NATO STANDARDIZATION AGENCY
AGENCE OTAN DE NORMALISATION

MILITARY COMMITTEE AIR STANDARDIZATION BOARD (MCASB)

6 April 2009 NSA(AIR)0416(2009)AMLI/7181

MCASB

STANAG 7181 AMLI (EDITION 1) - STANDARD METHOD FOR AIRFIELD PAVEMENT CONDITION INDEX (PCI) SURVEYS - AEP-56

Reference:
NSA(AIR)0922(2006)AMLI/7181 dated 24 November 2006 (Edition 1)(Ratification Draft 1)

1. The enclosed NATO Standardization Agreement, which has been ratified by nations as reflected in the NATO Standardization Document Database (NSDD), is promulgated herewith.

2. The reference listed above is to be destroyed in accordance with local document destruction procedures.

ACTION BY NATIONAL STAFFS

3. National staffs are requested to examine their ratification status of the STANAG and, if they have not already done so, advise the MCASB NSA, through their national delegation as appropriate of their intention regarding its ratification and implementation.

Cescu Boldun

fa Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

Enclosure:
STANAG 7181 (Edition 1)

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STANAG 7181
(Edition 1)

NORTH ATLANTIC TREATY ORGANIZATION
(NATO)

NATO STANDARDIZATION AGENCY
(NSA)

STANDARDIZATION AGREEMENT
(STANAG)

SUBJECT: STANAG 7181 AMLI (EDITION 1) - STANDARD METHOD FOR AIRFIELD PAVEMENT CONDITION INDEX (PCI) SURVEYS - AEP-56

Promulgated on 6 April 2009

Cesar Beldun

for

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

RECORD OF AMENDMENTS

N°	Reference/date of Amendment	Date entered	Signature

EXPLANATORY NOTES

AGREEMENT

1. This STANAG is promulgated by the Director NATO Standardization Agency under the authority vested in him by the NATO Standardization Organisation Charter.

2. No departure may be made from the agreement without informing the tasking authority in the form of a reservation. Nations may propose changes at any time to the tasking authority where they will be processed in the same manner as the original agreement.

3. Ratifying nations have agreed that national orders, manuals and instructions implementing this STANAG will include a reference to the STANAG number for purposes of identification.

RATIFICATION, IMPLEMENTATION AND RESERVATIONS

4. Ratification, implementation and reservation details are available on request or through the NSA websites (internet http://nsa.nato.int; NATO Secure WAN http://nsa.hq.nato.int).

FEEDBACK

5. Any comments concerning this publication should be directed to NATO/NSA – Bvd Leopold III - 1110 Brussels - Belgium.

NATO STANDARDIZATION AGREEMENT (STANAG)

NATO STANDARD METHOD FOR AIRFIELD PAVEMENT CONDITION INDEX (PCI) SURVEYS - AEP-56

Related Documents: None

AIM

1. The aim of this agreement is to register national acceptance of AEP-56.

AGREEMENT

2. Participating nations agree to use AEP-56 for guidance in determining airfield pavement condition through visual inspection and the PCI method of quantifying pavement condition.

3. Changes to AEP-56 will be incorporated into the publication and will be accepted as part of it provided they have been formally offered by the MC Air Standardization Board (MCASB), NSA, to national authorities concerned and have been agreed by them.

IMPLEMENTATION OF THE AGREEMENT

4. This STANAG and AEP-56 are implemented when the AEP has been received by the authorities and units concerned.

NATO

Standard Method for Airfield Pavement Condition Index (PCI) Surveys

AEP-56

April 2009

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NATO/PfP UNCLASSIFIED

NORTH ATLANTIC TREATY ORGANIZATION

NATO STANDARDIZATION AGENCY (NSA)

NATO LETTER OF PROMULGATION

6 April 2009

1. AEP-56 – NATO STANDARD METHOD FOR AIRFIELD PAVEMENT CONDITION INDEX (PCI) SURVEYS is a NATO/PfP UNCLASSIFIED publication. The agreement of nations to use this publication is recorded in STANAG 7181.

2. AEP-56 is effective upon receipt.

Juan A. MORENO
Vice Admiral, ESP(N)
Director, NATO Standardization Agency

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NATIONAL LETTER OF PROMULGATION

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RECORD OF CHANGES

Change Date	Date Entered	Effective Date	By whom Entered

CHAPTER/Annex	RECORD OF RESERVATION BY NATIONS

RECORD OF RESERVATIONS

NATION	SPECIFIC RESERVATIONS

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CHAPTER 1

GENERAL

0101 Scope

1. This AEP provides for the determination of airfield pavement condition through visual surveys using the Pavement Condition Index (PCI) method of quantifying pavement condition.

2. The values stated in SI units are to be regarded as the standard. The inch-pound units given in parentheses are for information only.

3. This AEP does not address all of the safety problems associated with its use. It is the responsibility of the user of this AEP to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use. Inspectors should coordinate with air traffic control officials prior to performing the inspection.

0102 Terminology

1. Additional Sample. A sample unit inspected in addition to the random sample units to include non-representative sample units in the determination of the pavement condition. This includes very poor or excellent samples that are not typical of the section and sample units which contain an unusual distress such as a utility cut. If a sample unit containing an unusual distress is chosen at random, it should be counted as an additional sample unit and another random sample unit should be chosen. If every sample unit is surveyed, then there are no additional sample units.

2. Asphalt Concrete (AC) Surface - aggregate mixture with an asphalt cement binder. This term also refers to surfaces constructed of coal tars and natural tars for purposes of this test method.

3. Deduct Value (DV) - a number from 0 to 100, with 0 indicating the distress has no impact on pavement condition, and 100 indicating an extremely serious distress which causes the pavement to fail.

4. Pavement Branch - a branch is an identifiable part of the pavement network that is a single entity and has a distinct function. For example, each runway or taxiway is a separate branch.

5. Pavement Condition Index (PCI) - a numerical rating of the pavement condition that ranges from 0 to 100 with 0 being the worst possible condition and 100 being the best possible condition.

6. Pavement Condition Rating (PCR) - a verbal description of pavement condition as a function of the PCI value. Engineering Technical Letter (ETL) 04-9, *Pavement Engineering Assessment (EA) Standards*, establishes a standard color code for the seven condition codes described in ASTM D5340-03 and also for a corresponding simplified PCI Rating system, used when performing EAs, of Good (PCI = 71 to 100), Fair (PCI = 56 to 70), and Poor (PCI = 0 to 55), as depicted in Figure 1-1.

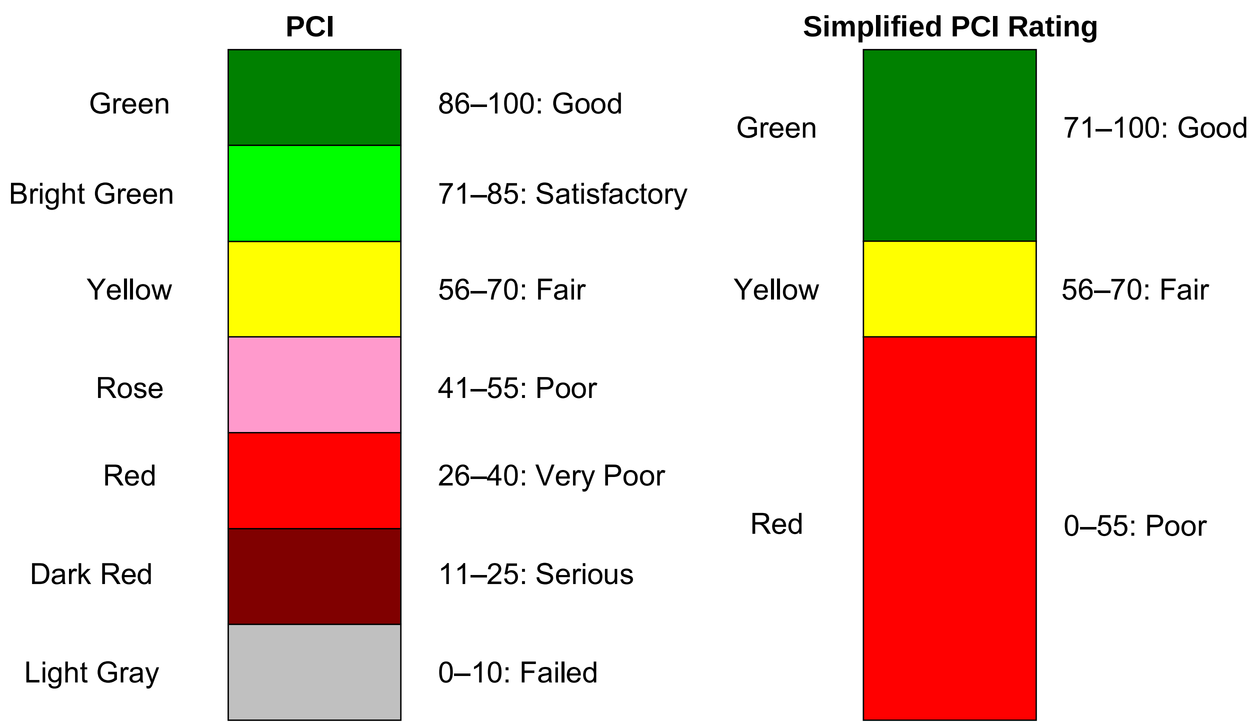

Figure 1-1 - Pavement Condition Index (PCI) and Simplified PCI Rating Scales

7. Pavement Distress - external indicators of pavement deterioration caused by loading, environmental factors, or construction deficiencies; or, combination thereof. Typical distresses are cracks, rutting, and weathering of the pavement surface. Distress types and severity levels detailed in Annex A for AC and Annex B for PCC pavements must be used to obtain an accurate PCI value.

8. **Pavement Sample Unit** - a subdivision of a pavement section that has a standard size range: 20 slabs (±8 slabs if the total number of slabs in the section is not evenly divided by 20, or to accommodate specific field condition) for PCC pavement, and contiguous 465 m^2 ± 185 m^2 (5000 ft^2 ±2000 ft^2) if the pavement is not evenly divided by 5000 (or to accommodate specific field condition) for AC pavement.

9. **Pavement Section** - a pavement area having uniform construction, maintenance, usage history, and condition. A section should have the same traffic volume and load intensity.

10. **Portland Cement Concrete (PCC) Pavement** - aggregate mixture with portland cement binder including non-reinforced and reinforced jointed pavement.

11. **Random Sample** - a sample unit of the pavement section selected for inspection by random sampling techniques such as a random number table or systematic random procedure.

0103 Summary of Practice

The pavement is divided into branches that are divided into sections. Each section is divided into sample units. The type and severity of pavement distress are assessed by visual inspection of the pavement sample units. The quantity of the distress is measured as described in Annexes A and B. The distress data are used to calculate the PCI for each sample unit. The PCI of the pavement section is determined based on the PCI of the inspected sample units within the section.

0104 Significance and Use

The PCI is a numerical indicator that rates the surface condition of the pavement. The PCI provides a measure of the present condition of the pavement based on the distress observed on the surface of the pavement, which also indicates the structural integrity and surface operational condition (localized roughness and safety). The PCI cannot measure structural capacity, nor does it provide direct measurement of skid resistance or roughness. The PCI provides an objective and rational basis for determining maintenance and repair needs and priorities. Continuous monitoring of the PCI is used to establish the rate of pavement deterioration, which permits early identification of major rehabilitation needs. The PCI provides feedback on pavement performance for validation or improvement of current pavement design and maintenance procedures.

0105 Data Sheets

1. Data Sheets are used to record: date, location, branch, section, sample unit size, slab number and size, distress types, severity levels, quantities, and names of surveyors, and are contained in Annex E as follows:

a. Example distress data survey sheets for AC pavements (Figures E-1a and E-1b).

b. Examples for PCC pavements (Figures E-2a and E-2b).

2. The sheets in figures E-1a and E-2a are more suitable when the PCI is manually calculated. The sheets in figures E-1b and E-2b are more suitable when the collected distress data are entered into an automated pavement management system (paragraph 404) and the PCI is automatically calculated. Calculation methods are described in Chapter 4.

0106 Measuring Devices

1. Hand Odometer Wheel, that reads to the nearest 30 mm (0.1 ft).

2. *Straightedge or String Line*, (AC only), 3 m (10 ft).

3. Scale*,* 300 mm (12 in) that reads to 3 mm (1/8 in) or better. Additional 300 mm (12 in) ruler or straight-edge is needed to measure faulting in PCC pavements.

4. *Layout Plan*, for network to be inspected.

CHAPTER 2

SAMPLING AND SAMPLE UNITS

0201 Procedure

1. Identify branches of the pavement with different uses such as runways, taxiways, and aprons on the network layout plan.

2. Divide each branch into sections based on the pavement's design, construction history, traffic, and condition.

3. Divide the pavement sections into sample units. If the pavement slabs in PCC have joint spacing greater than 8 m (25 ft), subdivide each slab into imaginary slabs. The imaginary slabs should all be less than or equal to 8 m (25 ft)in length, and the imaginary joints dividing the slabs are assumed to be in perfect condition. This is needed because the Deduct Values (DVs) were developed for jointed concrete slabs less than or equal to 8 m (25 ft).

4. Individual sample units to be inspected should be marked or identified in a manner to allow inspectors and quality control personnel to locate them easily on the pavement surface. Paint marks (not to violate traffic marking requirements) along the edge and sketches with locations connected to physical pavement features are acceptable. It is necessary to be able to relocate accurately the sample units to allow verification of current distress data, to examine changes in condition with time of a particular sample unit, and to enable future inspections of the same sample unit if desired.

5. Select the sample units to be inspected. The number of sample units to be inspected may vary from: all of the sample units in the section; a number of sample units that provide a 95% confidence level; or, a lesser number.

   a. All sample units in the section may be inspected to determine the average PCI of the section. This is usually precluded for routine management purposes by available manpower, funds, and time. Total sampling, however, is desirable for project analysis to help with the estimated maintenance and repair quantities.

   b. The minimum number of sample units (n) that must be surveyed within a given section to obtain a statistically adequate estimate (95% confidence) of the PCI of the section is calculated using the following formula and rounding n to the next highest whole number:

$$n = Ns^2/((e^2/4)(N - 1) + s^2) \qquad \text{(Equation 1)}$$

where:

e = acceptable error in estimating the section PCI. Commonly, e=±5 PCI points.

s = standard deviation of the PCI from one sample unit to another within the section. When performing the initial inspection, the standard deviation is assumed to be 10 for AC pavements and 15 for PCC pavements. This assumption should be checked as described below after PCI values are determined. For subsequent inspections, the standard deviation from the preceding inspection should be used to determine n.

N = total number of sample units in the section.

If obtaining the 95% confidence level is critical, the adequacy of the number of sample units surveyed must be confirmed. The number of sample units is estimated based on an assumed standard deviation. Calculate the actual standard deviation (s) as follows:

$$s = (\sum^{n}_{i=1}(PCI_i - PCI_s)^2/(n - 1))^{1/2} \qquad \text{(Equation 2)}$$

where:

PCI_i = PCI of surveyed sample units i,

PCI_s = PCI of section (mean PCI of surveyed sample units),

n = number of random sample units surveyed.

Calculate the revised minimum number of sample units (Equation 1) to be surveyed using the calculated standard deviation (Equation 2). If the revised number of sample units to be surveyed is greater than the number of sample units already surveyed, select and survey additional random sample units. These sample units should be evenly spaced across the section. Repeat the process of checking the revised number of sample units and surveying additional random sample units until the number of random sample units surveyed equals or exceeds the minimum required sample units (n) in Equation 1, using the actual total sample standard deviation.

c. The procedure presented in paragraph 201e(2) above provides the minimum number of sample units (n) to be inspected – to insure 95% confidence of the section PCI. However, a more customary method is to determine the number of sample units to survey, as a percentage of the total sample units in each section, as follows:

50% for runway keel

25% for runway outside areas

33% for taxiways

25% for aprons

d. Once the number of sample units to be inspected has been determined, compute the spacing interval of the units using systematic random sampling. Samples are equally spaced throughout the section with the first sample selected at random. The spacing interval (i) of the units to be sampled is calculated by the following formula rounded to the next lowest whole number:

$$i = N/n \qquad \text{(Equation 3)}$$

where:

N = total number of sample units in the section, and

n = number of sample units to be inspected.

The first sample unit to be inspected is selected at random from sample units 1 through i. The sample units within a section, that are successive increments of the interval i after the first randomly selected unit, are also inspected.

A lesser sampling rate than the above mentioned 95% confidence level can be used based on the condition survey objective. As an example, one agency uses the following table for selecting the number of sample units to be inspected for other than project analysis:

Given	Survey
1 to 5 sample units	1 sample unit
6 to 10 sample units	2 sample units
11 to 15 sample units	3 sample units
16 to 40 sample units	4 sample units
over 40 sample units	10%

0202 Additional Samples

Additional sample units are only to be inspected when non-representative distresses are observed as defined in paragraph 102a. These sample units are selected by the user.

CHAPTER 3

INSPECTION PROCEDURE

0301 Definitions and Guidelines

The definitions and guidelines for quantifying distresses for PCI determination are given in Annex A for AC pavements and Annex B for PCC pavements. Using this test method, inspectors should identify distress types accurately 95% of the time. Linear measurements should be considered accurate when they are within 10% if re-measured, and area measurements should be considered accurate when they are within 20% if re-measured. Distress severities that one determines based on ride quality are considered subjective.

0302 Asphalt Concrete (AC) Surfaced Pavement

Individually inspect each sample unit chosen. Sketch the sample unit, including orientation. Record the branch and section number, and number and type of the sample unit (random or additional). Record the sample unit size measured with the hand odometer. Conduct the distress inspection by walking over the sample unit being surveyed, measuring the quantity of each severity level of every distress type present, and recording the data. Each distress must correspond in type and severity to that described in Annex A. The method of measurement is included with each distress description. Repeat this procedure for each sample unit to be inspected. A blank "Flexible Pavement Condition Survey Data Sheet for Sample Unit" is included in Annex E.

0303 PCC Pavements

Individually inspect each sample unit chosen. Sketch the sample unit showing the location of the slabs. Record the sample unit size, branch and section number, and number and type of the sample unit (random or additional), the number of slabs in the sample unit and the slab size measured with the hand odometer. Perform the inspection by walking over the sidewalk/shoulder of the sample unit being surveyed and recording all distress existing in the slab along with their severity level. Each distress type and severity must correspond with that described in Annex B. Summarize the distress types, their severity levels, and the number of slabs in the sample unit containing each type and severity level. Repeat this procedure for each sample unit to be inspected. A blank "Jointed Rigid Pavement Condition Survey Data Sheet for Sample Unit" is included in Annex E.

CHAPTER 4

CALCULATIONS AND REPORTING

0401 Calculation of PCI for Asphalt Concrete (AC) Pavement

1. Add up the total quantity of each distress type at each severity level, and record them in the "Total Severities" section. For example, Figure 2-1 shows three entries for the Distress Type 8L, "Longitudinal and Transverse Cracking": 10, 20, and 15. The distress at each severity level is summed and entered in the "Total Severity" section as 13.7 m (45 ft). The units for the quantities may be either in meters (linear feet), square meters (square feet), or number of occurrences, depending on the distress type.

2. Divide the total quantity of each distress type at each severity level from 9.1 by the total area of the sample unit and multiply by 100 to obtain the percent density of each distress type and severity.

3. Determine the DV for each distress type and severity level combination from the distress DV curves in Annex C.

4. Determine the maximum Corrected Deduct Value (CDV): The procedure for determining maximum CDV from individual DVs is identical for both AC and PCC pavement types.

5. The following procedure must be used to determine the maximum CDV:

   a. If none or only one individual DV is greater than 5, the total value is used in place of the maximum CDV in determining the PCI; otherwise, maximum CDV must be determined using the procedure described in paragraphs 401e(2) through 401e(5).

   b. List the individual DVs in descending order. For example, in Figure 4-1 this will be: 27.0, 21.0, 20.0, 9.0, 4.9, 4.8, 4.0, and 2.0.

   c. Determine the allowable number of deducts, m, from Figure 4-2, or using the following formula:

$$m = 1 + (9/95)(100-HDV) \leq 10 \qquad \text{(Equation 4)}$$

where:

m = allowable number of deducts including fractions (must be less than or equal to ten),

HDV = highest individual DV.

(For the example, in Figure 4-1, m = 1 + (9/95)(100-27) = 7.9)

AIRFIELD ASPHALT PAVEMENT
CONDITION SURVEY DATA SHEET
FOR SAMPLE UNIT

BRANCH ______________ SECTION _____________ SAMPLE UNIT ________
SURVEYED BY ___________ DATE _____________ SAMPLE AREA _______

SKETCH:

41. Alligator Cracking 42. Bleeding 43. Block Cracking 44. Corrugation	45. Depression 46. Jet Blast 47. Jt. Reflection (PCC) 48. Long. & Trans. Cracking	49. Oil Spillage 50. Patching 51. Polished Aggregate 52. Raveling/Weathering	53. Rutting 54. Shoving from PCC 55. Slippage Cracking 56. Swell

DISTRESS SEVERITY	QUANTITY										TOTAL	DENSITY %	DEDUCT VALUE
48L	10	20	15								45	0.90	4.9
48M	9										9	0.19	4.9
41L	50										50	1.00	21.0
53L	200	175									375	7.50	27.0
53M	25										25	0.50	20.0
45L	15										15	0.30	2.0
45M	20										20	0.40	9.0
50L	50										50	1.00	4.0

Figure 4-1 – Example of a Flexible Pavement Condition Survey Data Sheet

Adjustment of Number of Deduct Values

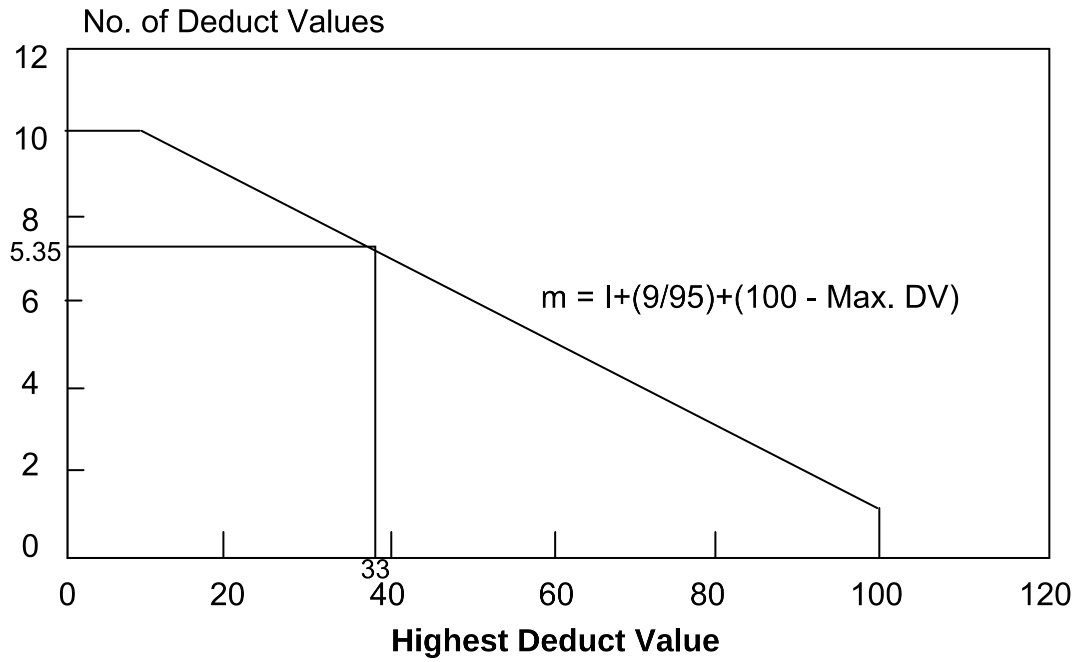

Figure 4-2 – Adjustment of Number of Deduct Values

d. The number of individual DVs is reduced to the m largest DVs, including the fractional part. For the example in Figure 2-3, the values are 27.0, 21.0, 20.0, 9.0, 4.9, 4.8, 4.0, and 1.8 (the 1.8 was obtained by multiplying 2.0 by 0.9, and the 4.8 was obtained by multiplying 5.3 by (7.9 - 7 = 0.9)). If less than m DVs are available, all of the DVs are used.

e. Determine maximum CDV (iteratively) as shown in Figure 4-3:

(1) Determine total DV by summing individual DVs. The total DV is obtained by adding the individual DVs in paragraph 401e(4) that is 92.5.

