:

Submit a plan, as required in Item 5XXX.7, that includes proposed remedial action(s) for the pavement areas where the performance results indicate that threshold levels have been exceeded.

Apply the remedial action(s) to the entire pavement area identified as exceeding the threshold levels unless otherwise noted in Item 341.8.C, “Pavement Performance Indicators,

Threshold Values, and Guide to Remedial Actions.” Restore the design thickness where the pavement thickness is reduced as part of the remedial work.

Article 341.10. Pavement Markings. is added as follows:

Restripe pavement markings and/or replace raised pavement markers damaged or obliterated due to Contractor’s maintenance and/or remedial work.

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CONSIDERATIONS FOR SPECIAL PROVISION 341---00X, DENSE GRADED HOT MIX ASPHALT (QCQA)

General

All or portions of the hot mix asphalt on a project could be included in the warranty. Options include designation of specific areas to be warranted (e.g., main lanes only, surface course only, exclude all detours, etc.).

The Contractor's responsibility would include the construction of the pavement as would normally be required. During the warranty period, the Contractor, if shown on the plans, would also be responsible for maintaining the pavement (e.g., repairing pavement failures, crack sealing, pothole repairs, treating flushed pavement areas, aggregate shelling, etc.). These maintenance responsibilities are further defined in Item 341.7, Maintenance Requirements. For pavement deficiencies identified by annual or special evaluations, the Contractor would be responsible for developing and performing remedial action(s) to correct the deficiency. Essentially, the Contractor would be responsible for all pavement-related construction, maintenance, and remedial action(s) during the construction and warranty periods of the contract.

The time periods specified could be reduced or lengthened based on practicality and an expeditious resolution of the subject issue.

341.8 Performance Requirements

The annual pavement evaluation surveys specified in the Special Provision is based on the procedures outlined in the "TxDOT Pavement Management Information System Rater's Manual." This manual provides for rating half-mile segments that have been designated for the annual rating. As specified, 100 percent of the pavement would be evaluated for distress.

An alternate approach employed by some State Highway Agencies is based on a statistical sampling and is as follows:

The pavement evaluation surveys will be conducted by dividing the warranted pavement into one-mile sections. Two 0.1 mile segments in each section will be evaluated for pavement distress. One segment will be from 0.3 mile to 0.4 mile from the start of the section. The second segment will be randomly selected from the nine remaining segments. The second segment to be evaluated will be reselected each year.

If areas outside the surveyed segments are suspected of exceeding a threshold level, the Agency will divide the entire project into 0.1 mile segments and conduct the evaluation survey in any, or all, segments to determine if a threshold level is exceeded.

Performance Indicators, Threshold Ranges, and Guide to Remedial Action

The information summarized in [Table 1](#) regarding pavement performance indicators was obtained from a survey of State Highway Agencies that are currently using asphalt concrete warranties. The goal of this table is to show the range of threshold values that have been used for each of the listed performance indicators.

The listed performance indicators are only candidate indicators. The values presented in [Table 1](#) will not necessarily be the threshold values selected for TxDOT Special Provision Item 341---00X, Dense Graded Hot Mix Asphalt (QCQA). The performance indicators and the threshold values that will be incorporated into the TxDOT specifications will be selected by TxDOT based on input from industry, TxDOT pavement evaluation historical data, and experience factors.

The overall objective is to select performance indicators that are good measures of a quality product and predictors of a long-term service life.

Table 1. Pavement Performance Indicators, Threshold Ranges, and Guide to Remedial Action.

Performance Indicator	Threshold Ranges			Guide to Remedial Action
	Minimum	Average	Maximum	
Rutting	0.25 inch	0.33 inch	0.39 inch	Mill surface with fine-toothed mill to remove ruts, overlay
Block Cracking*	1%	2.50%	4%	Remove and replace distressed layer(s). The removal area will be equal to 110% of the distressed surface
Alligator Cracking*		1%		Remove and replace distressed layer(s). The removal area will be equal to 150% of the distressed surface
Longitudinal Cracking**	2%	6.50%	10%	Rout and seal all cracks with rubberized crack filler, or agreed upon equal
Transverse Cracking***	2 cracks	8 cracks	25 cracks	Rout and seal all cracks with a rubberized crack filler, or approved equal
Raveling*	1%	4.50%	10%	Apply a one course surface treatment
Bleeding/Flushing*	1%	8.33%	20%	Remove and replace distressed surface mixture full depth
Debonding*	1%	2%	5%	Remove and replace distressed layer(s). The removal area will be equal to 150% of the distressed surface
Ride Quality (IRI)****		110inch/mile		Level-up, overlay, milling or combinations thereof to correct inadequacies
Popouts*****		29/sq. yd.		Remove and replace distressed layer(s). The removal area will be equal to 100% of the distressed surface

* For Block Cracking, Alligator Cracking, Raveling, Bleeding/Flushing, and Debonding, Threshold Ranges are given in percentage of area distressed in an evaluated pavement segment. The evaluated pavement segment is 0.1 miles long. Moreover, Alligator Cracking is used by only one state as a performance indicator, and Block Cracking is used by only two states as a performance indicator.

