TECHNICAL MANUAL

UNSURFACED ROAD MAINTENANCE MANAGEMENT

HEADQUARTERS, DEPARTMENT OF THE ARMY
JANUARY 1995

TECHNICAL MANUAL
NO. 5-626

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, DC, *16 January 1995*

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CHAPTER 1

INTRODUCTION

1-1. Purpose

This manual describes an unsurfaced road maintenance management system for use on military installations. This system is available in either a manual or computerized mode (Micro PAVER). The maintenance standards prescribed should protect Government property with an economical and effective expenditure of maintenance funds commensurate with the functional requirements and the planned future use of the facilities. Because of limited maintenance funds, timely and rational determinations of maintenance and repair (M&R) needs and priorities are very important factors. These factors can be determined by using the system as described in this manual. The use of the unsurfaced road maintenance management system by personnel who have the responsibility for unsurfaced road maintenance should ensure uniform, economical, and satisfactory unsurfaced area maintenance and repair. When information in this publication varies from that contained in the latest issue of Federal or military specifications, the specifications shall apply. Reference to Federal, Military, or other specifications is to the current issues of these specifications as identified by their basic number(s). It is intended to be used by all Army elements responsible for maintenance and repair (M&R) of unsurfaced roads, streets, parking lots, tank trails, and range roads.

1-2. Scope

The system presented in this manual consists of the following components.

a. Network identification. The process of dividing installation unsurfaced road networks into manageable segments for conducting surface inspection and determining M&R requirements and priorities (chap 2).

b. Surface condition inspection. The process of inspecting installation unsurfaced roads to determine existing distresses and their severity, and to compute the Unsurfaced Road Condition Index (URCI)-a rating system that measures the surface integrity and operational condition (chap 3).

c. M&R determination. The process of establishing M&R requirements and priorities based on inspection data, URCI, and other relevant information, such as traffic, loading, and structural composition (chap 4).

d. Data management. Data may be handled by any one of three methods.

(1) A stand alone manual system that is fully described in chapter 5 of this manual.

(2) A stand alone automated system using Micro PAVER, which is briefly described in chapter 6.

(3) A dual automated system using Micro PAVER for both unsurfaced roads and paved networks.

e. System description. Micro PAVER is fully described in TM 5-623.

1-3. References

Appendix A contains a list of references used in this manual.

1-4. Implementation of the unsurfaced road management system

The level of implementation is a function of the installation size, existing road conditions, and available manpower and money resources. The highest level of implementation would be the inclusion of all unsurfaced roads on the installation and use of the automated system. The lowest level would be use of the URCI as the basis for project approvals and establishment of priorities. A gradual implementation may be practical for many installations. Technical advice concerning any procedures outlined in this manual may be obtained from U.S. Army Center for Public Works, ATTN: CECPW-ER, 7701 Telegraph Road, Alexandria, VA 22310-3862.

CHAPTER 2

UNSURFACED ROAD NETWORK IDENTIFICATION

2-1. General

Before the unsurfaced road maintenance management system can be used, the installation's unsurfaced roads must be divided into components. This chapter defines the process.

2-2. Components

a. Unsurfaced road. An installation's unsurfaced road network consists of all unsurfaced areas that provide accessways for ground traffic, including roadways, parking areas, storage areas, tank trails, and range roads.

b. Brunch. A branch is an identifiable part of the unsurfaced road network that is a single entity and has a distinct function. For example, individual roads, parking areas, tank trails, and range roads are separate branches of an unsurfaced road network.

c. Section. A section is a division of a branch; it has certain consistent characteristics throughout its area or length. These characteristics are as follows.

(1) Structural composition (thickness and materials).

(2) Construction history.

(3) Traffic.

(4) Surface condition.

d. Sample unit. A sample unit is an identifiable area of the unsurfaced road section; it is the smallest component of the unsurfaced road network. Each unsurfaced section is divided into sample units for the purpose of a condition inspection. For unsurfaced roads, a sample unit is defined as an area of approximately 2,500 square feet (±1,000 square feet) (230 square meters [±90 square meters]).

2-3. Guidelines for unsurfaced road identification

a Dividing the unsurfaced road network into brunches. The first step is to identify the unsurfaced road branches. The easiest way to identify these branches is to use the installation's existing name identification system.

(1) For example, Boot Hill Road in figure 2-1 would be identified as a branch. Areas such as parking lots and storage areas that do not have names already assigned can be given descriptive names that associate them with their area.

(2) In addition to descriptive names, branches are assigned a unique code to help store and retrieve data from the files. This code has five characters that are numbers or letters given to the branches using any logical order. The first letter of the code will identify the type of branch, as shown in table 2-1. For example the parking lot 321 shown in figure 2-2 is given the code P0321. The code P0321 is derived from P representing parking lots and 0321 representing the nearest building to the parking area. Since the building number has less than four digits, a zero is used on the left to provide the required characters.

Table 2-1. Branch codes

Type of branch	*First letter in branch code*
Installation road	I
Parking lot	P
Motor pool	M
Storage	S
Tank trail	T
Range road	K
Other	X

b. Dividing branches into sections.

(1) Since branches are large units of the unsurfaced road network, they rarely have consistent or uniform characteristics along their entire length. Thus, for the purpose of unsurfaced road management, each branch must be subdivided into sections with consistent characteristics. As defined in paragraph 2-2c, a section must have uniform structural composition, traffic, and the same construction history.

(2) After each section is initially established, surface condition, drainage, and shoulders within the section can be used to subdivide it into other sections if a considerable variation in condition is encountered. For example, a section containing part of a two-lane road that has one lane in a significantly different condition than the other lane should be subdivided into two sections. Unique situations such as those that occur at roadway intersections should also be placed in separate sections. However, it must be remembered that the major section's structure usually carries through an intersection. The structure should be checked if there is doubt as to which

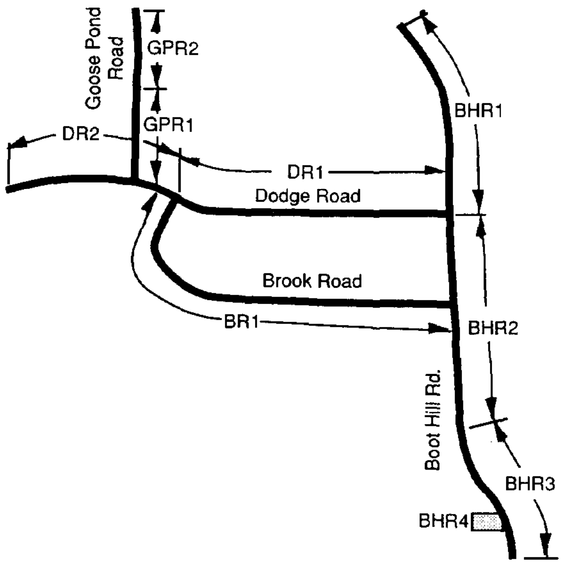


Figure 2-1. Typical road sections

surface would continue through the intersection. Some guidelines for dividing unsurfaced network branches into sections are as follows.

(a) Structure. Structure is one of the most important criteria for dividing a branch into sections. Structural information is not always available for all branches of an unsurfaced road network. To collect structure information, available construction records can be searched and repairs can be observed. In addition, test pits or coring programs can be developed to determine the structural composition of remaining road sections or to verify existing information.

(b) Traffic. The volume and load intensity of traffic should be consistent within each individual section.

(c) Construction history. All portions of a section should have been constructed at the same time. Roads constructed in intervals should be divided into separate sections corresponding to the dates of construction. Areas that have received major M&R work should also be considered as separate sections.

(d) Unsurfaced road rank. Unsurfaced road rank can also be used to divide a branch into sections. If a branch changes along its length from second class to third class, a section division should be made. If a branch becomes narrower along its length, a separate section should be defined.

(e) Drainage facilities and shoulders. It is

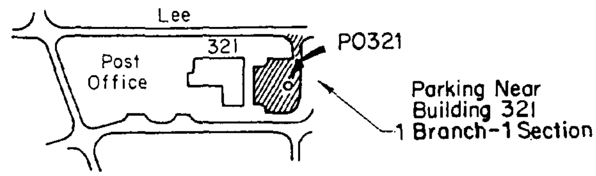


Figure 2-2. Installation map showing a way of identifying a parking area branch.

recommended that shoulder type and drainage facilities be consistent throughout a section.

(f) Test areas. An area where materials have been placed for testing should be identified as a separate section.

(3) By using the criteria in subparagraphs (2)*(a)* through *(f)* above, the unsurfaced road branches can be divided into sections. Sections are numbered beginning with one at the north or west end of the branch. The numbers then increase in a southerly or easterly direction. Each section should be identified on the installation map.

(4) To identify a section on the installation map, place an arrow at the starting point and ending point of each section as shown in figure 2-3. Sample units should be numbered in ascending order from the beginning of each section.

(5) Subparagraphs (2)*(a)* through *(f)* above that apply to roadways may also be applied to branch types, such as parking areas, storage areas, tank trails, range roads, etc. These branch types are usually considered one section, but may be subdivided. For example, a parking lot could be divided into more than one section; if the parking lot's drive areas were well defined, each drive area should be identified as a separate section.

(6) An example of dividing a parking area into sections is shown in figure 2-4. The area is very large and defined as one branch with five sections. The basic division of sections is based on traffic patterns and use. Field observations of these types of branches will help in the decision of how to divide such an area into sections.

c. Dividing a section into sample units. A sample unit is the smallest component of the unsurfaced road network and is used for inspection purposes to determine existing surface distress and condition. This is where the actual measurements will be made.

(1) The sizes of the sample units are described in paragraph 2-2*d*. For unsurfaced roads, a sample unit may vary in size from approximately 1,500 to

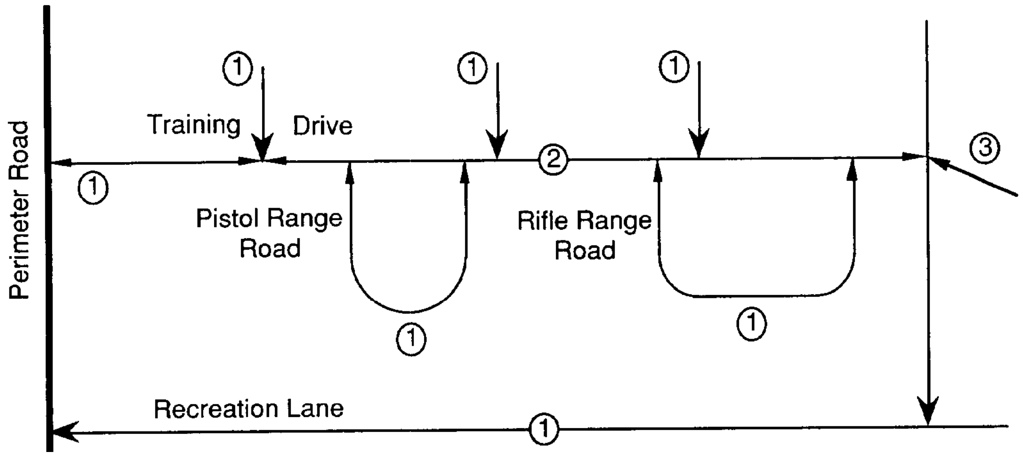


Figure 2-3. Sections identified on an installation map

3,500 square feet (140 to 325 square meters), with a recommended average of 2,500 square feet (231 square meters). In general, sample units are 100 feet (30 meters) long. If the road is narrower than 15 feet (4.5 meters), the length should be increased. If the road is wider than 35 feet (10.5 meters), the length should be shortened (see figure 2-5).

(2) Some judgment is needed in selecting the sample units. Try to choose a sample unit that is typical of the whole section. For example, if the section has drainage problems along part of its length, try to include some of that in the sample unit. The idea is to choose sample units so that the measurements will give a fair estimate for the entire section.

(3) If a small part of the section has particularly severe problems, make that part a special sample unit. (Make sure to note this on the inspection sheet, and don't use the rating for this unit when you calculate the average for the section.)

(4) In general, only two sample units per mile (per kilometer) are needed. If the road is less than 1/2 mile (0.8 kilometer) long, one sample unit should be sufficient.

(5) It is important to make a map showing the sizes and locations of the sample units so that you can find them again. Also, mark the field sites with permanent markers, i.e., wood stake, pipe, re-bar, etc.

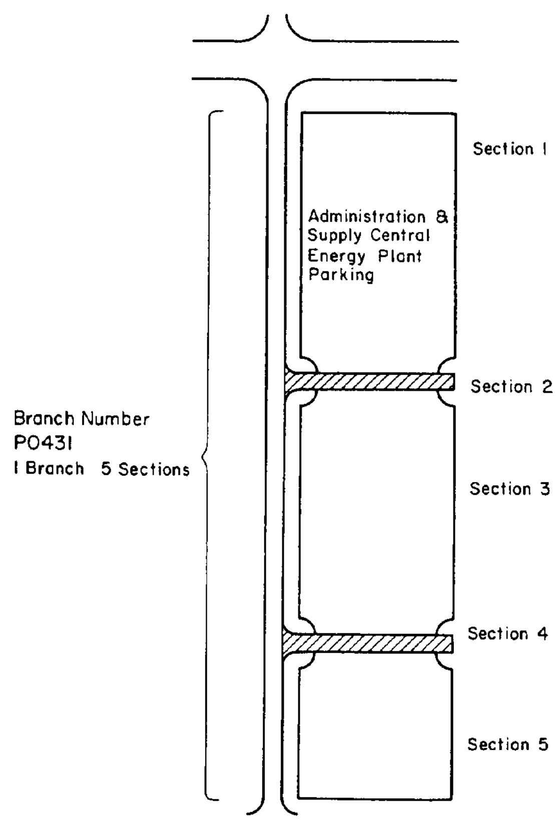


Figure 2-4. Large parking area divided into several sections.

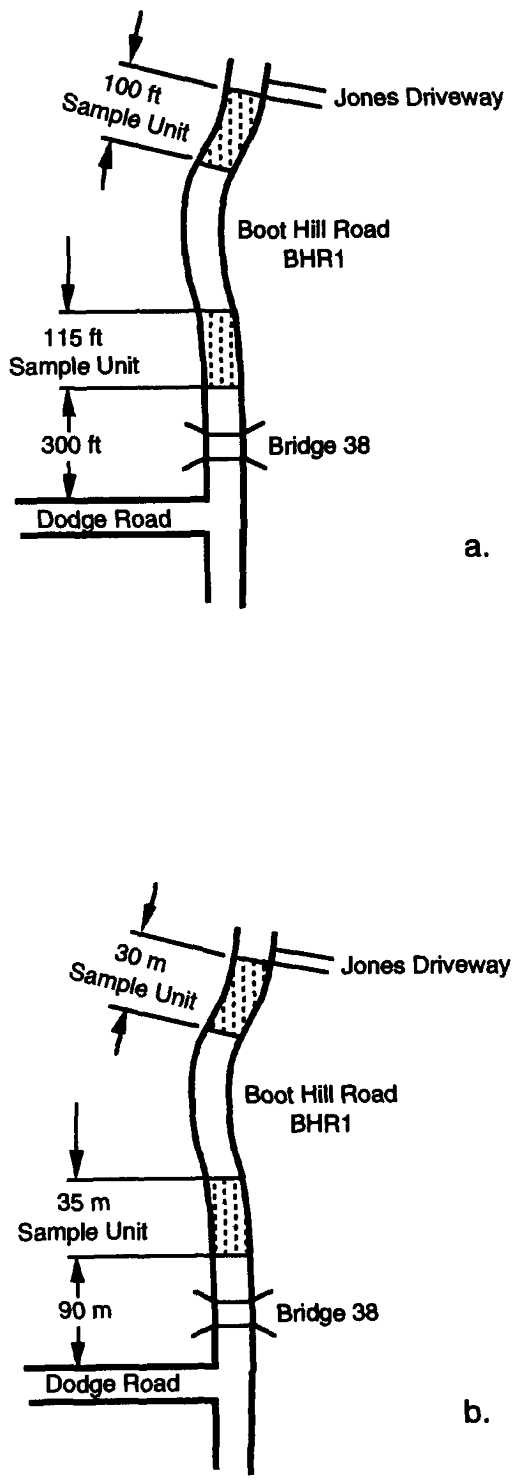


Figure 2-5. Examples of road with sample units (English and metric units).

