A PAVEMENT RATING SYSTEM FOR ASPHALT PAVEMENT

ASPHALT PAVEMENT RATING FORM[(1)(2)]

STREET/ROUTE/FACILITY NAME: _____

CITY OR COUNTY: _____ DATE: _____

LENGTH OF PROJECT: _____ WIDTH: _____

LOCATION OF SURVEY: _____ WEATHER: _____

PAVEMENT TYPE: _____

NOTES: _____

(Note: a rating of "0" indicates that the distress does not occur)

DISTRESS	RATING	SCORE
Transverse Cracks	0 to 5	_____
Longitudinal Cracks	0 to 5	_____
Block/Multiple Cracking	0 to 10	_____
Alligator Cracks	0 to 10	_____
Shrinkage Cracks	0 to 5	_____
Rutting	0 to 10	_____
Corrugations	0 to 5	_____
Raveling	0 to 5	_____
Shoving or Pushing	0 to 5	_____
Pot Holes	0 to 10	_____
Excess Asphalt/Binder	0 to 5	_____
Polished Aggregate	0 to 5	_____
Deficient Drainage	0 to 10	_____
Overall Riding Quality (0 is excellent; 10 is very poor)	0 to 10	_____
	Sum of Distresses =	_____

Condition Rating = 100 – Sum of Distresses
= 100 – _____

Condition Rating = [ ]

SOURCES:
(1) ASPHALT PAVING DESIGN GUIDE, MAPA
(2) INFORMATION SERIES NO. 169 (IS-169), THE ASPHALT INSTITUTE

A PAVEMENT RATING SYSTEM FOR ASPHALT PAVEMENT

INTRODUCTION

MAPA commissioned ERES Consultants to evaluate the performance history of asphalt pavements with and without an aggregate base, and of portland cement concrete pavements on the MnDOT highway system. The results showed that asphalt pavements typically provide 40 to 60 years of service life and receive three overlays in that time frame. The first overlay, on average, occurs between 15 and 16 years after construction, but the most common age for an overlay is 18 years. Pcc pavements have a service life similar in length to that of asphalt pavements, either full-depth or aggregate base design. Fifty percent of pcc pavements are either overlaid with asphalt or otherwise removed from service by the time they reach 20 years of age. Of the remaining fifty percent of pcc pavements, over 50 percent receive major repair work within the first 20 years. See www.AsphaltisBest.com for the *Summary of Minnesota Research Findings* more facts on asphalt.

While asphalt pavements have proven to provide the best driving surface at the lowest life cycle cost, it is important for individuals or agencies with the responsibility of maintaining roadways, streets, parking lots and other asphalt paved facilities to maintain a logical pavement management system to help decide when to perform routine maintenance, overlay, or reconstruction. Deciding which roads should get first attention is often difficult. One factor complicating the decision is the variety of pavement distress types and treatments – some serious, others rather insignificant.

This publication presents a system that utilizes the experience of an engineer, maintenance superintendent, or foreman to assign a numerical value to each type of pavement distress, taking into account both the extent of distress and its relative seriousness. The sum of these numerical values provides a fairly accurate, though subjective, index of the general condition of the paved surface. As the pavement condition survey is performed on a repeated and timely basis, the index can be useful in setting maintenance priorities. Part 1 of this publication explains the asphalt pavement condition rating system. Part 2 contains photographs and descriptions of the different types of distress.

PART 1 – WHERE THE SYSTEM APPLIES

The rating system is intended for agencies, organizations and/or owner not having the benefit of specialized highway engineering experience and without access to conventional testing facilities.

MAKING THE INSPECTION

An effective way of inspecting a pavement is first to drive slowly over the road to get an overall impression of its condition. Then, to make a thorough inspection on foot, making rough notes on the type and extent of distress as one goes along. When the inspection is completed, the rating form is filled out. It may be useful to drive again slowly over the pavement after filling out the rating form. Since the system is based on personal judgment, better results are obtained when two or more experienced individuals independently rate the pavements and the results are averaged.

RATING AN ASPHALT PAVEMENT

As mentioned earlier, some distresses affect the performance of a pavement more than others. Under this rating system, the less serious observations are assigned values between zero (0) and five (5). Distress of a more serious nature – those directly related to the strength of the pavement – are rated on a scale of zero (0) to ten (10). A rating of zero (0) means that the pavement is free of that particular type of distress. Part 2 of this publication should be helpful in identifying different types of distresses.

When assigning a rating to a particular type of distress, it is important to consider both its ***extent and severity***. For example, a rating of 10 for "rutting" would indicate that it occurs on most or all of the pavement, the ruts are probably deep enough to be a safety hazard (especially during rain), and it is an impediment to traffic at all times. On the other hand, a rating of 1 for "corrugations" would indicate that corrugations, although evident, are not numerous and that at present the distortions are not very large.

After each distress is rated, the individual distress ratings are added. This "Sum of Distresses" is then subtracted from 100, and the result is simply called the "condition rating," as shown in the "Asphalt Pavement Rating Form" on Page 8.

