Surface Distress Survey

Manual

Nebraska Department of Roads
Materials and Research Division
Roadway Asset Management Section

Prepared by
Pavement Management Unit

NDOR
Nebraska Department of Roads

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NEBRASKA DEPARTMENT OF ROADS

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ROADWAY ASSET MANAGEMENT SECTION

SURFACE DISTRESS SURVEY MANUAL

PREPARED BY

PAVEMENT MANAGEMENT UNIT

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SURFACE DISTRESS SURVEY MANUAL

INDEX

PURPOSE

This manual has been developed to assist Nebraska Department of Roads personnel in conducting a surface distress survey. Included are instructions for evaluating the entire Nebraska State Highway network. The entire system is surveyed annually.

The scope of the condition survey is to provide information necessary for scheduling pavement rehabilitation strategies for the Nebraska Department of Roads.

Other benefits of the condition survey include 1) a ranking system for pavement needs studies, 2) a summary of the overall condition of the pavement in any area of the state, 3) a uniform pavement rating system for highways throughout the state, 4) A means of monitoring the condition of any section of pavement with respect to particular special designs, etc., and 5) historical record of pavement performance and maintenance practice.

TERMINOLOGY

Detailed Record – A comprehensive analysis of the condition of a road, which is a combination of the sample site survey and the windshield survey.

Sample Site Survey – A small area approximately two hundred (200) feet in length located near a reference post where the road condition analysis is conducted.

Windshield Survey – A general overview of the conditions of a road assessed while driving between sample sites.

Rating Section Report (RSR) – This is a listing dividing the Nebraska Highway System into sections. Each section is described with its year built, surface type, number of lanes and district.

Surface Improvement Report – The one-year program list showing the contract resurfacing, reconstruction and preventative maintenance projects. Detailing project limits with descriptions of proposed work.

INSTRUCTIONS

A. INTRODUCTION

Revised October 1, 2011

These instructions provide a procedure for evaluating the condition of the Nebraska State Highway network relative to surface distress conditions as defined within this manual.

All rating data is organized by highway number, reference post number, lane number and direction. The two categories of surface condition information characterize rigid and flexible pavements. Rigid pavements are full depth concrete surfacing. Flexible pavements include full depth asphalt roads and rigid pavements with asphalt overlays. Brick surfaced roads are not rated.

Each Pavement Data Collection Manager uses a Rating Section Report (RSR), (paper copy or electronic) in setting up survey sections to be rated. When each section is rated, it should be marked as completed on the RSR.

Newly constructed or relocated roads whose surfacing is completed and can be driven on should be rated even if signs have not been placed. If reference posts have not been placed on these segments use the vehicles odometer along with the “Nebraska Highway Reference Log Book” to locate the sample sites for rating.

B. PAVEMENT CONDITION SURVEY

The Pavement Condition Survey Access Database is designed to facilitate rating of all visible distresses and uploading of data to the mainframe. Two database tables are used in the rating survey. One table is for evaluating the surface condition of PCC or rigid pavements, the other table is for bituminous or flexible and composite pavements. Completed table examples are shown in Figures 1 and Figure 2. These forms are now incorporated into the Access Database.

The method and form used for rating rigid and bituminous and composite pavements are similar. One line in the database represents a detailed record of a section of road. Each detailed record represents no more than a mile of pavement. A detailed survey on the sample site is performed at the beginning of a pavement segment or near a reference post. Then while driving to the next sample site a windshield survey evaluates the general surface condition of the entire pavement segment compared to the sample site.

1) Rigid Pavements

The sample site analysis of rigid segments consists of ten lane joints and panels. This will consist of five joints and panels in each lane. Conduct the detailed sample site analysis at the beginning of a uniform segment. The data collection manager may decide to get out of the vehicle for a closer inspection of the pavement. The detailed record is then evaluated using the windshield survey. Subsequent sample

site analyses are conducted starting at the first joint past the next reference post. The current date is entered on the detailed record and the highway number, reference post, lane direction, lane type and lane number is verified. Compare the pavement condition to the Access database table record and change it as necessary.

For each sample site, the data collection manager evaluates all distresses on the pavement surface within the two by five joint and panel region. The extents for rigid pavements of the following distresses are counted and recorded: 1) joint and panel repairs, 2) joint and panel spalls and 3) panel cracks. The combined total number panels showing Class I and Class II cracking may not exceed ten (10). The distress severity of joint pattern cracking and/or staining is coded as none (blank), moderate (M) and high (H). The distress severity of panel pattern cracking and/or staining is coded as none (blank), low (L), moderate (M) and high (H). Joint and panel crack sealant is coded (blank) for a good seal and (P) for absent or failed seal. Panel crack sealant is evaluated when either Class I or II cracking are present. All ten-lane joints are observed and the severities recorded. The severity of the ten panels is then observed and recorded. If the majority of the panels are Class II, then the longitudinal crack fault is measured. Then rate the surfaced shoulders. Evaluate surfaced shoulders when they are a minimum of two (2) feet wide and at least 80% of the mile or test segment in length. Next, begin the windshield survey to review all distresses until the next detail sample site. If the majority of distresses are more severe or less severe than those observed at the sample site the data collection manager will adjust the ratings accordingly. Any PCC roads with alkali silicate reaction (ASR), we will increase the rating to reflect the worst surface condition exhibited within the mile or segment. Severity levels of distress may be classified by comparisons with the cataloged photographs (Appendix A).

2) Bituminous Pavements

Sample site analyses of bituminous and composite pavements are conducted at the beginning of a uniform segment. The remaining portion of the test section is evaluated using the windshield survey. The data collection manager may decide to get out of the vehicle for a closer inspection of the pavement. Subsequent sample site ratings will be conducted at or near the highway reference posts. Enter the date on the detailed record and verify the highway number, reference post, lane direction, lane type and lane number. Then assess the pavement condition. Catalog distresses by the severity and/or extent and compare them to the Access database record and change as necessary. If present, evaluate the surfaced shoulders using the same criteria for shoulder rating as the rigid pavements.

The distresses of bituminous pavements can be identified by experience or comparison with cataloged photographs accompanied by word descriptions (Appendix A). The five categories of severity are: absent

(blank), low, moderate, high, or extreme. Further details are in the section on "Severity Condition" found on page 11.

The following road distresses are evaluated for Nebraska's bituminous pavements: alligator cracking, edge cracking, longitudinal (wheel path, centerline, between wheel path) cracking, transverse cracking, grid block cracking, raveling/weathering, excess asphalt and failures.

The windshield survey will review all distresses until the next detail sample site. If the majority of distresses are more severe or less severe than those observed at the sample site the data collection manager will adjust the ratings accordingly.

The six categories of extent are none (blank), trace, occasional, frequent, extensive or complete. See descriptions on pages 11 to 12.

If the data collection manager notes distresses in the previous rating that are not exhibited by the pavement and no maintenance activity has been performed to disguise or repair that distress, they will note and photograph the section in question and submit it to the pavement management supervisor for review.

Use the following procedures for collection of the pavement condition data:

1. Each data collection manager is to undergo a significant training effort to ensure the collection of uniform high quality data. Before the annual pavement condition surveys begin, a refresher training class is held. In addition, a group field review will be accomplished with instructions on distress identification and survey techniques.
2. Evaluate the entire Nebraska highway network.
3. The visual surveys are conducted during late winter, spring and summer months. Do not collect data during or immediately after a rain.
4. The goal for completion of the pavement rating is August 15 each year.
5. Transfer and update the completed rating data weekly to the mainframe.
6. (Revised Jan. 29, 2009) Weekly submit a copy of the Access Database to the pavement management supervisor.
7. On or about September 1st all data should be checked. Each data collection manager will use SQL queries to inspect the data for missing or old data. The pavement management supervisor will periodically check the data for large (±10%) changes in NSI ratings, missing data, ratings on the wrong surface type and verify that surfaced shoulders have been rated.
8. Use open line highway maps with this rating manual, Rating Section Report, and Surface Improvement Report to aid in rating.
9. (Revised Jan. 1, 2011) Multi-lane highways, (4 or more lanes), are to be surveyed separately in both directions. On multilane pavements with more than two lanes in a given direction, rate only the two lanes nearest the outside shoulder. One observation is needed per section for segments less than one (1) mile in length.
10. (Revised Jan. 1, 2011) The basic rule is to rate what you see. See page 9 item 16 and page 10 item 20 for exceptions related to maintenance activities. Various project sections are scheduled for resurfacing and other types of major rehabilitation or preventative maintenance. These sections are listed in the Surface Improvement Report. Do not rate the sections listed as current fiscal year construction resurfacing projects or projects under active construction. Place a “UC” code in the Bituminous Remarks or Rigid Remarks column but do NOT put a date on record(s) in these areas. Where old visual data is found “Nebraska Profiler” images will be checked when field work has been completed. A segment under construction will be profiled unless it is closed to traffic. If completed new surfacing is seen on the images for the entire project then the ratings on that segment will be updated or made new. If the “Nebraska Profiler” tests a segment of roadway listed in the one year program before construction is started or completed, then the

previous year’s visual ratings will be retained as current data. In either case the visual rating will be given the date the Profiler tested the segment and a ‘Y’ will be placed in the ‘Photo Rating’ column of the database. Old ratings will be updated in the rating cycle after construction is finished.

11. Each sample site survey is located at the beginning of a project and at every reference post thereafter. Although there may be exceptions for safety reasons, the sample sites are typically located on the ascending side of the reference post regardless of the survey direction. Ratings may be conducted in ascending or descending reference post direction. When pavement analysis is conducted in ascending reference post order the detail sample site rating is done followed by the windshield survey. When traveling in decreasing reference post order the windshield survey is completed first followed by the detail site survey.
12. Three lane roads are rated as a two-lane highway. Only the thru lanes are rated, not the climbing or turning lanes.
13. Two or four lane highways with mixed surface types will be rated separately. If one lane is rigid pavement and the other is bituminous pavement, rate each type using the appropriate table. Designate the side of the road as ascending (A) or descending (D) and number the lanes as necessary.
14. While rating on highways in ascending direction the reference posts will normally be located to the driver's right. While rating a pavement in descending direction, the reference posts will normally be to the drivers left. Raters should monitor the vehicles odometer to assist in location of a reference post in the event some are missing, moved, damaged or placed on the wrong side of the road. Sample sites may have to be located based on odometer readings.
15. Pavement sections 0.04 mile or shorter in length are not rated. They will be assumed part of an adjacent section regardless of surface type. The data collection manager records the reference post of this section at the beginning of the predominate surface type. For example, if a spur that is predominately bituminous surfacing has at its intersection with the main highway a 0.04 mile of rigid pavement, the manager records the reference post as 0.04 for the first rating. Then the reference post for each successive rating will be 1.00, 2.00, etc.
16. To give credit for applied maintenance treatments the pavement data collection manager may improve the severity of the distresses to the low severity depending on what is observed. The extent of the distresses cannot be changed. Rating failures is an exception to this rule. Since failures only have the extent criteria, the pavement data collection manager may improve the extent to a trace. Again, this decision will be based on the condition of the observed distress. However, in either case any previously identified distress cannot be removed. The following codes identify maintenance activities. They are placed in the Bituminous or Rigid Remarks Code column when a pavement rating is improved:

Bituminous Remark Codes

AC	Changes in rating due to armor coats.
CS	Changes in rating due to crack seals.
MI	Changes in rating due to surface milling.
MP	Changes in rating due to machine patches.
NC	Changes in rating due to new construction.
SP	Changes in rating due to skin patches.
SS	Changes in rating due to microsurfacing/slurry seals.
UC	Rating deferred due to pending construction or active construction

Rigid Pavement Remark Codes

CS	Changes in rating due to joint and crack seals.
GR	Changes in rating due to diamond grinding.
JR	Changes in rating due to joint repairs.
JS	Changes in rating due to joint sealing.
NC	Changes in rating due to new construction.
PR	Changes in rating due to panel repairs.
UC	Rating deferred due to pending construction or active construction.

17. (Updated January 2012) In rare occasions, the data collection manager finds a rated section of road that does not represent actual road conditions, such as having a bituminous rating on a PCC section or vice versa. If no valid reason for the discrepancy between the rating data and current road conditions can be found, a list of those sections will be noted and sent to the pavement management supervisor for review. Photographing the section in question and/or adding comments to the 'Remarks' column of the Access table are two ways of documenting section discrepancies. Sections with normal deterioration, maintenance or construction activities do not require any extra documentation.
18. Dowel Bar Retrofit projects on PCC roads normally include joint and crack sealing. Remove these deficiencies from those sections when appropriate.
19. (Revised Jan. 1, 2011) The Nebraska Highway System has some six-inch thick rigid pavements. These pavements have much Class II panel cracking. Many sample sites at the reference post are free from cracking. For this reason the sample site is chosen differently from regular rigid pavements. When the detailed record shows Class II cracking and the normal reference post sample site is not cracked, advance to an area where the Class II cracking is present to conduct the sample site survey. If any of the six-inch thick pavements have panels with longitudinal Class II cracking, evaluate and record severity of Panel Crack Faulting.
20. (Revised Jan. 1, 2011) When a rigid sample site has been completely replaced with new concrete pavement, adjust the sample

site location forward to rate the original concrete pavement. Do not rate the condition of the replaced concrete. When joints or panels have been repaired the previously identified distress can be reduced or eliminated depending on what the Pavement Data Collection Manager observes. Then add a corresponding amount of joint or panel repairs to the rating to replace the distresses that were removed.