(2) Determine q: q is the number of deducts with a value greater than 5.0. For example in Figure 4-3, q=4.

(3) Determine the CDV from total DV and q by looking up the appropriate correction curve for AC pavements in Annex C.

(4) Reduce the smallest individual DV greater than 5.0 to 5.0 and repeat paragraphs 401e(5)i through 4013(5)(iii) until q =1.

(5) Maximum CDV is the largest of the CDVs.

6. Calculate PCI by subtracting the maximum CDV from 100: PCI =100-max CDV.

7. Figure 4-3 shows a summary of PCI calculation for the example AC pavement data in Figure 4-1. A blank PCI calculation form is included in Annex E.

#	Deduct Values										Total	q	CDV
1	27.0	21.0	20.0	9.0	4.9	4.8	4.0	1.8			92.5	4	50.0
2	27.0	21.0	20.0	5.0	4.9	4.8	4.0	1.8			88.5	3	56.0
3	27.0	21.0	5.0	5.0	4.9	4.8	4.0	1.8			73.5	2	51.0
4	27.0	5.0	5.0	5.0	4.9	4.8	4.0	1.8			57.5	1	57.5
5													
6													
7													
8													
9													
10													

MAX CDV = 57.5
PCI = 100 – MAX CDV = 42.5

Figure 4-3 – Calculation of Corrected PCI Value – Flexible Pavement

0402 Calculation of PCI for Portland Cement Concrete (PCC) Pavement

1. For each unique combination of distress type and severity level, add up the total number of slabs in which they occur. For the example, in Figure 4-4 there are two slabs containing low-severity corner break (Distress 62L).

2. Divide the number of slabs from 10.1 by the total number of slabs in the sample unit and multiply by 100 to obtain the percent density of each distress type and severity combination.

3. Determine the DVs for each distress type severity level combination using the corresponding deduct curve in Annex D.

4. Determine PCI by following the procedures in paragraphs 401e and 401f, using the correction curve for PCC pavements (see Annex D) in place of the correction curve for AC pavements.

5. Figure 4-5 shows a summary of PCI calculation for the example PCC pavement distress data in Figure 4-4.

AIRFIELD ASPHALT PAVEMENT
CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT

BRANCH ________________ SECTION _______________ SAMPLE UNIT __________
SURVEYED BY ____LNE______ DATE ___18 JAN 92___ SAMPLE AREA 12.5' x 25'

Distress Types

61. Blow-up
62. Corner Break
63. Long./Trans. Diagonal Crack
64. Durability Crack
65. Joint Seal Coverage
66. Patching < 5 sq ft
67. Patching/Utility Cut
68. Popouts
69. Pumping
70. Scaling/Map Crack Crazing
71. Settlement/Fault
72. Shattered Slab
73. Shrinkage Crack
74. Spalling - Joints
75. Spalling - Corner

DIST TYPE	SEV	No. GLASS	DENSITY %	DEDUCT VALUE
65	h	20	10	12.0
62	l	2	10	8.0
62	m	1	5	9.0
63	l	3	15	11.0
63	m	5	25	27.0
75	l	3	15	6.0
74	l	2	10	3.0
72	l	1	5	10.0

SKETCH:

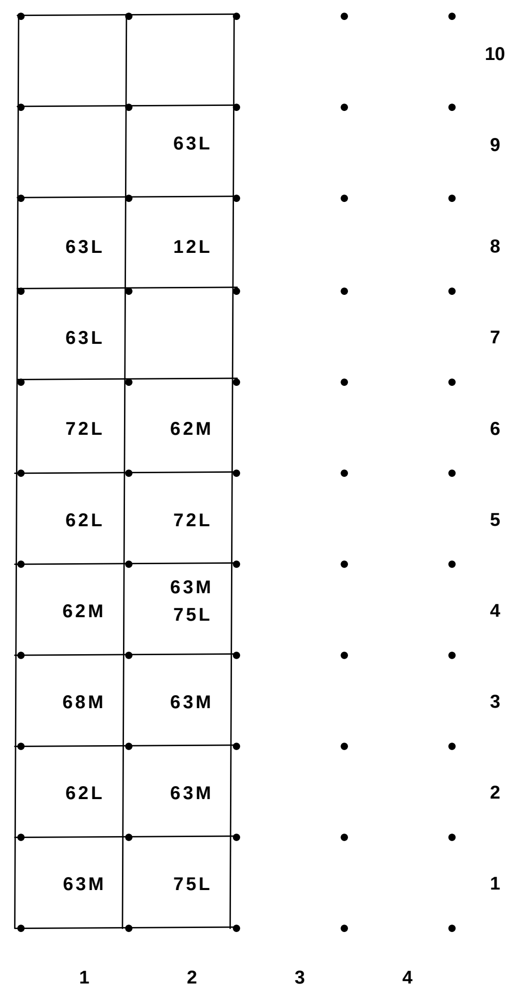

Figure 4-4 – Example of a Jointed Rigid Pavement Condition Survey Sheet

#	Deduct Values										Total	q	CDV
1	32.0	12.0	11.0	10.0	9.0	8.0	6.0	1.3			89.3	7	56.0
2	32.0	12.0	11.0	10.0	9.0	8.0	5.0	1.3			88.3	6	58.0
3	32.0	12.0	11.0	10.0	9.0	5.0	5.0	1.3			85.3	5	58.0
4	32.0	12.0	11.0	10.0	5.0	5.0	5.0	1.3			81.3	4	58.0
5	32.0	12.0	11.0	5.0	5.0	5.0	5.0	1.3			76.3	3	57.0
6	32.0	12.0	5.0	5.0	5.0	5.0	5.0	1.3			70.3	2	61.0
7	32.0	5.0	5.0	5.0	5.0	5.0	5.0	1.3			63.3	1	63.3
8													
9													
10													

Figure 4-5 – Calculation of Corrected PCI Value - Jointed Rigid Pavement

0403. Determination of Section PCI

1. If all surveyed sample units are selected randomly or if every sample unit is surveyed, then the PCI of the section is the average of the PCIs of the sample units.

$$\overline{PCI_r} = \frac{\sum_{i-1}^{n}(PCI_{ri} * A_{ri})}{\sum_{i-1}^{n} A_{ri}}$$

where:

$\overline{PCI_r}$ = area weighted PCI of randomly surveyed sample units
PCI_{ri} = PCI of random sample unit i
A_{ri} = area of random sample unit i
n = number of random sample units surveyed

2. If additional sample units, as defined in paragraph 102a, are surveyed, then a weighted average is used as follows:

Step 1: Calculate area weighted PCI of additional sample units:

$$\overline{PCI_a} = \frac{\sum_{i-1}^{m}(PCI_{ai} * A_{ai})}{\sum_{i-1}^{m} A_{ai}}$$

where:

$\overline{PCI_a}$ = area weighted PCI of randomly surveyed sample units

PCI_{ai} = PCI of random sample unit i

A_{ai} = area of random sample unit i

m = number of random sample units surveyed

Step 2: Calculate the section PCI:

$$PCI_s = \frac{\overline{PCI_r}(A - \sum_{i=1}^{m} A_{ai}) + \overline{PCI_a}(\sum_{i=1}^{m} A_{ai})}{A}$$

where:

A = area of section

m = number of additional sample units surveyed

PCI_S = area weighted PCI of the pavement section

3. Determine the overall condition rating of the section by using the section PCI and the condition rating scale in Figure 1-1.

0404 Automated Calculation Method

1. The Pavement Maintenance Management System (PAVER) is an automated pavement management system that provides a decision making tool for the development of cost effective maintenance and repair alternatives for roads and streets, parking lots, and airfields and provides capabilities.

2. PAVER is available at the following website: http://www.cecer.army.mil/paver

0405. Reporting

Develop a summary report for each section. The summary lists section location, size, total number of sample units, the sample units inspected, the PCIs obtained, the average PCI for the section, and the section condition rating.

Annex A

Pavement Condition Index (PCI)

AC Airfields

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A101 ALLIGATOR OR FATIGUE CRACKING

1. Description

Alligator or fatigue cracking is a series of interconnecting cracks caused by fatigue failure of the asphalt surface under repeated traffic loading. The cracking initiates at the bottom of the asphalt surface (or stabilized base) where tensile stress and strain is highest under a wheel load. The cracks propagate to the surface initially as a series of parallel cracks. After repeated traffic loading, the cracks connect and form many- sided, sharp- angled pieces that develop a pattern resembling chicken wire or the skin of an alligator. The pieces are less than 0.6 m (2 ft) on the longest side. Alligator cracking occurs only in areas that are subjected to repeated traffic loadings, such as wheel paths. Therefore, it would not occur over an entire area unless the entire area was subjected to traffic loading. (Pattern-type cracking, which occurs over an entire area that is not subject to loading, is rated as block cracking, which is not a load- associated distress.) Alligator cracking is considered a major structural distress.

2. Severity Levels

L Fine, longitudinal hairline cracks running parallel to each other with no or only a few interconnecting cracks. The cracks are not spalled (Figure A-1a).

M Further development of light alligator cracking into a pattern or network of cracks that may be lightly spalled (Figure A-1b).

H Network or pattern cracking progressed so that pieces are well-defined and spalled at the edges; some of the pieces rock under traffic (Figure A-1c).

3. How to Measure

Alligator cracking is measured in square meters (square feet) of surface area. The major difficulty in measuring this type of distress is that many times two or three levels of severity exist within one distressed area. If these portions can be easily distinguished from each other, they should be measured and recorded separately. However, if the different levels of severity cannot be easily divided, the entire area should be rated at the highest severity level present. If alligator cracking and rutting occur in the same area, each is recorded separately at its respective severity level.

Figure A-1a. Low-Severity Alligator Cracking

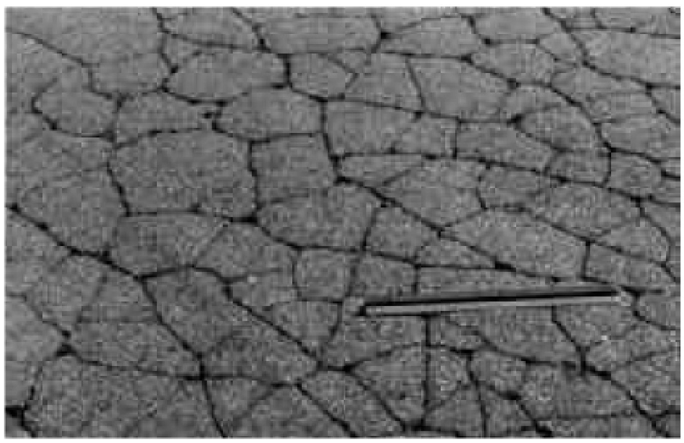

Figure A-1b. Medium-Severity Alligator Cracking

Figure A-1c. High-Severity Alligator Cracking

A102 BLEEDING

1. Description

Bleeding is a film of bituminous material on the pavement surface which creates a shiny, glass-like, reflecting surface that usually becomes quite sticky. Bleeding is caused by excessive amounts of asphalt cement or tars in the mix and/ or low air-void content. It occurs when asphalt fills the voids of the mix during hot weather and then expands onto the surface of the pavement. Since the bleeding process is not reversible during cold weather, asphalt or tar will accumulate on the surface.

2. Severity Levels

No degrees of severity are defined. Bleeding should be noted when it is extensive enough to cause a reduction in skid resistance (Figure A-2).

3. How to Measure

Bleeding is measured in square meters (square feet) of surface area. If bleeding is counted, polished aggregate is not counted in the same area.

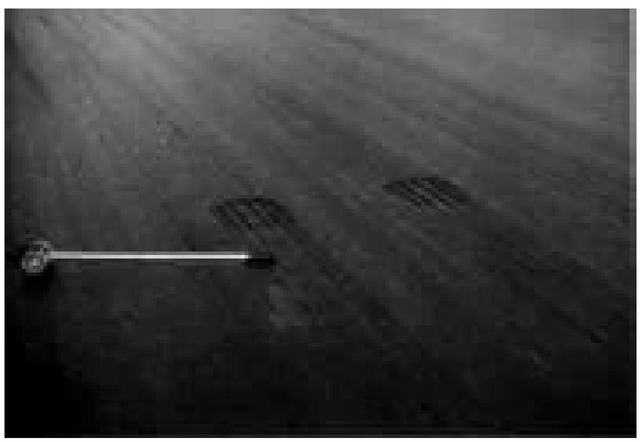

Figure A-2. Bleeding

A103 BLOCK CRACKING

1. Description

Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 0.3 by 0.3 m to 3 by 3 m (1 by 1 ft to 10 by 10 ft). Block cracking is caused mainly by shrinkage of the asphalt concrete (AC) and daily temperature cycling (which results in daily stress/ strain cycling). It is not load-associated. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large proportion of pavement area but sometimes will occur in non-traffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, many-sided pieces with sharp angles. Also, unlike block cracks, alligator cracks are caused by repeated traffic loadings and, therefore, are located only in traffic areas (i. e., wheel paths).

2. Severity Levels

L Blocks are defined by cracks that are non-spalled (sides of the crack are vertical) or only lightly spalled, causing no foreign object damage (FOD) potential. Non-filled cracks have 6 mm (1/ 4 in.) or less mean width, and filled cracks have filler in satisfactory condition (Figure A-3a).

M Blocks are defined by either: (1) filled or non-filled cracks that are moderately spalled (some FOD potential); (2) non-filled cracks that are not spalled or have only minor spalling (some FOD potential), but have a mean width greater than approximately 6 mm (1/ 4 in.); or (3) filled cracks that are not spalled or have only minor spalling (some FOD potential), but have filler in unsatisfactory condition (Figure A-3b).

H Blocks are well-defined by cracks that are severely spalled, causing a definite FOD potential (Figure A-3c).

3. How to Measure

Block cracking is measured in square feet (square meters) of surface area. It usually occurs at one severity level in a given pavement section; however, any areas of the pavement section having distinctly different levels of severity should be measured and recorded separately. For asphalt pavements, not including AC over PCC, if block cracking is recorded, no longitudinal and transverse cracking should be recorded in the same area. For asphalt overlay over concrete, block cracking, joint reflection cracking, and longitudinal and transverse cracking reflected from old concrete should all be recorded separately.

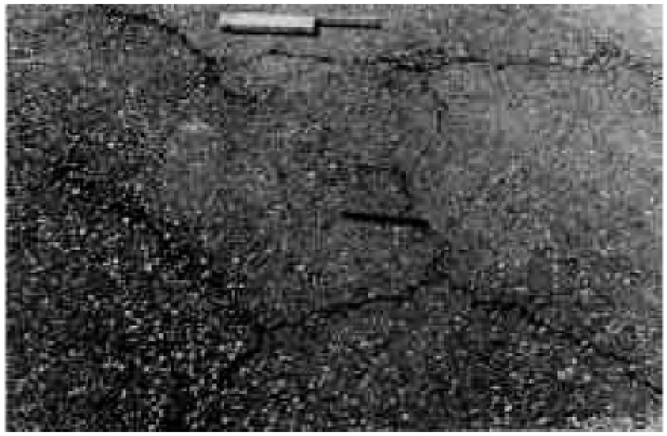

Figure A-3a. Low-Severity Block Cracking

Figure A-3b. Medium-Severity Block Cracking

Figure A-3c. High-Severity Block Cracking

A104 CORRUGATION

1. Description

Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 1.5 m (5 ft) along the pavement. The ridges are perpendicular to the traffic direction. Traffic action combined with an unstable pavement surface or base usually causes this type of distress. An example is shown in Figure A-4.

2. Severity Levels

L Corrugations are minor and do not significantly affect ride quality (see measurement criteria below).

M Corrugations are noticeable and significantly affect ride quality (see measurement criteria below).

H Corrugations are easily noticed and severely affect ride quality (see measurement criteria below).

3. How to Measure

Corrugation is measured in square meter (square feet) of surface area. The mean elevation difference between the ridges and valleys of the corrugations indicates the level of severity. To determine the mean elevation difference, a 3-meter (10-foot) straightedge should be placed perpendicular to the corrugations so that the depth of the valleys can be measured in millimeters (inches). The mean depth is calculated from five such measurements.

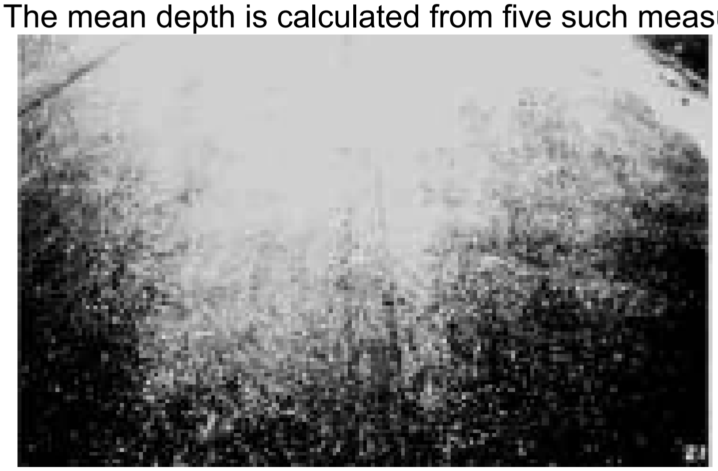

Figure A-4. Corrugation

A105 DEPRESSION

1. Description

Depressions are localized pavement surface areas having elevations slightly lower than those of the surrounding pavement. In many instances, light depressions are not noticeable until after a rain, when ponding water creates “birdbath” areas; but the depressions can also be located without rain because of stains created by ponding water. Depressions can be caused by settlement of the foundation soil or can be “built up” during construction. Depressions cause roughness and, when filled with water of sufficient depth, can cause hydroplaning of aircraft.

2. Severity Levels

L Depression can be observed or located by stained areas, only slightly affects pavement riding quality, and may cause hydroplaning potential on runways (see measurement criteria below) (Figure A-5a).

M The depression can be observed, moderately affects pavement riding quality, and causes hydroplaning potential on runways (see measurement criteria below) (Figure A-5b).

H The depression can be readily observed, severely affects pavement riding quality, and causes definite hydroplaning potential (see measurement criteria below) (Figure A-5c).

3. How to Measure

Depressions are measured in square feet (square meters) of surface area. The maximum depth of the depression determines the level of severity. This depth can be measured by placing a 3-meter (10-foot) straightedge across the depressed area and measuring the maximum depth in millimeters (inches). Depressions larger than 3 meters (10 feet) across must be measured by either visual estimation or direct measurement when filled with water.

Figure A-5a. Low-Severity Depression

Figure A-5b. Medium-Severity Depression

Figure A-5c. High Severity Depression

A106 JET BLAST EROSION

1. Description

Jet blast erosion causes darkened areas on the pavement surface when bituminous binder has been burned or carbonized; localized burned areas may vary in depth up to approximately 13 mm (1/ 2 in.).

2. Severity Levels

No degrees of severity are defined. It is sufficient to indicate that jet blast erosion exists (Figures A-6a and A-6b).

3. How to Measure

Jet blast erosion is measured in square meters (square feet) of surface area.

Figure A-6a. Jet Blast Erosion

Figure A-6b. Jet Blast Erosion

A107 JOINT- REFLECTION CRACKING FROM PCC (LONGITUDINAL AND TRANSVERSE)

1. Description

This distress occurs only on pavements having an asphalt or tar surface over a PCC slab. This category does not include reflection cracking from any other type of base (i. e., cement stabilized, lime stabilized); such cracks are listed as longitudinal and transverse cracks. Joint-reflection cracking is caused mainly by movement of the PCC slab beneath the AC surface because of thermal and moisture changes; it is not load related. However, traffic loading may cause a breakdown of the AC near the crack, resulting in spalling and FOD potential. If the pavement is fragmented along a crack, the crack is said to be spalled. A knowledge of slab dimensions beneath the AC surface will help to identify these cracks.

2. Severity Levels

L Cracks have only light spalling (little or no FOD potential) or no spalling and can be filled or non-filled. If non-filled, the cracks have a mean width of 6mm (1/ 4 in) or less. Filled cracks are of any width, but their filler material is in satisfactory condition (Figure A-7a).

M One of the following conditions exists: (1) cracks are moderately spalled (some FOD potential) and can be either filled or non-filled of any width; (2) filled cracks are not spalled or are only lightly spalled, but the filler is in unsatisfactory condition; (3) non-filled cracks are not spalled or are only lightly spalled, but the mean crack width is greater than 6 mm (1/ 4 in); or (4) light random cracking exists near the crack or at the corner of intersecting cracks (Figure A-7b).

H Cracks are severely spalled (definite FOD potential) and can be either filled or non-filled of any width (Figure A-7c).

3. How to Measure

Joint-reflection cracking is measured in linear meters (linear feet). The length and severity level of each crack should be identified and recorded. If the crack does not have the same severity level along its entire length, each portion should be recorded separately. For example, a crack that is 15 m (50 ft) long may have 3 m (10 ft) of high severity, 6 m (20 ft) of medium severity, and 6 m (20 ft) of light severity; these would all be recorded separately.

Figure A-7a. Low-Severity Joint Reflection Cracking

Figure A-7b. Medium-Severity Joint Reflection Cracking

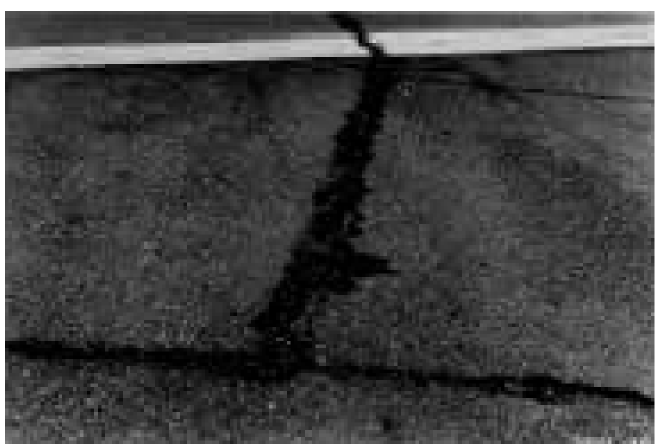

Figure A-7c. High-Severity Joint Reflection Cracking

A108 LONGITUDINAL AND TRANSVERSE CRACKING (NON-PCC JOINT REFLECTIVE)

1. Description

Longitudinal cracks are parallel to the pavement's centerline or laydown direction. They may be caused by (1) a poorly constructed paving lane joint, (2) shrinkage of the AC surface due to low temperatures or hardening of the asphalt, or (3) a reflective crack caused by cracks beneath the surface course, including cracks in PCC slabs (but not at PCC joints). Transverse cracks extend across the pavement at approximately right angles to the pavement centerline or direction of laydown. They may be caused by items 2 or 3 above. These types of cracks are not usually load-associated. If the pavement is fragmented along a crack, the crack is said to be spalled.

2. Severity Levels

L Cracks have either minor spalling (little or no FOD potential) or no spalling. The cracks can be filled or non-filled. Non-filled cracks have a mean width of 6 mm (1/4 in) or less; filled cracks are of any width, but their filler material is in satisfactory condition (Figure A-8a).

M One of the following conditions exists: (1) cracks are moderately spalled (some FOD potential) and can be either filled or non-filled of any width; (2) filled cracks are not spalled or are only lightly spalled, but the filler is in unsatisfactory condition; (3) non-filled cracks are not spalled or are only lightly spalled, but mean crack width is greater than (6 mm (1/4 in); or (4) lightly random cracking exists near the crack or at the corners of intersecting cracks (Figure A-8b).

H Cracks are severely spalled, causing definite FOD potential. They can be either filled or non-filled of any width (Figure A-8c).

3. Porous Friction Course Severity Levels

Note: these severity levels are in addition to the existing definitions.

L Average raveled area around the crack is less than 6 mm (1/ 4 in) wide

M Average raveled area around the crack is 6 to 25 mm (1/ 4 to 1 in) wide.