CHAPTER 3

UNSURFACED ROAD CONDITION SURVEY AND RATING PROCEDURES

3-1. General

This chapter explains how to conduct a condition survey inspection and how to determine the Unsurfaced Road Condition Index (URCI). It is essential to have a thorough working knowledge of the URCI and condition survey inspection techniques. An important component of the unsurfaced road maintenance management system is the surface condition survey and rating procedures. Data obtained from these procedures are the primary basis for determining M&R requirements and priorities.

3-2. Unsurfaced road condition rating

Surface condition is related to several factors, including structural integrity, structural capacity, roughness, and rate of deterioration. Direct measurement of all these factors requires expensive equipment and highly trained personnel. However, these factors can be assessed by observing and measuring the distress of the surface.

a. URCI. The unsurfaced road condition index is a numerical indicator based on a scale of 0 to 100. The URCI indicates the road's integrity and surface operational condition. Its scale and associated ratings are shown in figure 3-1 and is identical to the Pavement Condition Index (PCI) for surfaced roads.

b. Determination. of URCI. The URCI is determined by measuring surface distress. The method has been field tested and has proven to be a very useful device for determining M&R needs and priorities.

3-3. Unsurfaced road inspection

Before an unsurfaced road network is inspected, it must be divided into branches, sections, and sample units as described in chapter 2. Once this division is complete, survey data can be obtained and the URCI of each section determined.

a. Inspection procedures for unsurfaced roads. There are two methods of inspections. The first is a quick survey done from a moving vehicle. The second involves detailed measurements of distresses in the sample units.

(1) To do the "windshield inspection," drive the full length of the road (or branch) at 25 miles per hour (40 kilometers per hour). (The speed may be higher or lower depending on road conditions, local practice or speed limits).' Note any surface or drainage problems along the road. If the local area has times of the year when unsurfaced roads need regular maintenance to keep them usable, such as the spring "mud season" in New England, keep track of where the maintenance was done so that those areas can be inspected during the windshield survey. These inspections should be made four times a year-once each season. The results can be used for estimating maintenance needs and priorities.

(2) The detailed sample unit measurements necessary to compute the ratings should be conducted annually. Always make these measurements at the same time of year-when the roads are in their best and most consistent condition. To make the measurements, the inspector will need to recognize certain kinds of problems, which are called *distresses.* The seven distress types for unsurfaced roads are as follows.

(a) 81-Improper cross section.
(b) 82-Inadequate roadside drainage.
(c) 83-Corrugations.
(d) 84-Dust.
(e) 85-Potholes.
(f) 86-Ruts.
(g) 87-Loose aggregate.

(3) The descriptions and severity levels for each are given in appendix B. Since the URCI is based on these descriptions, it is imperative that the inspector follow appendix B closely when doing an inspection. The distresses are numbered 81-87, as those are the numbers assigned in Micro PAVER.

(4) The equipment needed to do a survey is a hand odometer (measuring wheel), used to measure distress lengths and areas, a straight edge, and a ruler to measure the depths of potholes, ruts, or loose aggregate, and the URCI distress guide (appendix B).

(5) DA Form 7348-R, (Unsurfaced Road Inspection Sheet) should be used to record inspection data for each sample unit. (A copy of DA Form 7348-R is available at the back of this manual. It will be locally reproduced on 8 1/2- by 11-inch paper.) The sample unit shown in figure 3-2 has 100 feet (30 meters) of medium severity improper cross section (distress 81), 200 feet (61 meters) (both ditches) of high severity inadequate roadside drainage (distress 82), low severity dust (distress 84), 490 square feet (45.5 square meters) of medium severity rutting (distress 86), and 910 square feet (84.5 square meters) of high severity rutting

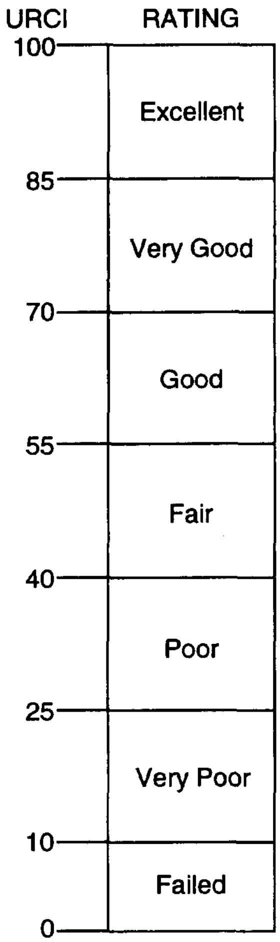


Figure 3-1. URCI scale and condition rating.

(distress 86). The units of measure are shown in parentheses after each distress type listed on the top part of the sheet. The total distress data are used to compute the URCI for the sample unit. That computation is explained in paragraph 3-4.

b. Remarks.

(1) For unsurfaced roads, it is important that each sample unit be identified precisely so that it can be located for reinspections. A stake, pin, or other permanent marker should be placed behind the ditch line at one of the four sample unit corners and distance noted to the nearest permanent marker (culvert, bridge, etc.) or intersection. A sketch of each section should also be made to show sample unit locations.

(2) It is imperative that the distress descriptions listed in appendix B be used when doing inspections. If these definitions are not followed, an accurate URCI cannot be determined.

(3) Make notes about anything unusual at the site-for example, if two distresses occur together, such as ruts and potholes, or if there is standing water in a ditch line.

(4) If two or more distresses occur together, measure each one separately. If it is hard to determine what distress is being observed, make a reasonable estimate-the system is flexible enough to calculate an accurate rating.

3-4. Calculating the URCI From inspection results

a. General. The distress measurements are used to calculate the Unsurfaced Road Condition Index (URCI), based on deduct values. A deduct value is a number from 0 to 100, with 0 meaning that the distress has no impact on the road condition and 100 meaning that the road has completely failed.

b. Calculating sample unit URCI. This calculation is made in four steps. Following is an example using figure 3-3.

(1) *Step 1.* Calculate the density for each distress type (except dust).

$$\text{Density} = \frac{\text{Amount of Distress}}{\text{Area of Sample Unit}} \times 100\% \qquad \text{(eq. 3-1)}$$

In this example the density of each distress and severity level is based on a sample unit of 1,800 square feet (167.4 square meters).

(a) For 100 linear feet of improper cross section (distress type 81), the density is

$$\frac{100}{1{,}800} \times 100 = 5.6 \qquad \text{(eq. 3-2)}$$

(b) For 30.5 linear meters of improper cross section (distress type 81), the density is

$$\frac{30.5}{167.4} \times 100 = 18.2 \qquad \text{(eq. 3-3)}$$

(c) For 900 square feet of corrugations (distress type 83), the density is

$$\frac{900}{1{,}800} \times 100 = 50.0 \qquad \text{(eq. 3-4)}$$

(d) For 83.7 square meters of corrugations (distress type 83), the density is

$$\frac{83.7}{167.4} \times 100 = 50.0 \qquad \text{(eq. 3-5)}$$

(e) No density calculation is needed for dust (distress type 84).

(f) For 160 linear feet of loose aggregate (distress type 87), the density is

$$\frac{160}{1{,}800} \times 100 = 8.8 \qquad \text{(eq. 3-6)}$$

(g) For 48.8 linear meters of loose aggregate (distress type 87), the density is

$$\frac{48.8}{167.4} \times 100 = 29.2 \qquad \text{(eq. 3-7)}$$

(2) *Step 2.* Using the deduct value curves, find the deduct values for each distress type and severity level. The deduct value curves are in appendix C .

(a) For improper cross section at low severity, locate on figure 3-4 (English units) the density of 5.6 on the horizontal axis, go vertically upward to the low severity curve, then go left horizontally to the y-axis intersection, which gives a value of 13 (English units). Similarly, for the metric system, locate on figure 3-4 (metric units) the density of 18.2 on the horizontal axis, which gives a value of 13.

(b) For corrugations at medium severity, the deduct value is 29 (fig C-3).

(c) For dust at medium severity, the deduct value is 4 (fig C-4).

(d) For loose aggregate at medium severity, the deduct value is 18 (fig C-7).

(3) *Step 3.* Find the Total Deduct Value (TDV) and the *q* value. Calculate the TDV by adding up all the deduct values. The *q* value is the number of individual deduct values greater than 5.0.

(a) TDV = 13 + 29 + 4 + 18 = 64 (which is the same in English and metric).

(b) The *q* value is 3 because three deduct values are greater than 5.0.

(4) *Step 4.* Find the Unsurfaced Road Condition Index (URCI) from the URCI curve. (NOTE: Slightly higher URCIs may result from manual computations.)

(a) From figure 3-5, the TDV is 64 and *q* is 3, so the URCI curve shows that the URCI is 59. From figure 3-1, the rating is "good."

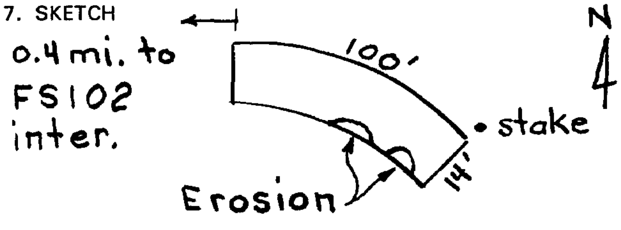
(b) This is the rating for this sample unit. The rating for the section is the average of the ratings from all the sample units in the section. For example, URCIs of 63, 59, and 67 in a section would give an average URCI of 63 for the whole section.

UNSURFACED ROAD INSPECTION SHEET

For use of this form, see TM 5-626; the proponent agency is USACE

1. BRANCH	2. SECTION	3. DATE
FS 144	1	7 Nov 94
4. SAMPLE UNIT	**5. AREA OF SAMPLE**	**6. INSPECTOR**
1	1400 ft²	R. Eaton

7. SKETCH



DISTRESS TYPES

81. Improper Cross Section *(linear feet)*
82. Inadequate Roadside Drainage *(linear feet)*
83. Corrugations *(square feet)*
84. Dust
85. Potholes *(number)*
86. Ruts *(square feet)*
87. Loose Aggregate *(linear feet)*

8. DISTRESS QUANTITY AND SEVERITY

TYPE		81	82	83	84	85	86	87
QUANTITY AND SEVERITY	L				✓			
	M	100					490	
	H		200				910	

9. URCI CALCULATION

DISTRESS TYPE *a*	DENSITY *b*	SEVERITY *c*	DEDUCT VALUE *d*
81	7.1	M	19
82	14.3	H	36
84	–	L	2
86	35.0	M	31
86	65.0	H	44

10. REMARKS

Erosion into road; standing water in ditches in several areas.

e. TOTAL DEDUCT VALUE	f. q =	g. URCI	h. RATING =
132	4	25	Poor

DA FORM 7348-R, NOV 94

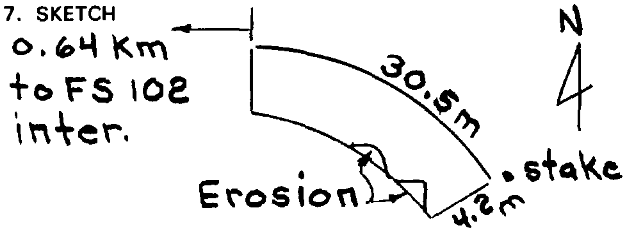
Figure 3-2. Example of completed inspection sheet (English units).

UNSURFACED ROAD INSPECTION SHEET

For use of this form, see TM 5-626; the proponent agency is USACE

1. BRANCH	2. SECTION	3. DATE
FS 144	1	7 Nov 94
4. SAMPLE UNIT	**5. AREA OF SAMPLE**	**6. INSPECTOR**
1	130 m²	R. Eaton

7. SKETCH



DISTRESS TYPES

81. Improper Cross Section *(linear feet)*
82. Inadequate Roadside Drainage *(linear feet)*
83. Corrugations *(square feet)*
84. Dust
85. Potholes *(number)*
86. Ruts *(square feet)*
87. Loose Aggregate *(linear feet)*

8. DISTRESS QUANTITY AND SEVERITY

TYPE		81	82	83	84	85	86	87
QUANTITY AND SEVERITY	L				✓			
	M	30.5					45.5	
	H		61.0				84.5	

9. URCI CALCULATION

DISTRESS TYPE *a*	DENSITY *b*	SEVERITY *c*	DEDUCT VALUE *d*
81	23.5	M	19
82	46.9	H	36
84	—	L	2
86	35.0	M	31
86	65.0	H	44

10. REMARKS

Erosion into road; standing water in ditches in several areas.

e. TOTAL DEDUCT VALUE	f. q =	g. URCI	h. RATING =
132	4	25	Poor

DA FORM 7348-R, NOV 94

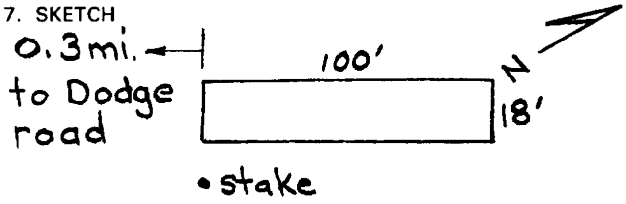
Figure 3-2. Example of completed inspection sheet (metric units).

UNSURFACED ROAD INSPECTION SHEET

For use of this form, see TM 5-626; the proponent agency is USACE

1. BRANCH	2. SECTION	3. DATE
FS 101	1	7 Nov 94
4. SAMPLE UNIT	**5. AREA OF SAMPLE**	**6. INSPECTOR**
2	1800 ft^2	R. Beaucham

7. SKETCH



DISTRESS TYPES

81. Improper Cross Section *(linear feet)*
82. Inadequate Roadside Drainage *(linear feet)*
83. Corrugations *(square feet)*
84. Dust
85. Potholes *(number)*
86. Ruts *(square feet)*
87. Loose Aggregate *(linear feet)*

8. DISTRESS QUANTITY AND SEVERITY

TYPE		81	82	83	84	85	86	87
QUANTITY AND SEVERITY	L	100						
	M			900	✓			160
	H							

9. URCI CALCULATION

DISTRESS TYPE *a*	DENSITY *b*	SEVERITY *c*	DEDUCT VALUE *d*
81	5.6	L	13
83	50.0	M	29
84	–	M	4
87	8.8	M	18

10. REMARKS

e. TOTAL DEDUCT VALUE	f. q =	g. URCI	h. RATING =
64	3	59	Good

DA FORM 7348-R, NOV 94

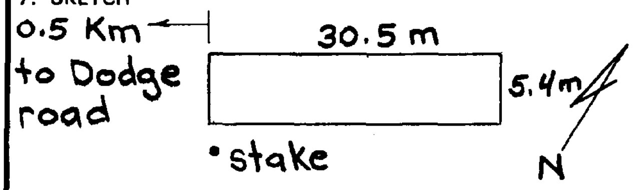
Figure 3-3. Example for calculating density of distresses (English units.).