21. Distant districts of the state will be rated on a rotating basis from collected profile images. Congested urban areas will be photo rated annually. The visual rating date will be the profile test date.

D. SEVERITY AND EXTENT RATING

Severity Condition

Revised January 2012

The severity condition determines how advanced the specific distress has become. The severity level answers the question of "how bad is the problem". Environmental distresses grid/block and transverse cracking in bituminous pavements have an extreme severity category in addition to low, moderate and high. Rigid pavements have severities of low, moderate and high for panel condition and panel crack fault. Joint condition only has moderate and high severity categories.

In Appendix A, the photographs illustrate the severity conditions for each distress. They are only provided as reference. These photographs do not show all conditions that might occur.

Extent Condition

Bituminous Pavements:

The extent condition determines the amount of a distress. The extent level answers the question of "how big is the problem" by describing the density of occurrence of the distress. Distresses have six (6) categories of extent. These are absent, trace, occasional, frequent, extensive and complete.

Extent description for edge, wheel path, centerline, between wheel path, grid/block and alligator cracking:

Description	Guide (%)
Absent	Not observed
Trace	Less Than 10%
Occasional	Approx. 10-30%
Frequent	Approx. 30-50%
Extensive	Approx. 50-80%
Complete	>80%

Extent description for failures:

Description	Guide (%)
Absent	< 2 ft^2 area observed
Trace	2 ft^2 area -10%
Occasional	Approx. 10-30%
Frequent	Approx. 30-50%
Extensive	Approx. 50-80%
Complete	> 80%

Extent description for transverse cracking:

Description	Guide
Absent	Not Observed
Trace	Distance between cracks greater than 500 ft. (< 11 cracks per mile)
Occasional	Distance between cracks from 200 to 500 feet. (11 to 26 cracks per mile)
Frequent	Distance between cracks from 100 to 200 feet. (27 to 53 cracks per mile)
Extensive	Distance between cracks from 50 to 100 feet. (54 to 106 cracks per mile)
Complete	Distance between cracks less 50 feet. (Over 106 cracks per mile)

Rigid Pavements:

The extent condition for rigid pavement is a direct count of any observed distress. The six (6) distress items counted are joint and panel spalls, joint and panel repairs and class I & II panel cracking. The number of joints or panels exhibiting these conditions are counted at the sample site and recorded. The codes are blank – not observed, 01, 02, 03, etc. to 10.

E. SAFETY

Revised October, 2011

Do not sacrifice safety while conducting the distress survey. While surveying a road keep alert to traffic that is near and traveling at high speeds. Often drivers are not alert to a single worker on the roadway.

Wear fluorescent orange or yellow ball caps and safety vests when outside of the vehicle. The vehicle should be equipped with a strobe warning lights or similar device to alert approaching motorists. Select sample sites that will afford the best possible sight distance and safety from approaching traffic.

APPENDIX A

CATALOG OF PAVEMENT DISTRESSES

BITUMINOUS PAVEMENTS

ALLIGATOR CRACKING

Low: Hairline cracks no greater than ⅛ inch wide that may be interconnected or running parallel to each other initially but could also look like an alligator pattern.

Moderate: Cracking forming an alligator pattern, cracks may be lightly spalled and are about ⅛ to ¼ inch wide.

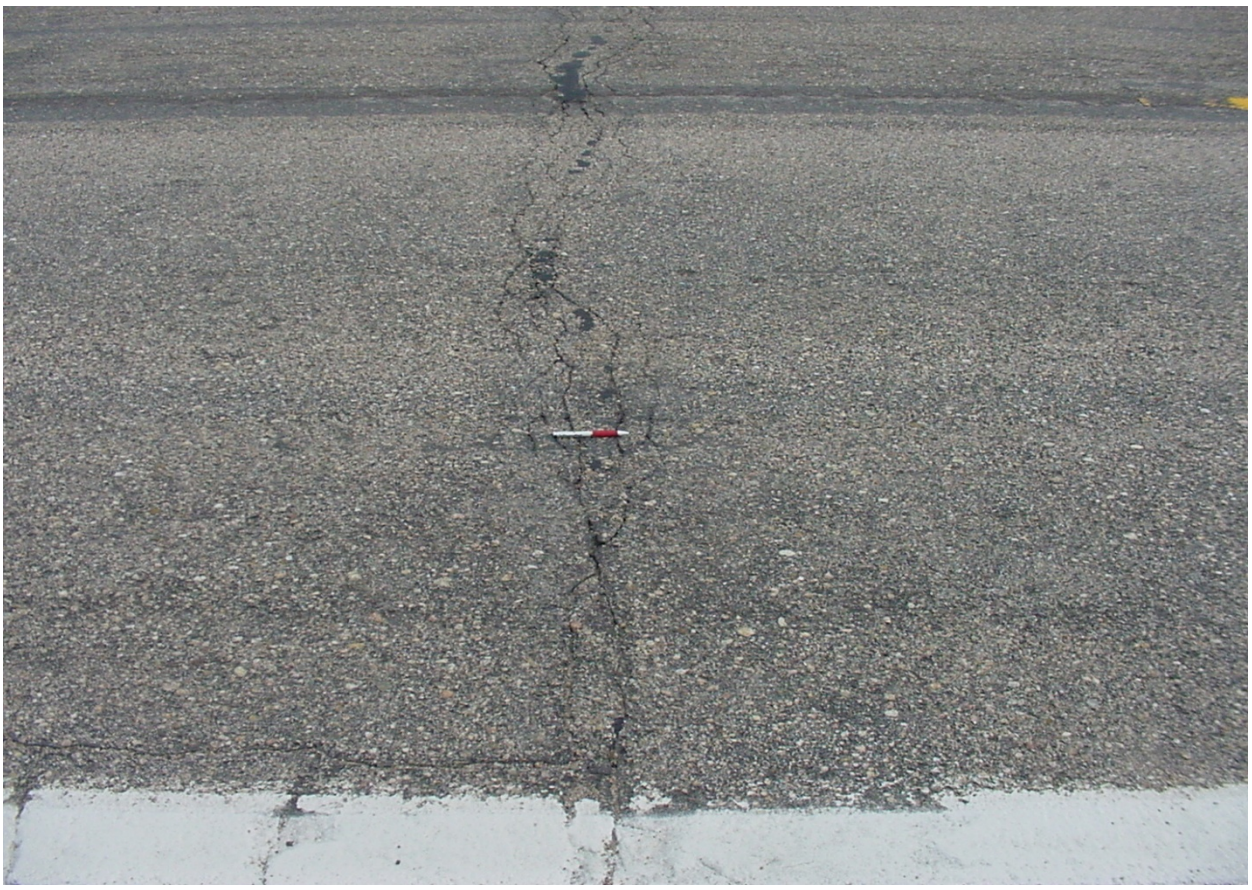
High: Cracking has progressed so that pieces appear loose with severely spalled edges, cracks are probably ¼ inch wide or greater, pumping of fines through the cracks may be visible on the pavement surface, failures may be present.

Description:

Alligator cracking is a structural failure. The failure can be in the surface, base or subgrade. Deformation (rutting) does not have to be present for there to be alligator cracking. Alligator cracking can be found anywhere on the pavement surface. It may start out as a single crack with only a few interconnecting cracks and with further stress progress to create an alligator pattern. Alligator cracking can develop around transverse cracking in the wheel paths and in advanced stages may develop cusping. See pages 37, 52 and 53. A longitudinal wheel path crack that meanders with a few branching cracks, will be classified as alligator cracking along with wheel path cracking. A straight wheel path crack is only recorded as wheel path cracking. When the straight wheel path crack begins developing secondary parallel cracking, then an amount of alligator cracking may also be included.

ALLIGATOR CRACKING - LOW SERVERITY

ALLIGATOR CRACKING ON TRANSVERSE CRACKS



ALLIGATOR CRACKING - MODERATE SEVERITY

ALLIGATOR CRACKING - HIGH SEVERITY

EDGE CRACKING (EDGE DETERIORATION)

Low: Hairline cracks just beginning to show; cracks are random with no pattern; cracks may be up to ¼ inch wide.

Moderate: Cracks are wider, being from ¼ inch to ½ inch in width or an alligator pattern of cracks less than a foot in width measured from the pavement edge.

High: Cracks greater than ½ inch, or sections with alligator cracking which has failed; pieces of pavement may be loose, or missing, or failures may be present.

Description:

The edge cracking distress can only be found on asphalt pavements without surfaced shoulders. Edge cracking is similar to alligator cracking but only located within one (1) foot of the edge of the pavement. Failure begins at the edge of the road and progresses toward the wheel path. Pavement edge distress can result in worsening of wheel path condition, allowing moisture intrusion in the subgrade soils and base materials.

EDGE CRACKING – LOW SEVERITY

EDGE CRACKING - MODERATE SEVERITY

EDGE CRACKING - HIGH SEVERITY

FAILURES (POTHOLES/SPALLS/SHEAR FAILURES)

Description: Revised October 1, 2011

A surface deformation (shoving or pushing) due to subgrade failure (softness or sponginess), or a pothole (surface breakout and loss of material) due to cracking, water penetration, vehicle loading and possible freeze/thaw condition are all examples (and causes) of bituminous roadway failures.

A trace (T) extent will be recorded in the failure column if the distress area is at least two feet square (2 Ft^2). Typically, there are not more than a trace of failures per section or mile. The following are the extent parameters:

Blank = None	Absent - < 2 Ft^2
T = Trace	2 Ft^2 - 10%
O = Occasional	10% - 30%
F = Frequent	30% - 50%
E = Extensive	50% - 80%
C = Complete	> 80%

The proper repair of a failure can lower its extent rating to trace. A saw cut, squared-up patch, level to the existing surface, is considered the proper and acceptable quality controlled maintenance activity to allow this change in identification. An armor coat, microsurfacing, machine patching or other surface maintenance activities can lower failures to a trace depending on what the Pavement Data Collection Manager observes. The failure rating cannot be improved when the repair is lower quality such as spot or throw and roll patches.

A trace of failures may be added if segments contain transverse or grid/block cracking greater than two (2) inches wide (extreme severity).

FAILURES

FAILURE – SUBSURFACE FAILURE

FAILURE – AT TRANSVERSE CRACK

FAILURES – WITH SPOT PATCHING

FAILURES – SHOVING IN LEFT WHEEL PATH

PATCHING

Do not rate patching. Leave the patching columns blank on the Access Database.

LONGITUDINAL CRACKING

Low: A continuous or discontinuous hairline to ¼ inch in width crack running parallel to centerline of the pavement.

Moderate: Cracks parallel to the centerline of the pavement are about a ¼ to ½ inch in width.

High: Longitudinal cracks wider than ½ inch in width.

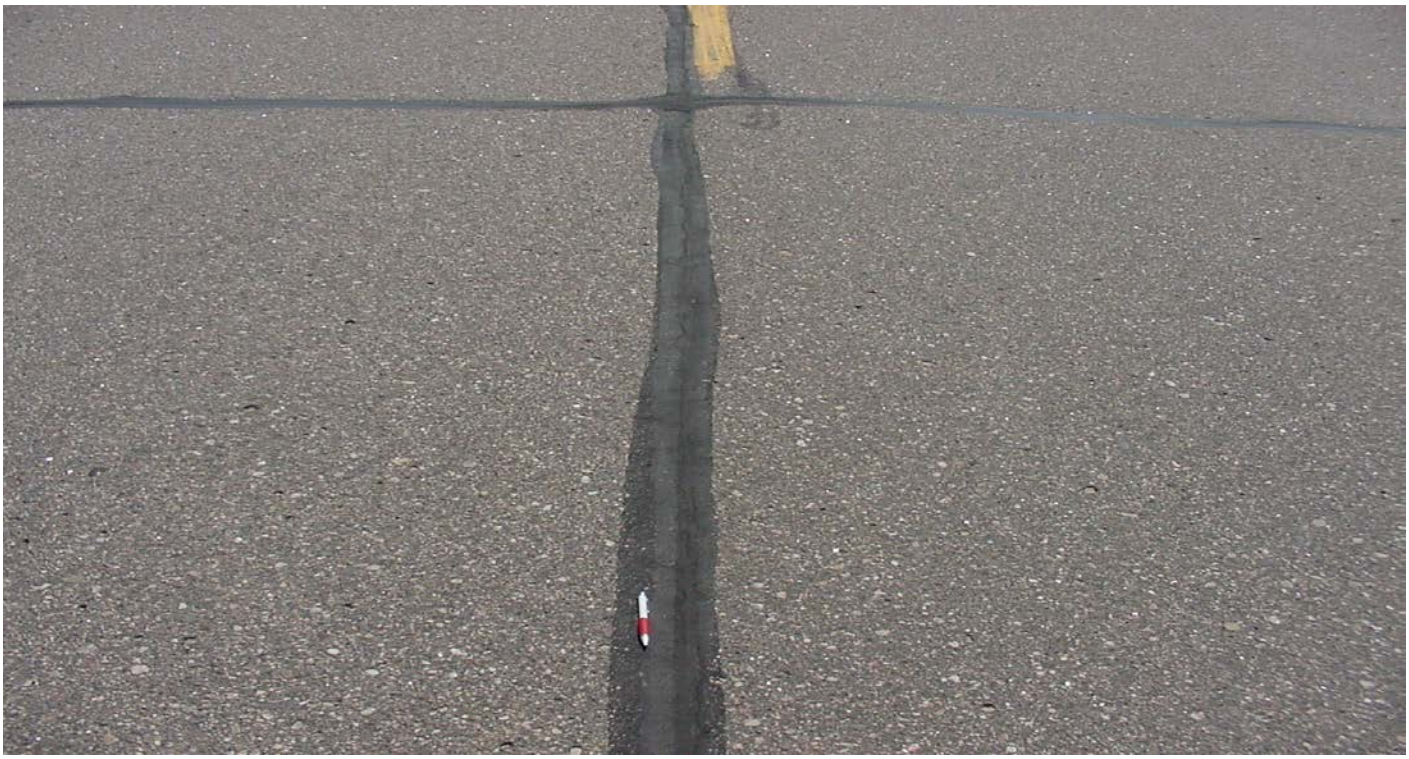
Description:

Longitudinal cracking can be observed in the wheel paths, between wheel paths, at lane joints, edges and centerline joints. Those cracks located along the centerline and lane/shoulders area are often due to the quality of construction practices. Longitudinal cracks in the wheel paths are due primarily to vehicle load. Between wheel path cracking can be environmental or load related. When secondary cracking occurs parallel to longitudinal cracking, alligator cracking should also be considered.