H Average raveled area around the crack is greater than 25 mm (1 in) wide.

4. How to Measure

Longitudinal and transverse cracks are measured in linear meters (linear feet). The length and severity of each crack should be identified and recorded. If the crack does not have the same severity level along its entire length, each portion of the crack having a different severity level should be recorded separately. For an example, see Joint-Reflection Cracking.

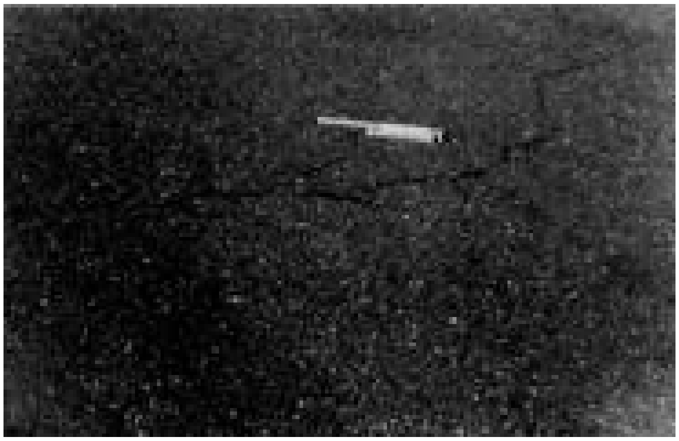

Figure A-8a. Low-Severity Longitudinal and Transverse Cracking

Figure A-8b. Medium-Severity Longitudinal and Transverse Cracking

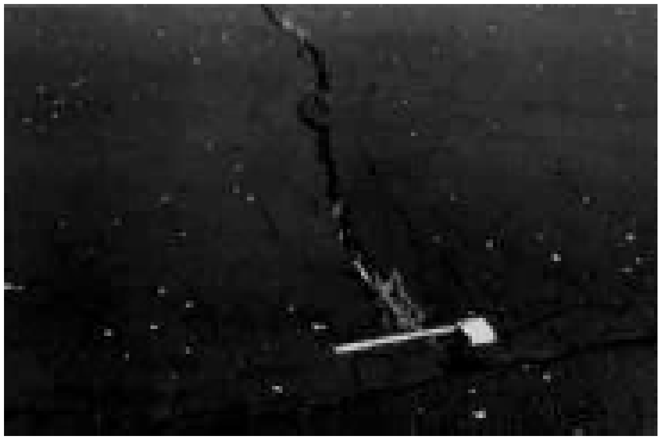

Figure A-8c. High-Severity Longitudinal and Transverse Cracking

A109 OIL SPILLAGE

1. Description

Oil spillage is the deterioration or softening of the pavement surface caused by the spilling of oil, fuel, or other solvents.

2. Severity Levels

No degrees of severity are defined. It is sufficient to indicate that oil spillage exists (Figure A-9a and A-9b).

3. How to Measure

Oil spillage is measured in square meters (square feet) of surface area.

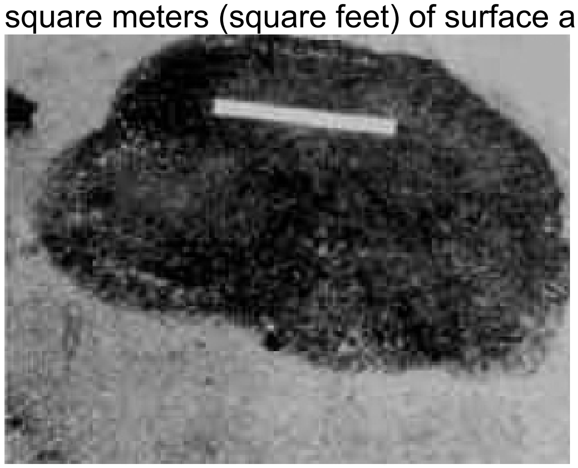

Figure A-9a. Oil Spillage Figure

Figure A-9b. Oil Spillage

A110 PATCHING AND UTILITY CUT PATCH

1. Description

A patch is considered a defect, regardless of how well it is performing.

2. Severity Levels

L Patch is in good condition and is performing satisfactorily (Figure A-10a).

M Patch is somewhat deteriorated and affects riding quality to some extent (Figure A-10b).

H Patch is badly deteriorated and affects riding quality significantly or has high FOD potential. Patch needs replacement (Figure A-10c).

3. Porous Friction Courses

The use of dense-graded AC patches in PFC surfaces causes a water damming effect at the patch that contributes to differential skid resistance of the surface. Low-severity, dense-graded patches should be rated as medium severity because of the differential friction problem. Medium- and high-severity patches are rated the same as above.

4. How to Measure

Patching is measured in square meters (square feet) of surface area. However, if a single patch has areas of differing severity levels, these areas should be measured and recorded separately. For example, a 2.5 square meter (25 square foot) patch may have 1 square meter (10 square feet) of medium severity and 1.5 square meters (15 square feet) of light severity. These areas would be recorded separately. Any distress found in a patched area will not be recorded; however, its effects on the patch will be considered when determining the patch's severity level.

Figure A-10a. Low-Severity Patching and Utility Cut Patch

Figure A-10b. Medium-Severity Patching and Utility Cut Patch

Figure A-10c. High-Severity Patching and Utility Cut Patch

A111 POLISHED AGGREGATE

1. Description

Aggregate polishing is caused by repeated traffic applications. Polished aggregate is present when close examination of a pavement reveals that the portion of aggregate extending above the asphalt is either very small or there are no rough or angular aggregate particles to provide good skid resistance. Existence of this type of distress is also indicated when the number on a skid resistance rating test is low or has dropped significantly from previous ratings.

2. Severity Levels

No degrees of severity are defined. However, the degree of polishing should be significant before it is included in the condition survey and rated as a defect (Figure A-11).

3. How to Measure

Polished aggregate is measured in square meters (square feet) of surface area. If bleeding is counted, polished aggregate is not counted in the same area.

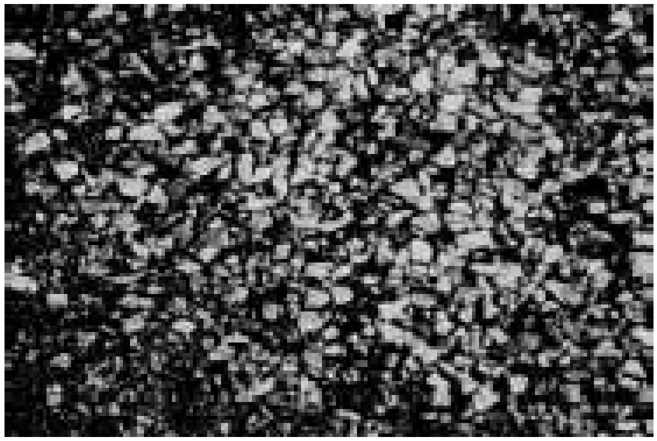

Figure A-11. Polished Aggregate

A112 RAVELING AND WEATHERING

1. Description

Raveling and weathering are the wearing away of the pavement surface caused by the dislodging of aggregate particles and loss of asphalt or tar binder. They may indicate that the asphalt binder has hardened significantly.

2. Dense Mix Severity Levels. As used herein, coarse aggregate refers to aggregate with a smallest dimension greater than or equal to 3/8 inch (10 millimeters). If in doubt, three representative square yards (square meters) should be inspected and the number of missing pieces of aggregate counted.

L Low severity occurs if any one of these conditions exist:

(1) The surface is in generally good condition, but fine aggregate and binder have worn away exposing the coarse aggregate. The coarse aggregate, however, is still firmly embedded in the mix.

(2) In a square yard (square meter) representative sample, the number of coarse aggregate pieces missing is between 5 and 20.

(3) In a square yard (square meter) representative sample, brushing one's foot across the surface dislodges no more than 20 coarse aggregate pieces.

See Figure A-12a.

M Medium severity occurs if either of these conditions exist:

(1) In a square yard (square meter) representative sample, the number of coarse aggregate pieces missing is between 21 and 40.

(2) In a square yard (square meter) representative sample, brushing one's foot across the surface dislodges between 21 and 40 coarse aggregate pieces.

See Figure A-12b.

H High severity occurs if either of these conditions exist:

(1) In a square yard (square meter) representative sample, the number of coarse aggregate pieces missing is over 40.

(2) In a square yard (square meter) representative sample, brushing one's foot across the surface dislodges more than 40 coarse aggregate pieces.

See Figure A-12c.

3. Surface Treatment / Tar over Dense Mix Severity Levels

L (1) Scaled area is less than 1%. (2) In case of coal tar where pattern cracking has developed, the tar surface cracks are less than 1/ 4 inch (6 millimeters) wide (Figure A-12d).

M (1) Scaled area is between 1 and 10% (2) In case of coal tar where pattern cracking has developed, the cracks are 1/ 4 inch (6 millimeters) wide or greater (Figure A-12e).

H (1) Scaled area is over 10%. (2) In case of coal tar the surface is peeling off (Figure A-12f).

4. Porous Friction Course Severity Levels

L In a square yard (square meter) representative sample, the number of aggregate pieces missing is between 5 and 20 and/ or the number of missing aggregate clusters (when more than one adjoining aggregate piece is missing) does not exceed 1 (Figure A-12g).

M In a square yard (square meter) representative sample, the number of aggregate pieces missing is between 21 and 40 and/ or the number of missing aggregate clusters is greater than 1 but does not exceed 25 percent of the square yard (square meter) area (Figure A-12h).

H In a square yard (square meter) representative sample, the number of aggregate pieces missing is over 40 and/or the number of missing aggregate clusters is greater than 25 percent of the square yard (square meter) area (Figure A-12i).

5. How to Measure

Raveling and weathering are measured in square feet (square meters) or surface area. Mechanical damage caused by hook drags, tire rims, or snowplows is counted as areas of high-severity raveling and weathering.

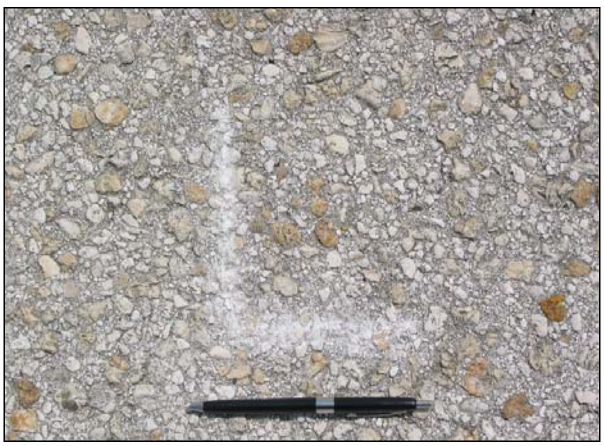

Figure A-12a. Dense Mix Low-Severity Raveling and Weathering

Figure A-12b. Dense Mix Medium-Severity Raveling and Weathering

Figure A-12c. Dense Mix High-Severity Raveling and Weathering

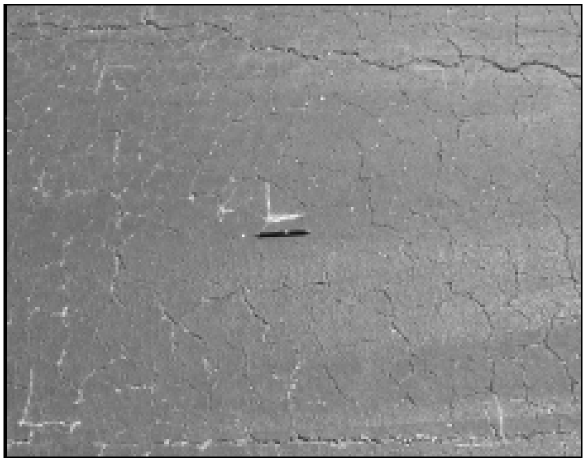

Figure A-12d. Tar over Dense Mix Low-Severity Raveling and Weathering

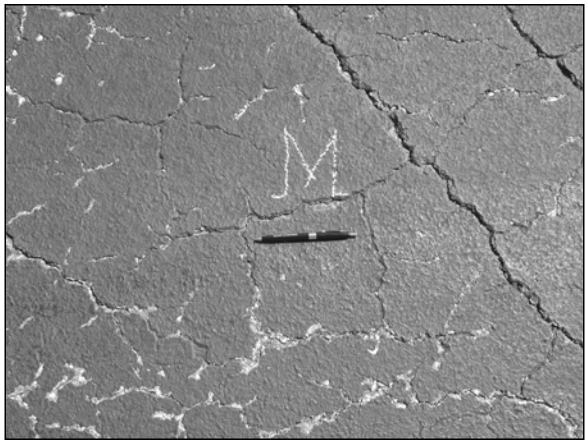

Figure A-12e. Tar over Dense Mix Medium-Severity Raveling and Weathering

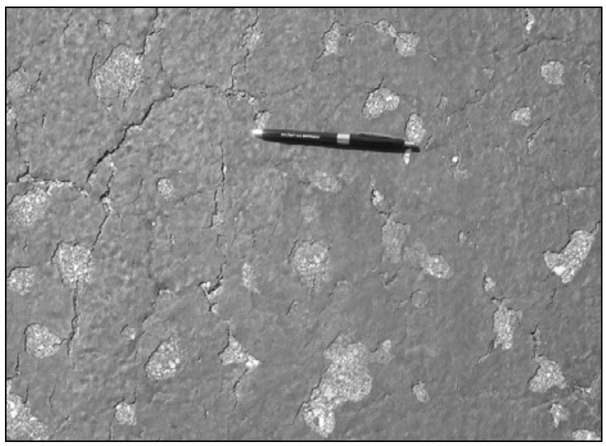

Figure A-12f. Tar over Dense Mix High-Severity Raveling and Weathering

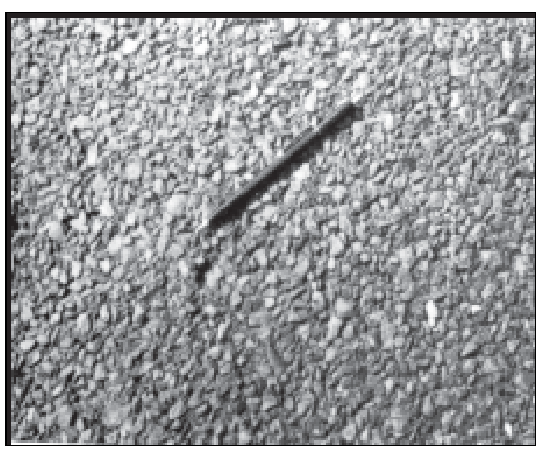

Figure A-12g. Porous Friction Course Low-Severity Raveling and Weathering

Figure A-12h. Porous Friction Course Medium-Severity Raveling and Weathering

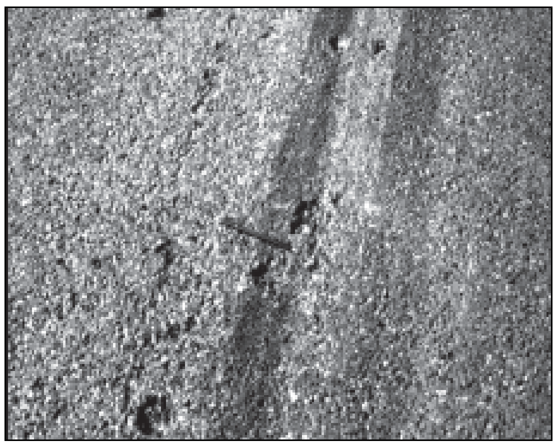

Figure A-12i. Porous Friction Course High-Severity Raveling and Weathering

A113 RUTTING

1. Description

A rut is a surface depression in the wheel path. Pavement uplift may occur along the sides of the rut; however, in many instances ruts are noticeable only after a rainfall, when the wheel paths are filled with water. Rutting stems from a permanent deformation in any of the pavement layers or subgrade. It is usually caused by consolidation or lateral movement of the materials due to traffic loads. Significant rutting can lead to major structural failure of the pavement.

2. Severity Levels

Table A-1. Mean Rut Depth Criteria

Severity	*All Pavement Sections*
L	6 to 13 mm (1/4 to 1/2 in) (Figure A-13a)
M	13 to 25 mm (1/2 to 1 in) (Figure A-13b)
H	> 25 mm > (1 in) (Figure A-13c)

3. How to Measure

Rutting is measured in square meters (square feet) of surface area, and its severity is determined by the depth of the rut. To determine the rut depth, a straightedge should be laid across the rut and the maximum depth measured.

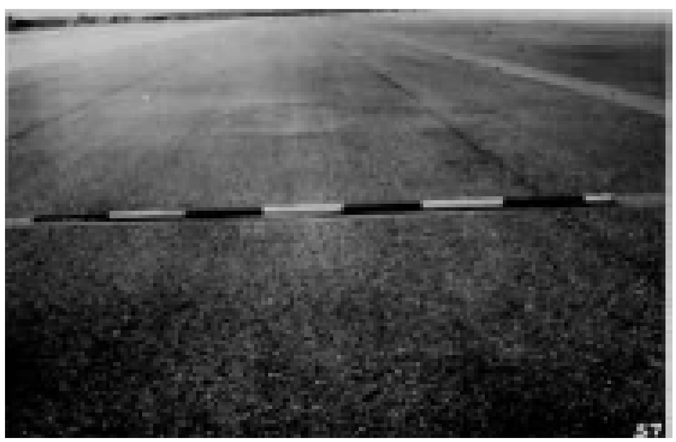

Figure A-13a. Low-Severity Rutting

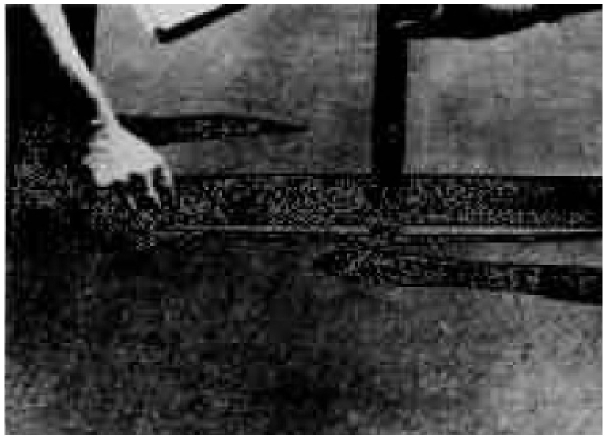

Figure A-13b. Medium-Severity Rutting

Figure A-13c. High-Severity Rutting

A114 SHOVING OF ASPHALT PAVEMENT BY PCC SLABS

1. Description

PCC pavements occasionally increase in length at ends where they adjoin flexible pavements (commonly referred to as "pavement growth"). This "growth" shoves the asphalt- or tar-surfaced pavements, causing them to swell and crack. The PCC slab "growth" is caused by a gradual opening of the joints as they are filled with incompressible materials that prevent them from reclosing.

2. Severity Levels

L A slight amount of shoving has occurred, with little effect on ride quality and no break-up of the asphalt pavement (Figure A-14a).

M A significant amount of shoving has occurred, causing moderate roughness or break-up of the asphalt pavement (Figure A-14b).

H A large amount of shoving has occurred, causing severe roughness or break-up of the asphalt pavement (Figure A-14c).

3. How to Measure

Shoving is measured by determining the area in square meters (square feet) of the swell caused by shoving.

Figure A-14a. Low-Severity Shoving on the Outside and Medium-Severity Shoving in the Middle

Figure A-14b. High-Severity Shoving

A115 SLIPPAGE CRACKING

1. Description

Slippage cracks are crescent- or half-moon shaped cracks having two ends pointed away from the direction of traffic. They are produced when braking or turning wheels cause the pavement surface to slide and deform. This usually occurs when there is a low-strength surface mix or poor bond between the surface and next layer of pavement structure.

2. Severity Levels

No degrees of severity are defined. It is sufficient to indicate that a slippage crack exists (Figures A-15a and A-15b).

3. How to Measure

Slippage cracking is measured in square meters (square feet) of surface area.

Figure A-15a. Slippage Cracking

Figure A-15b. Slippage Cracking

A116 SWELL

1. Description

A swell is characterized by an upward bulge in the pavement's surface. A swell may occur sharply over a small area or as a longer, gradual wave. Either type of swell can be accompanied by surface cracking. A swell is usually caused by frost action in the subgrade or by swelling soil, but a small swell can also occur on the surface of an asphalt overlay (over PCC) as a result of a blow- up in the PCC slab.

2. Severity Levels

L Swell is barely visible and has a minor effect on the pavement's ride quality as determined at the normal aircraft speed for the pavement section under consideration. (Low-severity swells may not always be observable, but their existence can be confirmed by driving a vehicle over the section at the normal aircraft speed. An upward acceleration will occur if the swell is present).

M Swell can be observed without difficulty and has a significant effect on the pavement's ride quality as determined at the normal aircraft speed for the pavement section under consideration.

H Swell can be readily observed and severely affects the pavement's ride quality at the normal aircraft speed for the pavement section under consideration (Figure A-16).

3. How to Measure

The surface area of the swell is measured in square meters (square feet). The severity rating should consider the type of pavement section (i. e., runway, taxiway, or apron). For example, a swell of sufficient magnitude to cause considerable roughness on a runway at high speeds would be rated as more severe than the same swell located on the apron or taxiway where the normal aircraft operating speeds are much lower. The following guidance is provided for runways:

Table A-2. Swell Criteria

Severity	***Height Differential***
L	< 19 mm (< 3/4 in)
M	20 to 40 mm (1/2 to 1-1/2 in)
H	> 40 mm (> 1-1/2 in)

Figure A-16. High-Severity Swell

Annex B

Pavement Condition Index (PCI) Concrete-Surfaced Airfields

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B101 BLOWUP

1. Description

Blowups occur in hot weather, usually at a transverse crack or joint that is not wide enough to permit expansion by the concrete slabs. The insufficient width is usually caused by infiltration of incompressible materials into the joint space. When expansion cannot relieve enough pressure, a localized upward movement of the slab edges (buckling) or shattering will occur in the vicinity of the joint. Blowups can also occur at utility cuts and drainage inlets. This type of distress is almost always repaired immediately because of severe damage potential to aircraft. Blowups are included for reference when closed sections are being evaluated for reopening.

2. Severity Levels

L Buckling or shattering has not rendered the pavement inoperative, and only a slight amount of roughness exists (Figure B-1a).

M Buckling or shattering has not rendered the pavement inoperative, but a significant amount of roughness exists (Figure B-1b).

H Buckling or shattering has rendered the pavement inoperative (Figure B-1c).

(*Note:* For pavements to be considered operational, all foreign material from blowups must have been removed.)

3. How to Count

A blowup usually occurs at a transverse crack or joint. At a crack, it is counted as being in one slab, but at a joint, two slabs are affected and the distress should be recorded as occurring in two slabs.

Figure B-1a. Low-Severity Blowup

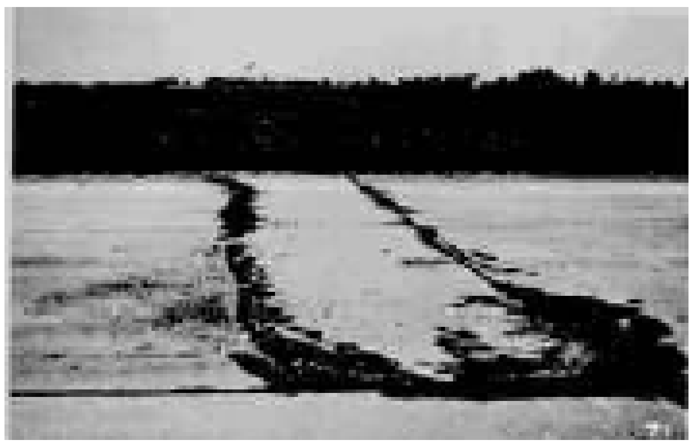

Figure B-1b. Medium-Severity Blowup

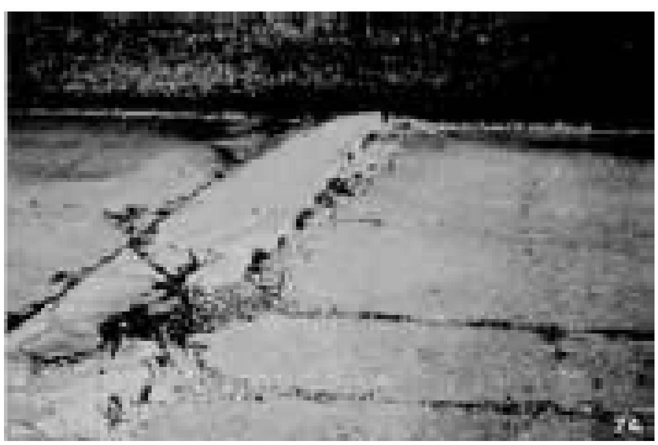

Figure B-1c. High-Severity Blowup

B102 CORNER BREAK

1. Description

A corner break is a crack that intersects the joints at a distance less than or equal to one-half the slab length on both sides, measured from the corner of the slab. For example, a slab with dimensions of 7.5 by 7.5 m (25 by 25 ft) that has a crack intersecting the joint 1.5 m (5 ft) from the corner on one side and 5 m (17 ft) on the other side is not considered a corner break; it is a diagonal crack. However, a crack that intersects 2.1 m (7 ft) on one side and 3 m (10 ft) on the other is considered a corner break. A corner break differs from a corner spall in that the crack extends vertically through the entire slab thickness, while a corner spall intersects the joint at an angle. Load repetition combined with loss of support and curling stresses usually causes corner breaks.