UNSURFACED ROAD INSPECTION SHEET

For use of this form, see TM 5-626; the proponent agency is USACE

1. BRANCH	2. SECTION	3. DATE
FS 101	1	7 Nov 94
4. SAMPLE UNIT	**5. AREA OF SAMPLE**	**6. INSPECTOR**
2	167 m²	R. Beaucham

7. SKETCH



DISTRESS TYPES

81. Improper Cross Section *(linear feet)*
82. Inadequate Roadside Drainage *(linear feet)*
83. Corrugations *(square feet)*
84. Dust
85. Potholes *(number)*
86. Ruts *(square feet)*
87. Loose Aggregate *(linear feet)*

8. DISTRESS QUANTITY AND SEVERITY

TYPE		81	82	83	84	85	86	87
QUANTITY AND SEVERITY	L	30.5						
	M			83.7	✓			48.8
	H							

9. URCI CALCULATION

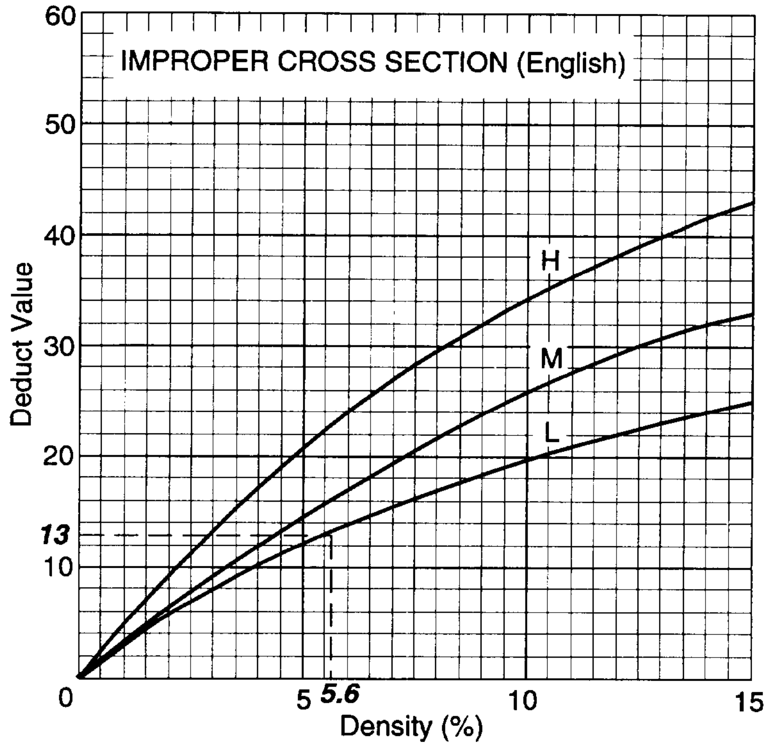
DISTRESS TYPE *a*	DENSITY *b*	SEVERITY *c*	DEDUCT VALUE *d*
81	18.2	L	13
83	50.0	M	29
84	–	M	4
87	29.2	M	18

10. REMARKS

e. TOTAL DEDUCT VALUE	f. q =	g. URCI	h. RATING =
64	3	59	Good

DA FORM 7348-R, NOV 94

Figure 3-3. Example for calculating density of distresses (metric units).



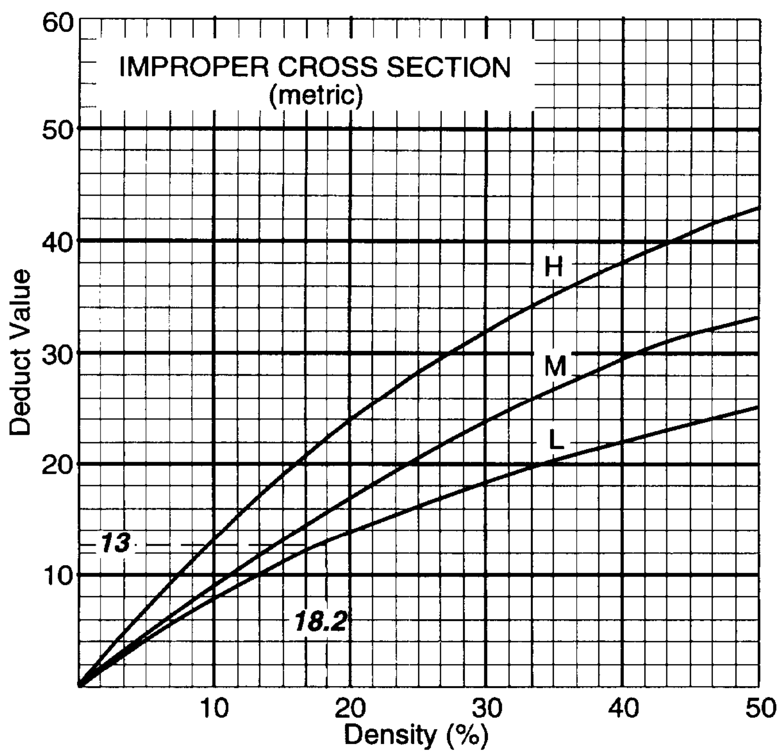


Figure 3-4. Distress 81-improper cross section deduct values curves (English and metric units).

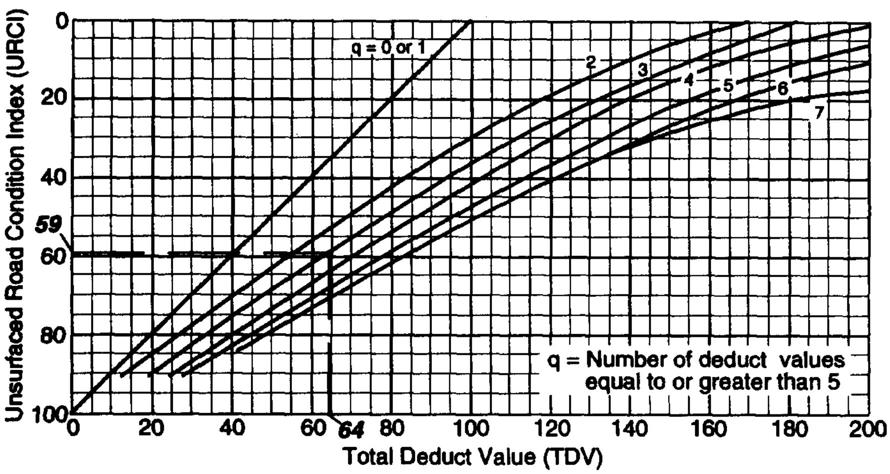


Figure 3-5. URCI curve.

CHAPTER 4

MAINTENANCE AND REPAIR (M&R) GUIDELINES

4-1. General

M&R requirements and priorities are highly related to the URCI, since the URCI is determined by distress information. This chapter describes how to do an unsurfaced road evaluation, how to determine feasible M&R alternatives, and how to establish M&R priorities.

4-2. Unsurfaced road evaluation procedure

Evaluation is done section by section, since each section represents a unit of the unsurfaced road network that is uniform in structure and subjected to consistent traffic loadings. It is necessary to comprehensively evaluate surface condition before feasible M&R alternatives can be rationally determined.

a. Overall condition. The URCI of an unsurfaced road section describes the section's overall condition. In turn, the overall condition of the section correlates highly with the needed level of M&R.

b. Variations of the URCI within a section. The URCI can vary within a section, either randomly localized or systematically. When a URCI value of a sample unit in the section is more than 10 points less than the sample unit average URCI value, a localized random variation exists. This variation should be considered when determining M&R requirements. Systematic variation occurs whenever a large, concentrated area of a section has a significantly different condition. For example, if traffic is channeled into a certain portion of a large parking lot, that portion may show much more distress or be in a poorer condition than the rest of the area. Whenever a significant amount of systematic variability exists within a section, the section should be subdivided into two or more sections.

c. Rate of deterioration. Both the long- and short-term rate of deterioration of each unsurfaced road section should be checked. The long-term rate is measured from the time of construction or time of last overall M&R (such as regarding).

d. Distress evaluation. Examination of the specific distress types, severities, and quantities present in a road section can help identify the cause of surface deterioration, its condition, and eventually its M&R requirements.

4-3. Comprehensive maintenance program

a. Steps. Following are five steps used to establish a comprehensive maintenance program for unsurfaced roads.

(1) Surveying the road network (step one).

(2) Establishing a road condition index (step two).

(3) Setting maintenance priorities (step three).

(4) Determining maintenance alternatives (step four).

(5) Calculating actual maintenance costs (step five).

b. Step one. Survey the road network. Survey all roads within the network and divide them into branches, sections, and sample units as described in chapters 2 and 3. Branches are a single area, such as a road or parking lot. A section is a division of a branch with consistent characteristics of the following.

(1) Structure.

(2) Traffic.

(3) Construction history.

(4) Road rank.

(5) Drainage and shoulders.

(6) A sample unit, the smallest division, is generally a 100-foot-long (30-meter-long) segment of a section and is the area consistently surveyed and used for determining the road condition. *Ideally, an inspector should conduct a "windshield inspection" of the entire road network once each season* (four times a year), and a detailed inspection of the sample units annually. (NOTE: Dividing the road network is a one-time requirement, after which minor adjustments are made as needed.)

c. Step two. Establish the unsurfaced road condition index (URCI). Rate the sample unit with the seven distresses and the severity level of low, *medium, or high* for each. The distresses are listed below and shown in figure 4-1.

(1) 81-Improper cross section.

(2) 82-Inadequate roadside drainage.

(3) 83-Corrugations.

(4) 84-Dust.

(5) 85-Potholes.

(6) 86-Ruts.

(7) 87-Loose aggregate.

(8) The URCI is used to determine the extent and magnitude of road problems and the M&R required.

d. Step three. Establish maintenance priorities. Set priorities for maintenance by using figure 4-2. The maintenance priority is set by a combination of the URCI and the amount of traffic per day on the road.

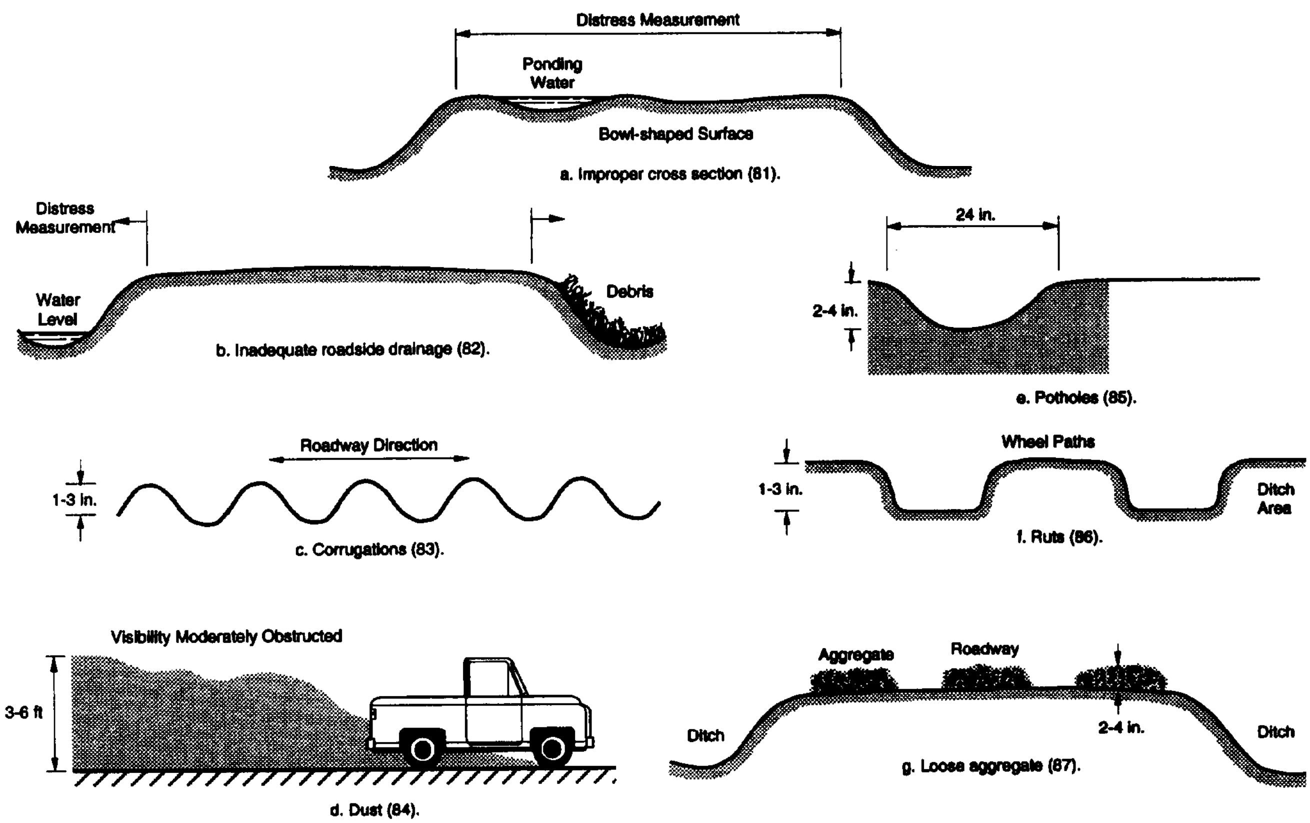


Figure 4-1. Medium severity distresses (English units).