Longitudinal cracking in asphalt pavements due to concrete base course widening is also included. This type of cracking generally occurs one (1) to two (2) feet from the outer edge of the pavement and parallel to it. The frequency in older pavements can be extensive or complete thru the entire section.

Examples of sealed longitudinal cracking are also found on pages 25, 32 and 35.

LONGITUDINAL CRACKING – LOW SEVERITY



LONGITUDINAL CRACKING - MODERATE SEVERITY

LONGITUDINAL BWP CRACKING – MODERATE

LONGITUDINAL CRACKING - HIGH SEVERITY

WHEEL PATH CRACKING – MODERATE SEVERITY

WHEEL PATH CRACKING near curb – LOW SEVERITY **Added July 2011**

Low: Hairline cracks to ¼ inch in width, with interconnecting longitudinal cracking. The pattern may be block, map, transverse or branched. Crack spacing may be relatively great (50 to 100 feet or more apart).

Moderate: Branched cracks may be ¼ to ½ inch in width and may or may not be slightly spalled. Definite cusps within the region of the crack are evident.

High: Block, map, or branched cracks with single cracks greater than ½ to two (2) inches in width or multiple cracks hairline or wider. These cracks usually cusp with regions outside of the cracked areas distorted or slightly bulged. The surface often takes on a "turtle" or "tortoise" shell appearance. Alligator cracking may also be present.

Extreme: Single cracks greater than two (2) inches wide, many bundles of multiple cracks, cracks spalled and cracks with depressions greater than one (1) inch. Alligator cracking is usually present.

Description:

Grid block cracks divide the pavement into rough rectangular or polyangular pieces. This type of cracking is thermally induced. Water penetration and heavy traffic on grid block cracking can develop secondary adjacent alligator cracking and shear failures. When secondary cracking occurs parallel to the grid block cracking, alligator cracking should also be considered.

Slippage is also included in this category. Slippage is the distress where the surface layer of asphalt is sliding on the underlying surfacing.

RANDOM/GRID BLOCK CRACKING **LOW SEVERITY**

RANDOM / GRID BLOCK CRACKING - MODERATE SEVERITY

RANDOM/GRID BLOCK CRACKING – HIGH SEVERITY

RANDOM/GRID BLOCK CRACKING – EXTREME SEVERITY

Low: Minimal aggregate loss. Small amounts of pitting may be detected. Aggregate or binder has started to wear away.

Moderate: Nominal aggregate loss. Small areas stripped away.

High: Pitting, stripping, and erosion of aggregate and binder.

Description:

Raveling/weathering may occur in all asphalt mix types and surface treatments. Raveling is the wearing away of the pavement surface caused by dislodging of aggregate particles in mixes that are oxidizing or low in asphalt binder. Construction materials, snowplows, weather, and traffic elements all contribute to the cause of this distress. Extent condition does not apply to the ravel/weathering distress.

RAVELING/WEATHERING - LOW SEVERITY

RAVELING/WEATHERING - MODERATE SEVERITY

RAVELING/WEATHERING - HIGH SEVERITY

RAVELING/WEATHERING on Armor Coated Surface (snow plow damage)
Added June, 2011

Low: Intermittent films of bituminous material on the surface of the asphalt pavement. These create a slightly darker surface relative to the rest of the pavement.

Moderate: Large areas or continuous strips of bituminous films, which are shiny in appearance. Most aggregate is present but appears sparsely distributed throughout the bituminous material. The bituminous areas appear almost fluid but do not track.

High: Areas of excess bituminous films that are fluid and exhibit plastic flow. Little if any aggregate can be observed. Excess bituminous material is wet appearing and actually liquefies during hot weather.

Description:

Excess asphalt is usually observed in the wheel tracks and can occur in all asphalt mix types and surface treatments, except fog seals. Bleeding or excess asphalt at the surface of a bituminous road can be caused by a variety of factors including too much asphalt in the mix, asphalt too soft for climate, traffic consolidation of the surface, stripping, and other reasons. It can cause friction loss and be a traffic hazard. Extent condition does not apply to the excess asphalt distress.

EXCESS ASPHALT on Armor Coated Road (Moderate Severity) Added June 2011

EXCESS ASPHALT on Armor Coated Road (Low Severity) Added July, 2011

EXCESS ASPHALT - LOW SEVERITY

EXCESS ASPHALT - MODERATE SEVERITY

EXCESS ASPHALT - HIGH SEVERITY

Low: Cracks hairline to ¼ inch wide and twelve (12) feet long generally perpendicular to pavement centerline. Cracks have no spalling or depression. Low severity transverse cracks cannot be felt in the vehicle when driven over.

Moderate: Cracks ¼ to ½ inch in width. Cracks have little or no spalling or depression

High: Single cracks ½ to two (2) inches wide. With single bundles of multiple cracks (alligator), cracks spalled and cracks with depressions or bumps near one (1) inch. Cracks are noticeable when driven over.

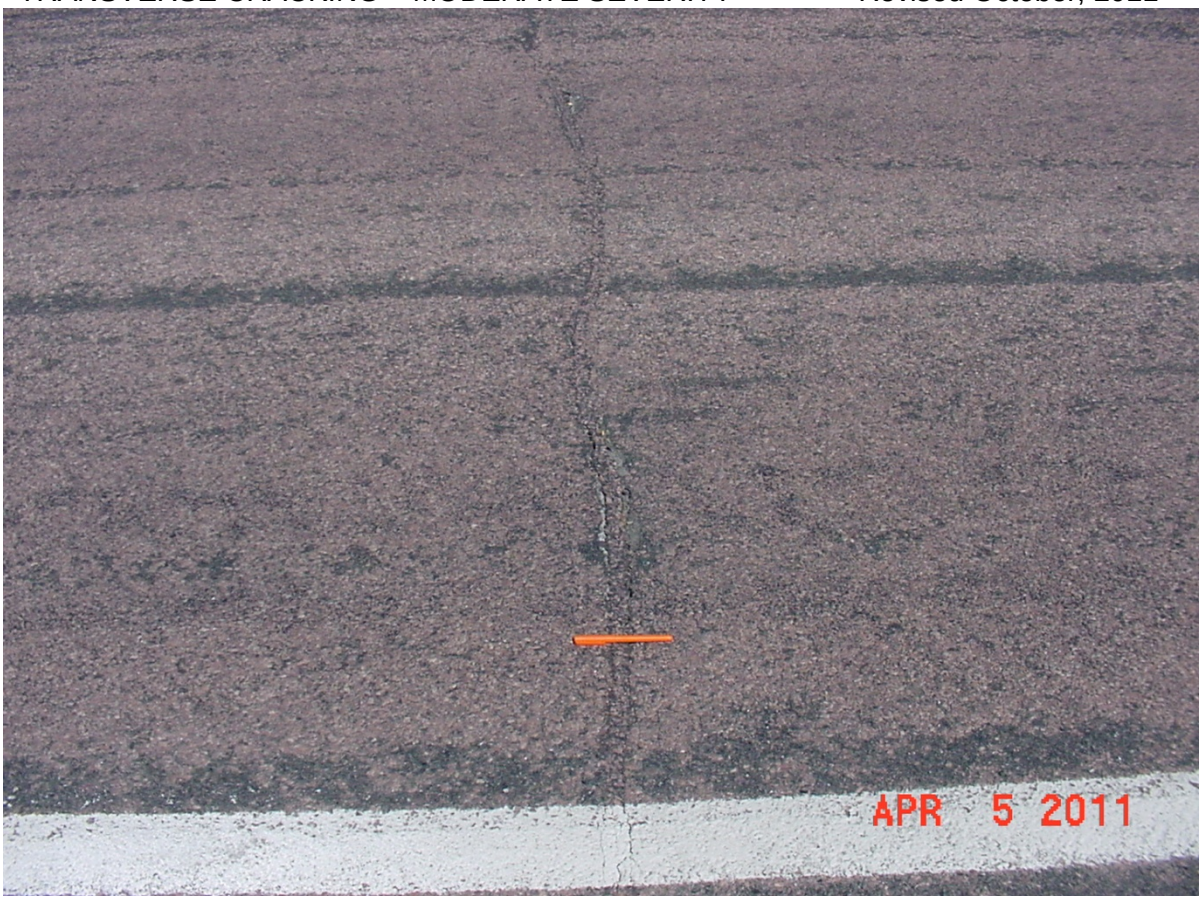
Extreme: Single cracks greater than two (2) inches wide. With many bundles of multiple cracks (alligator), cracks spalled and cracks with depressions greater than one (1) inch. Usually cracks are very noticeable when driven over at highway speeds.

Description:

Transverse cracks are single cracks a minimum of twelve (12) feet long perpendicular to the centerline of the pavement. These cracks may start out at the edge of the driving lane and go to the centerline of the road or they may start at the center of one lane and go to the center of the next lane a distance of approximately twelve (12) feet. The cracks normally result from thermal or other environmental conditions.

The extent of transverse cracking is a function of frequency rather than area of distress. Use a hand tally counter as an aid in counting transverse cracks.

TRANSVERSE CRACKING - LOW SEVERITY



TRANSVERSE CRACKING – MODERATE SEVERITY w/ ALLIGATOR CRACKING

TRANSVERSE CRACKING - HIGH SEVERITY


MAY 26 2011


JUL 14 2011

TRANSVERSE CRACKING – EXTREME SEVERITY

JOINT CONDITION Revised October, 2011

Moderate: Any discoloration exhibited in the corners or along the length of the joint. Joints with visible hairline cracking with or without staining will be rated moderate.

High: Discoloration radiating across the joint or just in the corners of the panels exhibiting greater than hairline cracking. Joints with greater than hairline cracking without staining. Any joint cracking showing a white paste gel or are spalling. When PCC shoulders are stained, cracked and showing paste the adjacent joint shall be labeled high without any visible distresses evident on the roadway joint.

Description:

This category includes distresses near sawed construction joints and joints created by a twelve (12) foot wide concrete repair of a failed joint. The joint area is within two (2) feet on either side of the sawed joint or repair. Record the number of repaired joints in the sample site in the rating table.

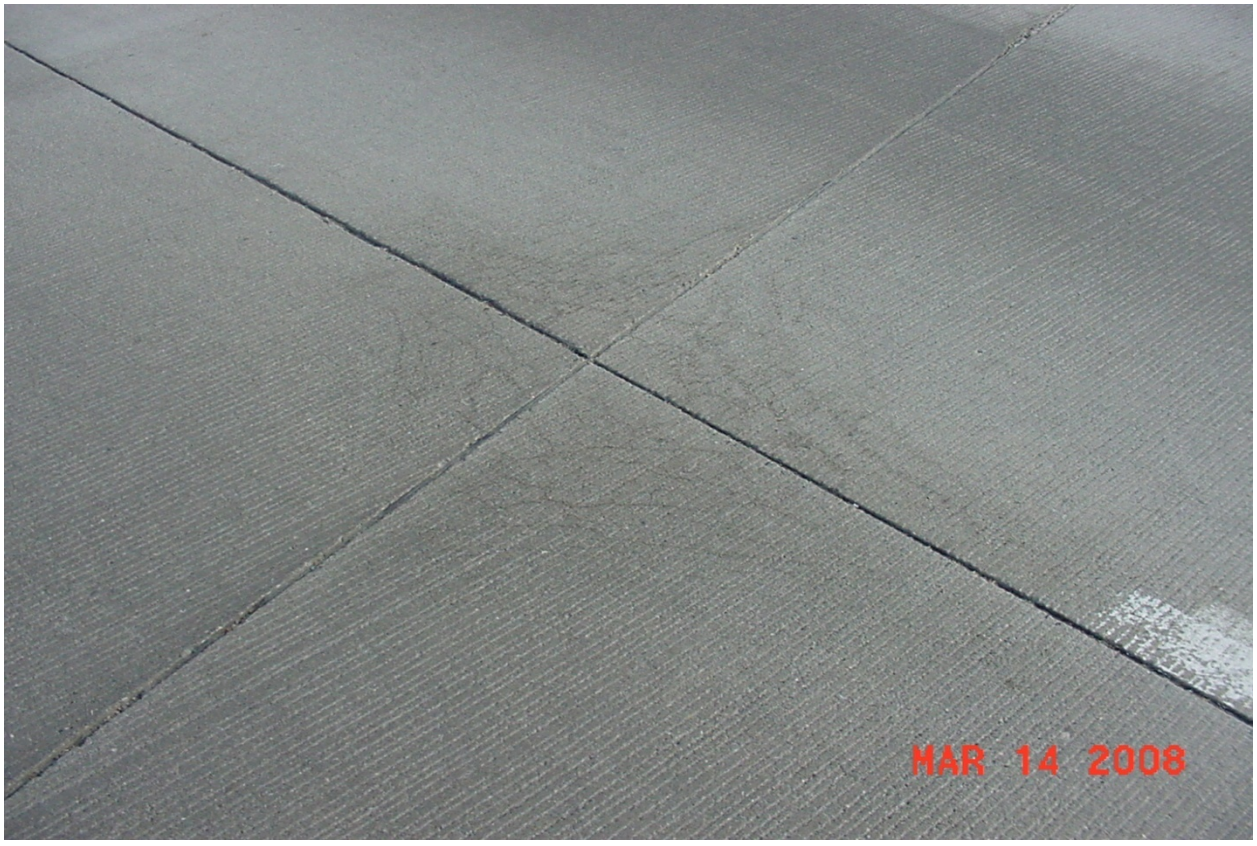
Three other associated distresses are evaluated with joint condition. These are 1) spalling at the joint, 2) faulting or displacement and 3) joint seal. The Nebraska Profiler records joint faulting.