2. Severity Levels

L Crack has either no spalling or minor spalling (no FOD potential). If non-filled, it has a mean width less than approximately 3 mm (1/8 in); a filled crack can be of any width, but the filler material must be in satisfactory condition. The area between the corner break and the joints is not cracked (Figure B-2a).

M One of the following conditions exists: (1) filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 3 mm (1/8 in) and 25 mm (1 in); (3) a filled crack is not spalled or only lightly spalled, but the filler is in unsatisfactory condition; (4) the area between the corner break and the joints is lightly cracked with loose or missing particles (Figure B-2b).

H One of the following conditions exists: (1) filled or non-filled crack is severely spalled, causing definite FOD potential; (2) a non-filled crack has a mean width greater than approximately 25 mm (1 in), creating a tire damage potential; or (3) the area between the corner break and the joints is severely cracked (Figure B-2c).

3. How to Count

A distressed slab is recorded as one slab if it (1) contains a single corner break, (2) contains more than one break of a particular severity, or (3) contains two or more breaks of different severities. For two or more breaks, the highest level of severity should be recorded. For example, a slab containing both light and medium-severity corner breaks should be counted as one slab with a medium-severity corner break.

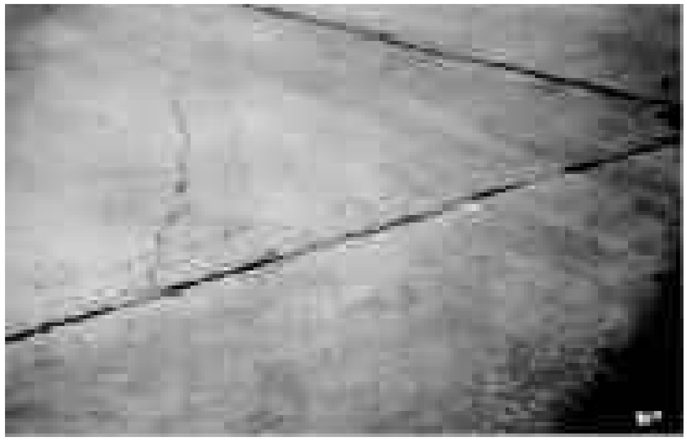

Figure B-2a. Low-Severity Corner Break

Figure B-2b. Medium-Severity Corner Break

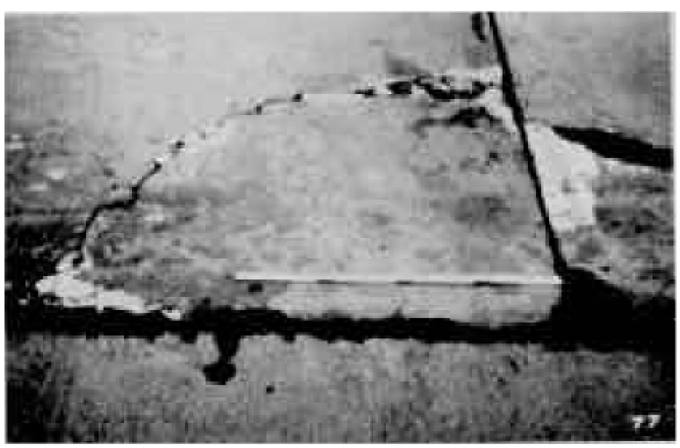

Figure B-2c. High-Severity Corner Break

B103 CRACKS (LONGITUDINAL, TRANSVERSE, AND DIAGONAL)

1. Description

These cracks, which divide the slab into two or three pieces, are usually caused by a combination of load repetition, curling stresses, and shrinkage stresses. (For slabs divided into four or more pieces, see Shattered Slab/Intersecting Cracks.) Low-severity cracks are usually warping- or friction-related and are not considered major structural distresses. Medium- or high-severity cracks are usually working cracks and are considered major structural distresses.

2. Non-reinforced PCC Severity Levels

L Crack has no spalling or minor spalling (no FOD potential). If non-filled, it is less than 3.2 mm (1/8 in) wide; a filled crack can be of any width, but its filler material must be in satisfactory condition (Figure B-3a).

M One of the following conditions exists: (1) a filled or non-filled crack is moderately spalled (some FOD potential); (2) a non-filled crack has a mean width between 3 mm (1/8 in) and 25 mm (1 in); (3) a filled crack has no spalling or minor spalling, but the filler is in unsatisfactory condition; or (4) the slab is divided into three pieces by two or more cracks (Figure B-3b).

H One of the following conditions exists: (1) a filled or non-filled crack is severely spalled (definite FOD potential); (2) a non-filled crack has a mean width approximately greater than 25 mm (1 in), creating tire damage potential, or (3) the slab is divided into three pieces by two or more cracks, one of which is at least medium severity (Figure B-3c).

3. Reinforced Concrete Severity Levels

L (1) Non-filled crack, 3 mm (1/8 in.) to 13 mm (1/2 in) wide, with no faulting or spalling; (2) filled or non-filled cracks of any width < 13 mm (1/2 in), with low-severity spalling; or (3) filled cracks of any width (filler satisfactory), with no faulting or spalling. *(Note:* Crack less than 3 mm (1/8 in) wide with no spalling or faulting should be counted as shrinkage cracking.)

M (1) Non-filled cracks, 13 mm (1/2 in) to 25 mm (1 in) wide, no faulting or spalling; (2) filled cracks of any width, with faulting < 10 mm (3/8 in) or medium-severity spalling; or (3) non-filled cracks of width < 25 mm (1 in) with faulting < 10mm (3/8 in) or medium-severity spalling.

H (1) Non-filled cracks of width > 25 mm (1 in); (2) non-filled cracks of any width, with faulting > 10 mm (3/8 in) or medium-severity spalling; or (3) filled cracks of any width, with faulting > 10 mm (3/8 in) or high-severity spalling.

4. How to Count

Once the severity has been identified, the distress is recorded as one slab. If a crack is repaired by a narrow patch (e.g., 100 to 250 mm (4 to 10 in wide), only the crack and not the patch should be recorded at the appropriate severity level.

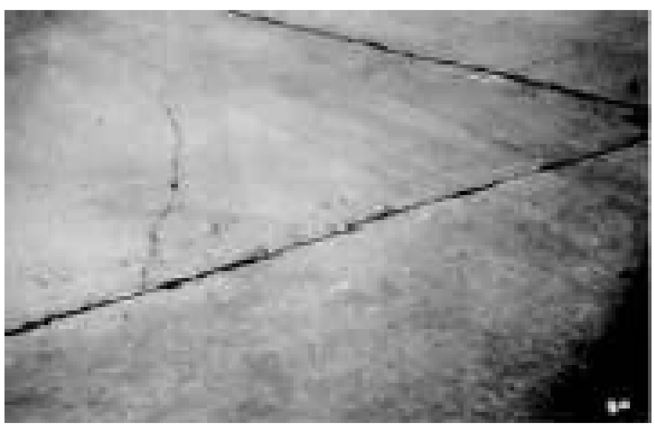

Figure B-3a. Low-Severity Diagonal Crack

Figure B-3b. Medium-Severity Longitudinal Crack

Figure B-3c. High-Severity Crack

B104 DURABILITY ("D") CRACKING

1. Description

Durability cracking is caused by the inability of the concrete to withstand environmental factors such as freeze-thaw cycles. It usually appears as a pattern of cracks running parallel to a joint or linear crack. A dark coloring can usually be seen around the fine durability cracks. This type of cracking may eventually lead to disintegration of the concrete within 30 to 60 mm (1 to 2 ft) of the joint or crack.

2. Severity Levels

L "D" cracking is defined by hairline cracks occurring in a limited area of the slab, such as one or two corners or along one joint. Little or no disintegration has occurred. No FOD potential (Figure B-4a).

M (1) "D" cracking has developed over a considerable amount of slab area with little or no disintegration or FOD potential; or (2) "D" cracking has occurred in a limited area of the slab, such as in one or two corners or along one joint, but pieces are missing and disintegration has occurred. Some FOD potential (Figure B-4b).

H "D" cracking has developed over a considerable amount of slab area with disintegration of FOD potential (Figure B-4c).

3. How to Count

When the distress is located and rated at one severity, it is counted as one slab. If more than one severity level is found, the slab is counted as having the higher severity distress. If "D" cracking is counted, scaling on the same slab should not be recorded.

Figure B-4a. Low-Severity Durability Cracking

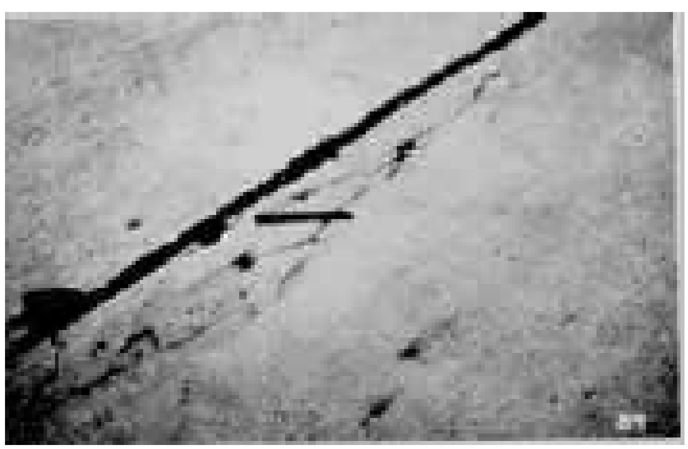

Figure B-4b. Medium-Severity Durability Cracking

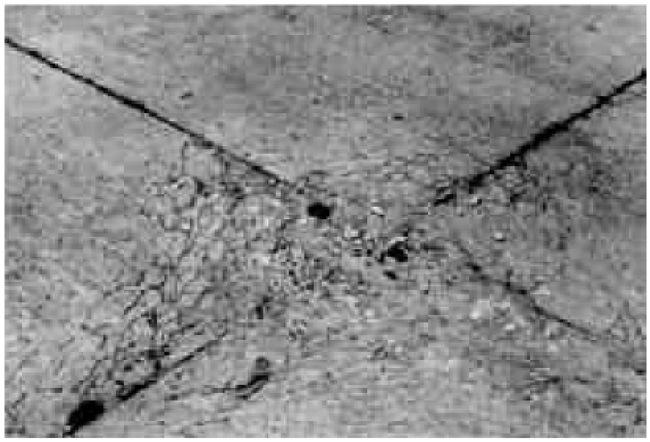

Figure B-4c. High-Severity Durability Cracking

B105 JOINT SEAL DAMAGE

1. Description

Joint seal damage is any condition which enables soil or rocks to accumulate in the joints or allows significant infiltration of water. Accumulation of incompressible materials prevents the slabs from expanding and may result in buckling, shattering, or spalling. A pliable joint filler bonded to the edges of the slabs protects the joints from accumulation of materials and also prevents water from seeping down and softening the foundation supporting the slab. Typical types of joint seal damage are (a) stripping of joint sealant, (b) extrusion of joint sealant, (c) weed growth, (d) hardening of the filler (oxidation), (e) loss of bond to the slab edges, and (f) lack or absence of sealant in the joint.

2. Severity Levels

L Joint sealer is in generally good condition throughout the section. Sealant is performing well, with only a minor amount of any of the above types of damage present (Figure B-5a).

M Joint sealer is in generally fair condition over the entire surveyed section, with one or more of the above types of damage occurring to a moderate degree. Sealant needs replacement within 2 years (Figure B-5b).

H Joint sealer is in generally poor condition over the entire surveyed section, with one or more of the above types of damage occurring to a severe degree. Sealant needs immediate replacement (Figure B-5c).

3. How to Count

Joint seal damage is not counted on a slab-by-slab basis but is rated based on the overall condition of the sealant in the sample unit.

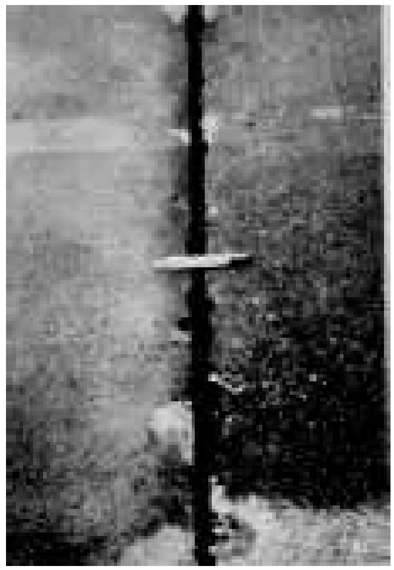

Figure B-5a. Low-Severity Joint Seal Damage

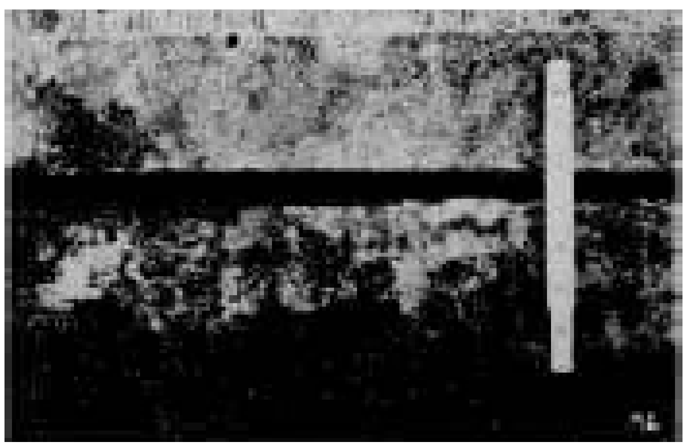

Figure B-5b. Medium-Severity Joint Seal Damage

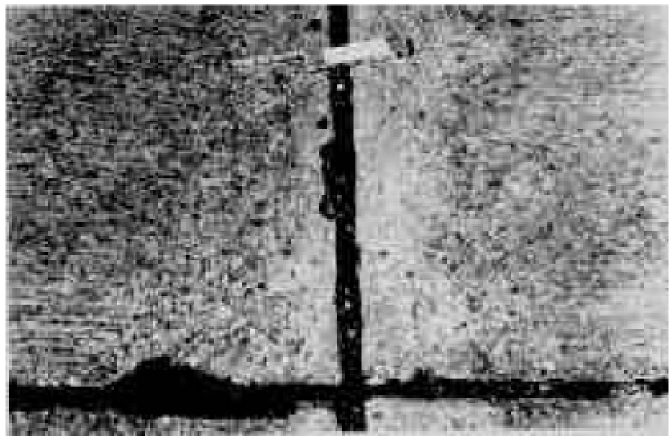

Figure B-5c. High-Severity Joint Seal Damage

B106 PATCHING, SMALL (LESS THAN 0.5 M^2 (5 SQ. FT))

1. Description

A patch is an area where the original pavement has been removed and replaced by a filler material. For condition evaluation, patching is divided into two types: small (less than 0.5 m^2 (5 sq. ft)) and large (over 0.5 m^2 (5 sq. ft)). Large patches are defined as a separate distress.

2. Severity Levels

L Patch is functioning well, with little or no deterioration (Figure B-6a).

M Patch has deteriorated, and/or moderate spalling can be seen around the edges. Patch material can be dislodged, with considerable effort (minor FOD potential) (Figure B-6b).

H Patch has deteriorated, either by spalling around the patch or cracking within the patch, to a state which warrants replacement (Figure B-6c).

3. How to Measure

If one or more small patches having the same severity level are located in a slab, it is counted as one slab containing that distress. If more than one severity level occurs, it is counted as one slab with the higher severity level being recorded. If a crack is repaired by a narrow patch (e.g., 100 to 250 mm (4 to 10 in) wide), only the crack and not the patch should be recorded at the appropriate severity level. If the original distress of a patch is more severe than the patch itself, the original distress type should be recorded.

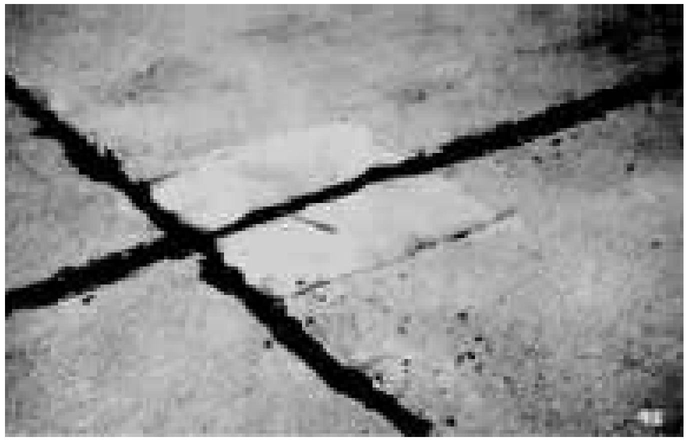

Figure B-6a. Low-Severity Patching, Small

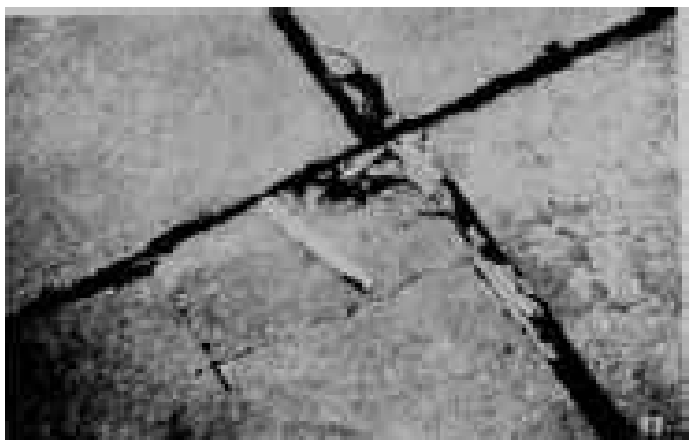

Figure B-6b. Medium-Severity Patching, Small

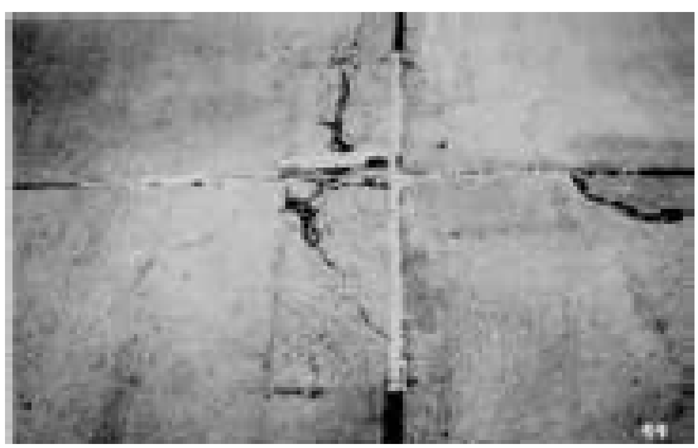

Figure B-6c. High-Severity Patching, Small

B107 PATCHING, LARGE (OVER 0.5 M^2 (5 SQ. FT)) AND UTILITY CUT

1. Description

Patching is the same as defined in the previous section. A utility cut is a patch that has replaced the original pavement because of placement of underground utilities. The severity levels of a utility cut are the same as those for regular patching.

2. Severity Levels

L Patch is functioning well with *very* little or no deterioration (Figure B-7a).

M Patch has deteriorated and/or moderate spalling can be seen around the edges. Patch material can be dislodged with considerable effort, causing some FOD potential (Figure B-7b).

H Patch has deteriorated to a state which causes considerable roughness and/or high FOD potential. The extent of the deterioration warrants replacement of the patch (Figure B-7c).

3. How to Count

The criteria are the same as for small patches.

Figure B-7a. Low-Severity Patching, Large

Figure B-7b. Medium-Severity Patching, Large

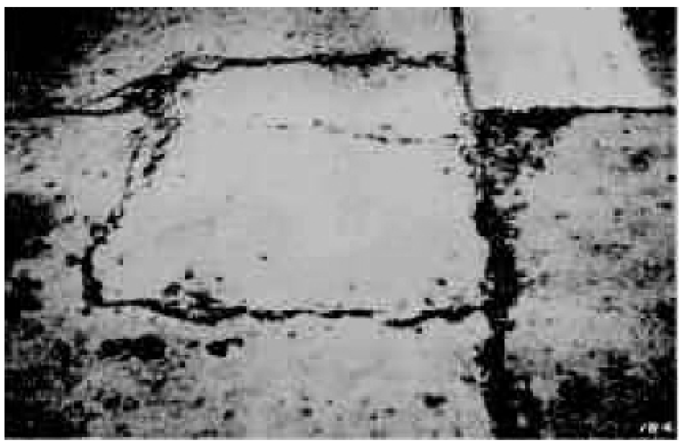

Figure B-7c. High-Severity Patching, Large

B108 POPOUTS

1. Description

A popout is a small piece of pavement that breaks loose from the surface due to freeze-thaw action in combination with expansive aggregates. Popouts usually range from approximately 25 mm (1 in) to 100 mm (4 in) in diameter and from 13 mm (1/2 in) to 50 mm (2 in) deep.

2. Severity Levels

No degrees of severity are defined for popouts. However, popouts must be extensive before they are counted as a distress; i.e., average popout density must exceed approximately three popouts per square yard over the entire slab area (Figure B-8).

3. How to Count

The density of the distress must be measured. If there is any doubt about the average being greater than three popouts per square yard (per square meter), at least three, random, 1 square meter (1-square yard) areas should be checked. When the average is greater than this density, the slab is counted.

Figure B-8. Popouts

B109 PUMPING

1. Description

Pumping is the ejection of material by water through joints or cracks caused by deflection of the slab under passing loads. As the water is ejected, it carries particles of gravel, sand, clay, or silt and results in a progressive loss of pavement support. Surface staining and base or subgrade material on the pavement close to joints or cracks are evidence of pumping. Pumping near joints indicates poor joint sealer and loss of support which will lead to cracking under repeated loads.

2. Severity Levels

No degrees of severity are defined. It is sufficient to indicate that pumping exists (Figures B-9a, B-9b, and B-9c).

3. How to Count

Slabs are counted as follows: one pumping joint between two slabs is counted as two slabs. However, if the remaining joints around the slab are also pumping, one slab is added per additional pumping joint.