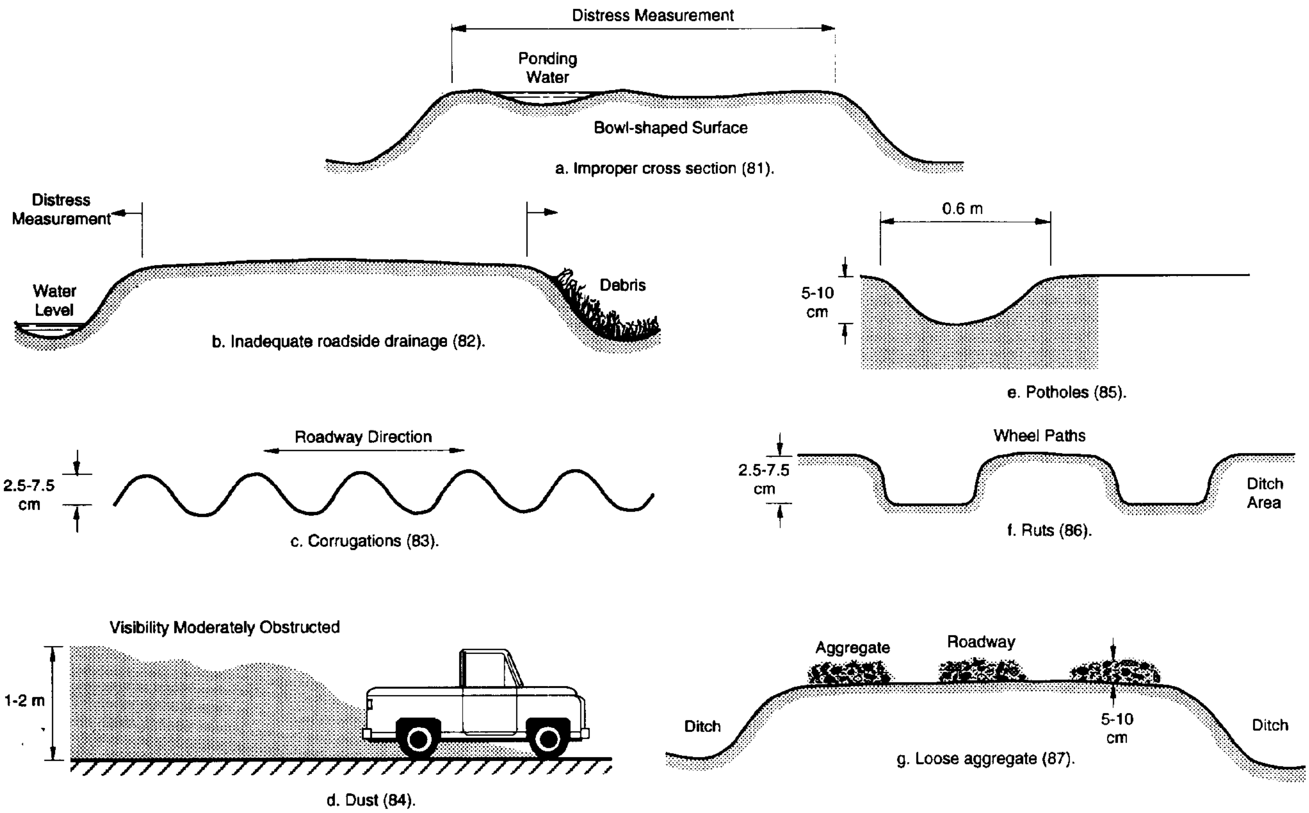


Figure 4-1. Medium severity distresses (metric units).

(1) *Category I* road has more than 200 vehicles per day (vpd).

(2) *Category II* has 100 to 199 vpd.

(3) *Category III* has 50 to 99 vpd.

(4) *Category IV* has 0 to 49 vpd.

(5) Find the surveyed road's URCI rating number on the left side of figure 4-2. *The lower the URCl and the higher the traffic volume, the greater the priority.* If the URCI rating is below the solid line for that traffic category, the priority is highest. All roads within the network can then be rated as low, medium, or high priority based upon road category, the budget, and local practice. *Maintaining a road with a high URCI rating is less expensive than rebuilding a failed road.*

(6) The criteria for establishing priorities for road sections where routine M&R is required are different from those used for sections that need major M&R.

(7) Priorities for sections requiring routine M&R are a function of existing individual distress types and severities. A single method is usually applied for a given area, which may consist of many sections, rather than different M&R methods for one section. Distresses that may have a considerable negative effect on the section's operational performance are usually corrected first. For example, medium- and high-severity bumps, corrugations, and potholes would usually receive high priority.

(8) Priorities among sections requiring major M&R are a function of the overall section condition, as reflected in the URCI, traffic, and management policies. For example, a decision might be made to repair all primary roads with a URCI of less than 50, secondary roads with a URCI of less than 40, and parking lots with a URCI of less than 30. The above URCI limits are provided as an example. Local conditions at Army installations and commands will dictate what actual values to use.

(9) The priority for maintenance can remain flexible. Physical catastrophes such as floods or severe storms or immediate safety defects demand immediate repairs. The completion of previously started projects or the addition of outside funding can also affect the priorities.

e. Step four. Determine maintenance alternatives. In the process of selecting feasible alternatives, one of the primary assumptions is that the strategy will be implemented within 2 years. The

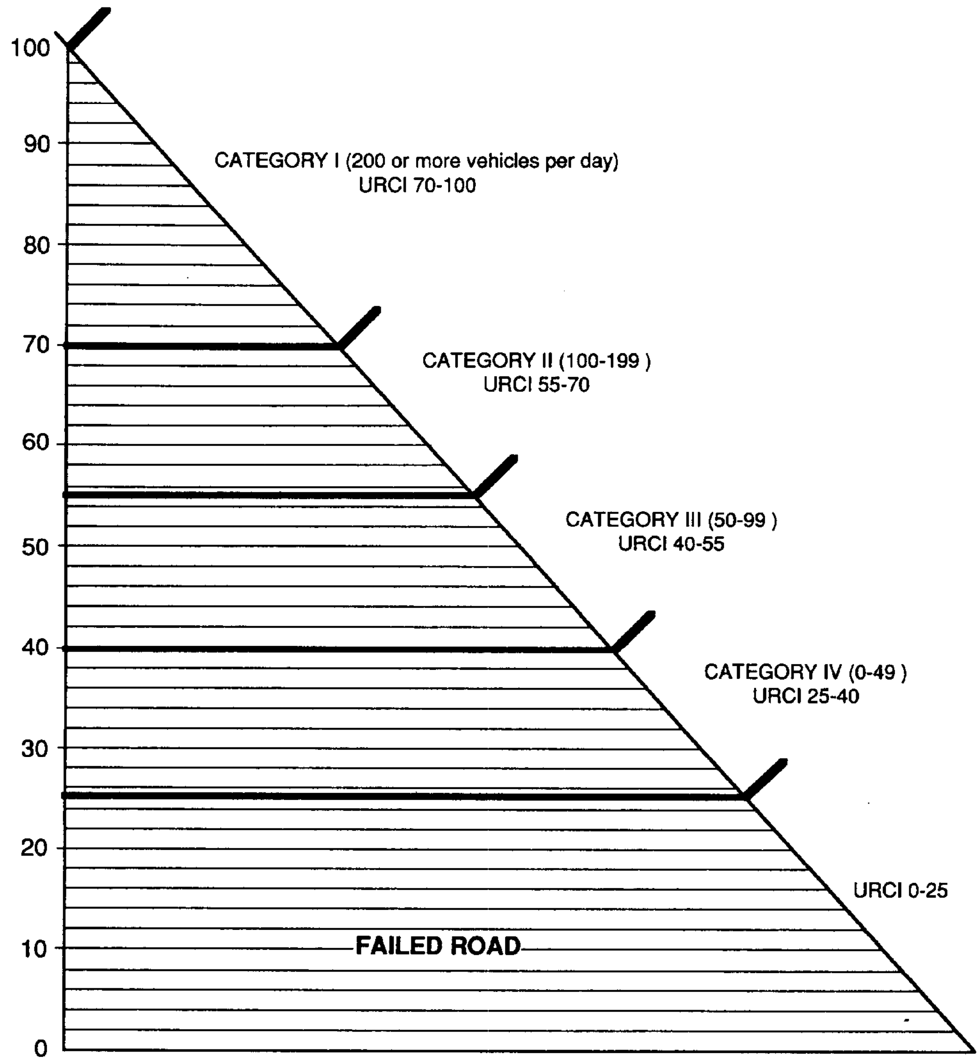


Figure 4-2. Maintenance priority graph

process of selecting feasible M&R alternatives is described below.

(1) Determine M&R strategy.

(a) The purpose of this step is to identify the road sections that need comprehensive analysis. The data required for the identification are the URCI, distress, road rank, road usage, traffic, and management policy.

(b) Based on these data, a limiting URCI value is established for each type of road: e.g., 70 for primary roads with traffic volume exceeding 200 vehicles per day. If a road has a URCI above the limiting value, continuation of existing maintenance policy is recommended unless review of the distress data shows that the majority of distress is caused by inadequate road strength or if the rate of surface deterioration is thought to be high, or both.

(c) If the M&R strategy decision is to continue existing maintenance policy, the information in table 4-1 is used as a guide to select the appropriate maintenance method. This table presents feasible maintenance methods for each distress type at a given severity level.

Table 4-1. Maintenance alternatives

Distress	*Severity code*	*cost code*[1]	*Description*
81-Improper cross section	L	*B*	Grade only.
	M	B/C	Grade only/grade and add material (water or aggregate or both), and compact. Bank curve. Adjust transitions.
	H	C	Cut to base, add aggregate, shape, water, and compact.
82-Improper roadside drainage	L	B	Clear ditches every 1-2 years.
	M	A B	Clean out culverts. Reshape, construct, compact or flare out ditch.
	H	C	Install underdrain, larger culvert, ditch dam, rip rap, or geotextiles.
83-Corrugations	L	B	Grade only.
	M	B/C	Grade only/grade and add material (water or aggregate or both), and compact.
	H	C	Cut to base, add aggregate, shape, water, and compact.
84-Dust stabilization	L	C	Add water.
	M	C	Add stabilizer.
	H	C	Increase stabilizer use. Cut to base, add stabilizer, water, and compact. Cut to base, add aggregate and stabilizer, shape, water, and compact.
85-Potholes	L	B	Grade only.
	M	B/C	Grade only/grade and add material (water, aggregate, or 50/50 mix of calcium chloride and crushed gravel), and compact.
	H	C	Cut to base, add aggregate, shape, water, and compact.
86-Ruts	L	B	Grade only.
	M	B/C	Grade only/grade, add material, and compact.
	H	C	Cut to base, add aggregate, shape, water, and compact.
87-Loose aggregate	L	B	Grade only.
	M	B/C	Grade only/grade, add material, and compact.
	H	C	Cut to base, add aggregate, shape, water, and compact.

[1]Cost code guide: A = labor, overhead; B = labor, equipment, overhead, C = labor, equipment, materials, overhead.

(2) Determine feasible M&R alternatives based on the branch condition evaluation summary (see DA Form 5155-R in TM 5-623).

(a) The purpose of this step is to determine whether alternatives other than existing maintenance policy should be considered (e.g., paving or sealing), and, if so, what specific feasible alternatives to consider. This is done by analyzing data for the section under consideration. Based on this analysis, existing maintenance would usually be recommended except when one or more of the following conditions exists.

(b) Long- or short-term rate of road deterioration is high.

(c) Load-carrying capacity is deficient.

(d) Load-associated distress accounts for a majority of the distress deduct value.

(e) Surface roughness is rated major.

(f) A change in mission requires greater load-carrying capacity.

(g) Table 4-1 lists most of the available overall repair procedures for unsurfaced roads.

(h) All feasible alternatives should be identified based on a careful analysis of the section evaluation summary (see DA Form 5156-R in TM 5-623). Life-cycle cost analysis of the feasible alternatives will help rank the alternatives based on cost, and thus provide necessary information for selecting a cost-effective M&R alternative.

(3) Determine maintenance alternatives. Do this by looking up the distress type and the severity code in table 4-1.

(a) The problem or *distress* is listed in the left hand column. It is followed by the *severity level.* Simply locate the applicable distress and severity level and follow it across the page to the *description* column. The maintenance alternatives

are given there. The cost guide is useful in determining the amount of labor, material or equipment needed for each alternative. A description of costs involved in each code is listed at the bottom of the table.

(b) For example, use *Potholes* entry of table 4-1. *Low* severity- *Grade only*-cost code *B* indicates labor, equipment, and overhead costs are involved:

Distress	*Severity code*	*cost code*	*Description*
85-Potholes	L	B	Grade only.
	M	B/C	Grade only/grade and add material (water, aggregate, or 50/50 mix of calcium chloride and crushed gravel), and compact.
	H	C	Cut to base, add aggregate, shape, water, and compact.

(c) It is important to recognize that drainage problems are usually the basic cause of a number of distresses. Corrugations, potholes and ruts, while corrected by grading, may have been created because a road does not drain properly. Therefore, adequate drainage both on, and beside, the road must be addressed to eliminate or decrease future distresses and cut down on the amount of grading needed to properly maintain a road. *Adequate drainage is always necessary.*

f. Step five. Calculate actual maintenance costs. A yearly maintenance record should be completed. An example format is given in figure 4-3. List all roads by priority with the *highest priority first, lowest last.* For road 1 (greatest priority) show *total* funds available. Show the estimated cost to upgrade that road. By subtracting the amount needed from the amount available, you can easily see the *balance* remaining. That balance now becomes the *total* available for the next road. Put that amount for the second road. Put in the estimated cost to repair the second road and subtract again. The new balance is shown as the available funds for the third road. Repeat this process until all the available funds are used. When the balance is at $0.00, all required maintenance that is currently unfunded is easily seen. This enables allocation of money more effectively and, if necessary, justification of requests for additional funds.

	Road	Total Funds Available for Maintenance	Estimated cost to Upgrade Road	Balance
1.	Eaton Road	$ 50,000	$ 2,500	$ 47,500
2.	Beaucham Road	47,500	16,500	31,000
3.	Gerard Road	31,000	4,000	27,000
4.	Lebraun Lane	27,000	20,000	7,000
5.	Roberts Road	7,000	12,000	-5,000
6.	Glenn Road	0	9,000	Unfunded
7.	Leland Lane	0	10,000	Unfunded

Figure 4-3. Sample yearly maintenance record.

CHAPTER 5

DATA MANAGEMENT-MANUAL SYSTEM

5-1. General

Chapters 2 through 4 discussed the data collection and analysis procedures that make up the unsurfaced road management system. To use this system, it is necessary to store data in a usable manner; this data storage can be achieved by using either a computer or a manual recordkeeping system. If a manual system is used, initial data storage is usually small and handled easily. The more the management system is used, more data must be collected and stored, Thus, the manual data storage system described in this chapter has been designed so conversion to computer data storage will not be complex or time-consuming.

5-2. Manual system forms

Forms are used to store collected data in the manual system. Two forms, each containing pertinent information on the road network, have been designed to store data. They both refer to the road branches. Blank reproducible forms are provided in TM 5-623.

5-3. Use of the manual data forms

a. DA Form 5149-R (Branch Identification Summary). This form lists all branches in the road network, thereby providing an inventory of all network branches and sections.

b. DA Form 5149-1-R (Branch Identification Summary-Continuation Sheet). This form provides space to list branch code, branch name, branch use, number of sections, and branch area. Since all installations would have more branches than could be listed on the DA Form 5149-R, the continuation forms would be used to complete the total number of branches in the network.

5-4. Manual recordkeeping process

The manual recordkeeping system consists primarily of the two forms described in paragraph 5-3. Those forms are used for information storage. To use data efficiently, this information must be stored in an orderly way. Figure 5-1 is an example of such a system; it can be described as follows.

a. Branch summary. One folder stores the network inventory. This is the information recorded on DA Form 5149-R.

b. Branch identification information. One folder stores branch identification information. This folder serves as a heading card and as the storage slot for DA Form 5155-R (Branch Maintenance and Repair Requirements). (This allows anticipated maintenance activities for each section of the branch to be stored in one location.) DA Form 5155-R is available in TM 5-623. The branch identification forms should be filed in the order shown on the DA Forms 5149-R.

c. Branch sections. After the Branch Identification Summary Forms, a series of file folders should be provided for each section of the branch. One folder each is provided for DA Forms 5149-1-R. (These forms contain basic information on the section.)

d. Inspection data. Field survey data on the sample unit inspection sheets (DA Form 7348-R) should be retained. The inspection sheets can help verify data, and would be essential if the installation wanted to convert from the manual system to the computerized Micro PAVER system.