INTERPRETING THE CONDITION RATING

There are two ways that the condition rating can be used. First, as a relative measurement, it provides a rational method for ranking paved streets or facilities according to their condition. Secondly, as an absolute measure, the condition rating provides a general indicator of the type and degree of repair work necessary. As a very general rule, if the condition rating is between 80 and 100, normal maintenance operations such as crack sealing (CRS-2, AC3, crack filling (MnDOT 3719), pot hole repair, or perhaps surface treatment (eg. Fog seal using CSS-1, SS-1, etc.) are usually all that is required. If the condition rating falls below 80, it is likely that an overlay will be necessary. In this event, it may be advisable to contact the Minnesota Asphalt Pavement Association or other qualified engineering personnel for assistance. If the condition rating is below 30, chances are that major reconstruction is necessary, see Figure 1 below.

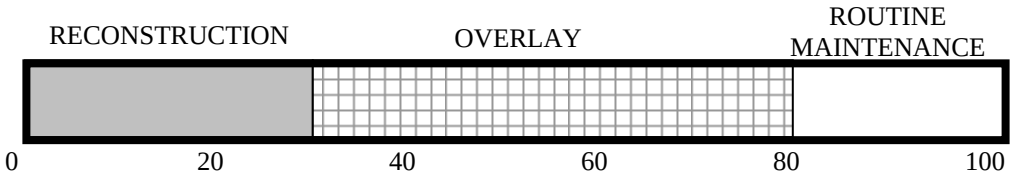


Figure 1. Condition Rating as a General Indicator of Type of Maintenance.

PART 2 – PAVEMENT DISTRESS

CAUSES OF PAVEMENT DISTRESS

Although a detailed discussion of the subject is beyond the scope of this publication, an understanding of the cause of a pavement distress is essential before an attempt is made to remedy it. Similarly, efficient use of a maintenance budget requires that proven methods be used to prevent recurrence of a problem. Accompanying the illustrations of distresses that follow, there is a brief statement of their usual cause and the suggested means of repair. If more detailed assistance is needed in determining either the cause of a distress or the proper method of its repair, it may be advisable to contact MAPA.

More Resources:

- Distress Identification Manual for the Long-Term Pavement Performance Project, U.S. Department of Transportation, Federal Highway Administration, Publication No. FHWA-RD-03-031, June 2003.
- Mn/DOT Distress Identification Manual, Minnesota Department of Transportation, Office of Materials and Road Research, Pavement Management Unit, February 2003.
- Crack Sealing Bituminous Pavements in Minnesota, MnDOT Report No. 92-03, 1992.
- Asphalt Pavement Maintenance Field Guide, Manual Number 2001-05 Rev., January 2002.
- Flexible Pavement Distress Manual, Local Road Research Board.
- Surface Condition Rating System, NCHRP Project 10-9, Civil and Mineral Engineering Department, University of Minnesota, January 1973.
- Full-Depth Asphalt Patching, Asphalt Institute, CL-19.
- Overlays and Pavement Rehabilitation, Asphalt Institute, MS-17.
- Minnesota Asphalt Pavement Association Web Site: www.AsphaltisBest.com, "Resources" tab.

PAVEMENT DISTRESSES ILLUSTRATIONS

TRANSVERSE CRACK: A crack that follows a course approximately at right angles to the pavement centerline. This frequently is caused by movement in the pavement beneath the asphalt pavement layer (reflection cracking). It can also result from stresses induced by low-temperature contraction of the pavement. It may require sealing or filling with asphalt material. At a later date, this may be followed by an overlay (eg. tight blade, paver lay) or mill and fill over the entire surface. *Photo courtesy of the US DOT.*

LONGITUDINAL CRACK: A crack that follows a course approximately parallel to the centerline. This usually results from a weak joint between paving lanes. These cracks can also result from earth movements, particularly on embankments. Two closely-spaced longitudinal cracks in the wheel path usually indicate bending stress induced by rutting. Longitudinal cracks can also occur as a result of movement in the pavement beneath the asphalt pavement layer (reflection cracking or stripping). For repair, see "Transverse Crack." *Photo courtesy of the US DOT.*

BLOCK/MULTIPLE CRACKING: A pattern of cracks that divides the pavement into approximately rectangular pieces. Block/multiple cracking is not the result of a structural distress (see alligator cracking), rather it is the result of transverse and longitudinal cracks becoming interconnected. Depending on the severity of the block/multiple crack pattern and dimensions, cracks may be treated by crack sealing, or fog treatment with asphalt material possibly followed by a surface treatment over the entire surface.

ALLIGATOR CRACKING: Interconnected cracks forming a series of small polygons, the pattern resembles an alligator's skin, and is a load-related structural distress found in the wheel path. It is caused by excessive deflection of the surface over unstable pavement base or subgrade layers that leads to fatigue failure. The unstable support usually is the result of saturated layer or layers or an unstable pavement design. It requires deep patching with asphalt.