Figure B-9a. Pumping (note fine material on surface that has been pumped and has caused corner break)

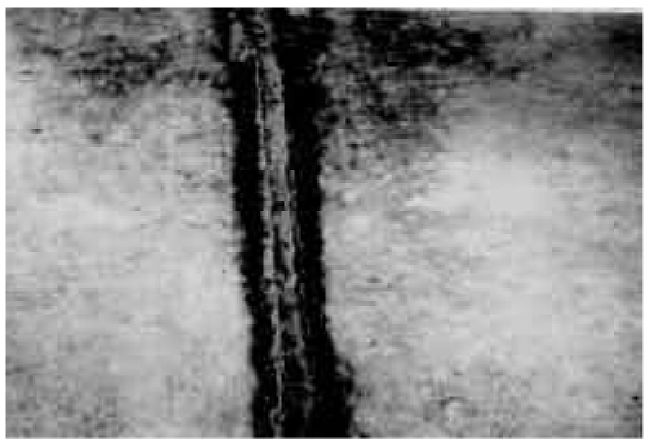

Figure B-9b. Pumping (close-up of fine materials collecting in the joint)

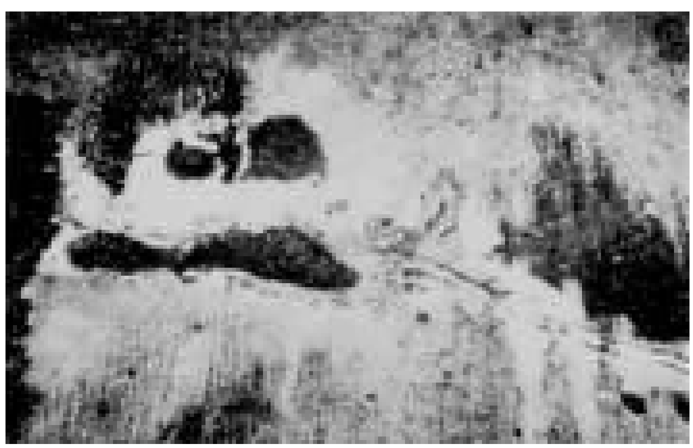

Figure B-9c. Pumping

B110 SCALING, MAP CRACKING, AND CRAZING

1. Description

Map cracking or crazing refers to a network of shallow, fine, or hairline cracks which extend only through the upper surface of the concrete. The cracks tend to intersect at angles of 120 degrees. Map cracking or crazing is usually caused by over-finishing the concrete and may lead to scaling of the surface. Scaling is the breakdown of the slab surface to a depth of approximately 6mm (1/4 in) to 13 mm (1/2 in). Scaling may also be caused by deicing salts, improper construction, freeze-thaw cycles, and poor aggregate. Another recognized source of distress is the reaction between the alkalies (Na_2O and K_2O) in some cements and certain minerals in some aggregates. Products formed by the reaction between the alkalies and aggregate result in expansions that cause a breakdown in the concrete. This generally occurs throughout the slab and not just at joints where "D" cracking normally occurs.

2. Severity Levels Not Applicable to Alkali-Silica Reaction

L Crazing or map cracking exists over most of the slab area; the surface is in good condition with no scaling (Figure B-10a). *(Note:* The low-severity level is an indicator that scaling may develop in the future. A slab should only be counted if, in the judgment of the pavement inspector, future scaling is likely to occur within 2 to 3 years.)

M Slab is scaled over approximately 5 percent or less of the surface, causing some FOD potential (Figure B-10b).

H Slab is severely scaled, causing a high FOD potential. Usually more than 5 percent of the surface is affected (FigureB-10c).

3. Severity Levels Applicable to Alkali-Silica

L Alkali-silica reaction is noted on only a small portion of the slab and produces no FOD.

M Alkali-silica reaction is noted over the entire slab, but no loose aggregate exists.

H Alkali-silica reaction is causing scaling and producing FOD.

4. How to Count

If two or more levels of severity exist on a slab, the slab is counted as one slab having the maximum level of severity. For example, if both low-severity crazing and medium scaling exist on one slab, the slab is counted as one slab containing medium scaling. If "D" cracking is counted, scaling is not counted.

Figure B-10a. Low-Severity Crazing

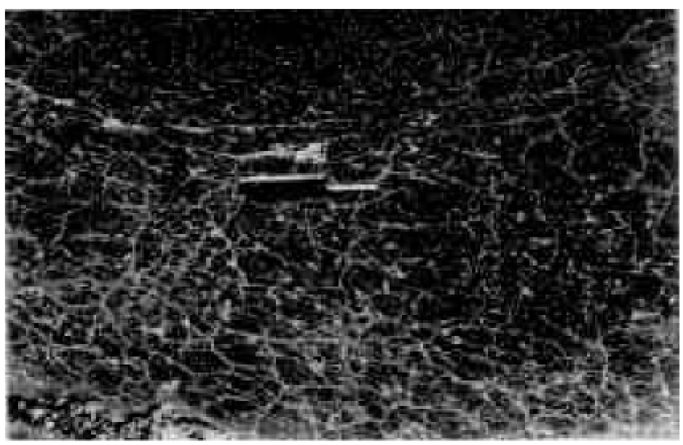

Figure B-10b. Medium-Severity Scaling

Figure B-10c. High-Severity Scaling

B111 SETTLEMENT OR FAULTING

1. Description

Settlement or faulting is a difference of elevation at a joint or crack caused by upheaval or consolidation.

2. Severity Levels

Severity levels are defined by the difference in elevation across the fault and the associated decrease in ride quality and safety as severity increases.

Table B-1. Difference in Elevation

Severity	*Runways/Taxiways*	*Aprons*
L	< 6.5 mm (< 1/4 in)	3 – 13 mm (1/8 – 1/2 in) (Figure B-11a)
M	6.5 – 13 mm (1/4 – 1/2 in)	13 – 25 mm (1/2 - 1 in) (Figure B-11b)
H	> 13 mm > (1/2 in)	> 25 mm (Figure B-11c)

3. How to Count

In counting settlement, a fault between two slabs is counted as one slab. A straightedge or level should be used to aid in measuring the difference in elevation between the two slabs.

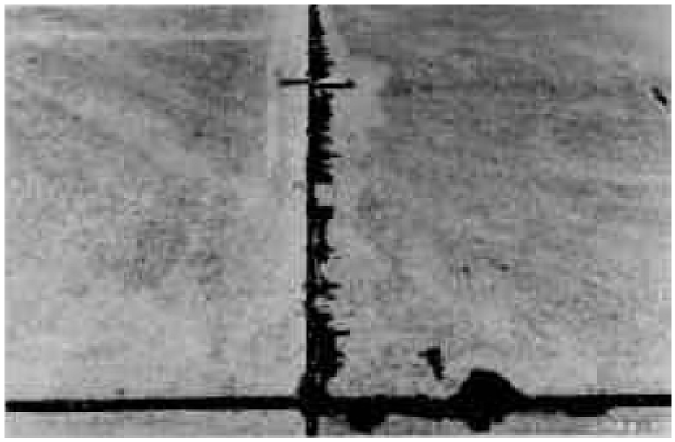

Figure B-11a. Low-Severity Settlement on Apron

Figure B-11b. Medium-Severity Settlement on Apron

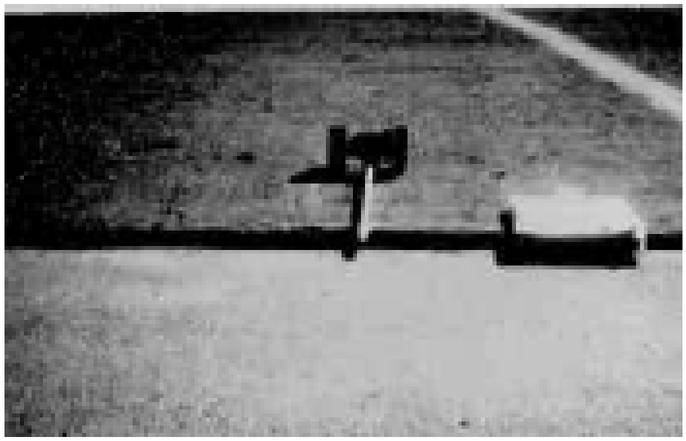

Figure B-11c. High-Severity Settlement on Taxiway/Runway

B112 SHATTERED SLAB/INTERSECTING CRACKS

1. Description

Intersecting cracks are cracks that break into four or more pieces because of overloading and/or inadequate support. The high-severity level of this distress type, as defined below, is referred to as a shattered slab. If all pieces or cracks are contained within a corner break, the distress is categorized as a severe corner break.

2. Severity Levels

L Slab is broken into four or five pieces with the vast majority of the cracks (over 85 percent) of low-severity (Figure B-12a).

M (1) Slab is broken into four or five pieces with over 15 percent of the cracks of medium severity (no high-severity cracks); or (2) slab is broken into six or more pieces with over 85 percent of the cracks of low- severity (Figure B-12b).

H At this level of severity, the slab is called shattered: (1) slab is broken into four or five pieces with some or all of the cracks of high severity; (2) slab is broken into six or more pieces with over 15 percent of the cracks of medium- or high-severity (Figure B-12c).

3. How to Count

No other distress such as scaling, spalling, or durability cracking should be recorded if the slab is medium- or high-severity level, since the severity of this distress would affect the slab's rating substantially.

Figure B-12a. Low-Severity Intersecting Cracks

Figure B-12b. Medium-Severity Intersecting Cracks

Figure B-12c. Shattered Slab

B113 SHRINKAGE CRACKS

1. Description

Shrinkage cracks are hairline cracks that are usually only a few feet long and do not extend across the entire slab. They are formed during the setting and curing of the concrete and usually do not extend through the depth of the slab.

2. Severity Levels

No degrees of severity are defined. It is sufficient to indicate that shrinkage cracks exist (Figures B-13a and B-13b).

3. How to Count

If one or more shrinkage cracks exist on one particular slab, the slab is counted as one slab with shrinkage cracks.

Figure B-13a. Shrinkage Crack

Figure B-13b. Shrinkage Cracks

B114 SPALLING (TRANSVERSE AND LONGITUDINAL JOINTS)

1. Description

Joint spalling is the breakdown of the slab edges within 60 mm (2 ft) of the side of the joint. A joint spall usually does not extend vertically through the slab but intersects the joint at an angle. Spalling results from excessive stresses at the joint or crack caused by infiltration of incompressible materials or traffic loads. Weak concrete at the joint (caused by overworking) combined with traffic loads is another cause of spalling. Examples are shown in Figures B-14a – B-14c.

2. Severity Levels

Table B-2. Severity Levels of Spalling

Severity	***Spall Length***	***Description***
L	< 60 mm (2 ft)	spall is broken into pieces or fragmented; little FOD or tire damage potential exists
	> 60 mm (2 ft)	(a) spall is broken into no more than three pieces defined by low- or medium-severity cracks; little or no FOD potential exists; or (b) joint is lightly frayed; little or no FOD potential exists.
M	< 60 mm (2 ft)	spall is broken into pieces or fragmented, with some of the pieces loose or absent, causing considerable FOD or tire damage potential

	> 60 mm (2 ft)	(a) spall is broken into more than three pieces defined by light or medium cracks; (b) spall is broken into no more than three pieces with one or more of the cracks being severe with some FOD potential existing; or (c) joint is moderately frayed, with some FOD potential
H	> 60 mm (2 ft)	(1) spall is broken into more than three pieces defined by one or more high-severity cracks with high FOD potential; or (2) joint is severely frayed, with high FOD potential *(Note:* If less than 60 mm (2 ft) of the joint is lightly frayed, the spall should not be counted.)

3. How to Count

If the joint spall is located along the edge of one slab, it is counted as one slab with joint spalling. If spalling is located on more than one edge of the same slab, the edge having the highest severity is counted and recorded as one slab. Joint spalling can also occur along the edges of two adjacent slabs. If this is the case, each slab is counted as having joint spalling. If a joint spall is small enough to be filled during a joint seal repair, it should not be recorded.

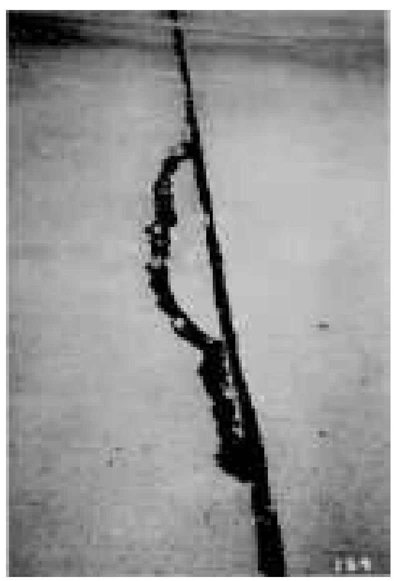

Figure B-14a. Low-Severity Joint Spall

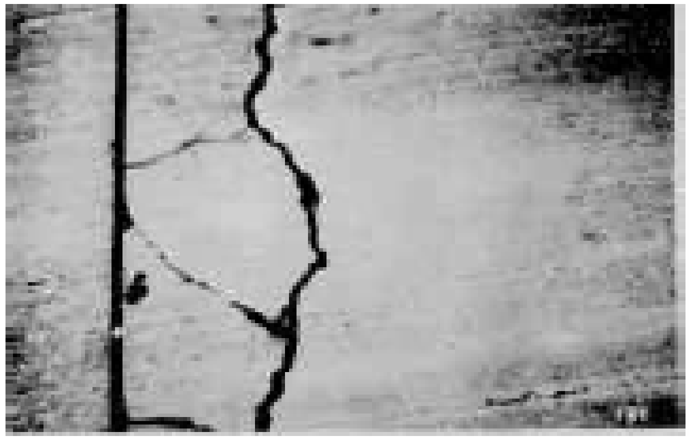

Figure B-14b. Medium-Severity Joint Spall

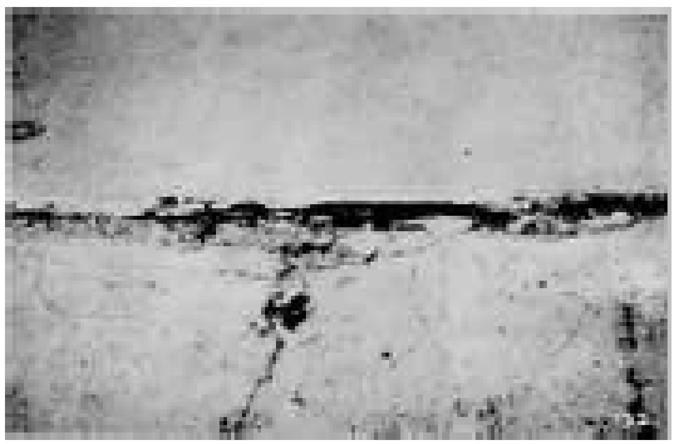

Figure B-14c. High-Severity Joint Spall

B115 SPALLING (CORNER)

1. Description

Corner spalling is the raveling or breakdown of the slab within approximately 60mm (2 ft) of the corner. A corner spall differs from the corner break in that the spall angles downward to intersect the joint, while a break extends vertically through the slab.

2. Severity Levels

L One of the following conditions exists: (1) spall is broken into one or two pieces defined by low-severity cracks (little or no FOD potential), (2) spall is defined by one medium-severity crack (little or no FOD potential) (Figure B-15a).

M One of the following conditions exists: (1) spall is broken into two or more pieces defined by medium-severity crack(s), and a few small fragments may be absent or loose; (2) spall is defined by one severe, fragmented crack that may be accompanied by a few hairline cracks; or (3) spall has deteriorated to the point where loose material is causing some FOD potential (Figure B-15b).

H One of the following conditions exists: (1) spall is broken into two or more pieces defined by high-severity fragmented crack(s), with loose or absent fragments; (2) pieces of the spall have been displaced to the extent that a tire damage hazard exists; or (3) spall has deteriorated to the point where loose material is causing high FOD potential (Figure B-15c).

3. How to Count

If one or more corner spalls having the same severity level are located in a slab, the slab is counted as one slab with corner spalling. If more than one severity level occurs, it is counted as one slab having the higher severity level.

Figure B-15a. Low-Severity Corner Spall

Figure B-15b. Medium-Severity Corner Spall

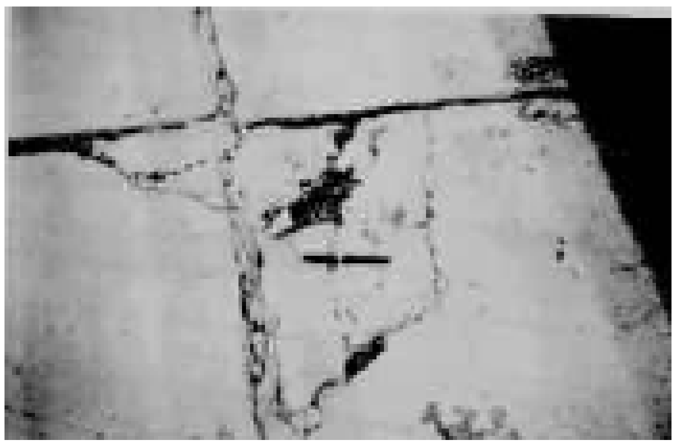

Figure B-15c. High-Severity Corner Spall

Annex C

AC Pavement Deduct Curves

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Figure C-6 -	Jet Blast Erosion, Airfields - Asphalt 46	C - 8
Figure C-7 -	Joint Reflection Cracking, Airfields - Asphalt 47	C - 9
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Figure C-16 -	Shoving, Airfields - Asphalt 54	C - 18
Figure C-17 -	Slipping Cracking, Airfields - Asphalt 55	C - 19
Figure C-18 -	Swell, Airfields - Asphalt 56	C - 20
Figure C-19 -	Airfields: Asphalt	C - 21