5-5. Record upkeep

Once the initial division of the road network into branches and sections has been completed, the filing system can be started. As the initial inspections take place, the information on DA Forms 5149-1-R can be compiled. As branches are completed, data analyses can begin (chap 4).

a. Updating forms. Forms must be updated once maintenance activities begin. Also, as work is completed, information must be transferred to the M&R Record. Performance of maintenance activities will also change the condition of the section; thus, the condition survey should also be updated.

b. Updating of condition survey. If a section receives no maintenance, the condition survey should be updated based on the rate of deterioration. Initially, this rate can be estimated by briefly inspecting the section to observe changes in distress types or severities. Until data are compiled, sections should be reviewed at least annually to observe this change in condition. Once the rate of deterioration is determined, sections with low rates may be inspected at more infrequent intervals. If the filing system is updated continuously as work is done and inspections are completed, it should not be necessary to do a condition survey of the entire system at one time.

c. Economic analysis. Any economic analysis made to determine M&R strategies for given sections should also be filed with the section information cards.

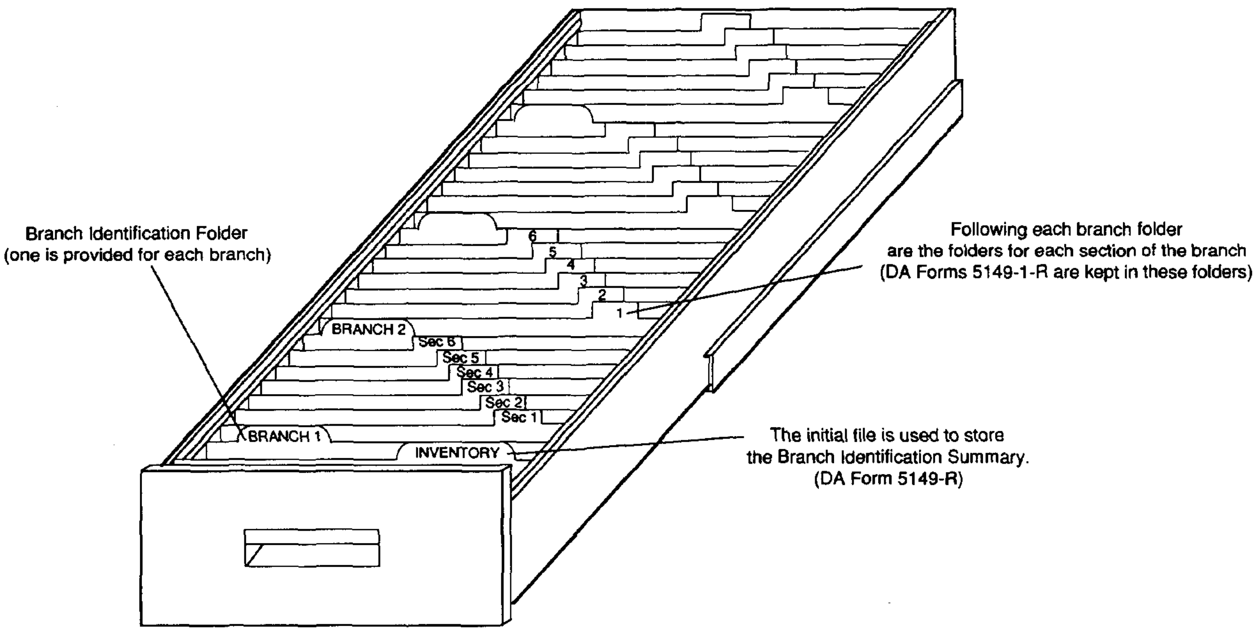


Figure 5-1. Example of a filing sequence for a manual recordkeeping system.

CHAPTER 6

DATA MANAGEMENT-COMPUTERIZED MICRO PAVER SYSTEM

6-1. General

a. The manual data management system described in chapter 5 is a systematic way of recording and storing information needed for effective road maintenance management. However, for medium- to large-sized installations, the number of record cards can increase to the point where it is time-consuming to manually search, sort, and compile information for various maintenance management applications. An optional computerized system is available to automatically retrieve, sort, and compile data. In addition, the computer may be used to make a number of calculations that would have to be done manually.

b. The unsurfaced roads management system is a component of the Micro PAVER pavement management system. This chapter briefly describes the computerized Micro PAVER system. Specific user instructions may be obtained from the assigned responsible agency-the U.S. Army Center for Public Works.

6-2. Use of computerized Micro PAVER

Generally, the computerized system is recommended for expedient data handling and report generation. It may become advantageous to use it for road networks with a large number of road sections (more than 200). However, if the choice of system is not clear-cut, it is always possible to implement a manual system and then later convert to a computerized system.

6-3. System description

The system consists of a computerized data base and a number of programs that store, retrieve, and manipulate the data, as well as do a variety of analyses and calculations required for network and project management decisions. The data base will store properties of each section of road as well as numerous other types of data on secondary structures, traffic, maintenance history, etc. In addition, the system stores detailed cost records and the local maintenance policy.

a. All of these data are not required to use the system effectively. New types of data can be incrementally added. The system's programs rely primarily on distress analysis for ranking, budgeting, and forecasting. These data are collected by trained inspection teams on a sampling basis.

b. Micro PAVER is designed to run on IBM or IBM-compatible equipment (MS-DOS), with a minimum of 640-k RAM and a 20-Meg hard drive.

6-4. System use and update

Micro PAVER should be used and updated in a way similar to the manual system. Some of the computer reports can be used as an aid in scheduling work for the road maintenance crew or to generate work to be done by contract. Other reports can be used to communicate road condition and maintenance requirements to higher management. Micro PAVER will automatically delete the corresponding project from the road work plan and will store the work in completed projects as work history, thereby capturing the history of the distresses, repairs, quantities, and associated cost.

a. Unsurfaced road inspection information. As road sections are inspected, information should be input to Micro PAVER; Micro PAVER will not delete the results from any previous inspection of the section unless specifically required to do so by the user. Therefore, road condition information showing a condition profile over a period of time will be readily available. Micro PAVER is fully described in TM 5-623.

b. Work requirements. For those sections where existing maintenance policy is to continue (usually the majority of sections in a road network), work requirements can be automatically developed by Micro PAVER based on user maintenance policy and distress results of road inspections.

c. Incorporation of improvements. It should be noted that Micro PAVER has been designed so new technological procedures and improvements can be incorporated into it as they become available.

APPENDIX A

REFERENCES AND BIBLIOGRAPHY

A-1. References

Department of the Army publications

AR 420-72	Surfaced Areas, Bridges, Railroad Track and Associated Appurtenances
TM 5-623	Pavement Maintenance Management
TM 5-624	Maintenance and Repair of Surface Areas
TM 5-822-2	General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas

Department of the Army forms

DA Form 7348-R	Unsurfaced Road Inspection Sheet (Prescribed in para 3-3.)
DA Form 5149-R	Branch Identification Summary
DA Form 5149-1-R	Branch Identification Summary-Continuation Sheet
DA Form 5155-R	Branch Maintenance and Repair Requirements

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APPENDIX B

DISTRESS DESCRIPTIONS

B-1. Introduction

The seven distress types and severity levels for unsurfaced roads are discussed below and are shown in figures B-1 through B-14.

B-2. Distress 81 -Improper cross section

a. Description. An unsurfaced road should have a crown with enough slope from the centerline to the shoulder to drain all water from the road's surface. No crown is used on curves, because they are usually banked. The cross section is improper when the road surface is not shaped or maintained to carry water to the ditches.

b. Severity levels.

(1) At security level L-

(a) Small amounts of ponding water or evidence of ponding water on the road surface.

(b) The road surface is completely flat (no cross-slope).

(2) At security level M-

(a) Moderate amounts of ponding water or evidence of ponding water on the road surface.

(b) The road surface is bowl-shaped.

(3) At security level H-

(a) Large amounts of ponding water or evidence of ponding water on the road surface.

(b) The road surface contains severe depressions.

c. How to measure. Improper cross section is measured in linear feet (linear meters) per sample unit (along the centerline or parallel to the centerline). The cross section runs from the outside shoulder break on one side of the road to the outside shoulder break on the other side. Different severity levels may exist within the sample unit. For example, there could be 60 feet (18 meters) with medium severity and 40 feet (12 meters) with low severity. The maximum length would be equal to the length of the sample unit.

B-3. Distress 82-Inadequate roadside drainage

a. Description. Poor drainage causes water to pond. Drainage becomes a problem when ditches and culverts are not in good enough condition to direct and carry runoff water because of improper shape or maintenance.

b. Severity levels.

(1) At security level L, small amounts of the following exist:

(a) Ponding water or evidence of ponding water in the ditches.

(b) Overgrowth or debris in the ditches.

(2) At security level M, moderate amounts of the following exist:

(a) Ponding water or evidence of ponding water on the road surface.

(b) Overgrowth or debris in the ditches.

(c) Erosion of the ditches into the shoulders or roadway.

(3) At security level H, large amounts of the following exist:

(a) Ponding water or evidence of ponding water in the ditches.

(b) Water running across or down the road.

(c) Overgrowth or debris in the ditches.

(d) Erosion of the ditches into the shoulders or roadway.

c. How to measure. Drainage problems are measured in linear feet (linear meters) per section parallel to the centerline. The maximum length is two times the length of the sample unit (two ditches for the total length of the sample unit). For example, a sample unit may have 120 feet (36 meters) with low severity and 35 feet (10.5 meters) with high severity.

B-4. Distress 83-Corrugations

a. Description. Corrugations (also known as washboarding) are closely spaced ridges and valleys (ripples) at fairly regular intervals. The ridges are perpendicular to the traffic direction. This type of distress is usually caused by traffic and loose aggregate. These ridges usually form on hills, on curves, in areas of acceleration or deceleration, or in areas where the road is soft or potholed.

b. Severity levels.

(1) At security level L, corrugations are less than 1 inch (2.5 centimeters) deep.

(2) At security level M, corrugations are between 1 and 3 inches (2.5 and 7.5 centimeters) deep.

(3) At security level H, corrugations are deeper than 3 inches (7.5 centimeters).

c. How to measure. Corrugations are measured in square feet (square meters) of surface area per sample unit. The amount cannot exceed the total area of the sample unit. For example, a sample unit may have 230 square feet (21 square meters) with moderate severity and 50 square feet (4.6 square meters) with high severity.

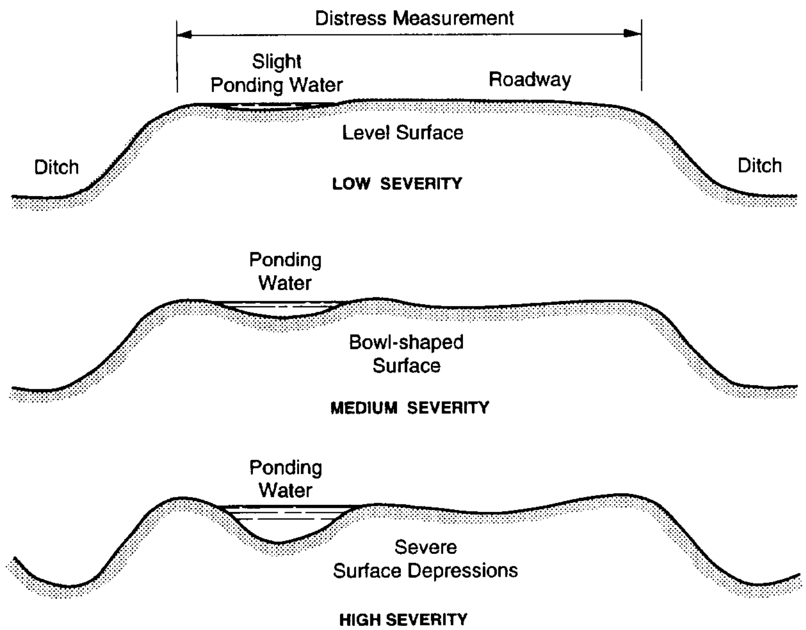


Figure B-1. Improper cross section (English or metric units).

Figure B-2. High severity example of improper cross section.

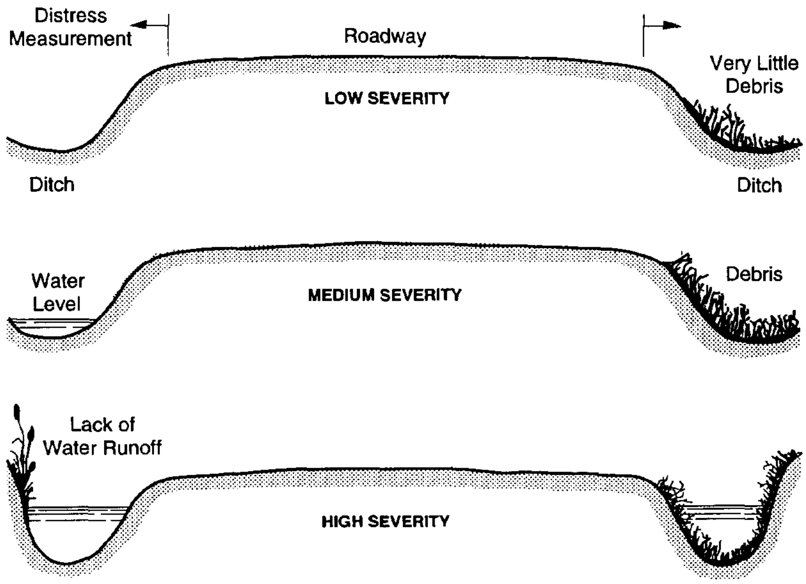


Figure B-3. Inadequate roadside drainage severity levels (English or metric units).

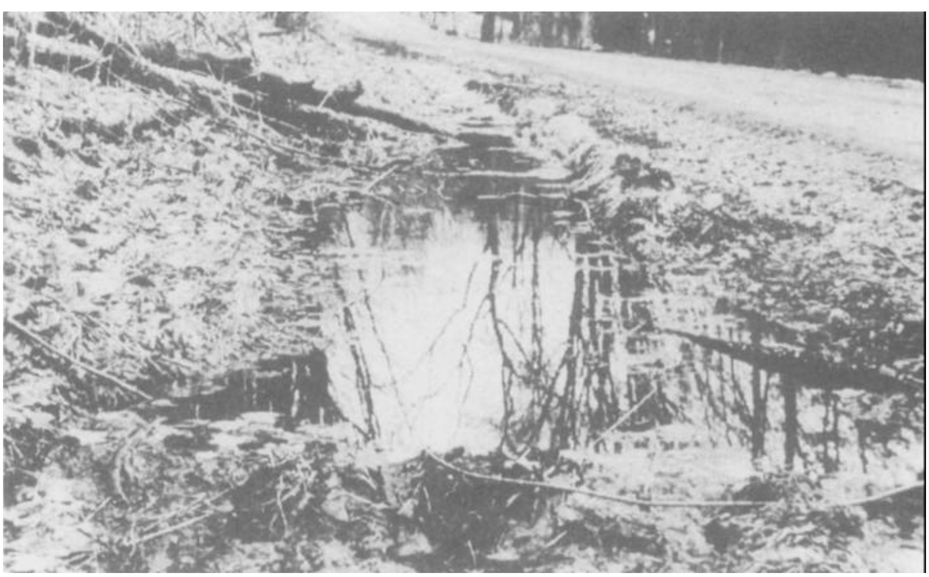


Figure B-4. High severity example of inadequate roadside drainage.