Spalling at the joint usually starts in the corners of the slab where the most discoloration and cracking occur or in the wheel track region. Spalling at any condition is a significant distress in that it leads to excessive pavement roughness and requires immediate maintenance. Record spalling if any is observed within two (2) feet of the joint. See ‘Joint Spalls’ on page 74.

Use the windshield survey of the mile to finalize the ratings. For rigid (PCC) pavements exhibiting ASR only, record the highest severity observed in the mile.

REGULAR JOINT – STAINED MODERATE SEVERITY

REGULAR JOINT – STAINED AND CRACKED MODERATE SEVERITY

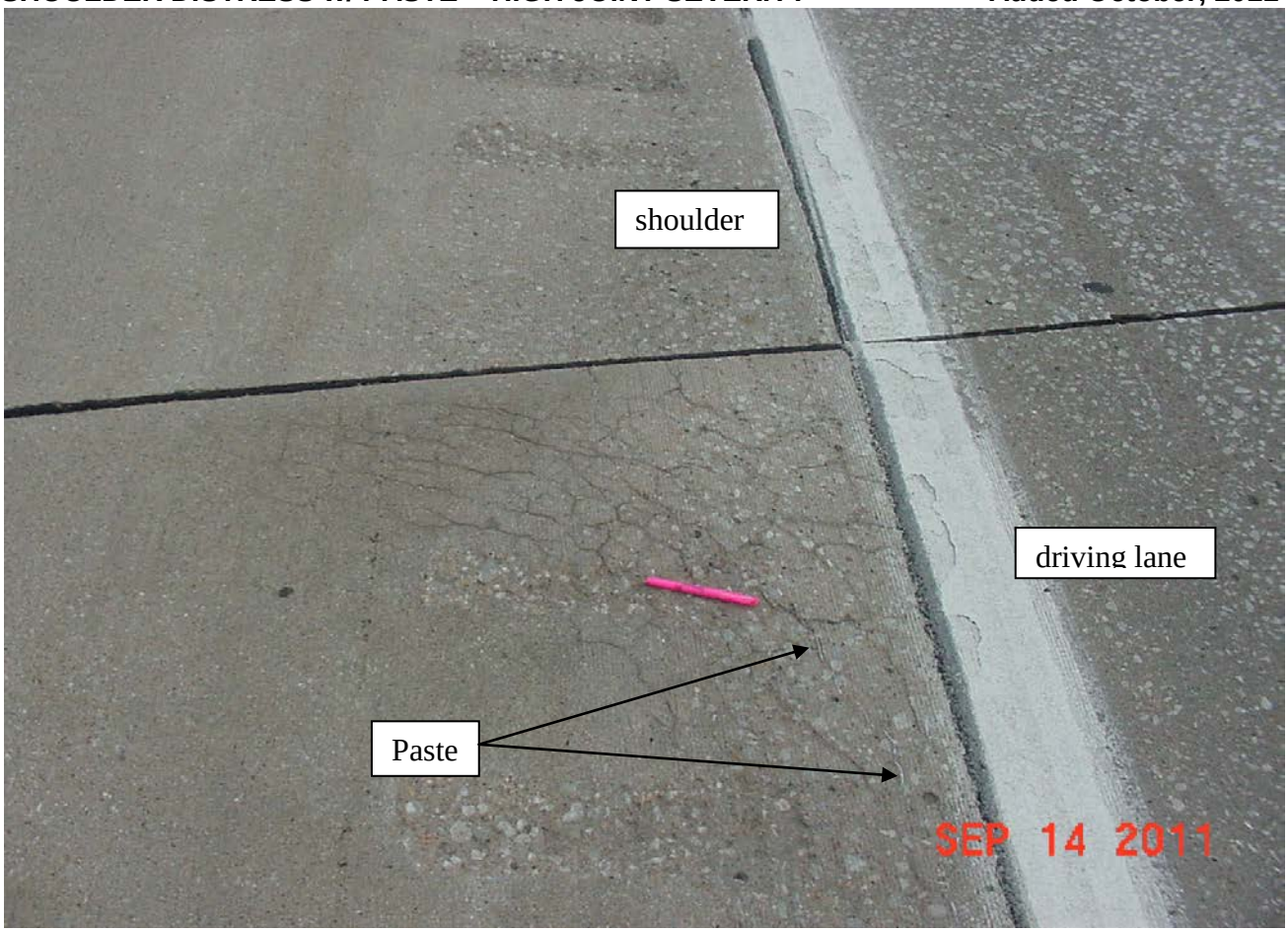


REGULAR JOINT – STAINED MODERATE SEVERITY

REGULAR JOINT – STAINED MODERATE SEVERITY

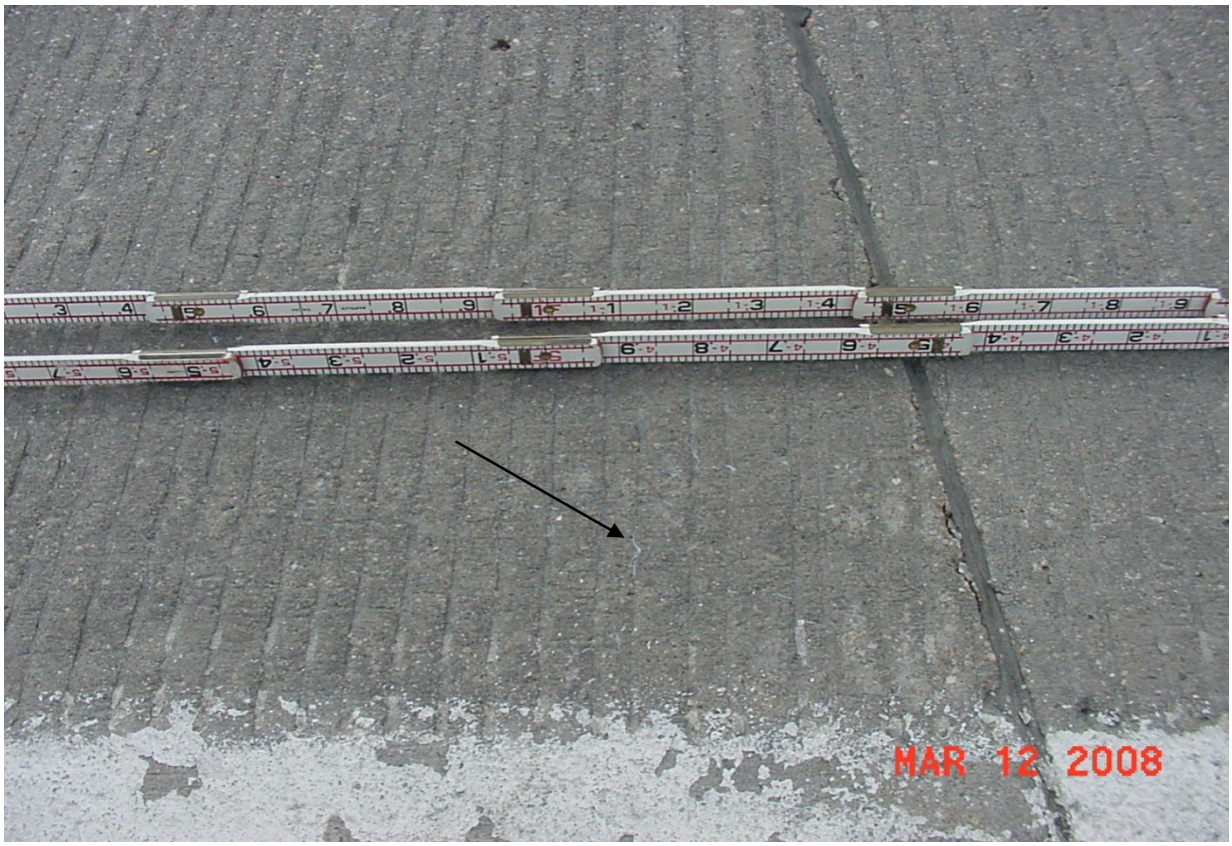
GOOD JOINT **Rev. September, 2010**

SHOULDER DISTRESS w/ PASTE = HIGH JOINT SEVERITY **Added October, 2011**



REGULAR JOINT – STAINED AND SPALLED HIGH SEVERITY

REGULAR JOINT – CRACKS SHOWING PASTE - HIGH SEVERITY

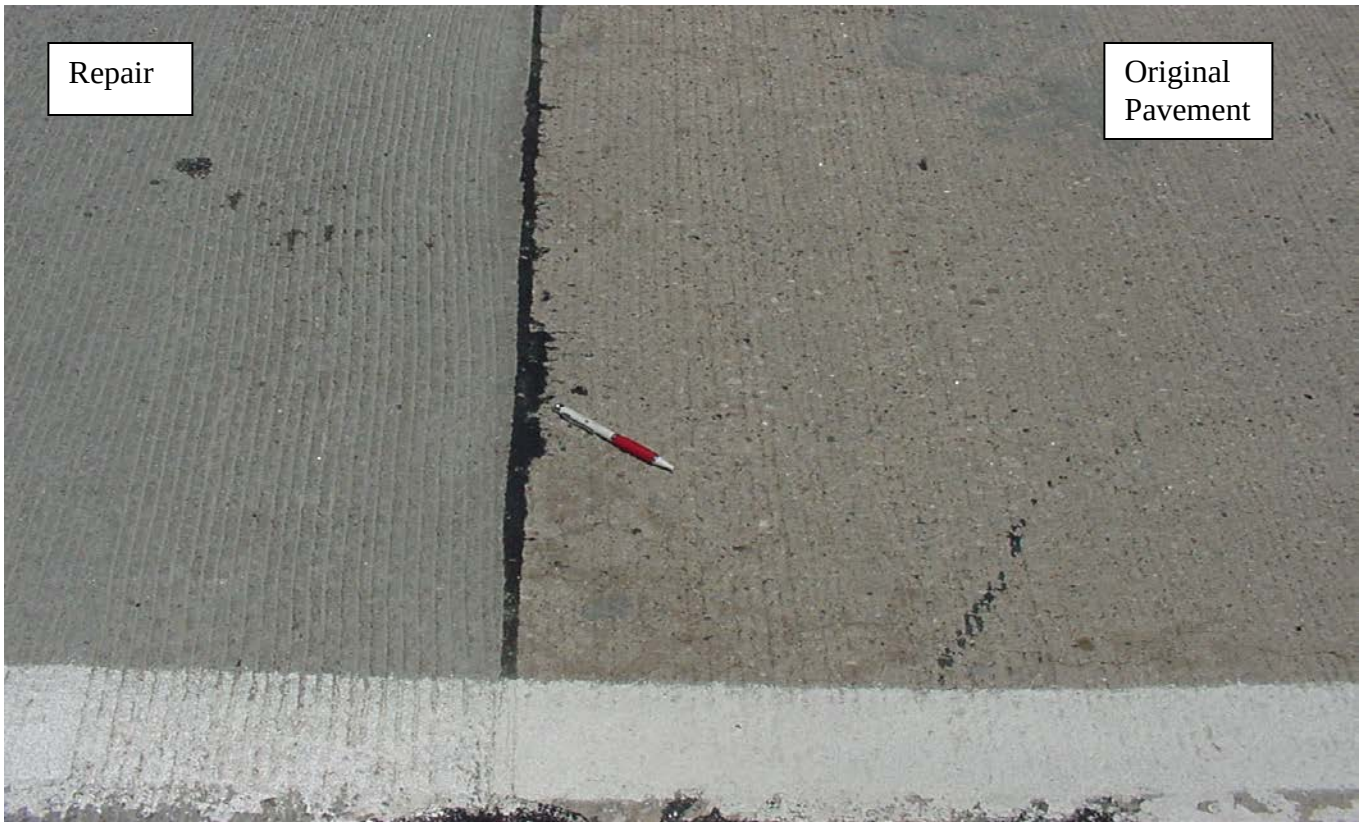


REGULAR JOINT – CRACKS SHOWING PASTE - HIGH SEVERITY

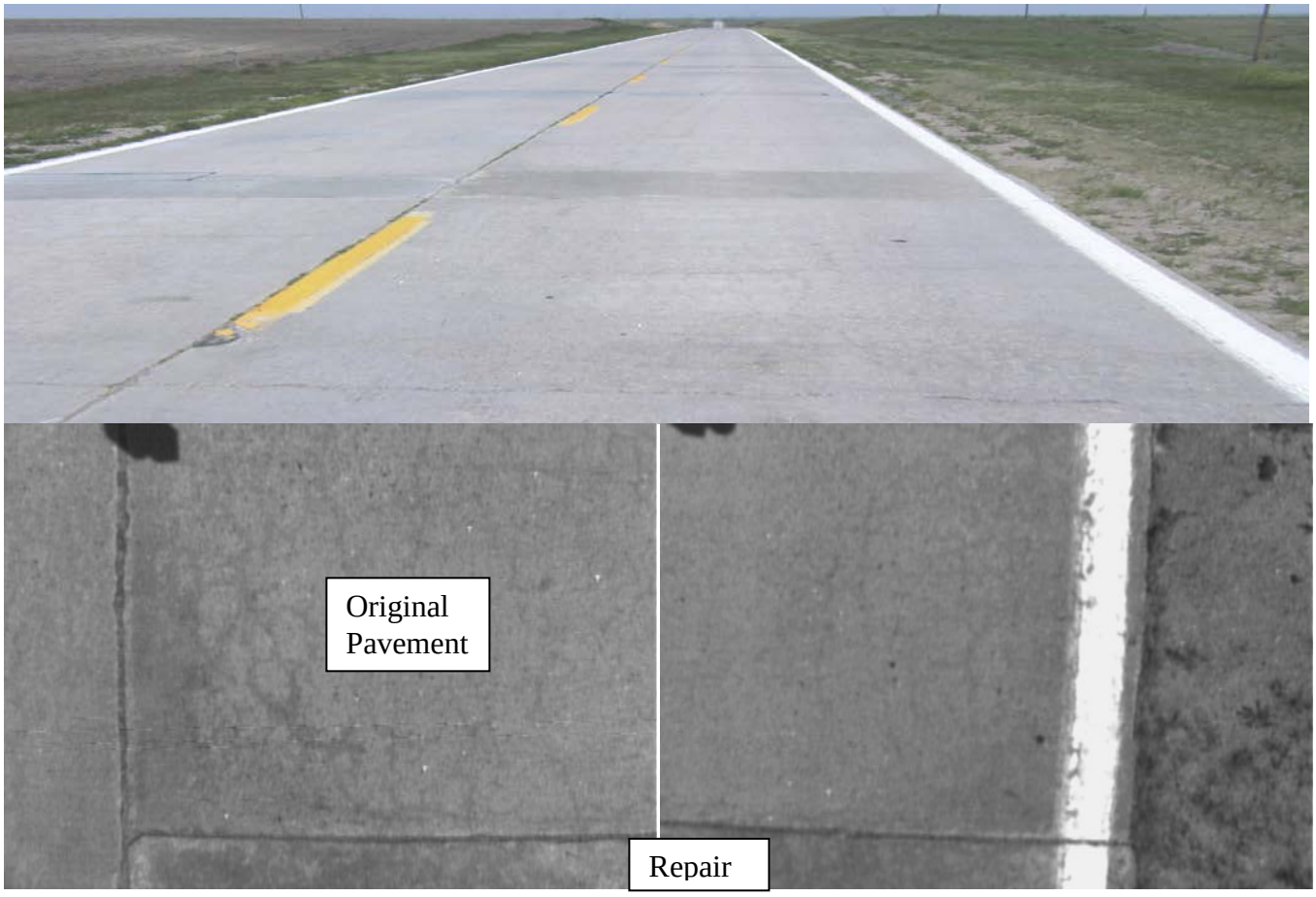
REGULAR JOINT – HIGH SEVERITY CRACKING **Added January, 2011**