** For Longitudinal Cracking, Threshold Ranges are given in percentage of the evaluated pavement segment length.

*** For Transverse Cracking, Threshold Ranges are given in number of transverse cracks observed in an evaluated pavement segment.

**** Ride Quality and Popouts are each used by only one state as a performance indicator. Popouts are defined as small pieces of pavement or aggregate broken loose from the surface greater than 3/8 inch in diameter.

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PRODUCT 4498-P2, SPECIAL PROVISION 316---00X, SURFACE TREATMENTS

For this project, Item 316, "Surface Treatments" of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Article 316.1. Description. is voided and replaced by the following:

Construct and warrant a surface treatment consisting of one or more applications of a single layer of asphaltic material covered with a single layer of aggregate. Comply with the provisions of Special Specification Item 5XXX. "Warranted Construction." Perform any required remedial action(s) to correct deficiencies identified in periodic evaluations.

Article 316.6. Payment. is voided and replaced with the following:

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid "Asphalt (Warranted)" and "Aggregate (Warranted)" of the types and grades specified. These prices are full compensation for surface preparation; furnishing, preparing, hauling, and placing materials; removing existing pavement markers and excess aggregate; rolling; cleaning up stockpiles; equipment, labor, tools, and incidentals; and for any remedial action(s) required by the warranty provisions.

No direct payment will be made for work associated with fulfilling the specified warranty requirements; including materials, equipment, labor, tools, and incidentals. Also included are the replacement of pavement markers and stripping obliterated by warranty-related work.

Article 316.7. Performance Requirements. is added as follows:

- A. Performance Indicators.** The indicators used to measure performance of the pavement are listed in Section C, "Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions."
- B. Evaluation Parameters and Methods.** The Engineer will conduct the pavement evaluation in accordance with the standard methods adopted by the Department and described in "Pavement Management Information System (PMIS) Rater's Manual" and the "Skid Resistance Determination Manual."

Annual pavement evaluation surveys will be conducted by dividing the warranted pavement into nominal half-mile sections. Performance results for each nominal half-mile section will be determined.

Additional surveys may be performed, either on additional segments, or at additional times during the warranty period if the Engineer has reason to suspect that threshold levels are exceeded.

The results of the pavement evaluation survey and the identification of segments where threshold levels have been exceeded, together with the identification of the deficiencies, will be reported to the Contractor within fourteen (14) days of completing the survey.

C. Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.

PERFORMANCE INDICATOR	THRESHOLD LEVELS	GUIDE TO REMEDIAL ACTION
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined
To be determined	To be determined	To be determined

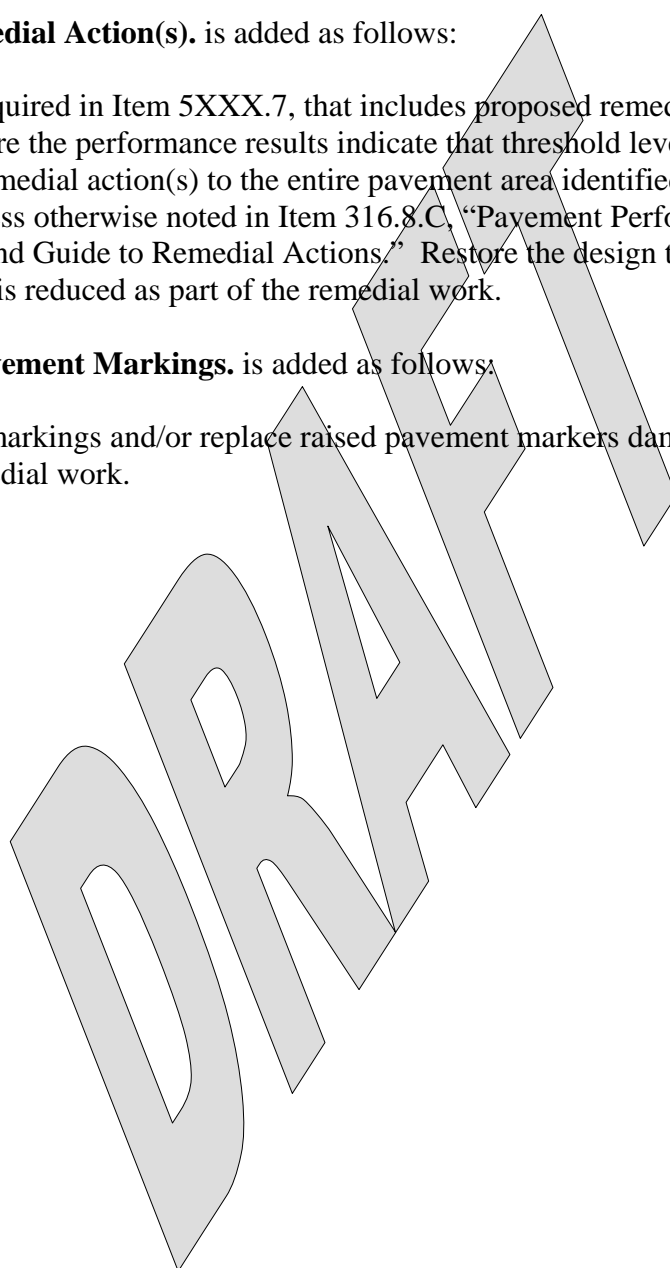
Article 316.9. Remedial Action(s). is added as follows:

Submit a plan, as required in Item 5XXX.7, that includes proposed remedial action(s) for the pavement areas where the performance results indicate that threshold levels have been exceeded.

Apply the remedial action(s) to the entire pavement area identified as exceeding the threshold levels unless otherwise noted in Item 316.8.C, "Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions." Restore the design thickness where the pavement thickness is reduced as part of the remedial work.

Article 316.10. Pavement Markings. is added as follows:

Restripe pavement markings and/or replace raised pavement markers damaged or obliterated due to Contractor's remedial work.



CONSIDERATIONS FOR SPECIAL PROVISION 316---00X SURFACE TREATMENTS

The information summarized in [Table 1](#) pavement performance indicators was obtained from a survey of State Highway Agencies that are currently using surface treatment warranties. The goal of this table is to show the range of threshold values that have been used for each of the listed performance indicators.

The listed performance indicators are only candidate indicators. The values presented in [Table 1](#) will not necessarily be the threshold values selected for TxDOT Special Provision Item 316---00X, Surface Treatments. The performance indicators and the threshold values that will be incorporated into the TxDOT specifications will be selected by TxDOT based on input from industry, TxDOT pavement evaluation historical data, and experience factors.

The overall objective is to select performance indicators that are good measures of a quality product and predictors of a long-term service life.

Table 1. Pavement Performance Indicators, Threshold Ranges, and Guide to Remedial Action.

Performance Indicator	Threshold Ranges			Guide To Remedial Action
	Minimum	Average	Maximum	
Aggregate Loss*	10%	25%	40%	Resurface
Surface Patterns**		40%		Resurface
Bleeding/Flushing	5%	23%	40%	Resurface
Surface Cracking**		25 Cracks		Resurface

Threshold Ranges are given in percentage of area distressed in an evaluated pavement segment. The evaluated pavement segment is 0.1-mile long.

* Aggregate Loss is defined as areas of dislodged and removed aggregate from the chip seal surface caused by the mechanical action of vehicles.

** Surface Patterns and Surface Cracking are each used by only one state as a performance indicator. Surface Patterns are described as light and heavy lines over the pavement surface. Surface Cracking is measured as the total number of defective cracks within a segment. Transverse cracks and longitudinal cracks are converted to defective cracks by the following:

- One transverse crack 6 feet or greater, in length = one defective crack
- Five transverse cracks between 6 inches and 6 feet = one defective crack
- A total of 125 feet of longitudinal crack(s) = one defective crack

PRODUCT 4498-P3, SPECIAL PROVISION 350---00X, MICROSURFACING

For this project, Item 350, "Microsurfacing" of the Standard Specifications, is hereby amended with respect to the clauses below, and no other clauses or requirements of this Item are waived or changed hereby.

Article 350.1. Description. is voided and replaced by the following:

Furnish, place, and warrant a Grade 1 (fine) or Grade 2 (coarse) microsurfacing system consisting of a mixture of cationic polymer-modified asphalt emulsion, mineral aggregate, mineral filler, water, and other additives. Comply with the provisions of Special Specification Item 5XXX. "Warranted Construction." Perform any required remedial action(s) to correct deficiencies identified in periodic evaluations.