B-5. Distress 84-Dust

a. Description. The wear and tear of traffic on unsurfaced roads will eventually loosen the larger particles from the soil binder. As traffic passes, dust clouds create a danger to trailing or passing vehicles and cause significant environmental problems.

b. Severity levels.

(1) At security level L, normal traffic produces a thin dust that does not obstruct visibility.

(2) At security level M, normal traffic produces a moderately thick cloud that partially obstructs visibility and causes traffic to slow down.

(3) At security level H, normal traffic produces a very thick cloud that severely obstructs visibility and causes traffic to slow down significantly or stop.

c. How to measure. Drive a vehicle at 25 miles per hour (40 kilometers per hour) and watch the dust cloud. Dust is measured as low, medium, or high severity for the sample unit.

B-6. Distress 85-Potholes

a. Description. Potholes are bowl-shaped depressions in the road surface. They are usually less than 3 feet (1 meter) in diameter. Potholes are produced when traffic wears away small pieces of the road surface. They grow faster when water collects inside the hole. The road then continues to disintegrate because of loosening surface material or weak spots in the underlying soils.

b. Severity levels. The levels of severity for potholes are based on both the diameter and the depth of the pothole according to table B-l below:

Table B-1. Pothole severity levels

	Average diameter			
Maximum depth	*Less than 1 foot (0.3 meter)*	*l-2 feet (0.3-0.6 meter)*	*2-3 feet (0.6-1 meter)*	*More than 3 feet[1] (1 meter)*
1/2-2 inches (1.5-5 cm)	L	L	M	M
2-4 inches (5-10 cm)	L	M	H	H
4+ inches (10+ cm)	M	H	H	H

[1]If the pothole is over 3 feet (1 meter) in diameter, the area should be determined in square feet (square meters) and divided by 7 to find the equivalent number of potholes.

c. How to measure. Potholes are measured by counting the number that are low, medium, and high severity in a sample unit and recording them separately by severity level. For example, there may be 14 potholes of medium severity and 8 potholes of low severity.

B-7. Distress 86-Ruts

a. Description. A rut is a surface depression in the wheel path that is parallel to the road centerline. Ruts are caused by a permanent deformation in any of the road layers or subgrade. They result from repeated vehicle passes, especially when the road is soft. Significant rutting can destroy a road.

b. Severity levels.

(1) At security level L, ruts are less than 1 inch (2.5 centimeters) deep.

(2) At security level M, ruts are between 1 and 3 inches (2.5 to 7.5 centimeters) deep.

(3) At security level H, ruts are deeper than 3 inches (7.5 centimeters).

c. How to measure. Ruts are measured in square feet (square meters) of surface area per sample unit. For example, a sample unit may have 75 square feet (7 square meters) with high severity and 240 square feet (23 square meters) with medium severity.

B-8. Distress 87-loose aggregate

a. Description. The wear and tear of traffic on unsurfaced roads will eventually loosen the larger aggregate particles from the soil binder. This leads to loose aggregate particles on the road surface or shoulder. Traffic moves loose aggregate particles away from the normal road wheel path and forms berms in the center or along the shoulder (the less-traveled areas).

b. Severity levels.

(1) At security level L, loose aggregate on the road surface, or a berm of aggregate (less than 2 inches [5 centimeters] deep) on the shoulder or less-traveled area.

(2) At security level M, moderate aggregate berm (between 2 and 4 inches 15 and 10 centimeters] deep) on the shoulder or less-traveled area. A large amount of fine soil particles is usually found on the roadway surface.

(3) At security level H, large aggregate berm (greater than 4 inches [10 centimeters] deep) on the shoulder or less-traveled area.

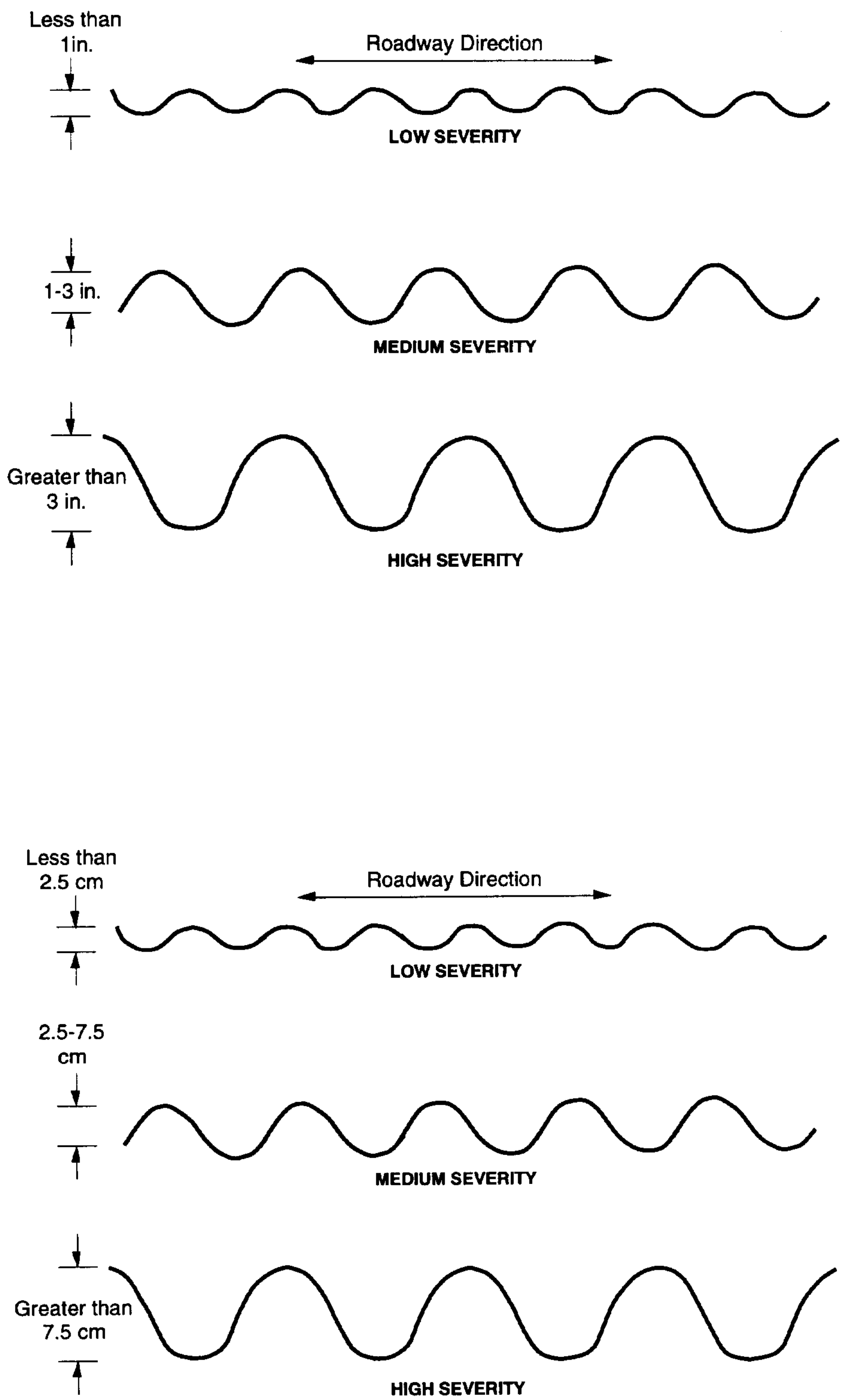


Figure B-5. Severity Levels of corrugations (English and metric units).

c. How to measure. Loose aggregate is measured in linear feet parallel to the centerline in a sample unit. Each berm is measured separately. For example, if a sample unit that is 100 feet (30 meters) long has three berms of medium-severity loose aggregate-one on each side and one down the middle-then the measurement would be 300 feet (90 meters) at medium severity.

Figure B-6. Medium severity example of corrugations.

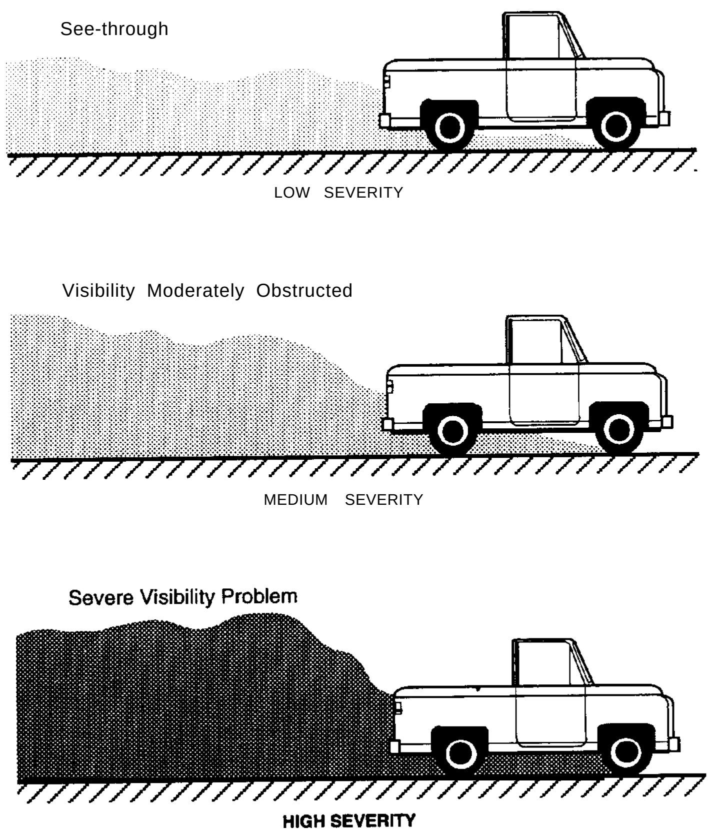


Figure B-7. Dust severity levels (English or metric units)

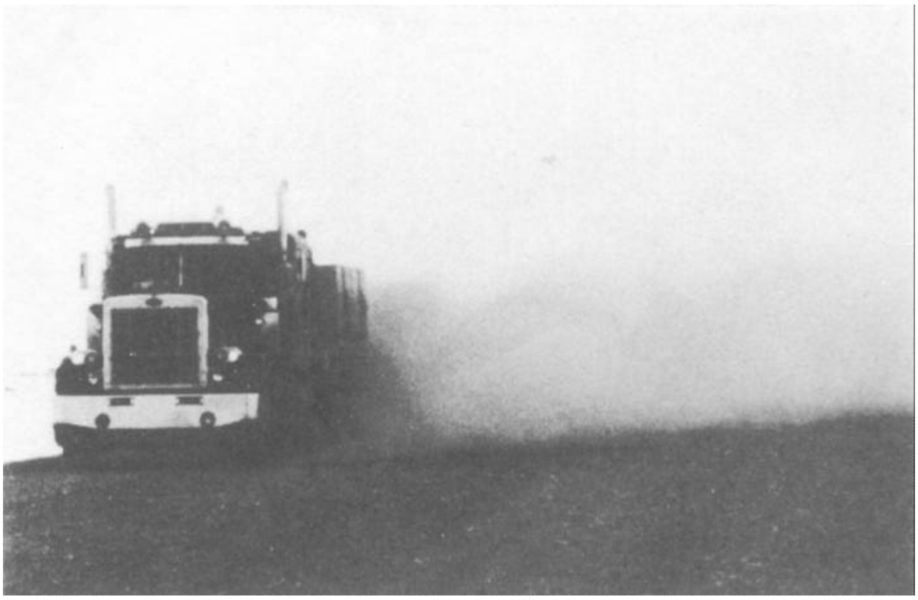


Figure B-8. High severity example of dust.

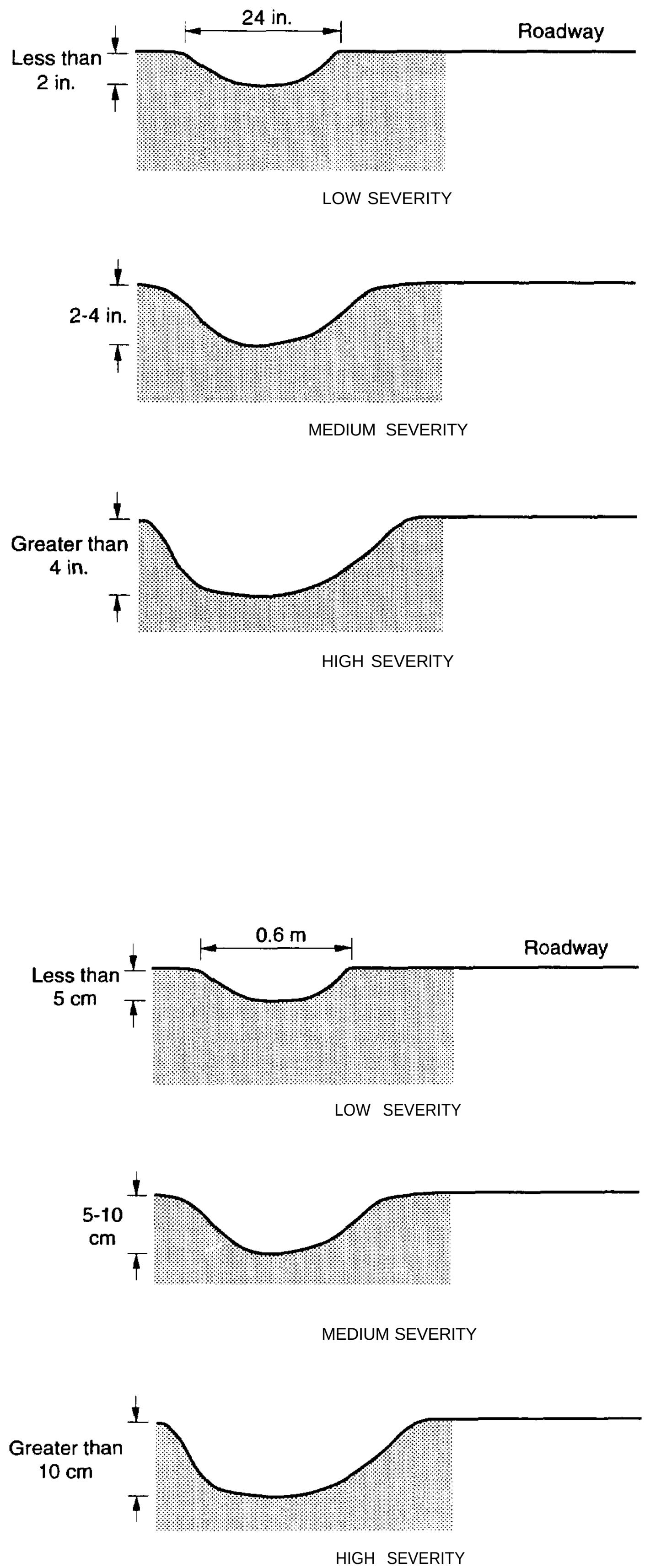


Figure B-9. Severity levels of potholes (English and metric units)

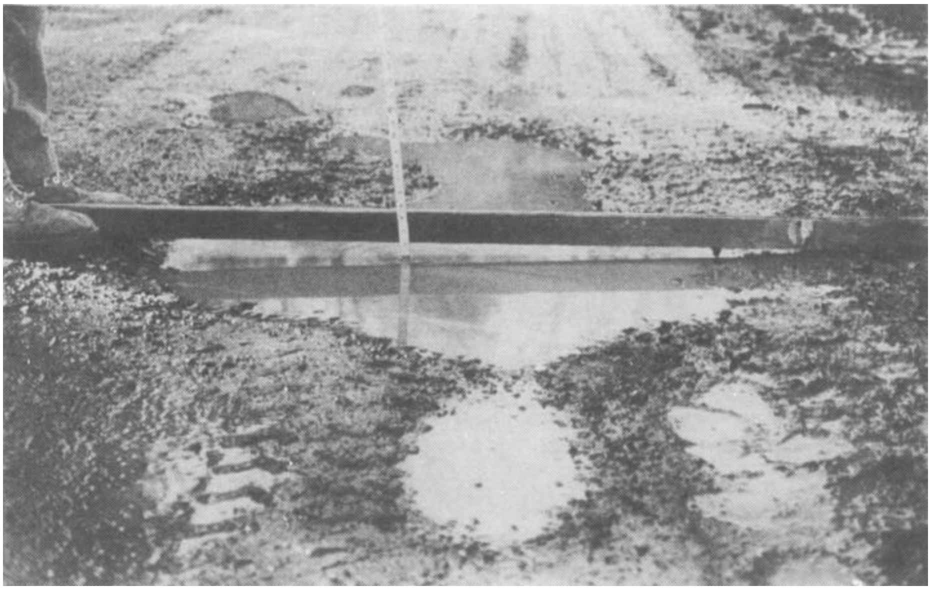


Figure B-10. High severity example of potholes.