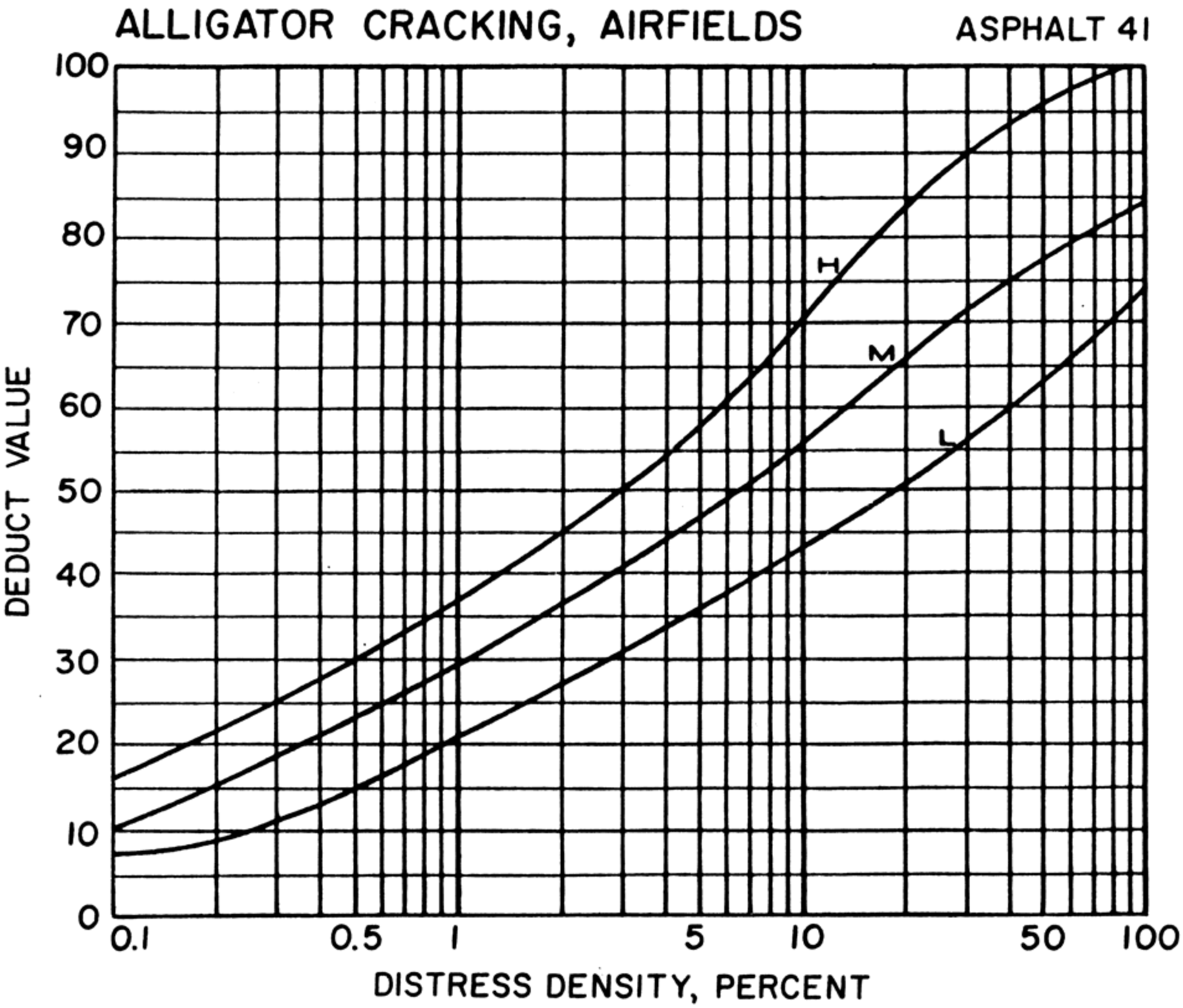

Figure C-1. Alligator Cracking, Airfields – Asphalt 41

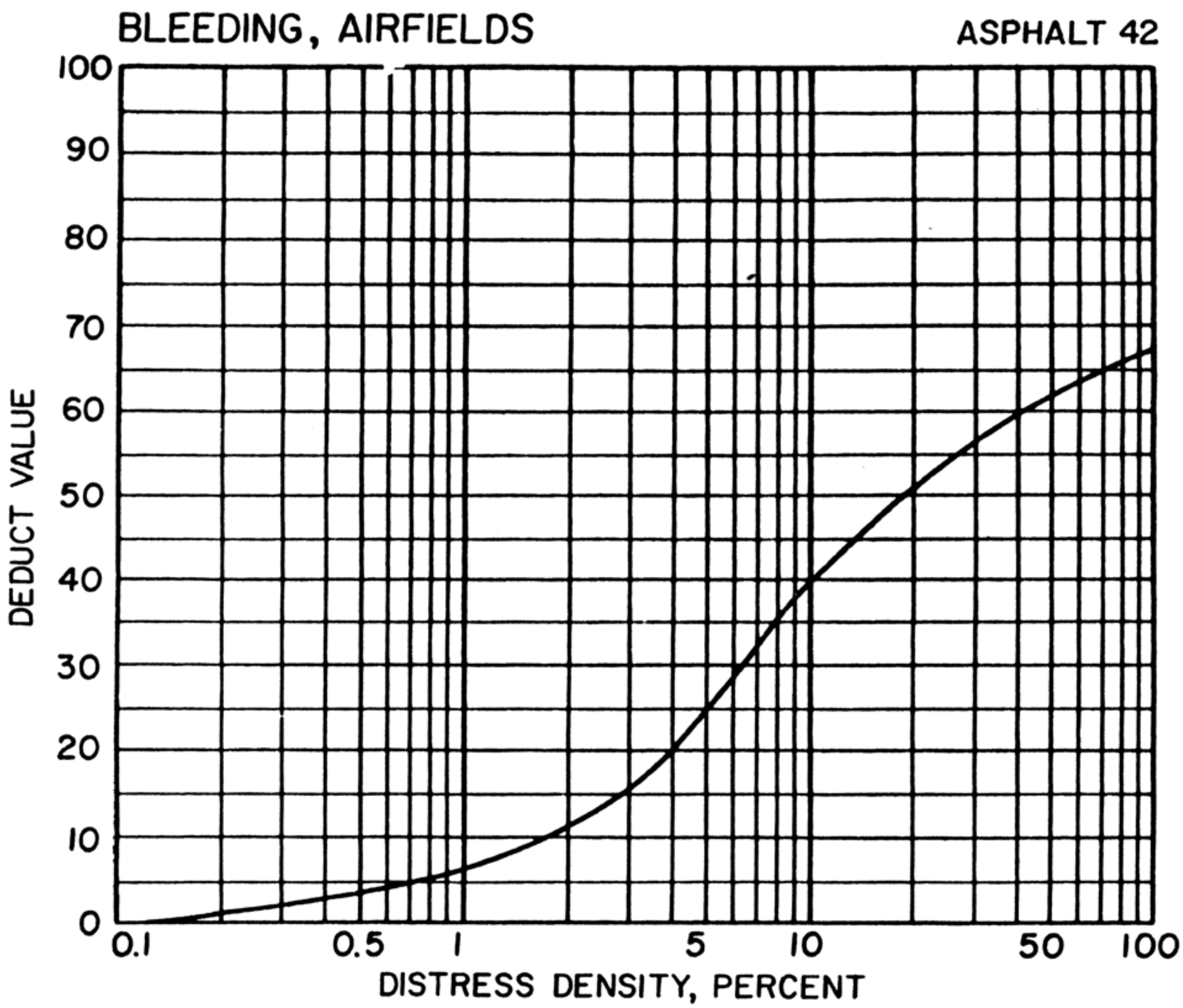

Figure C-2. Bleeding, Airfields – Asphalt 42

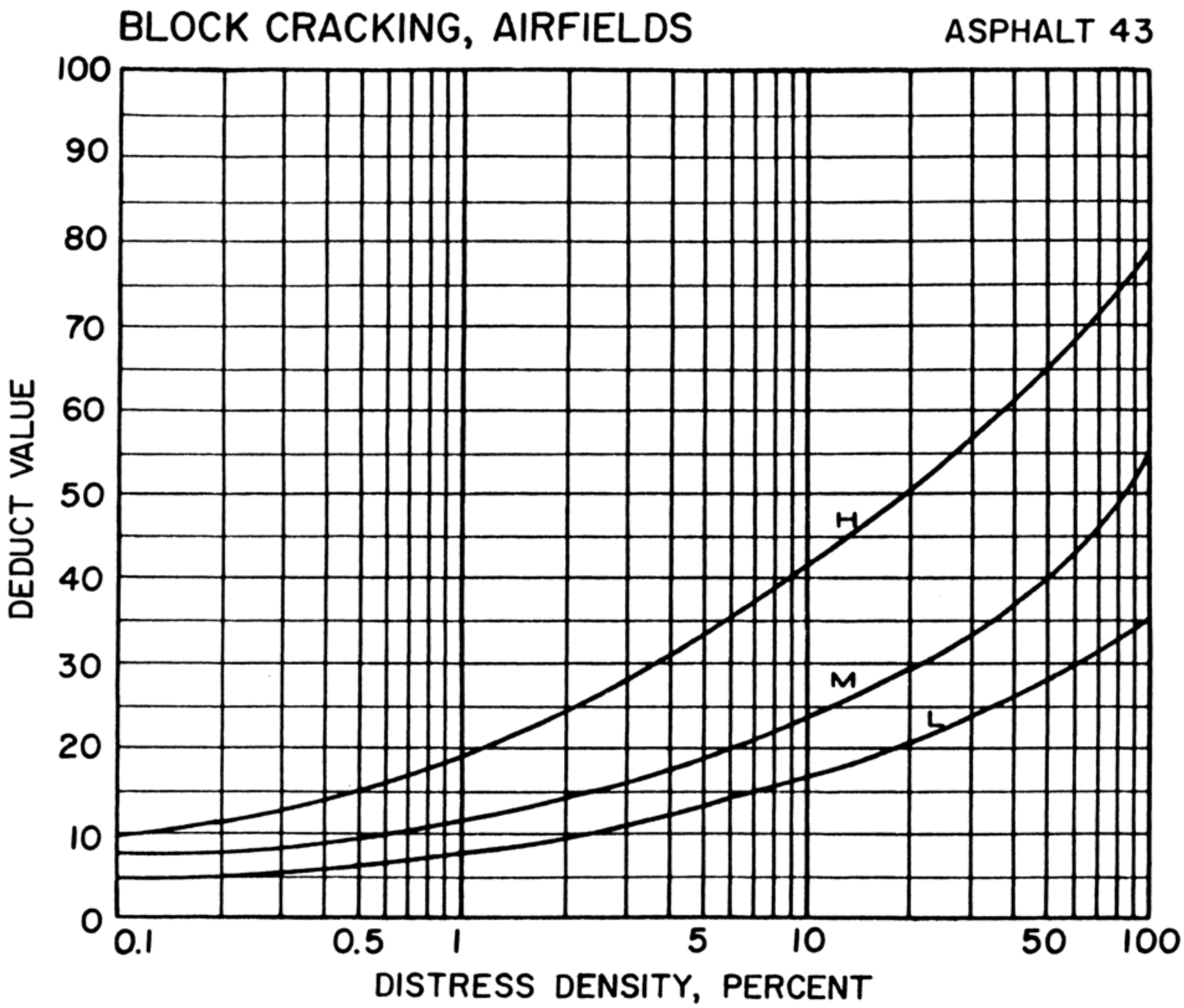

Figure C-3. Block Cracking, Airfields – Asphalt 43

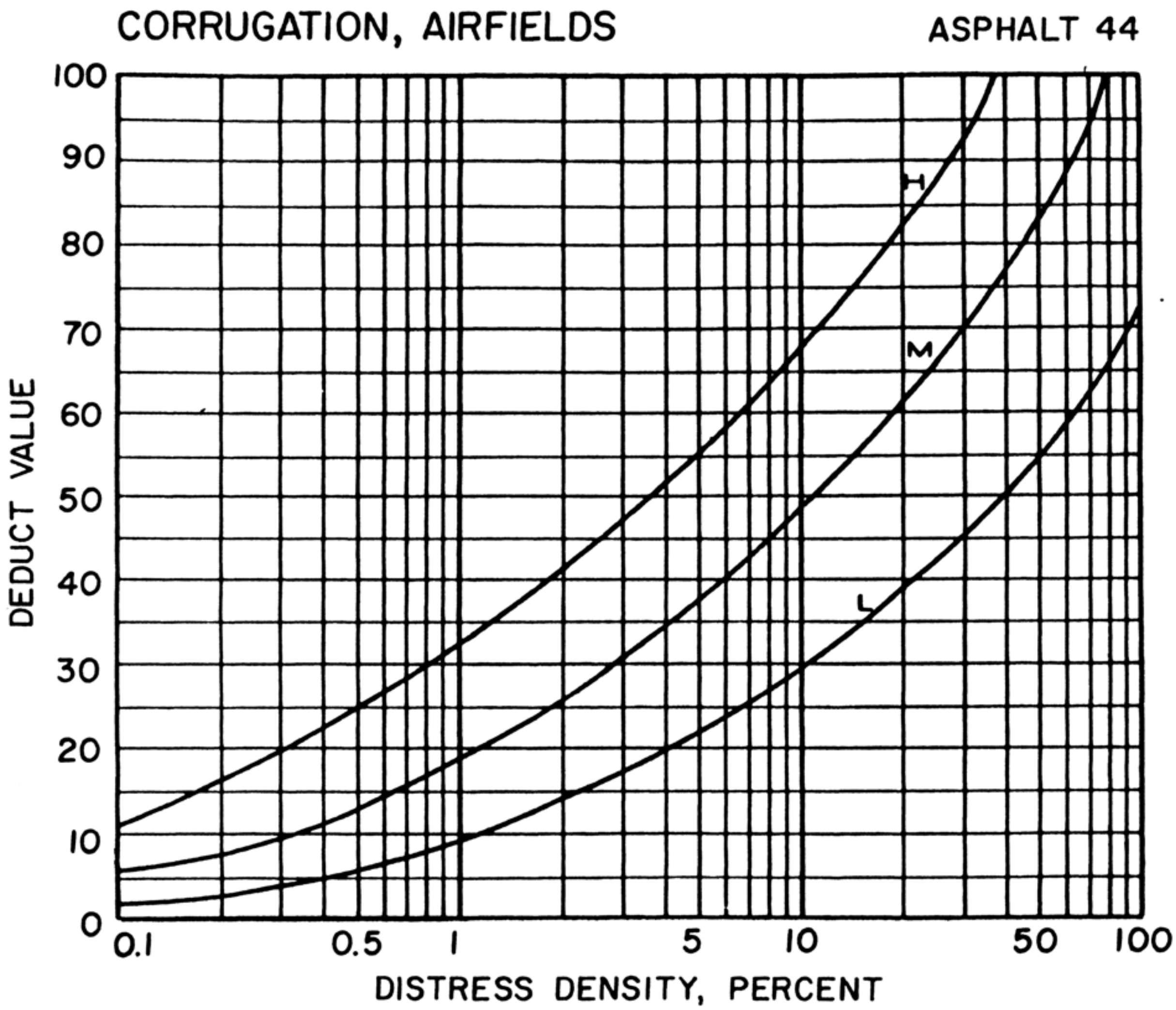

Figure C-4. Corrugation, Airfields – Asphalt 44

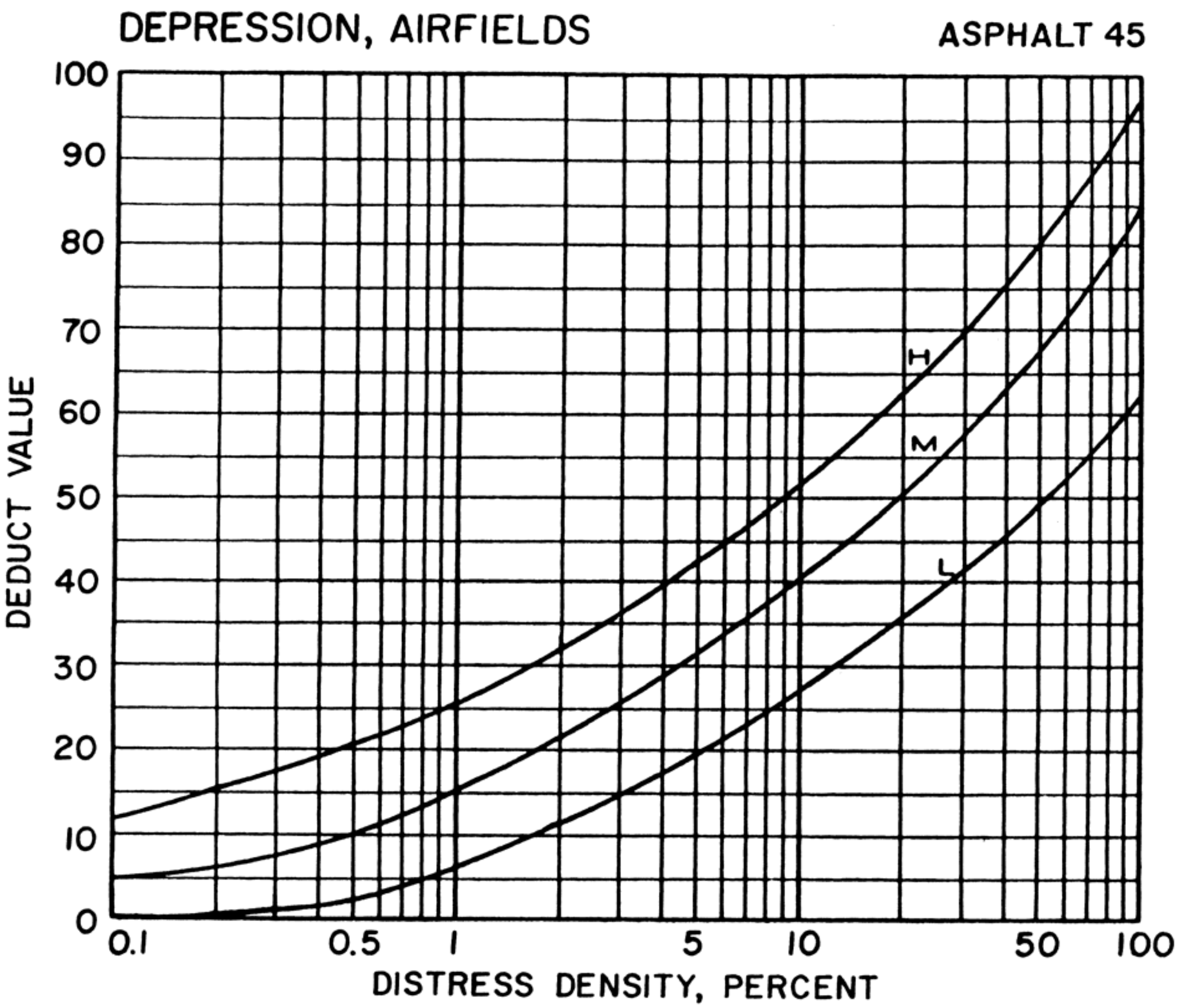

Figure C-5. Depression, Airfields – Asphalt 45

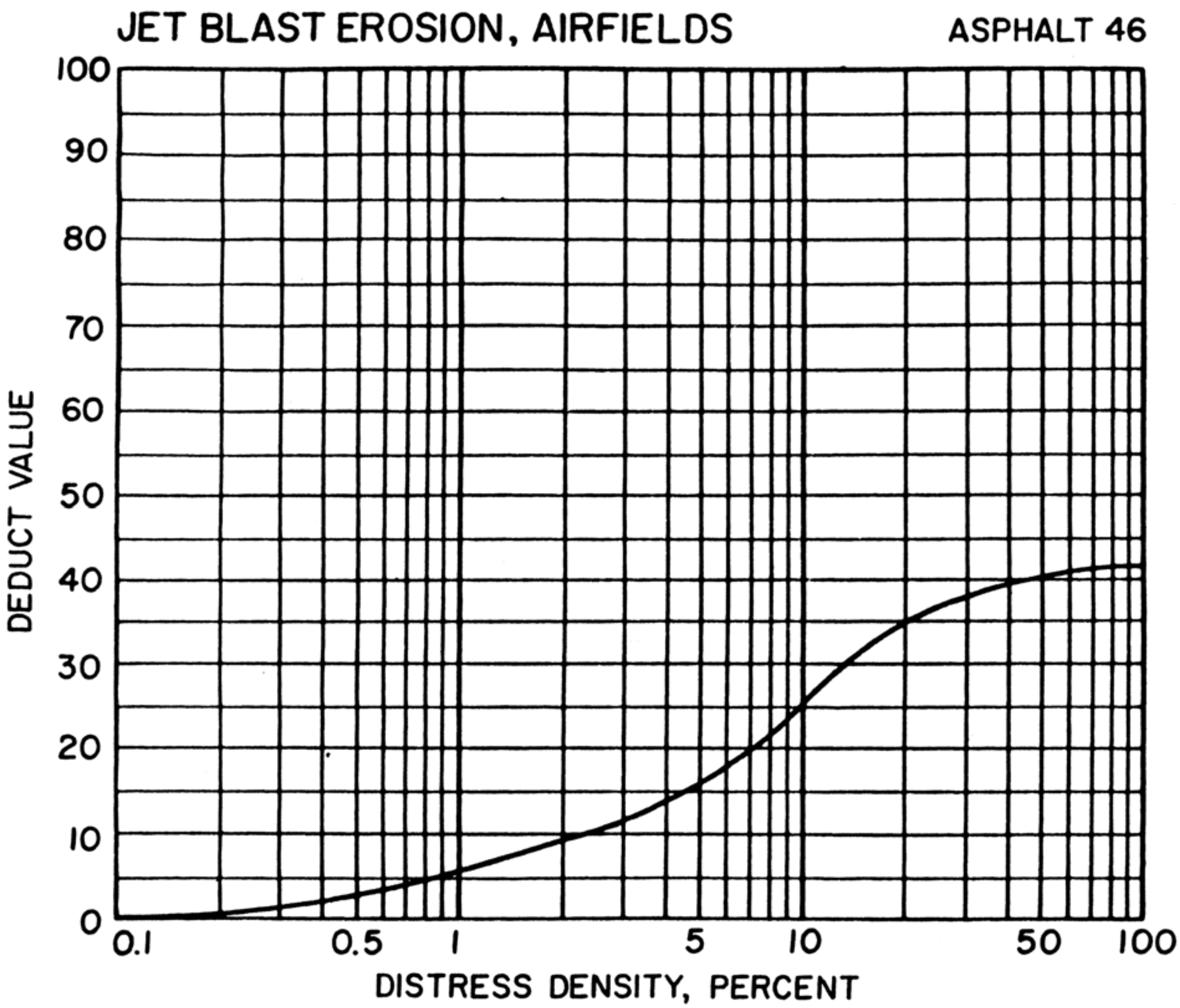

Figure C-6. Jet Blast Erosion, Airfields – Asphalt 46

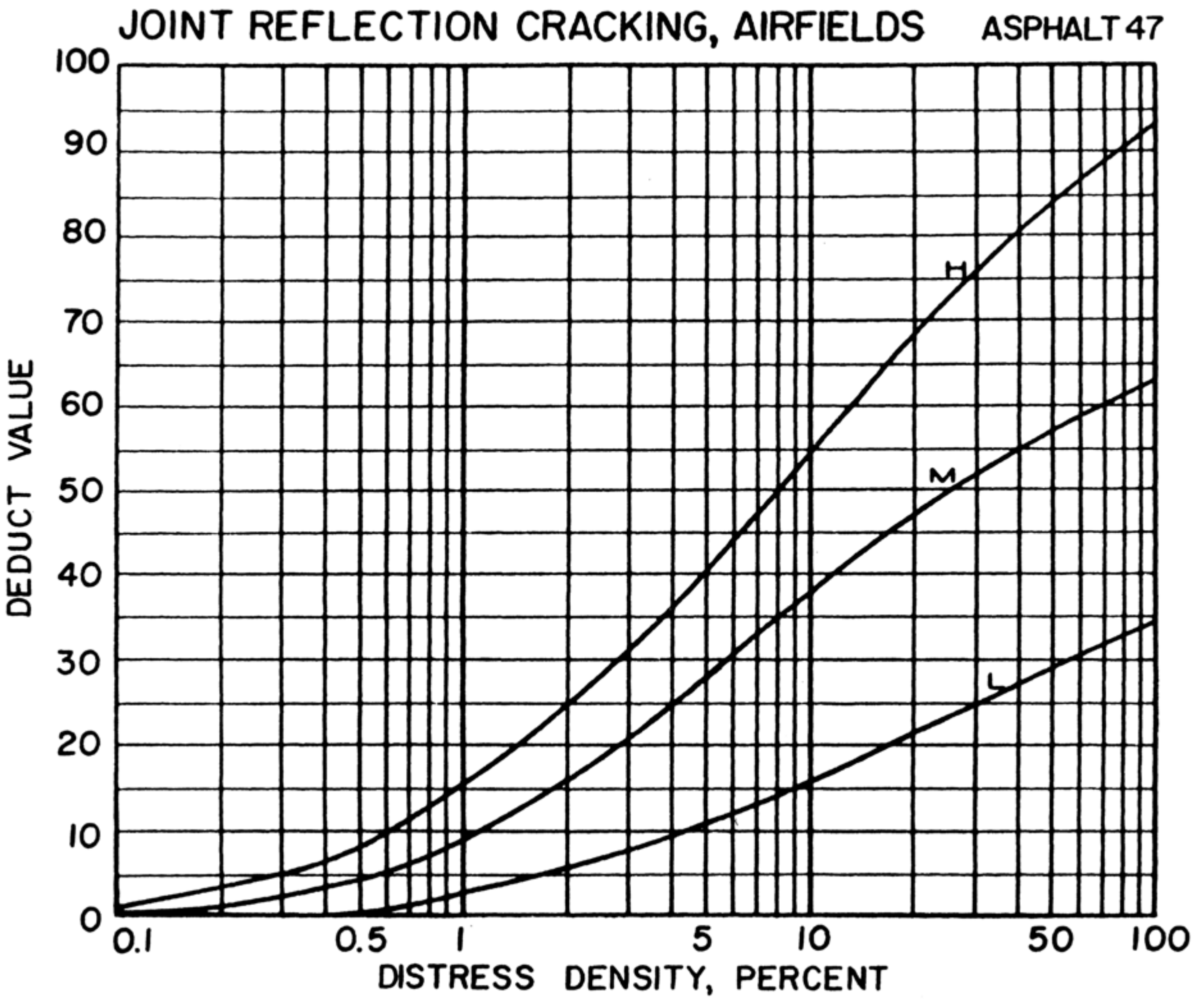

Figure C-7. Joint Reflection Cracking, Airfields – Asphalt 47

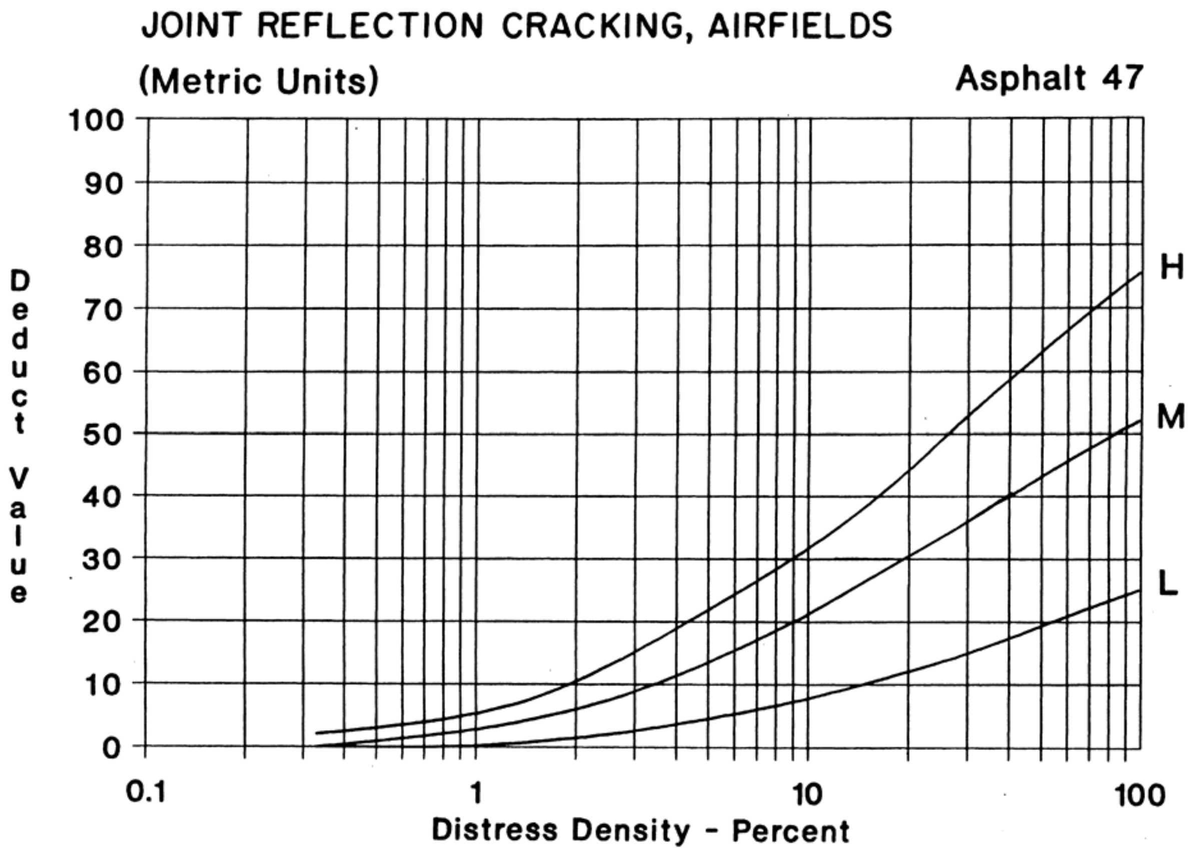

Figure C-8. Joint Reflection Cracking, Airfields (metric) – Asphalt 47