REGULAR JOINT – HIGH SEVERITY

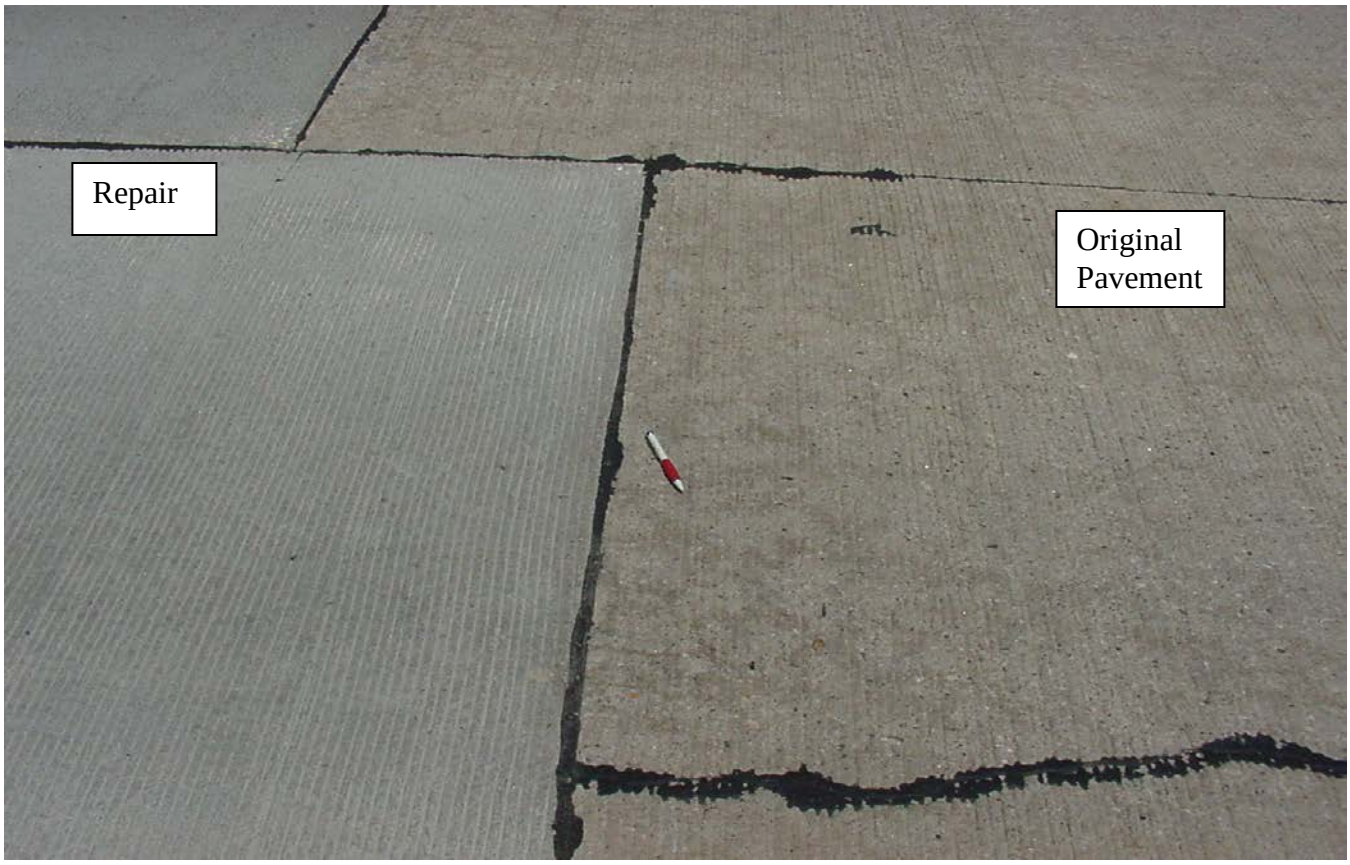
REGULAR JOINT - HIGH SEVERITY



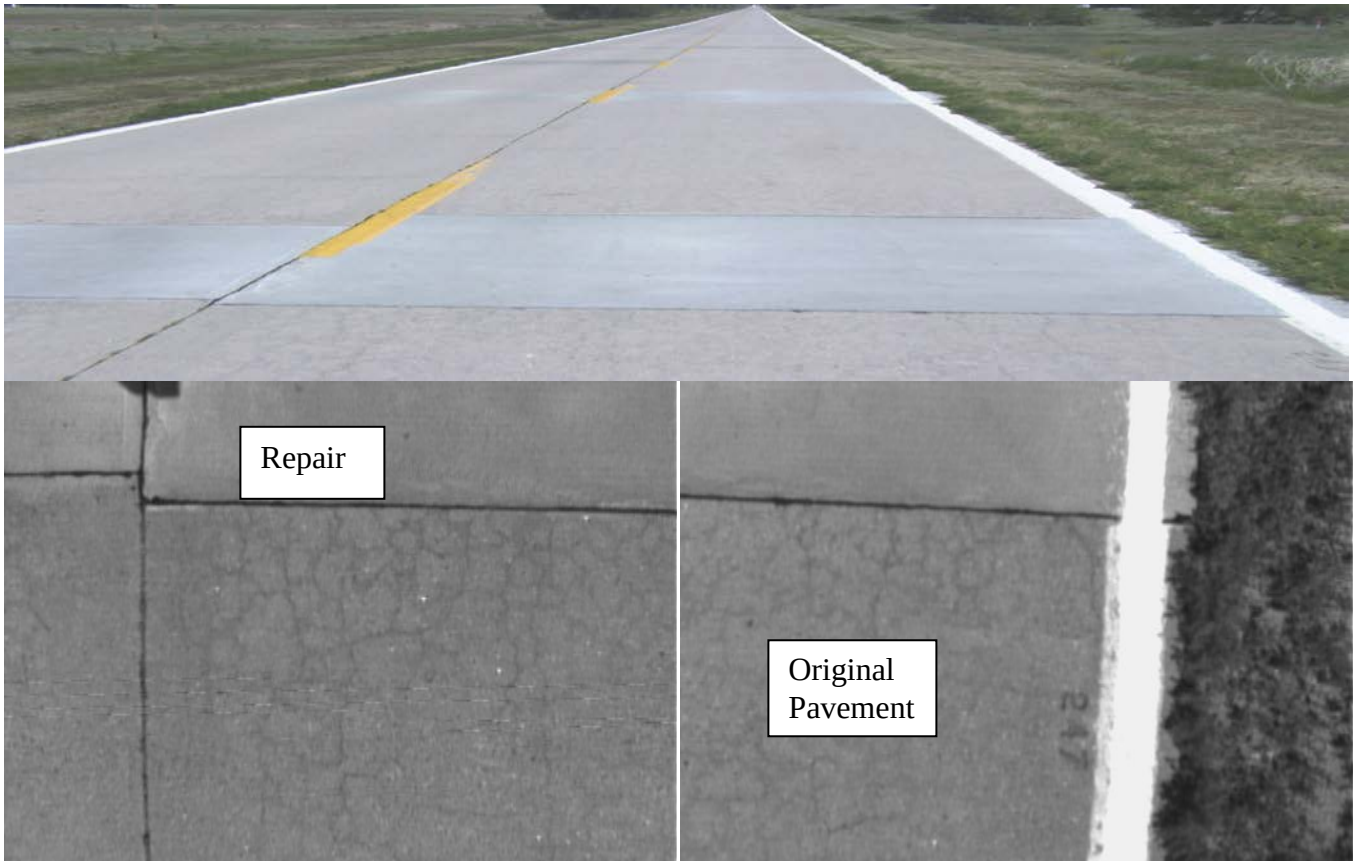
REPAIRED JOINT – MODERATE SEVERITY



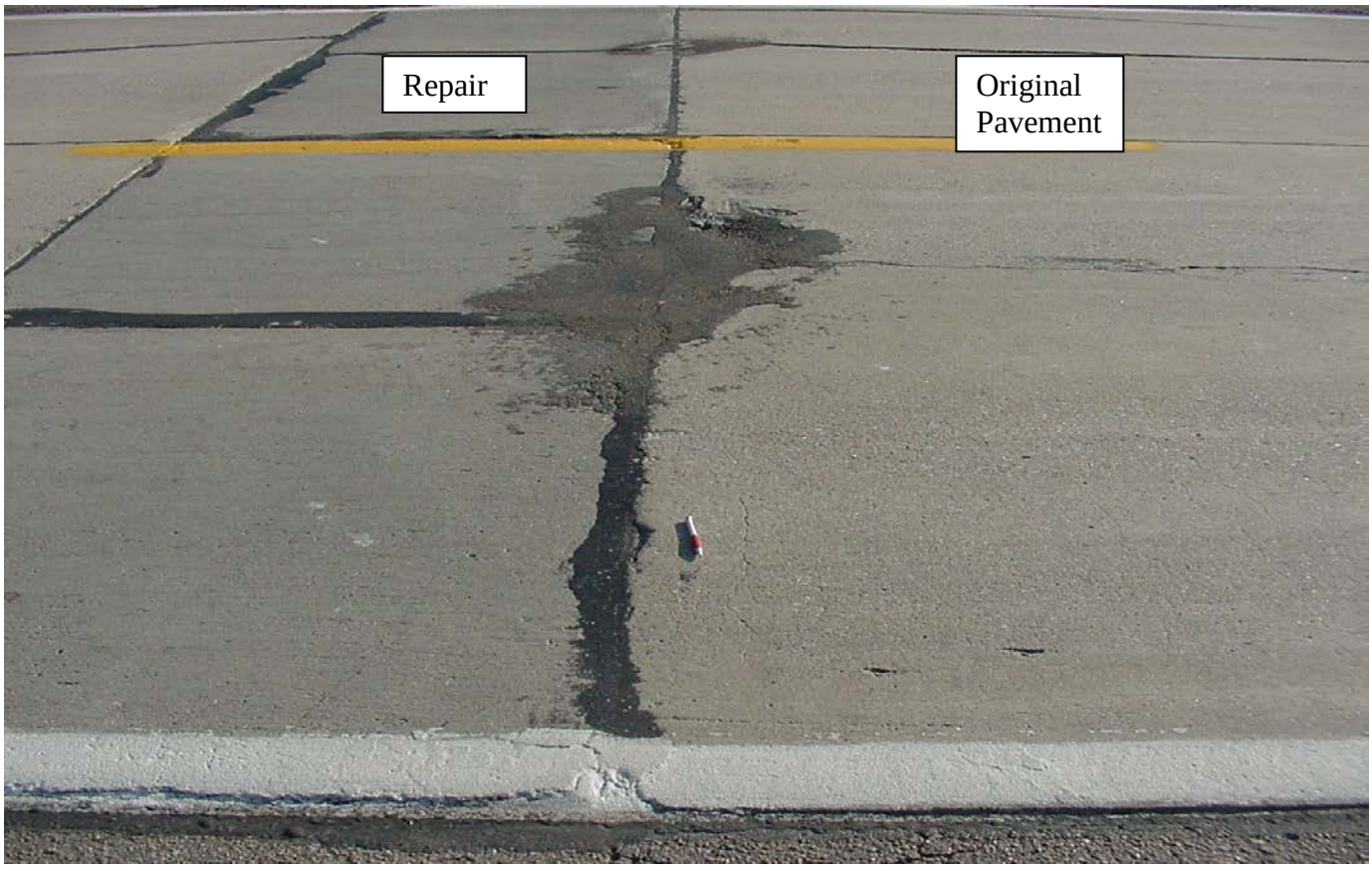
REPAIRED JOINT – MODERATE SEVERITY



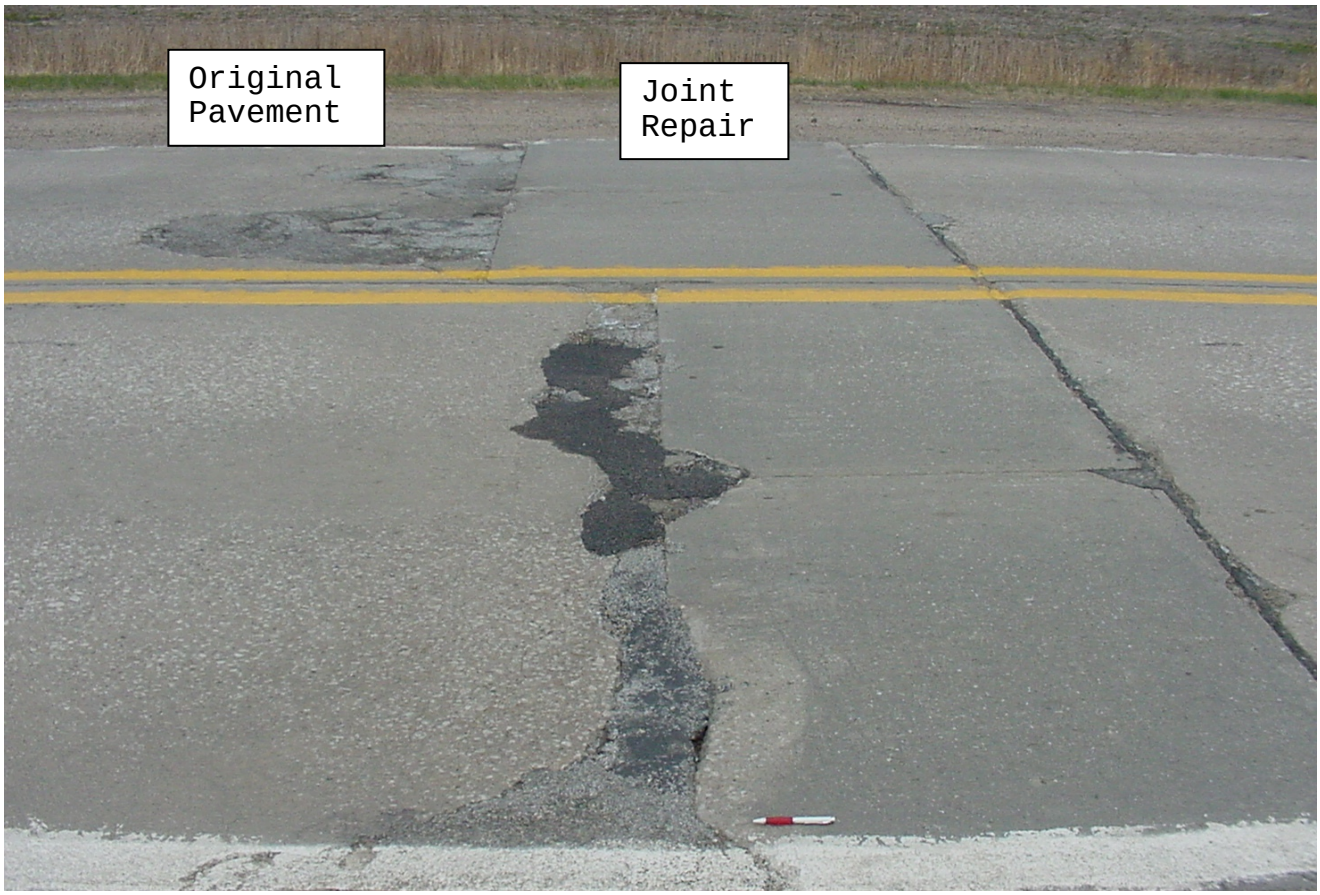
REPAIRED JOINT – HIGH SEVERITY

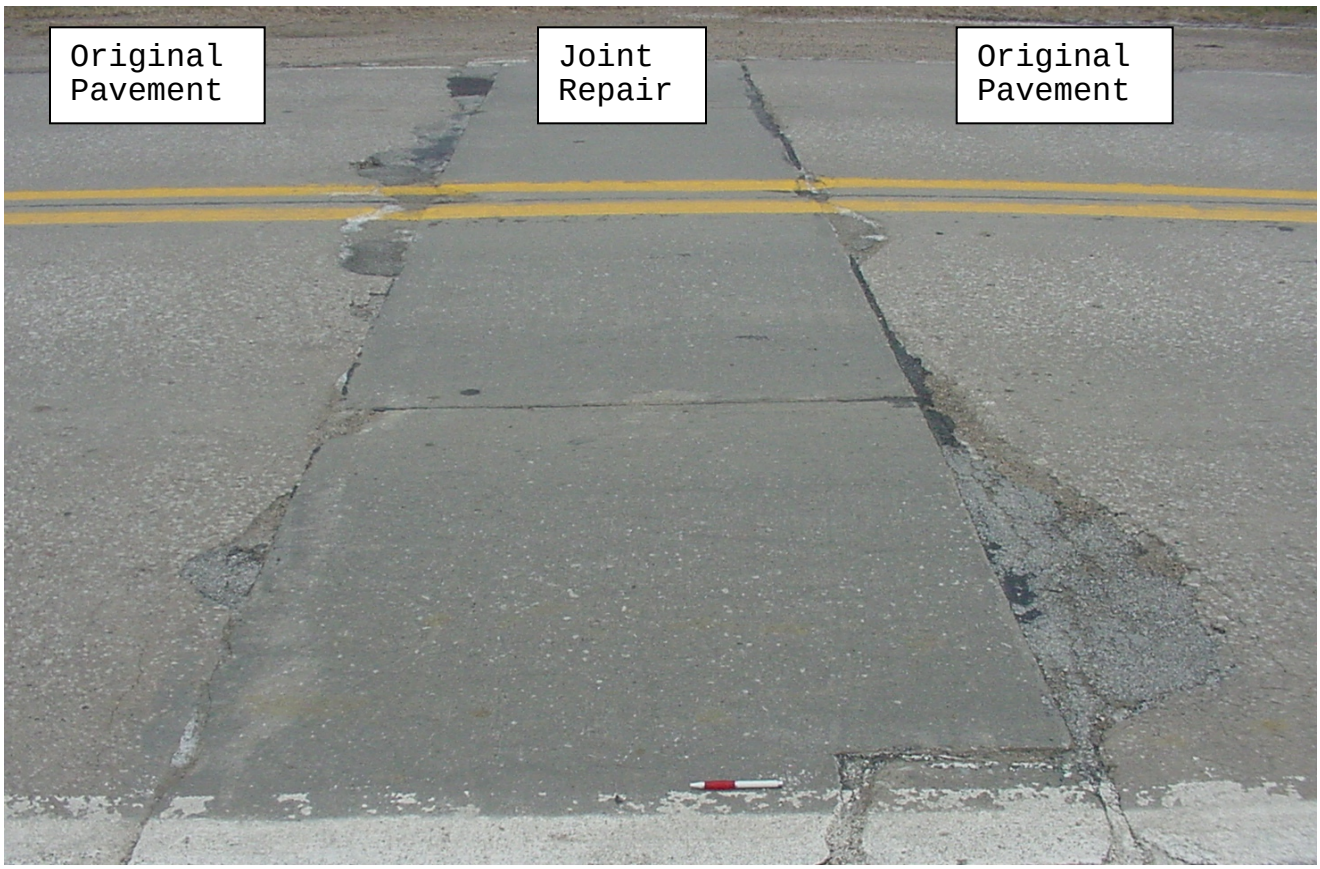


REPAIRED JOINT – HIGH SEVERITY



REPAIRED JOINT – HIGH SEVERITY





FAULTING

Blank: A fault or vertical displacement between adjacent panels of a joint or longitudinal crack of less than ⅛ inch.

Low: A fault between ⅛ to ¼ inch.

Moderate: A fault between ¼ to ½ inch.

High: Faults in excess of ½ inch.

Description:

Faulting that can develop at joints and transverse or longitudinal cracks in rigid pavements decreases serviceability sharply. Both joints and cracks are measured and the nominal maximum faulting is recorded. The “Nebraska Profiler” collects faulting data on transverse joints and cracks. The data collection manager measures longitudinal crack faulting. Measure and record longitudinal crack faulting when there are more Class II panels than Class I panels in the detailed record. Measure and record longitudinal faulting on six-inch thick pavements with any Class II panel cracking.

JOINT OR PANEL CRACK SEAL Revised October, 2011

Description:

Failure of a joint or crack seal is indicated by missing sealant, gaps in the sealant, hard, dry and cracked sealant, or sealant that has pulled away from one side of the joint or crack. Any sealant that allows moisture to enter the subgrade has failed. Good sealant is a preventative to pumping, further displacement or early fatigue failure. Sealing of all joints and cracks is important. If any amount of the joint or crack sealant in the ten (10) joint/panel sample site has any gaps or is pulling away from the side of the joint or crack it will be considered failed. When the sealant on joint and panel cracking is good, the coding is (blank) a poor/failed seal is coded (P).

FAULTING - HIGH SEVERITY

LONGITUDINAL FAULTING – HIGH SEVERITY

PANEL CONDITION Revised January, 2012

Low: Light staining only without any visible cracking.

Moderate: Discoloration/staining on edge of panel without visible cracking. Also includes random hairline cracking with or without staining. (See below)

High: Occasional to extensive cracks greater than hairline width with an interconnecting pattern. The spacing between high severity cracks is generally only a few inches. Any panel cracking showing white paste is rated as high.

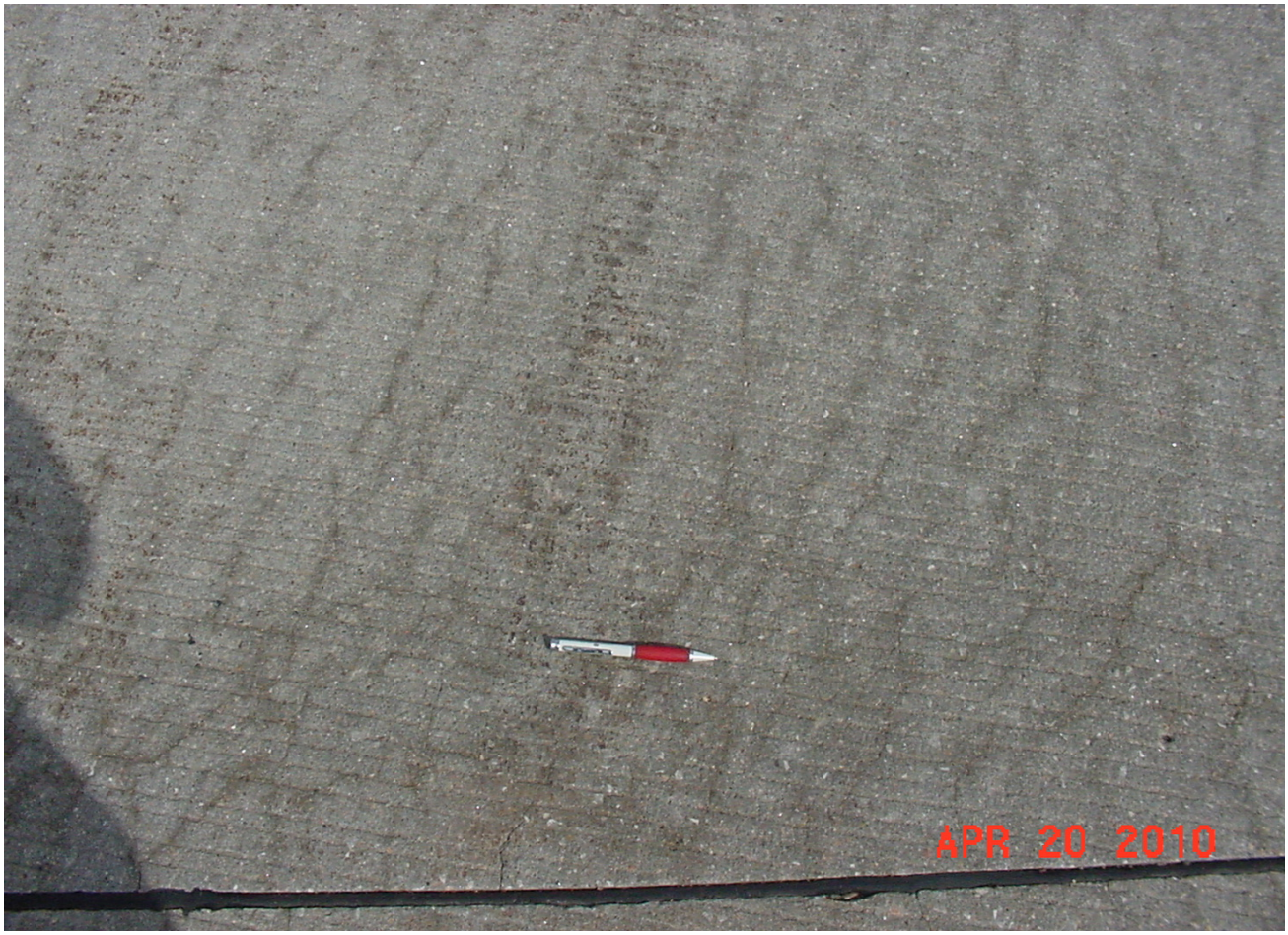
Description:

Within a panel, the appearance of staining/discoloration, map, pattern, or "D" cracking will signal the approaching loss in durability of portland cement concrete. Staining usually begins along the longitudinal joints of the panel. This distress can result from cement-aggregate reaction, nondurable materials and/or climatic conditions. The severity of pattern cracking is sometimes an indication of structural adequacy.