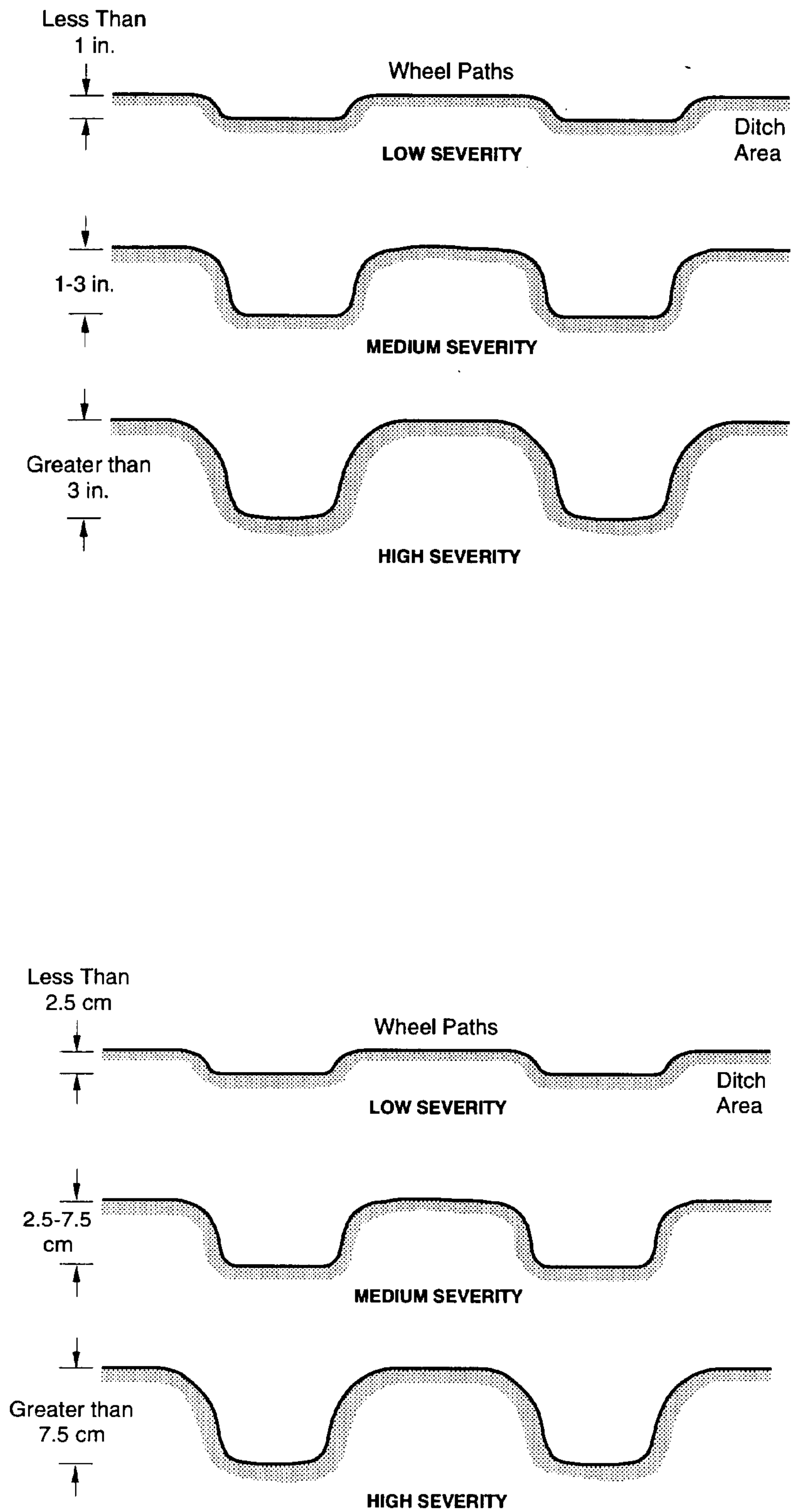


Figure B-11. Severity levels of ruts (English and metric units).

Figure B-12. Low severity example of ruts.

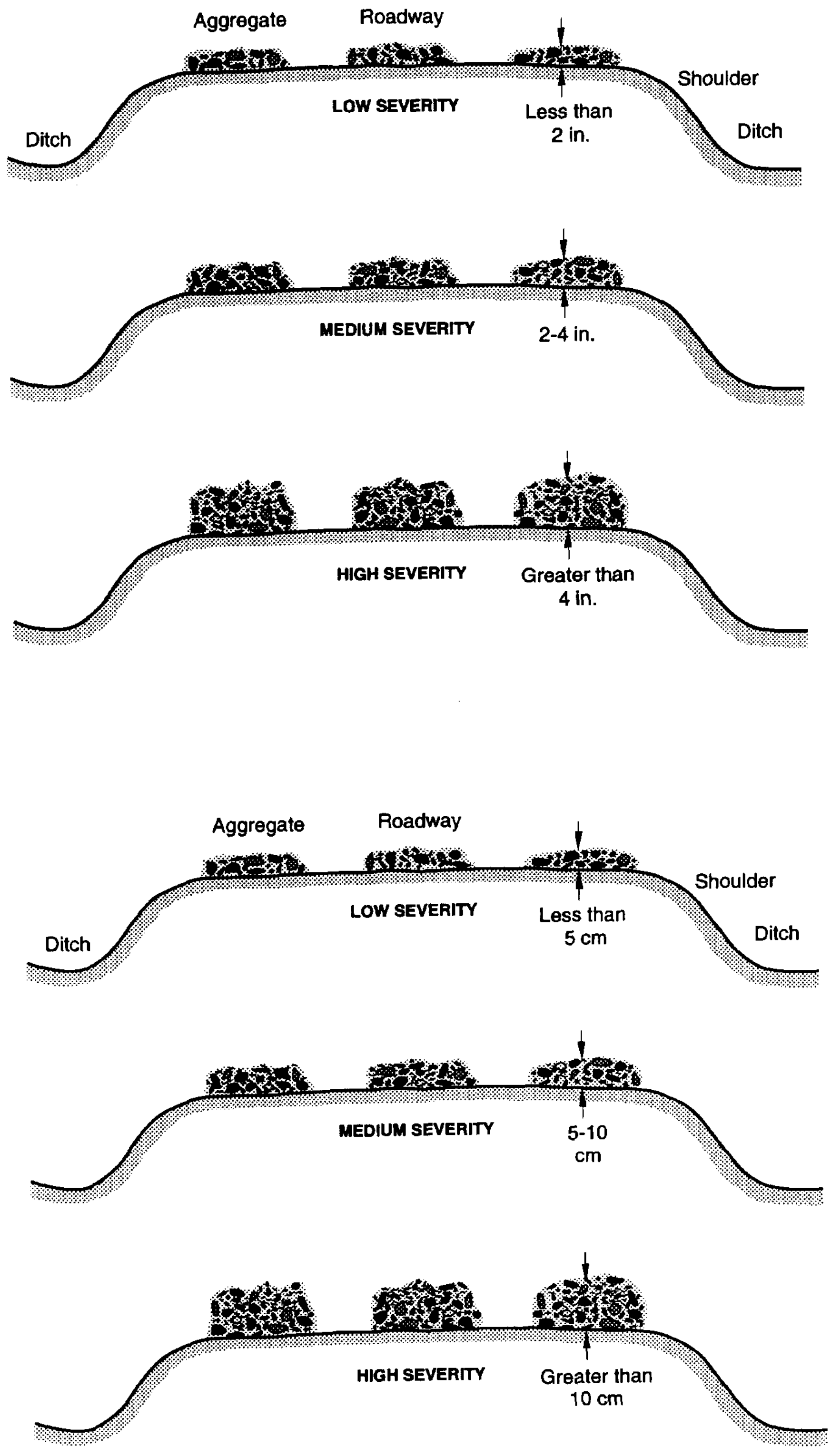


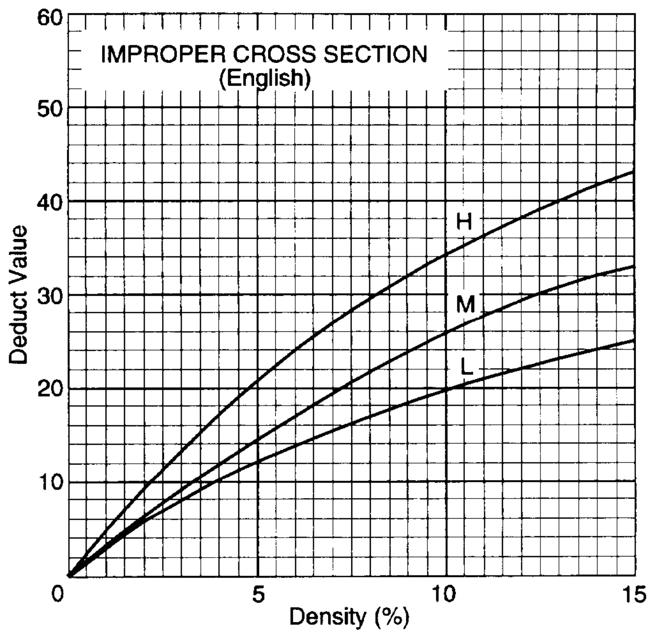
Figure B-13. Loose aggregate severity levels (English and metric units).

Figure B-14. Low severity example of loose aggregate.

APPENDIX C

DEDUCT VALUE CURVES

Deduct value curves for the unsurfaced roads distress are shown in figures C-1 through C-8.



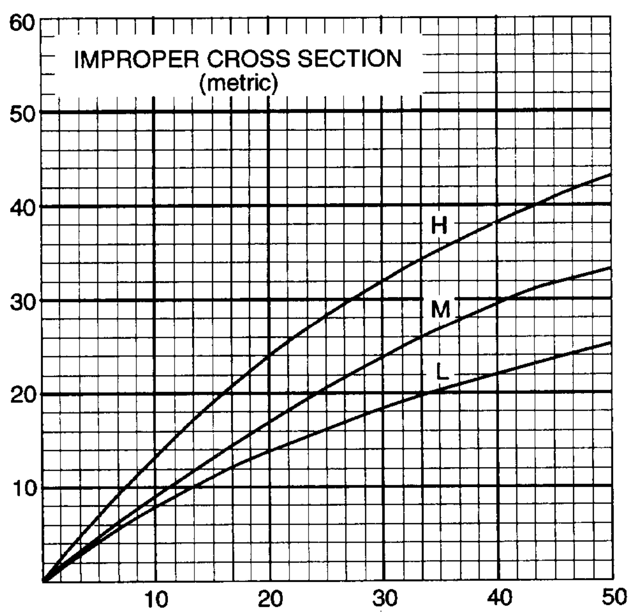
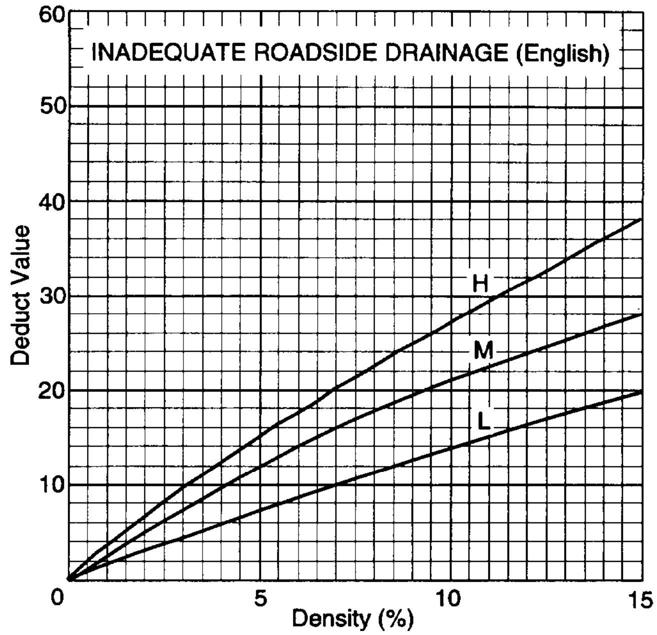


Figure C-1. Distress 81-improper cross section deduct values (English and metric units).



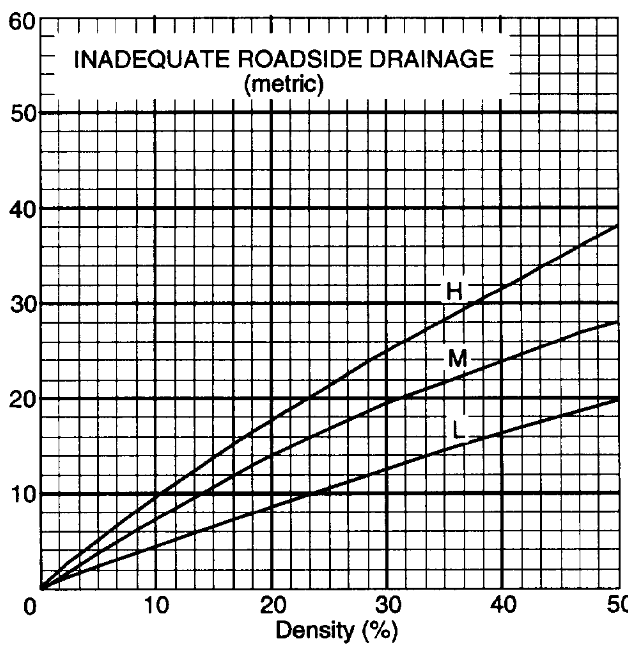


Figure C-2. Distress 82-inadequate roadside drainage deduct values (English and metric units).