Article 350.6. Payment. is voided and replaced with the following:

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid per ton for "Warranted Microsurfacing (Polymer Modified)" of the grade specified. This price is full compensation for cleaning the existing surface; furnishing, hauling, preparing, and placing materials; equipment, labor, tools, and incidentals; and for any remedial action(s) required by the warranty provisions.

No direct payment will be made for work associated with fulfilling the specified warranty requirements, including materials, equipment, labor, tools, and incidentals. Also included are the replacement of pavement markers and stripping obliterated by warranty-related work.

Article 350.7. Performance Requirements. is added as follows:

- A. Performance Indicators.** The indicators used to measure performance of the pavement are listed in Section C, "Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions."
- B. Evaluation Parameters and Methods.** The Engineer will conduct the pavement evaluation in accordance with the standard methods adopted by the Department and described in "Pavement Management Information System (PMIS) Rater's Manual" and the "Skid Resistance Determination Manual."

Annual pavement evaluation surveys will be conducted by dividing the warranted pavement into nominal half-mile sections. Performance results for each nominal half-mile section will be determined.

Additional surveys may be performed, either on additional segments, or at additional times during the warranty period if the Engineer has reason to suspect that threshold levels are exceeded.

The results of the pavement evaluation survey and the identification of segments where threshold levels have been exceeded, together with the identification of the deficiencies, will be reported to the Contractor within fourteen (14) days of completing the survey.

C. Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.

PERFORMANCE INDICATOR	THRESHOLD LEVELS	GUIDE TO REMEDIAL ACTION
Rutting (See Note)	1/4 inch during the first 120 days following acceptance, or 3/8 inch at the end of the warranty period	Apply additional microsurfacing to eliminate ruts
Skid Resistance	Skid Number of 40	Apply microsurfacing to eliminate the inadequacies
Bleeding/Flushing	5% of segment	Remove excess asphalt if necessary and apply microsurfacing to affected area
Raveling	5% of segment	Remove excess asphalt if necessary and apply microsurfacing to affected area
Delamination	2% of segment	Remove delaminated microsurfacing and apply a new microsurfacing to the affected area

Note: The warranty related to bleeding or flushed areas will not apply to any preexisting bleeding or flushed areas. Pavement area where the rut depth prior to microsurfacing exceeds one (1) inch are excluded from the rutting-related provisions of the warranty.

Article 350.8. Remedial Action(s). is added as follows:

Submit a plan, as required in Item 5XXX.7, that includes proposed remedial action(s) for the pavement areas where the performance results indicate that threshold levels have been exceeded.

Apply the remedial action(s) to the entire pavement area identified as exceeding the threshold levels unless otherwise noted in Item 316.8.C, “Pavement Performance Indicators, Threshold Values, and Guide to Remedial Actions.” Restore the design thickness where the pavement thickness is reduced as part of the remedial work.

Article 350.9. Pavement Markings. is added as follows:

Restripe pavement markings and/or replace raised pavement markers damaged or obliterated due to Contractor’s maintenance and/or remedial work.

MODEL GENERAL NOTES FOR IMPLEMENTING THE WARRANTY PROVISIONS

The initiation of the warranty period and the warranty bond and retainage provisions could be included in General Notes and Specification Data, such as the following.

An option to the above could be developing for each project those special provisions/special specifications that would define the warranty period, amount, etc.

5XXX – Provide a warranty bond for this project in the amount of \$_____. The period of the warranty will be _____ years from the date of acceptance of the warranted construction.

Maintain the warranted construction during the warranty period as provided in **Item 5XXX.8 Maintenance**. (*Or – The Contractor will not be responsible for maintaining the warranted construction.*)

Alternate General Note Providing for Early Initiation of Warranty Period for Specified Segments of the Project

Item 5XXX – Provide a warranty bond for this project in the amount of \$_____. The period of the warranty will be _____ years. The warranty period will begin with the date of acceptance of the warranted pavement for each of the following sections.

(Note: The following is an example listing of the sections of a project that could be completed and accepted before the entire project is completed. This would permit the warranty period to begin at an earlier and appropriate date when the completed pavement is opened to traffic.)

- Northbound Lanes
- Southbound Lanes
- West Frontage Roads
- East Frontage Roads

Or in the case of a seal coat project involving multiple highways-

- SH XX from _____ to _____
- FM XXX from _____ to _____

Maintain the warranted construction during the warranty period as provided in **Item 5XXX.8 Maintenance.** (*Or – The Contractor will not be responsible for maintaining the warranted construction.*)

If retainage is to be withheld as a guarantee of the required warranty work, include the following General Note.

Item 9 – A total of \$_____ (*or* ___%) of the retainage withheld in accordance with Special Provision 9---00X will not be released until the Engineer has issued written acceptance of the warranted construction.

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