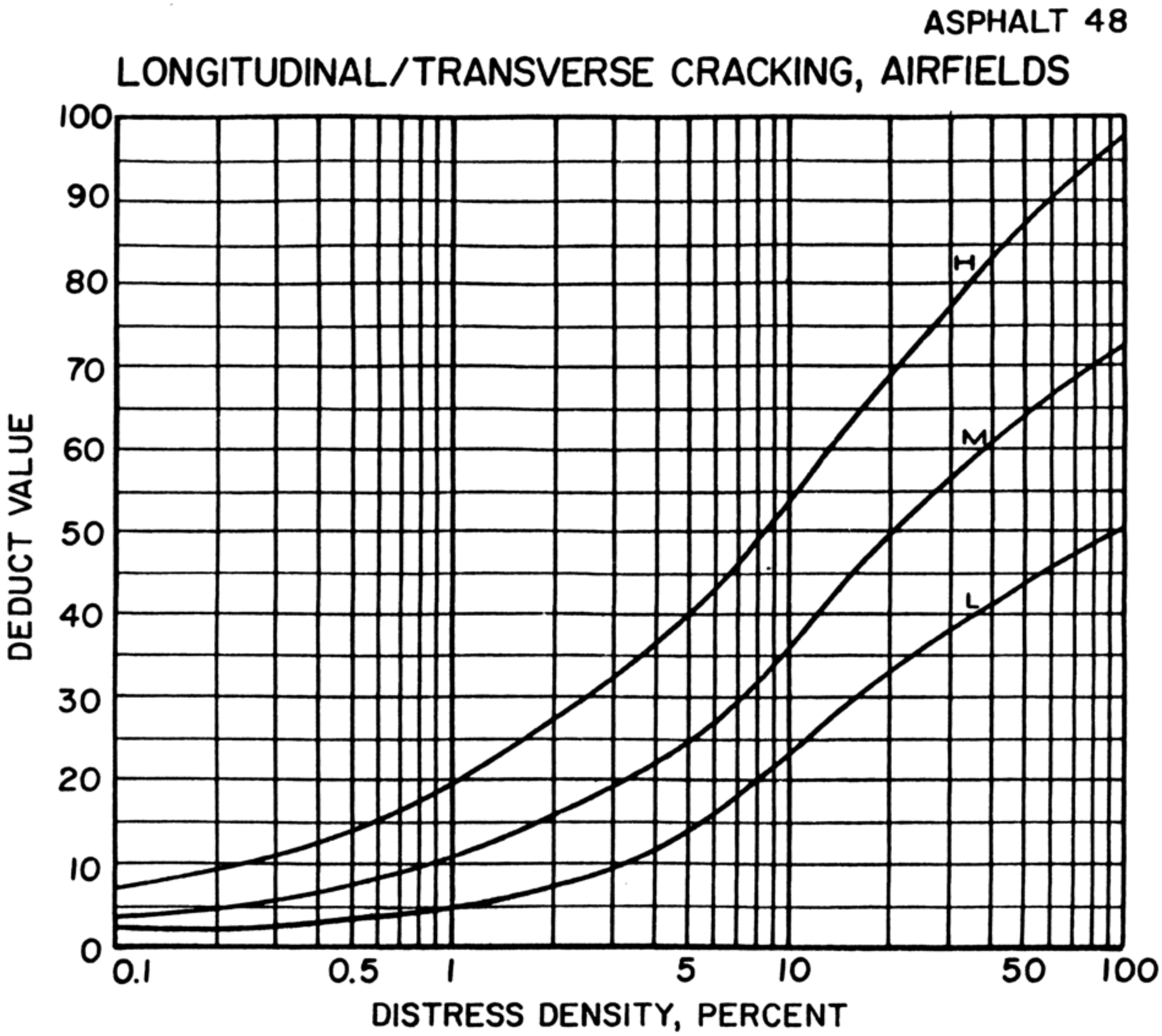

Figure C-9. Longitudinal/Transverse Cracking, Airfields – Asphalt 48

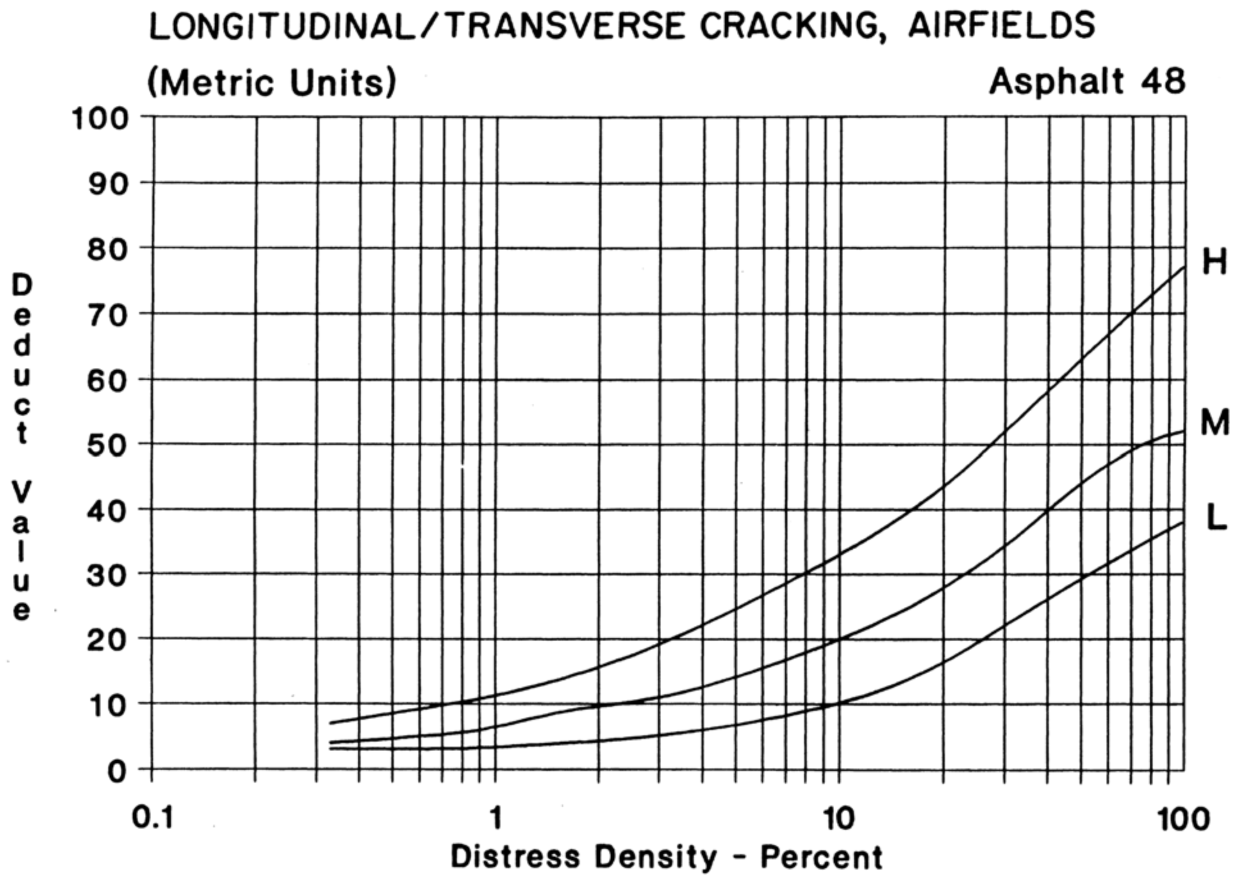

Figure C-10. Longitudinal/Transverse Cracking, Airfields(metric) – Asphalt 48

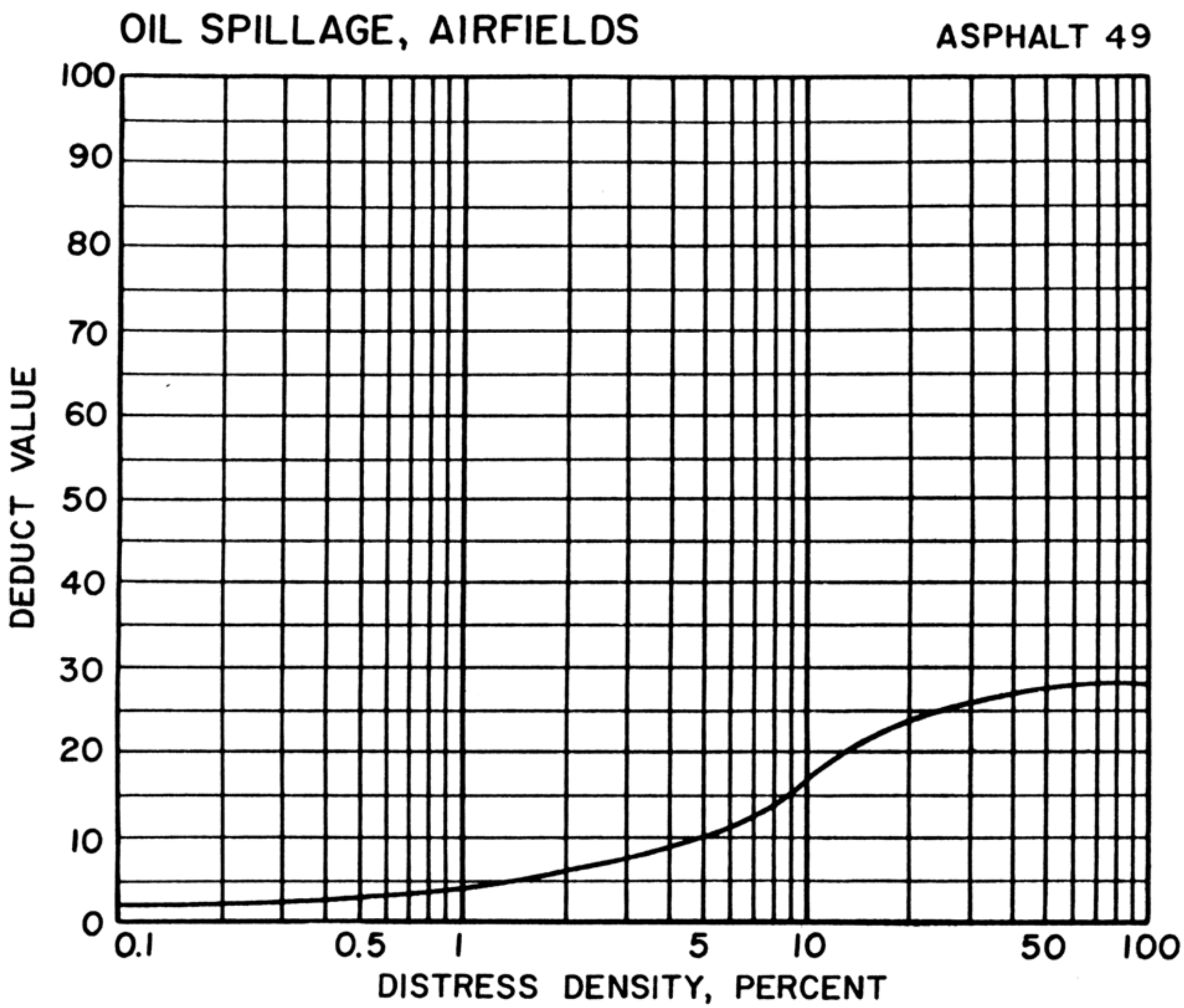

Figure C-11. Oil Spillage, Airfields – Asphalt 49

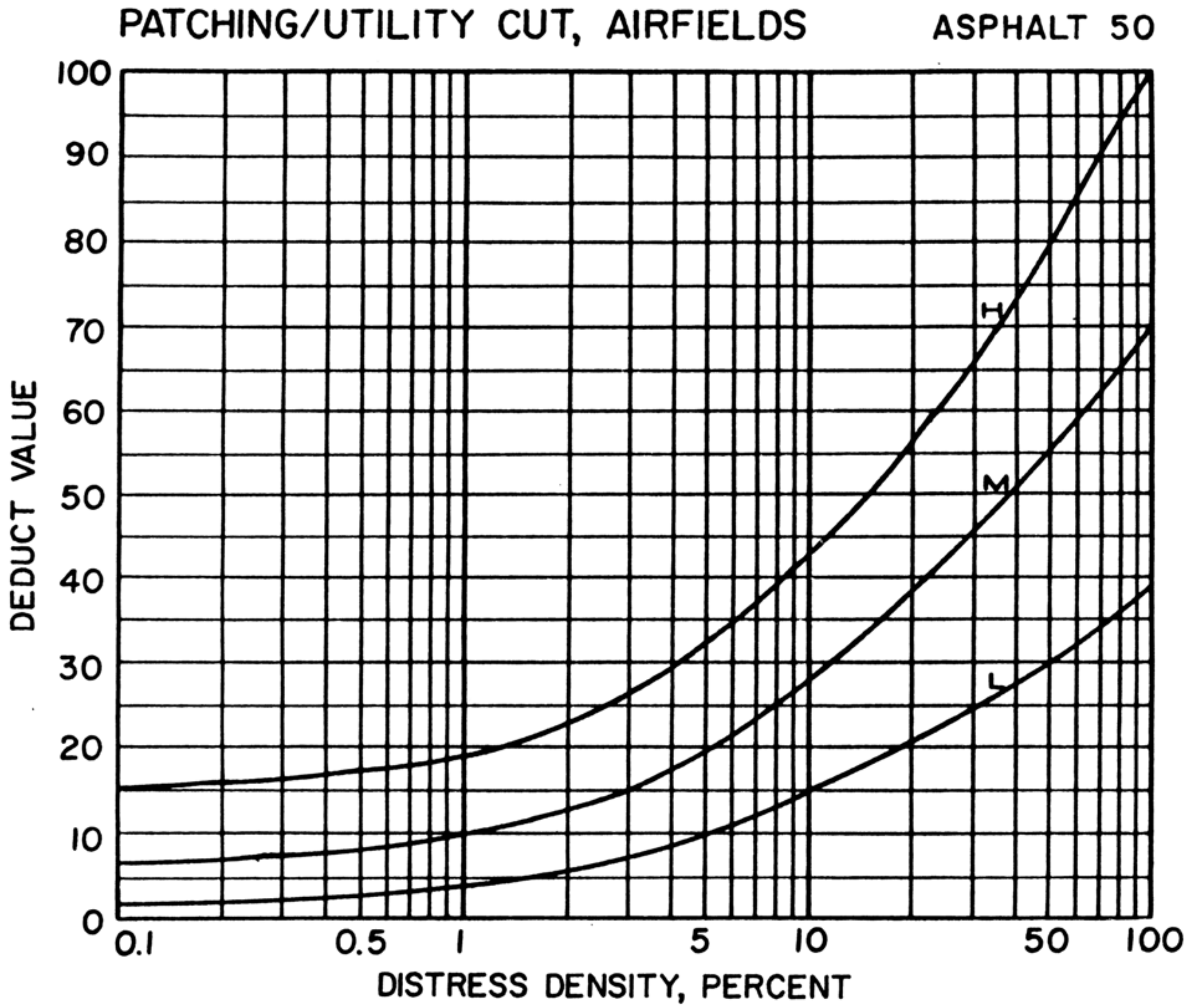

Figure C-12. Patching/Utility, Airfields – Asphalt 50

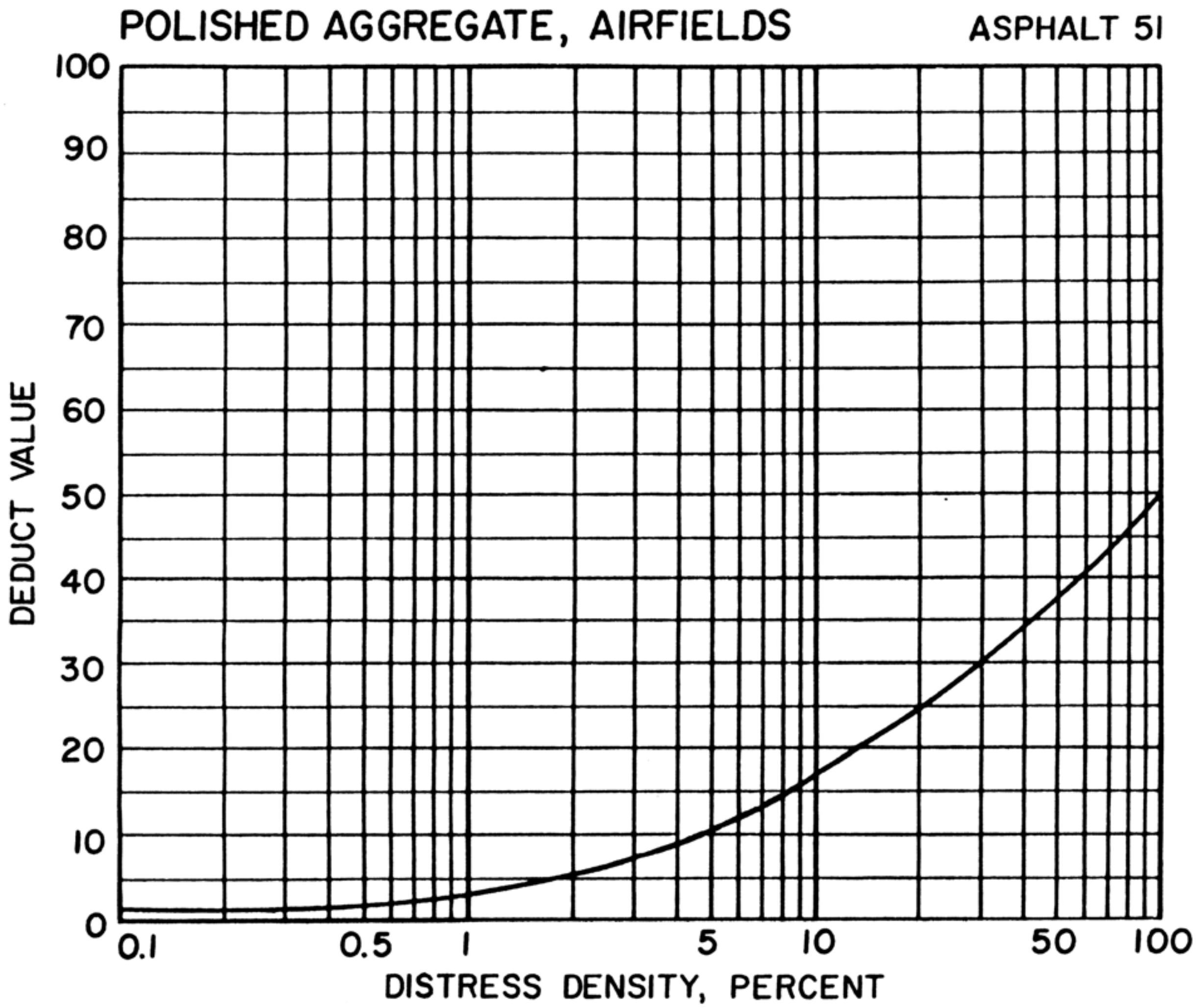

Figure C-13. Polished Aggregate, Airfields – Asphalt 51

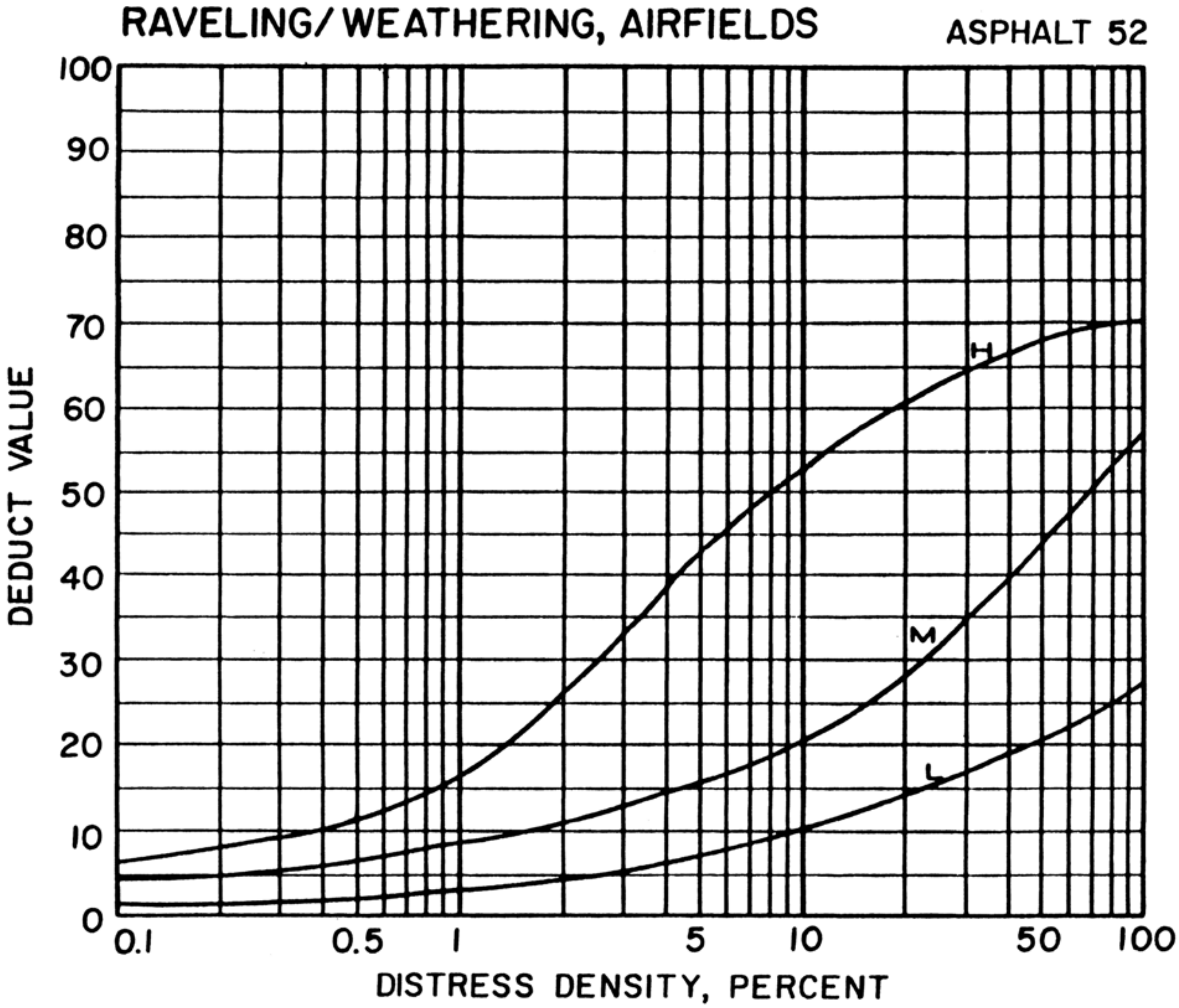

Figure C-14. Raveling/Weathering, Airfields – Asphalt 52

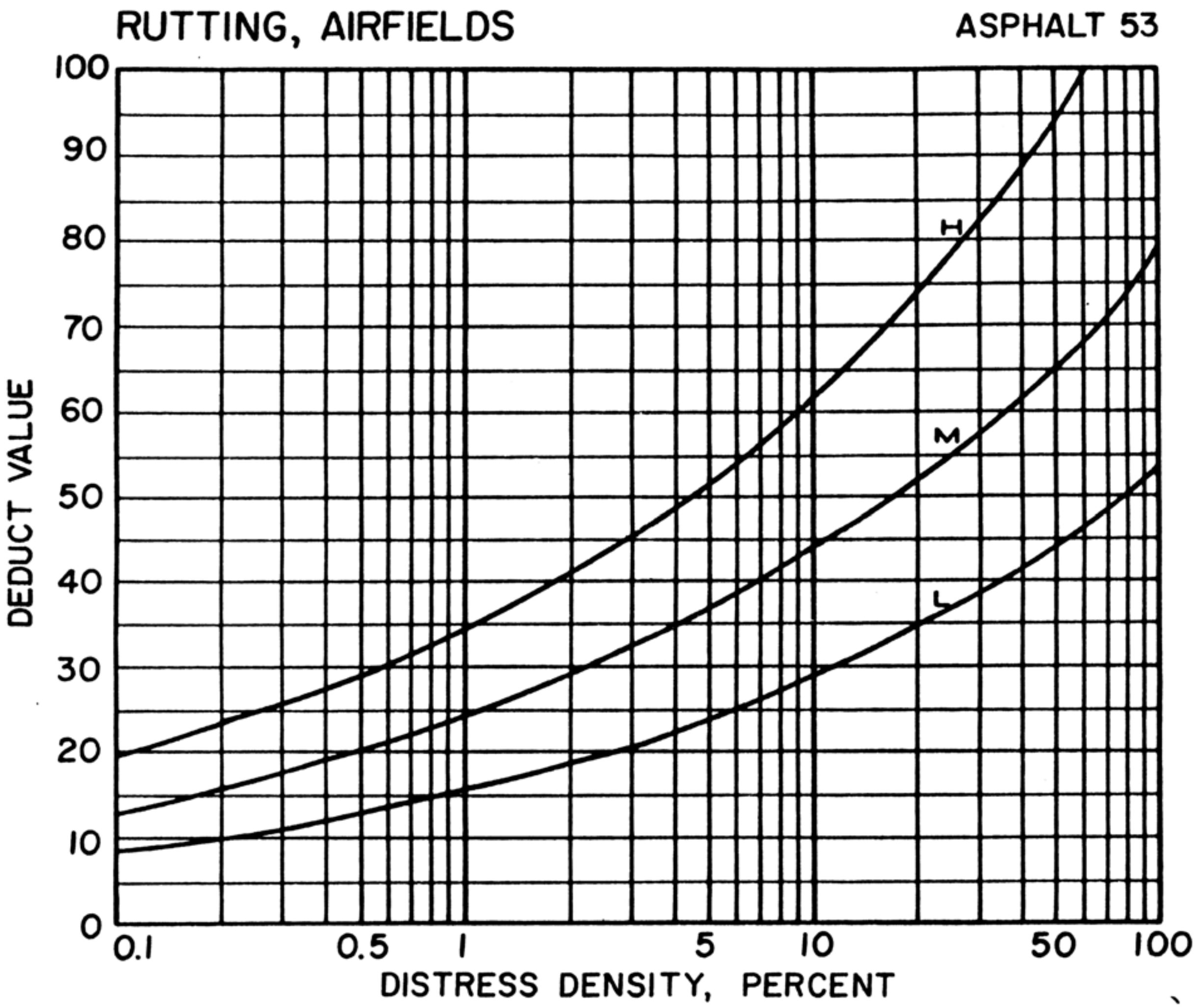

Figure C-15. Rutting, Airfields – Asphalt 53

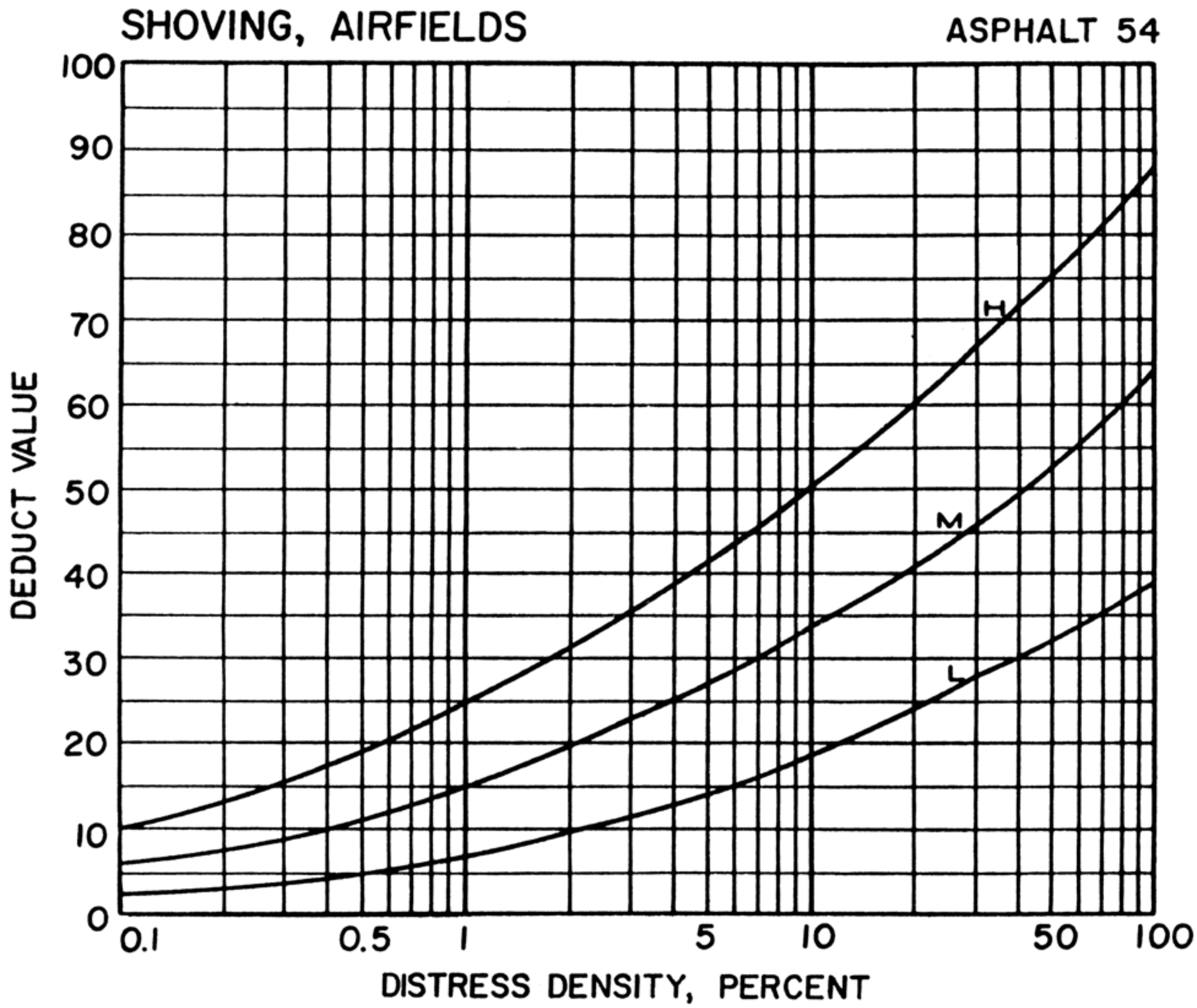