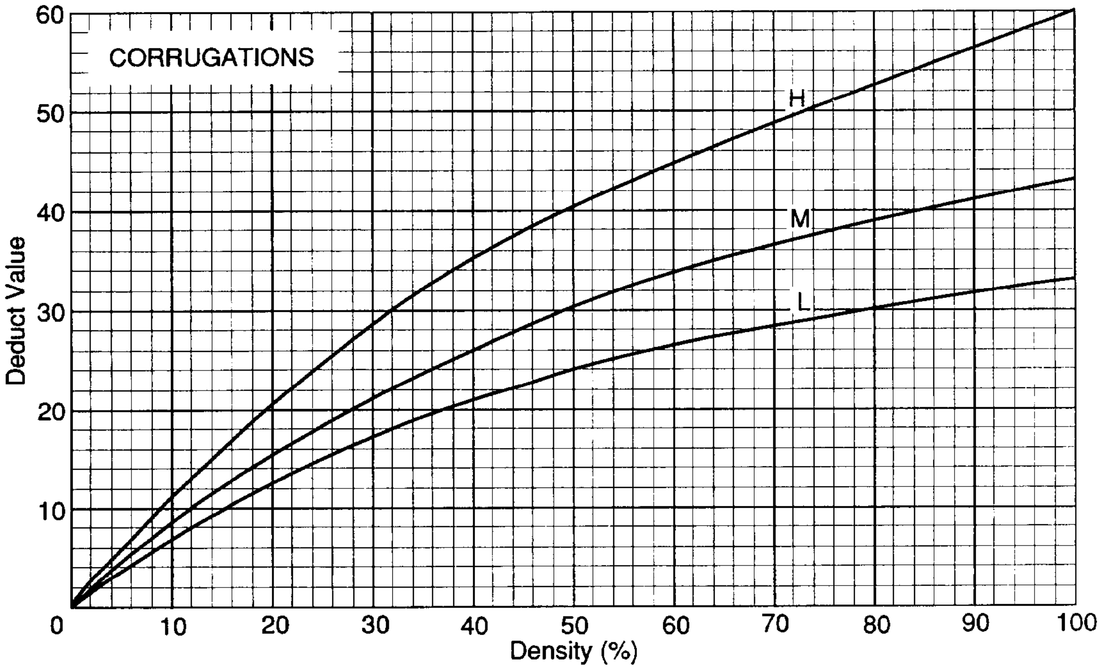


Figure C-3. Distress 83-corrugations deduct values (English or metric units)

DUST

Dust is not rated by density. The deduct values for the levels of severity are:

Low —— 2 Points
Medium —— 4 Points
High —— 15 Points

Figure C-4. Distress 84-dust deduct values (English or metric units).

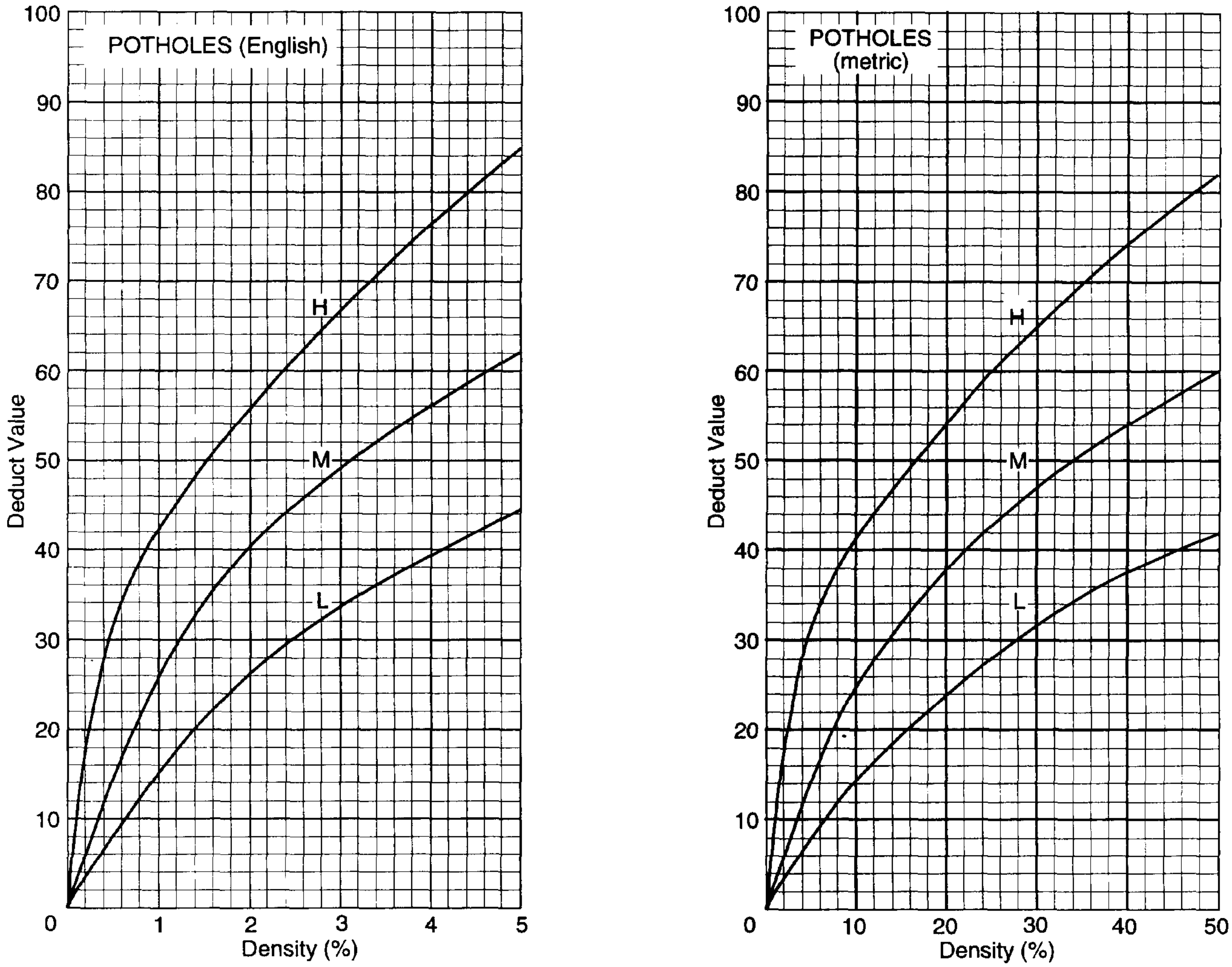


Figure C-5. Distress 85-potholes deduct values (English and metric units).

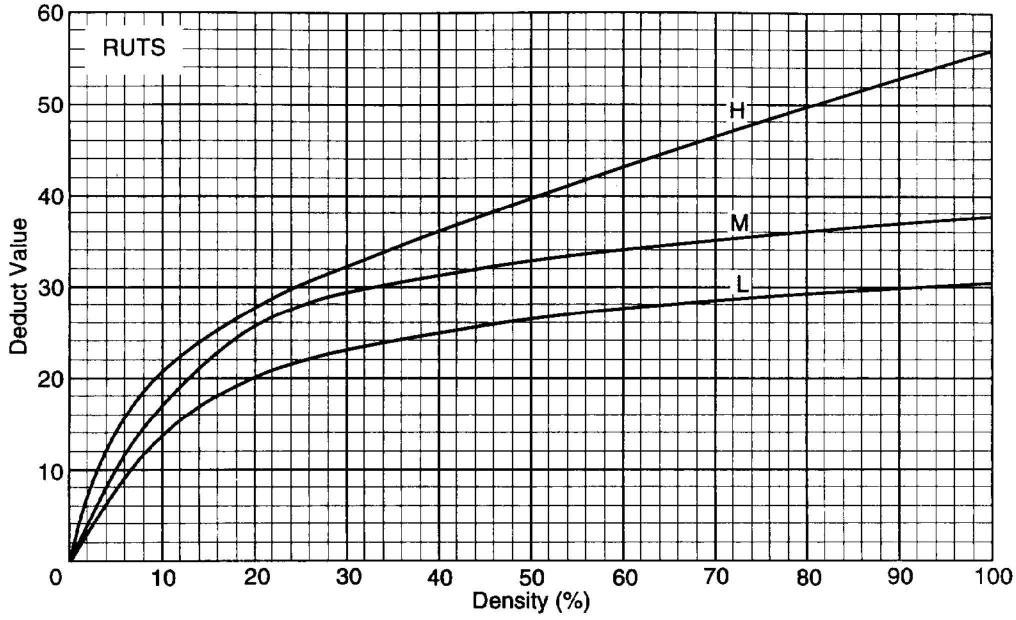
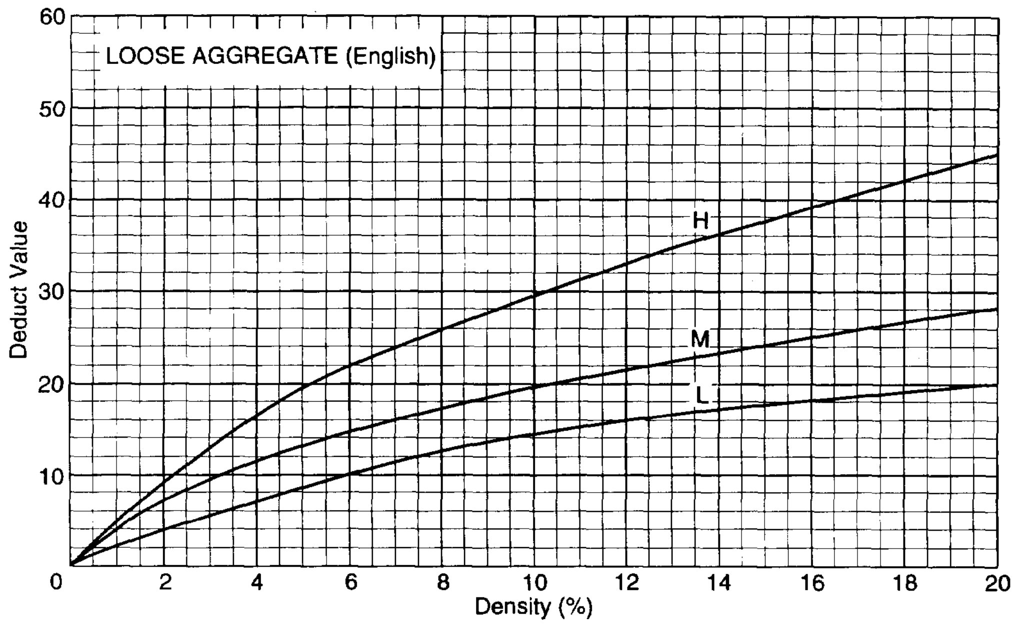


Figure C-6. Distress 86-ruts deduct values (English or metric units).



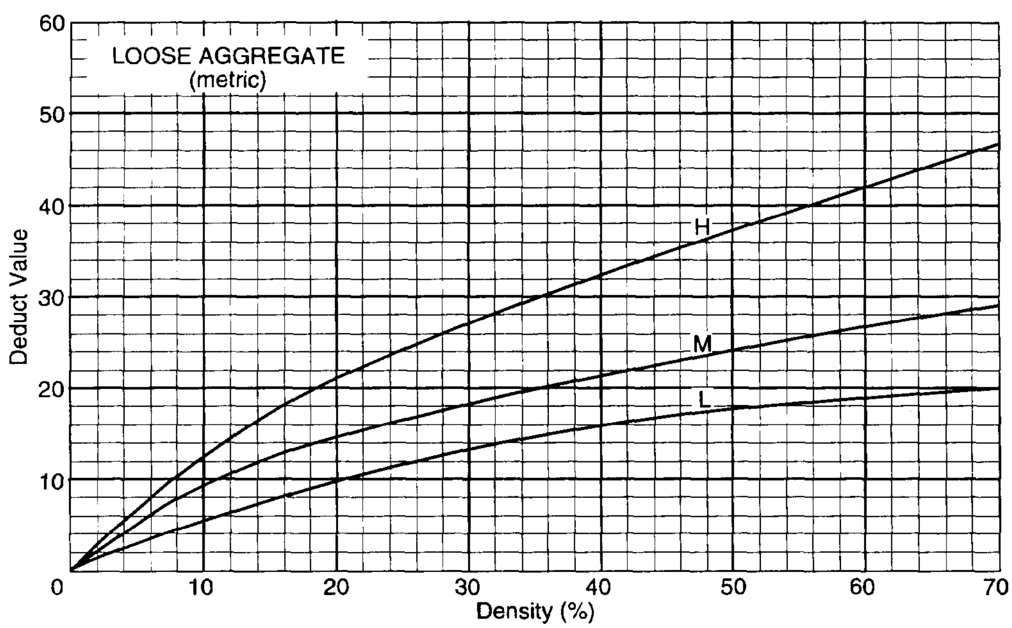


Figure C-7. Distress 87-loose aggregate deduct values (English and metric units)

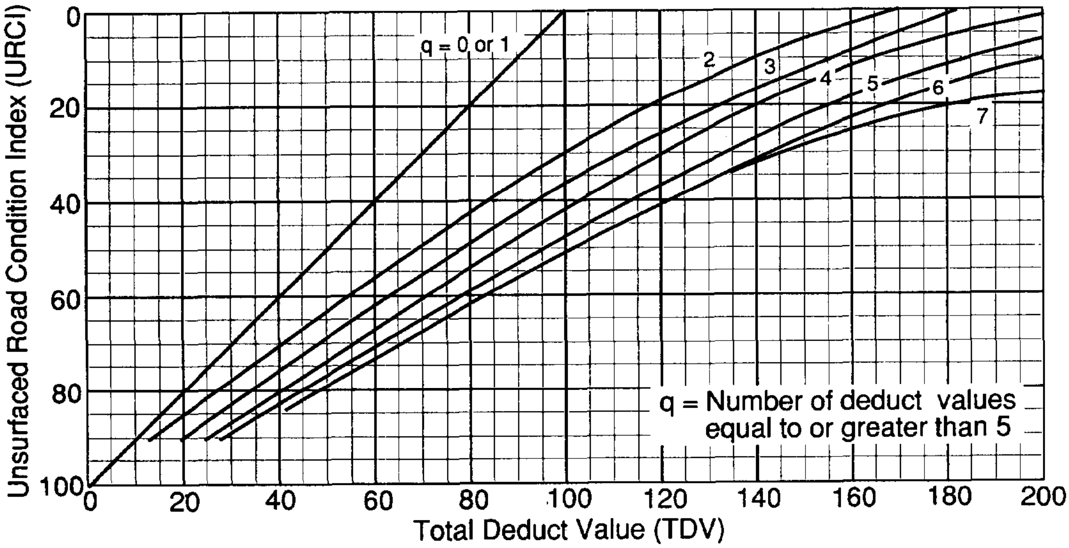


Figure C-8. URCI curves (English or metric units).

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UNSURFACED ROAD INSPECTION SHEET

For use of this form, see TM 5-626; the proponent agency is USACE

1. BRANCH	2. SECTION	3. DATE
4. SAMPLE UNIT	5. AREA OF SAMPLE	6. INSPECTOR

7. SKETCH

DISTRESS TYPES

81. improper Cross Section *(linear feet)*
82. Inadequate Roadside Drainage *(linear feet)*
83. Corrugations *(square feet)*
84. Dust
85. Potholes *(number)*
86. Ruts *(square feet)*
87. Loose Aggregate *(linear feet)*

8. DISTRESS QUANTITY AND SEVERITY

TYPE		81	82	83	84	85	86	87
QUANTITY AND SEVERITY	L							
	M							
	H							

9. URCI CALCULATION

DISTRESS TYPE a	DENSITY *b*	SEVERITY *c*	DEDUCT VALUE *d*

10. REMARKS

e. TOTAL DEDUCT VALUE	f. q =	g. URCI	h. RATING =

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