SHRINKAGE CRACKS: Interconnected cracks forming a series of large polygons, usually having sharp angles at the corners. Shrinkage crack are not related to traffic loading. It is caused by volume change in the base or subgrade. It requires monitoring of the hairline cracks, crack sealing, or fog treatment with asphalt material possibly followed by a surface treatment over the entire surface. *Photo courtesy of MnDOT.*

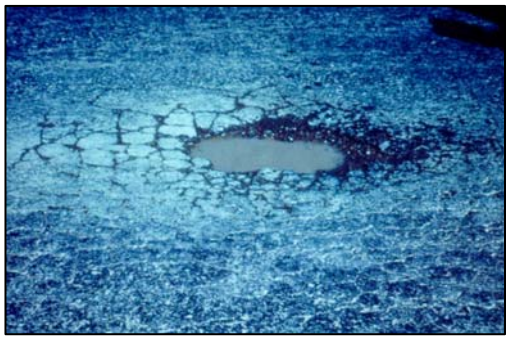
RUTTING: Longitudinal depressions that form under traffic in the wheel paths and have a minimum length of at least 20 ft. It is caused by consolidation or lateral movement under traffic in one or more of the underlying courses, or by displacement in the surface layer itself. Ruts should be filled with asphalt (tight-blade) to restore proper cross-section. This should be followed by a thin overlay of asphalt pavement. *Photo courtesy of MnDOT.*

CORRUGATIONS: Transverse undulations at regular intervals in the surface of the pavement consisting of alternate, closely-spaced valleys and crests. It is caused by a lack of stability in the surface layers and requires repair before resurfacing. If the corrugated pavement has an aggregate base with a thick surfaced treatment, a satisfactory corrective measure is to mill off the surface to a uniform depth, and replace with asphalt. If the pavement has more than three inches (3") of asphalt pavement, shallow corrugations can be removed with a pavement milling machine, better known as "cold milling." This can be followed with a surface treatment or asphalt overlay. *Photo courtesy of the US DOT.*

RAVELING: The progressive disintegration from the surface downward, or edges inward by the dislodgement of aggregate particles. It is caused by the original mix type, compaction capability during construction, construction during wet or cold weather, or overheating of the asphalt mix. It usually requires a surface treatment of some type. *Photo courtesy of MnDOT.*

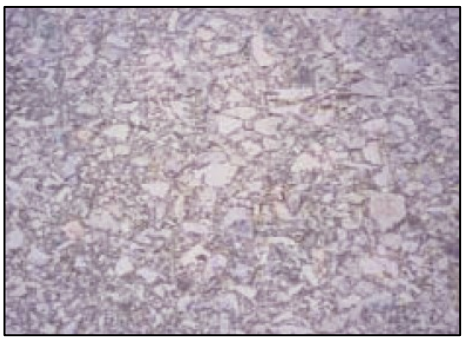
SHOVING: Lateral displacement of paving material due to traffic, generally resulting in the bulging of the surface. It is caused by lack of stability in the subgrade, base, or surface layers. It requires the removal of the affected area followed by deep patching with asphalt. *Photo courtesy of FHWA.*

POT HOLES: Bowl-shaped holes of varying sizes in the pavement, often resulting from the progressive deterioration of other distresses such as alligator cracking. It usually is caused by a combination of weaknesses in the pavement for the given traffic resulting from insufficient asphalt pavement surface thickness, too many or too few fines, and/or poor drainage. It requires removal of the affected area followed by deep patching with asphalt. *Photo courtesy of the US DOT.*



EXCESS ASPHALT/BINDER (BLEEDING): Free asphalt/binder on the surface of the pavement. It is caused by too much asphalt/binder in one or more of the surface layers. In many cases, bleeding can be corrected by repeated applications of hot sand, hot screenings, or hot rock screenings to blot up the excess asphalt/binder. Sometimes, when bleeding is light, a plant mixed surface treatment or an aggregate seal coat using absorptive aggregate is the only treatment needed. In rare instances of heavily over-asphalted surfaces, the surface should be completely removed and replaced with asphalt pavement.

POLISHED AGGREGATE: Aggregates in the surface of the pavement that have been polished smooth. It is caused by naturally smooth, non-crushed gravels and/or crushed rock that wears down quickly under action of traffic. It requires covering the surface with a asphalt pavement treatment that has good frictional characteristics. *Photo courtesy of US DOT.*



DEFICIENT DRAINAGE: Drainage problems may be considered in two categories: surface and subsurface. Proper surface drainage efficiently removes runoff from the pavement and the nearby ground. Standing water on the pavement or in the side ditches indicates a drainage deficiency. Proper subsurface drainage keeps groundwater from the pavement structure. Two indicators of deficient subsurface drainage are 1) constant water in the side ditch, possibly with cat tails growing, and in the absence of precipitation, or 2) alligator cracking with moisture in the cracks.

OVERALL RIDING QUALITY: The overall riding quality is a measure of how smooth the pavement rides. For example, a smooth asphalt pavement will be given a lower number as it should have less distresses, and a poor riding pavement will have a higher number assigned to it as it should have more distresses.

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