RANDOM STAINING/DISCOLORATION without CRACKING – LIGHT SEVERITY

RANDOM STAINING/DISCOLORATION without CRACKING – LIGHT SEVERITY Rev. Sept., 2010

STAINING/DISCOLORATION with CRACKING – MODERATE SEVERITY Revised Sept., 2010

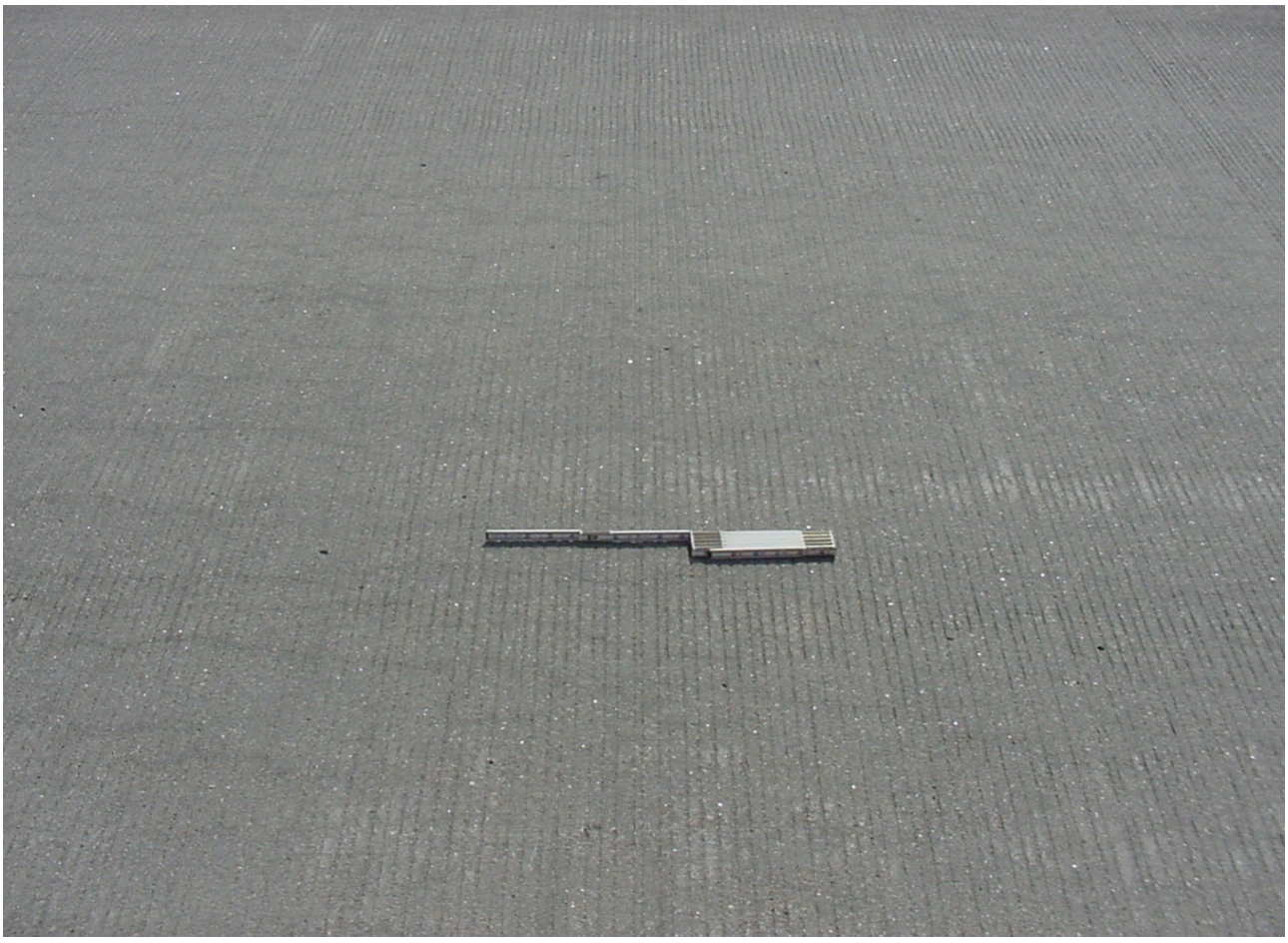


RANDOM STAINING/DISCOLORATION with CRACKING – MODERATE SEVERITY

STAINING/DISCOLORATION on LANE EDGE – MODERATE SEVERITY

STAINING/DISCOLORATION on CENTERLINE – MODERATE SEVERITY

PATTERN CRACKING – MODERATE SEVERITY



PATTERN CRACKING - HIGH SEVERITY

PANEL SPALLS Revised January, 2011

Description:

Panel spalls are potholes or asphalt patched regions in a panel beyond two (2) feet either side of the transverse joints. Scaling or spalling of concrete can result from a variety of causes. Such distress leads to roughness and often indicates poor concrete durability or possible structural inadequacy. Record spalling if an area one (1) ft^2 or more is observed within a twelve (12) foot wide panel. Record the number of panels that contain spalls in the sample site. See page 73 and 75.

JOINT SPALLS Revised January, 2011

Description:

Joint spalls are potholes or asphalt patched regions within two (2) feet either side of the sawed transverse joints. Common causes of joint spalling are alkali/aggregate reactivity and repeated heavy loadings. Record spalling if any is observed per twelve (12) foot long joint. Chips along a joint created by joint sawing during construction will not be recorded as spalls. See below. Record the number of joints that contain spalls in the sample site. See pages 58, 61, 64 and 65.

CHIPS ON JOINT NOT SPALLED **Rev. January, 2011**

PANEL SPALLS

SLAB CRACKING

Class I: Single hairline structural crack in a pavement panel, longitudinal, transversely or diagonal that extends edge to edge. The crack breaks the slab into two (2) pieces with no displacement vertically or horizontally. Aggregate interlock remains intact providing load transference across the panel.

Class II: A single structural crack that extends edge to edge that has faulted or separated. Two (2) or more Class I cracks that extend edge to edge or some combination of the above that breaks the panel into two (2) or more pieces.

Description:

A significant cause of distress in rigid pavements deals with the structural adequacy of the pavement-base-subgrade structure. Warping, contraction, pressure and loadings can form structural cracks in the pavement. These uncontrolled joints can also fault and spall. Rate sealed and unsealed slab cracks of the same width equally. The total number of panels noted in both Class I and Class II will not exceed ten (10) (The total number of panels rated per sample site).

SLAB CRACKING

CLASS Ⅰ

SLAB CRACKING

CLASS Ⅱ

SLAB CRACKING **CLASS I**

SLAB CRACKING **CLASS II**

SLAB CRACKING - CLASS II

6” Concrete Pavement

SHOULDER WIDTH AND CONDITION Revised October, 2011

TYPE OF DISTRESS	SEVERITY	
Lane/Shoulder Separation	Blank:	No separation or separated but sealed well.
	"X":	One (1) inch vertical and/or one (1) inch horizontal displacement between edge of pavement and surfaced shoulder.
Bituminous Shoulder Condition	10:	No Distresses.
	07 to 09:	Transverse Cracks only.
	07 to 09:	Edge Cracks only.
	04 to 06:	Transverse & Edge Cracking.
	04 to 06:	Light alligator cracks.
	01 to 03:	Moderate to High alligator cracking, Failures and/or Breakouts.
PCC Shoulder Condition	10:	No Distresses.
	07 to 09:	Low Distress.
	04 to 06:	Moderate Distress.
	01 to 03:	High Distress, only when AC patched.

DESCRIPTION:

If the shoulder is paved, and the width is equal to or greater than two (2) feet and covers 80% of the section, evaluate and record lane/shoulder separation and shoulder surface condition.

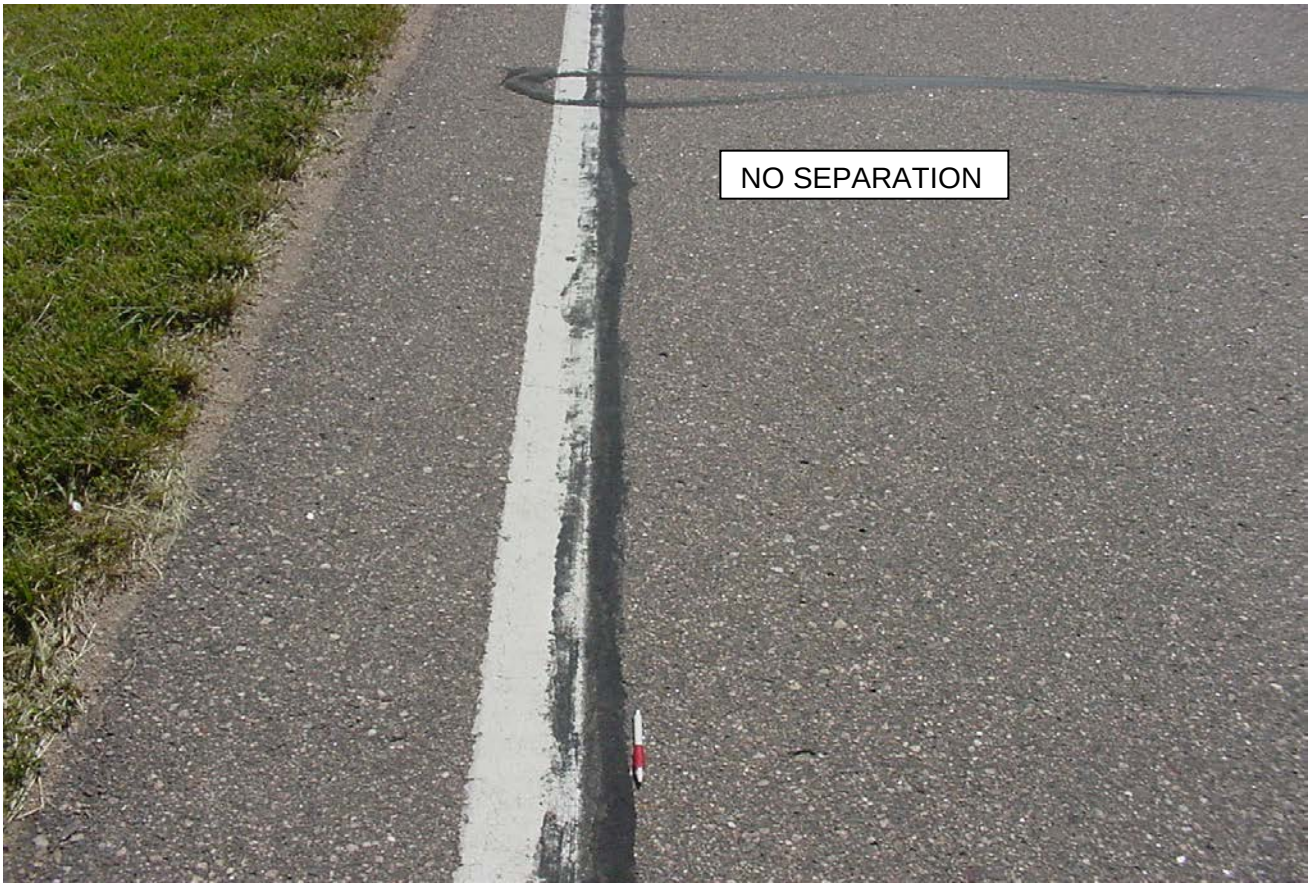
LANE/SHOULDER SEPARATION

NO SEPARATION

SEPARATION

LANE/SHOULDER SEPARATION

LANE/SHOULDER SEPARATION



SHOULDER CONDITION

LOW SEVERITY

MODERATE SEVERITY

SHOULDER CONDITION – HIGH SEVERITY

SHOULDER CONDITION – NO DISTRESS Added January, 2011

SHOULDER CONDITION – LOW DISTRESS

APPENDIX B

PAVEMENT DISTRESS CODES

Key PAVEMENT DISTRESS CODES January, 2012

Highway Number: Examples (L10C) (002) (080) (180) Enter left justified.
Reference Post: Must be numeric, Examples (00050) (00100) (01000) (10000).
Direction Code: B = Both Directions on 2-lanes, A = Ascending, D = Descend on 3-lane or more.
Lane Number: 1 = First lane on either side of CL or Median, 2 = Lane to right of lane 1, 3 = Lane to right of lane 2, Etc.
Date: Enter numeric month, day and year, Ex. 03071994.

Bituminous Pavements

Distress Type	Severity	Extent
Longitudinal Cracking (Edge Cracking) (Wheel Path) (Center Line) (Between Wheel Path)	Blank = Absent L = Low M = Moderate H = High	Blank = Absent T = Trace < 10% O = Occasional 10%-30% F = Frequent 30%-50% E = Extensive 50%-80% C = Complete > 80%
Grid/Block Cracking (Slippage)	Blank = Absent L = Low M = Moderate H = High X = Extreme Severity	Blank = Absent T = Trace < 10% O = Occasional 10%-30% F = Frequent 30%-50% E = Extensive 50%-80% C = Complete > 80%
Transverse Cracks Number of Cracks Per Mile 01-10=T 11-26=O 27-53=F 54-105=E >105=C	Blank = Absent L = Low M = Moderate H = High X = Extreme Severity	Blank = Absent T = Trace (>500') O = Occ. (200'- 500') F = Freq.(100'- 200') E = Ext. (50'- 100') C = Complete (< 50')
Alligator Cracking Wheel Path (Cusp) Center Line Between Wheel Path	Blank = Absent L = Low M = Moderate H = High	Blank = Absent T = Trace < 10% O = Occasional 10%-30% F = Frequent 30%-50% E = Extensive 50%-80% C = Complete > 80%
Failures		Blank = Absent < 2 Sq.Ft. T = Trace 2 Sq.Ft.-10% O = Occasional 10%-30% F = Frequent 30%-50% E = Extensive 50%-80% C = Complete > 80%
Ravel/Weathering	Blank = Absent L = Low M = Moderate H = High	
Excess Asphalt	Blank = Absent L = Low M = Moderate H = High	
Bituminous Remark Code (Can improve rating severity levels to what is observed for AC, MP, SP, CS or SS Extent remains the same.)	AC= Armor Coat UC= Under Construction MI= Surface Milling SS= Slurry Seal NC= New Construction MP= Machine Patch SP= Skin Patch CS= Crack Seal	

RIGID PAVEMENT		Revised May, 2010
Distress Type	**Severity**	
Joint Repairs - Count number of repairs	Full and Partial	
Joint Severity	Blank = Absent M = Moderate H = High	
Joint Spalls - Count no. of spalled joints (1 sq. ft. min./12 ft. joint)		
Joint Seal - any failure	Blank = Good seal P = None or Poor seal	
Panel Surface		
Panel Cracks - Class I -- Count panels with Class I distress.		
Panel Cracks - Class II - Count panels with Class II distress.		
Pattern Crack	Blank = Absent L = Low M = Moderate H = High	
Panel Spalls - Count spalled panels 1 sq. ft. or more per 12' wide panel		
Panel Repairs - Count panels with repairs.		
Crack Seal - any failure	Blank = Good seal P = None or Poor seal	
Panel Crack Faulting used for Class II Panels	Fault or Displacement	
If the majority of the panels with slab cracking contain Class II cracks then a rating of the severity of displacement of the Class II cracks is recorded.	Blank = 0 - 1/8" L = >1/8" - 1/4"	
If any six inch thick pavements have panels with Class II cracking then record the severity of displacement of the Class II cracks.	M = >1/4" - 1/2" H = >1/2"	
Rigid Remark Code (Can improve rating severity level to what is observed for CS, GR, JR, MI, PR)	CS= Crack Seal PR= Panel Repairs GR= Diamond Grinding JR= Joint Repairs MI= Surface Milling NC= New Construction UC= Under Construction	
Surfaced Shoulders (Bituminous or Rigid)		
Lane/Shoulder Separation	Blank = Absent X = Present	
Deterioration	**Bit Shoulder**	**PCC Shoulder**
1 - 10 Scale 10 = Best 01 = Worst	No Distresses =10 Transverse Cracks =07 to 09 Edge Cracks =07 to 09 Transverse & Edge =04 to 06 Light Alligator Cracking =04 to 06 Moderate Alligator Cracking =01 to 03 High Failure/Breakout/Patched	No Distresses Low Moderate High

ACCESS TABLE LAYOUT EXAMPLES

Figure 1

Bituminous Distress Survey Form

DATE	HWY	RP	LD	LN	EC	WP	CL	BW	GB	TC	AG	F	PA	W	X	BR	SS	SC	RI	ID	P	REMARK
12132002	281	12400	B	1			LO		LT	LC					L	AC	X	08	095	DR3012		
12132002	281	12500	B	1		LT	LO	LT	LT	LC					L	AC	X	08	095	DR3012		
12132002	281	12600	B	1		LT	LO	LT	LT	LC					L	AC	X	08	095	DR3012		
12132002	281	12700	B	1		LO	LE	LT	LT	LC					L			08	090	DR3012		
12132002	281	12800	B	1		LT	LF		LO	LC					L			08	090	DR3012		
12132002	281	12900	B	1	MT	LT	LO		LT	LC		T			L	AC		08	081	DR3012		
12132002	281	13000	B	1		LT	LE	LT	LT	LC	LT	T			L	AC		08	079	DR3012		
12132002	281	13100	B	1			LT		LT	LC					L	AC		08	095	DR3012		
12132002	L10B	00003	B	1	HT	MT	LO	LO	MT	MC	MT	T			L				072	DR3012	Y	
12132002	L10B	00032	B	1	HE	LO	LO	LO	LE	LC	LO	T							068	DR3012	Y	
12132002	L10B	00100	B	1	HE	MO	LO	LO	LE	LC	LO	O			L				049	DR3012	Y	
12132002	L10C	00200	B	1		LO	LO	LO	LO	ME	LT	T			L				078	DR3012		
12132002	L30F	00021	B	1	HF	HT		HF	HO	XE	HT	O							046	DR3012		
12132002	L30G	00000	B	1	HO	HO	HO		XT	XC	HT	O							046	DR3012		
12132002	L40C	00000	B	1					LT	LT					L				098	DR3012		
12132002	L40C	00030	B	1	LT	LT	LO	LT	LT	LE	LT	T		L					080	DR3012		
12132002	L40C	00100	B	1	LT	LO	LT		LT	LE	LT			L					093	DR3012		
12132002	L40C	00200	B	1	LT	LT	LT	LT	LT	LE	LT			L					094	DR3012		
12132002	L40C	00300	B	1	LT	MO	LT	LT	LT	LE	LT	T		L					074	DR3012		
12132002	L40C	00400	B	1	LT	LT	LT		LT	LE				L					096	DR3012		
12132002	L40C	00500	B	1	LT	LO		LT	LT	LE	LT	T		L					079	DR3012		
12132002	L93B	00500	B	1		HT	LT		MT	HF		T				MP		07	077	DR3012		
12142002	S01A	00006	B	1		LF	LF	LT	LT	LF	LT	T							078	DR3012		
12142002	S01A	00100	B	1		LF	LE	LO	LT	LE	LT								089	DR3012		
12142002	S01A	00200	B	1	LT	LO	LF	LT	LT	LF	LT	T							079	DR3012		
12142002	S01A	00300	B	1			LF		LT										098	DR3012		

Figure 2

Rigid Distress Survey Form

DATE	HWY	RP	LD	LN	JR	JC	JS	SJ	C1	C2	PC	SP	PR	CS	CF	RRC	S	SC	RI	ID	P	REMARK
12162002	002	45900	A	2					01					P					098	DR3012		
12162002	002	45900	D	2					01	01				P					088	DR3012		
12162002	002	45980	A	2	01	H	01												078	DR3012		
12162002	002	45990	D	2		H	01		01	01	L			P					085	DR3012		
12162002	002	46035	A	2	02	H	03		01					P				09	065	DR3012		
12162002	002	46045	D	2		H	01		01									09	087	DR3012		
12162002	002	46075	A	2														09	095	DR3012		
12162002	002	46086	A	2	01				01	02	L		01					09	077	DR3012		
12162002	002	46086	D	2	01	H	01		01	06	L		01	P				09	065	DR3012		
12162002	002	46100	A	2		H	03		02	01			03					09	059	DR3012		
12162002	002	46100	D	2	01	H	01	P	01	06	M	01	01	P	L			09	066	DR3012		
12162002	002	46114	A	2	01	H	02		02	02			01	P				09	066	DR3012		
12162002	002	46200	A	2	02	H	01		01	01			02	P			X	09	064	DR3012		
12162002	002	46200	D	2	01	H	01		06	01	H	01	01	P				09	067	DR3012		
12162002	002	46488	A	2												NC		09	096	DR3012		
12162002	002	46489	D	2		M			01									08	094	DR3012		
12162002	002	46500	A	2		M			01	01								09	092	DR3012		
12162002	008	14908	B	1	01	M		P	02	08	L	01	01	P	L				058	DR3012		
12162002	015	00000	B	1		M			01		L								094	DR3012		
12162002	015	00100	B	1		M													096	DR3012		
12162002	015	00600	B	1		M			01										096	DR3012		
12162002	015	00700	B	1		M													096	DR3012		
12162002	015	00881	B	1												NC			100	DR3012		
12162002	136	23700	B	1		M			01	01							X	03	095	DR3012		
12162002	L55K	00000	A	2				P	01	01		01	01	P					088	DR3012	Y	
12162002	L55K	00000	D	2		H	01	P	01	02				P					082	DR3012	Y	
12162002	L55W	00000	A	2		H	01		01	03	L			P	L				084	DR3012	Y	
12162002	L55W	00000	D	2		H	01												091	DR3012	Y	
12162002	L55W	00030	D	2															096	DR3012	Y	
12162002	L55W	00053	A	2	01	H	03		01	07	L	02	01	P					050	DR3012	Y	
12162002	L55W	00053	D	2		H	03		01	09	H	01		P					050	DR3012	Y	
12162002	S12B	00000	B	1		H	03	P	01			02		P			X	07	067	DR3012		
12162002	S13C	00000	B	1		H	01		01	05					L				077	DR3012		

Check List for pavement rating (minimum equipment list).

1. Computer Laptop with Access Database program
    a. Rigid and Bituminous tables
2. Rating Section Report
3. Surface Improvement Report
4. Surfaced shoulder list and/or maps
5. 6″ Pavement List
6. Nebraska Highway Reference Log Book
7. Hand Type Tally Counter
8. Orange/green vest/shirt & cap
9. Mobile phone
10. Camera

Verification Process

January 29, 2009

Verification Rating Data: (target time for verification: March-April and July-August)

1. Verification Map – map new records collected.
    a. Mark records with >10% change from the previous year's rating.
    b. Plot last year and next year's projects.
    c. Exclude resurfacing projects < 3 years old.
    d. Exclude previous year's Surface treatments.
    e. Include PCC pavements built 1984 to 2000.
2. Build a RDCP108 table to check roads on a project level with >4 NSI drop.
3. A date is entered on all individual ratings that are visually verified. Ratings with changes through verification will have the verifiers DOR # instead of the original raters number.

Profile data: (target time for run: July and after August 15)
Variability on correlation sections can be a maximum of 5 %. (as per Pathways) Ex. If the average of the readings was 100 then acceptable values would be from 95 to 105.

1. Check for IRI for zero IRI in both left and right WP's.
2. Check if data was double loaded where the activation date = the deactivation date.
3. Check for previous year's data not deactivated by present year's data. Usually run toward the end of the testing season.
4. Compare last years point data to this years point data.
    a. IRI – current year = last year + 3 IRI increase.
    b. Faulting – current year = last year + 5 mm increase.
    c. Rutting – current year = last year + 5 mm increase.
5. Query large spikes in data. Add age and under construction to list.
    a. IRI – > 8 increase
    b. Faulting – > 15 mm increase
    c. Rutting – > 25 mm increase
6. Build a RDCP108 table to check roads on a project level compared to last years data (needs sections).
    a. IRI – change > 3 IRI increase.
    b. Faulting – change > 1 mm increase.
    c. Rutting – change > 5 mm increase.
    d. NSI – change >= 10 NSI drop
7. When bad data encountered have it retested. If not possible to retest reactivate the previous years data.

Pavement Condition Ratings Verification: (target time for running: August 15)

1. Select previous years data not deactivated.
2. NSI – drop in point data of >= 10 NSI from last year.
3. Select previous years data that are zero or blank/missing from RDCP0108 table using the needs sections. Ex. IRI, Faulting, Rutting and NSI.
4. Run query that compares Pavement Management Sections limits to Classification and Needs Section project limits.
5. Run query that compares Pavement Management Sections beginning and end points to match a beginning and end point of the Needs Sections and give to the Classification and Needs Supervisor.
6. Check for no shoulder ratings on >=2' shoulders or shoulders on roads with < 2' width.
7. Count records verified that were changed.
8. Query records where Lt and Rt INO >= 6mm difference