Figure C-16. Shoving, Airfields – Asphalt 54

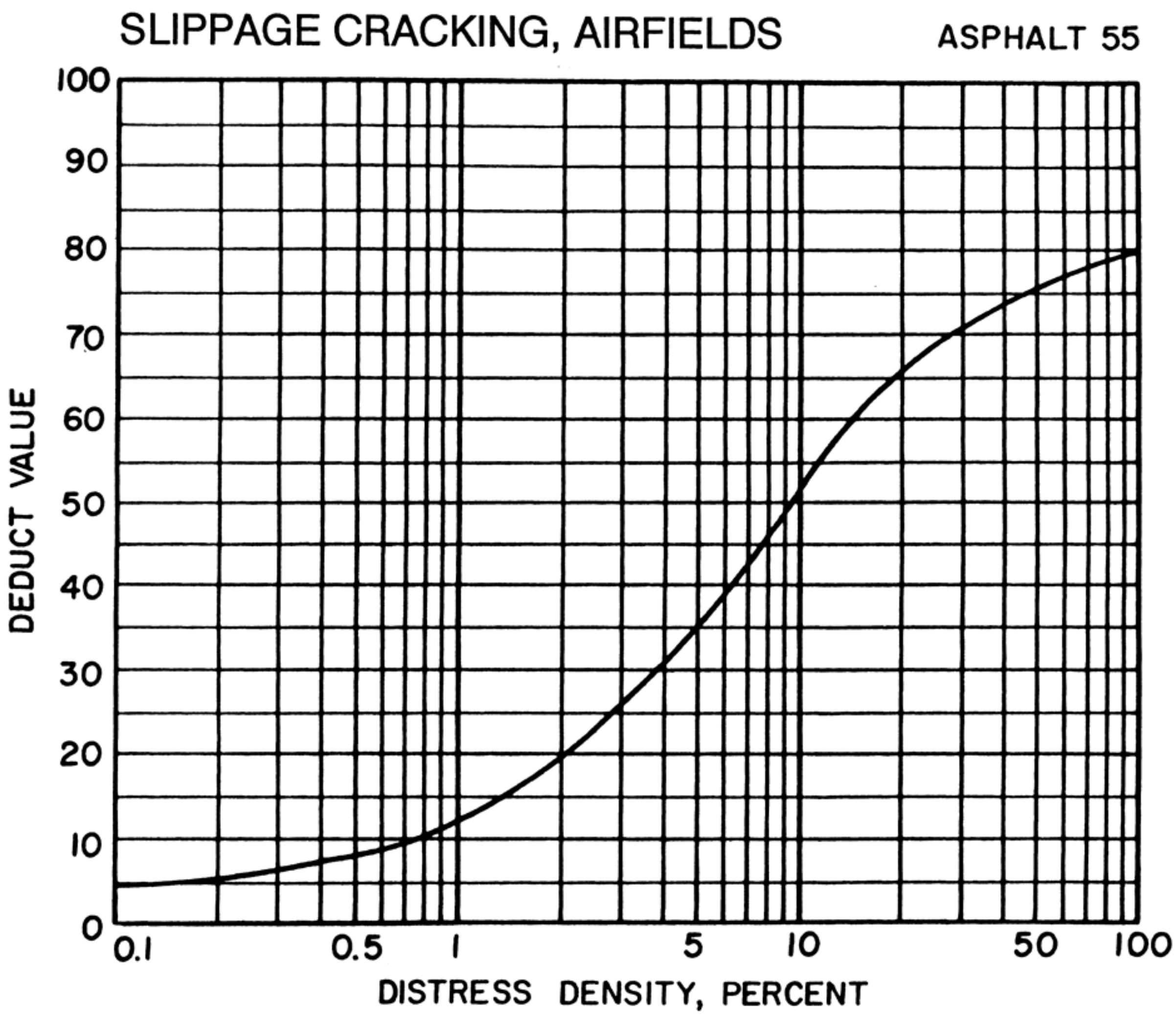

Figure C-17. Slipping Cracking, Airfields – Asphalt 55

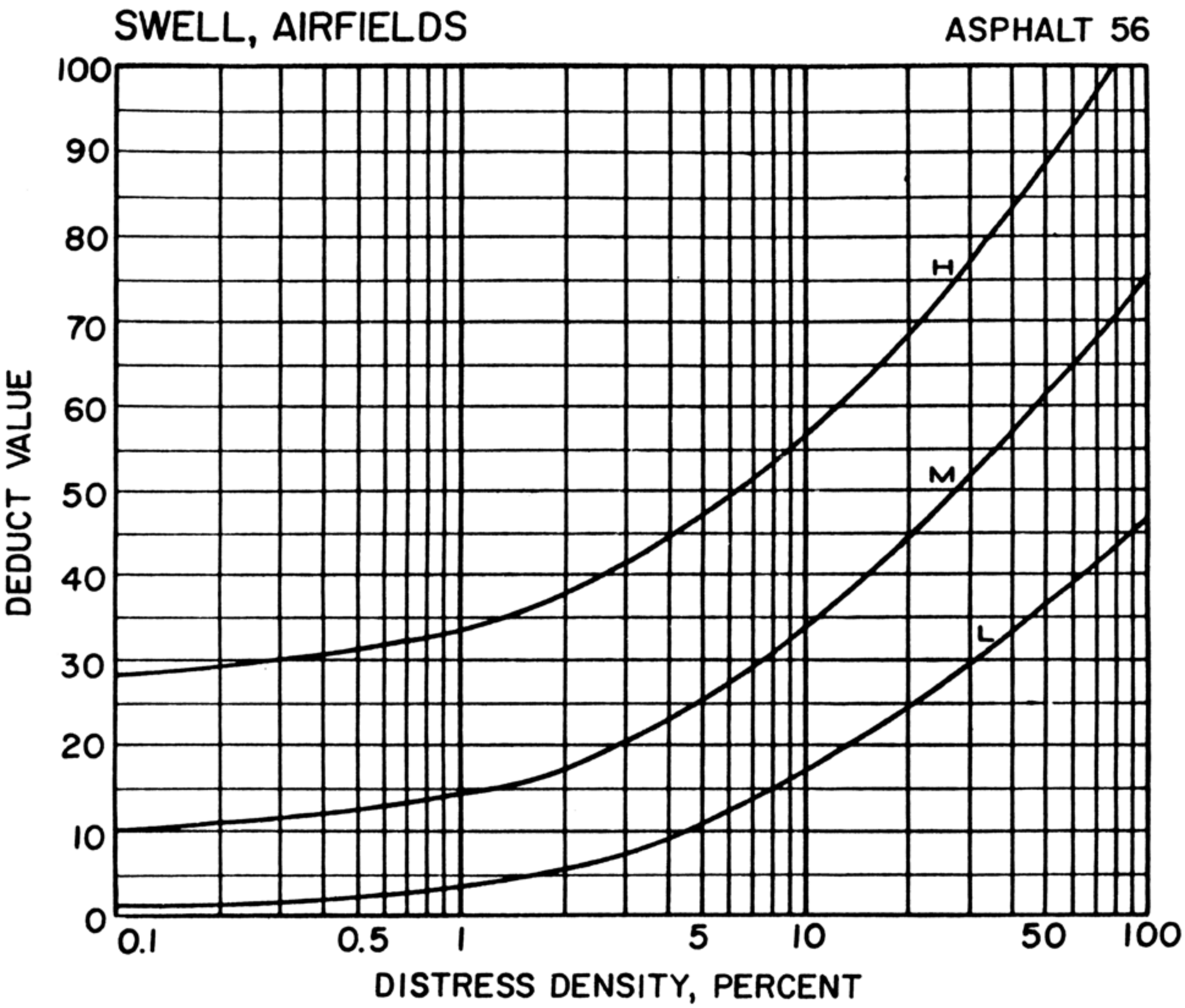

Figure C-18. Swell, Airfields – Asphalt 56

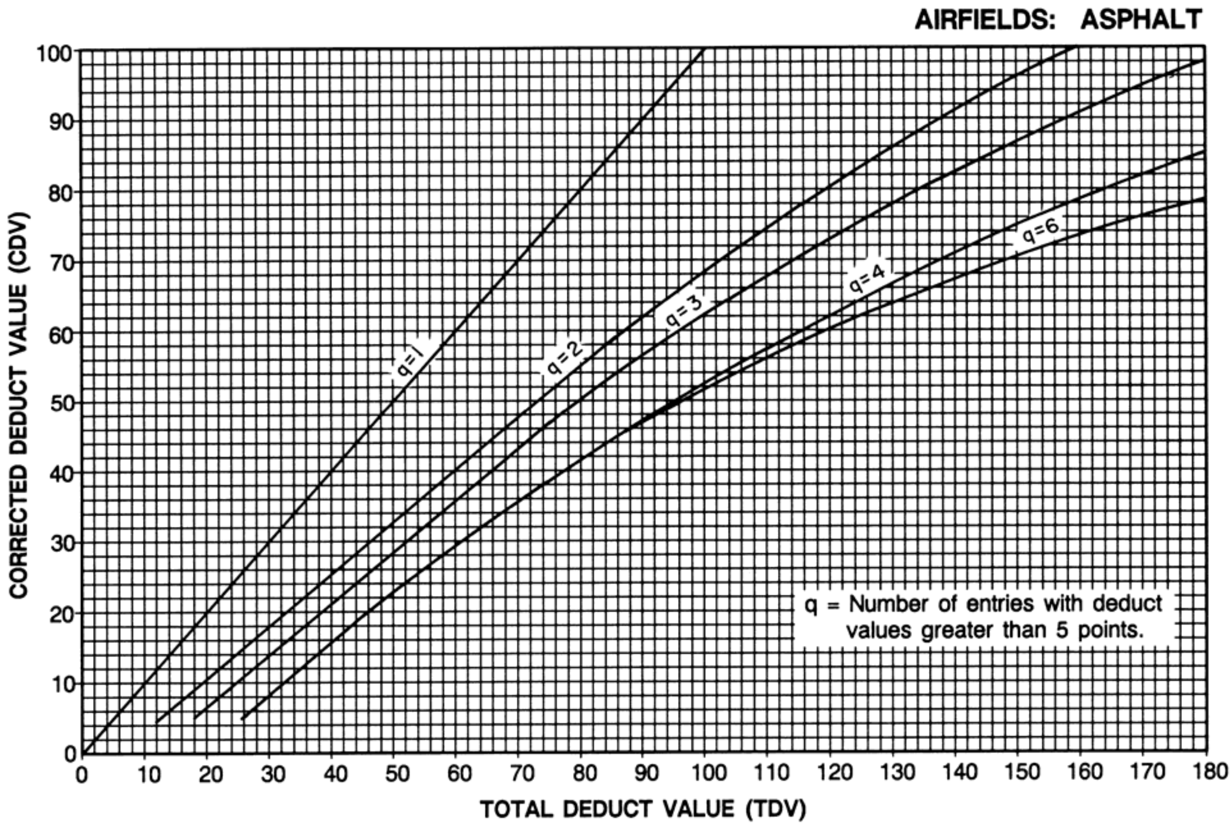

Figure C-19. Airfields: Asphalt

Annex D

PCC Pavement Deduct Curves

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Figure D-6 - Small Patch, Aifields - Concrete 66	D - 8
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Figure D-8 - Popouts, Airfields - Concrete 68	D - 10
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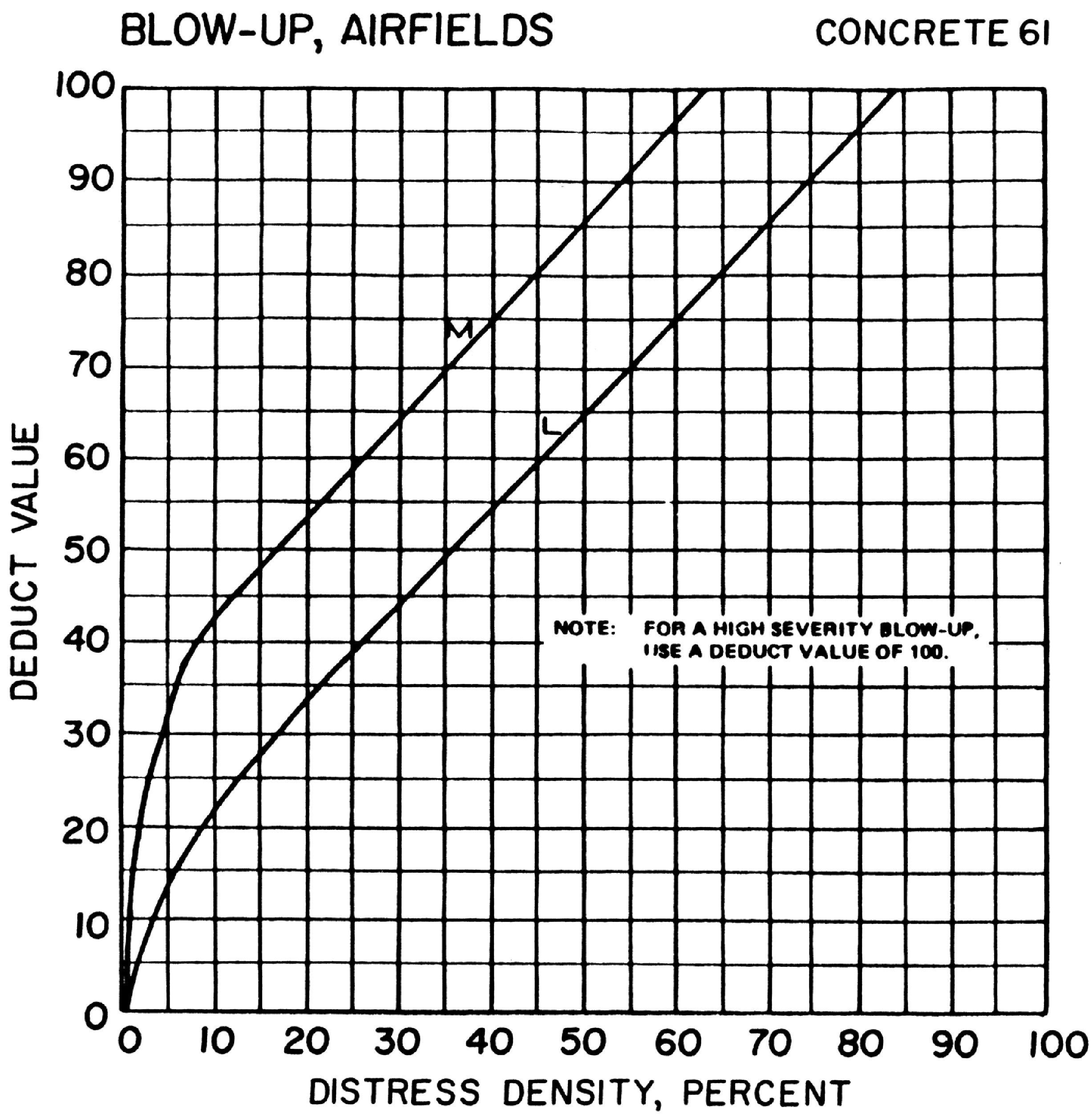

Figure D-1. Blow-up, Airfields – Concrete 61

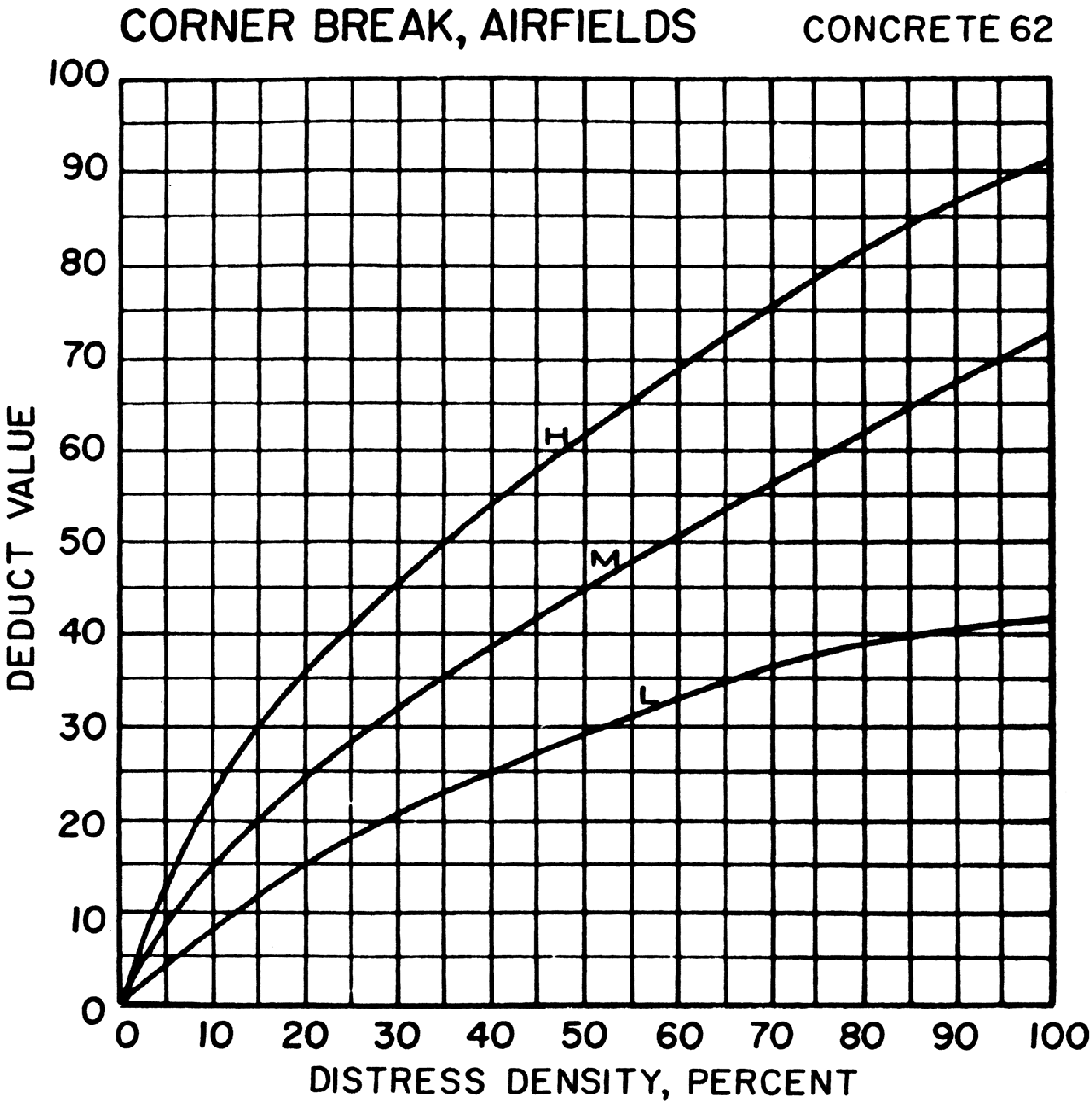

Figure D-2. Corner Break, Airfields – Concrete 62

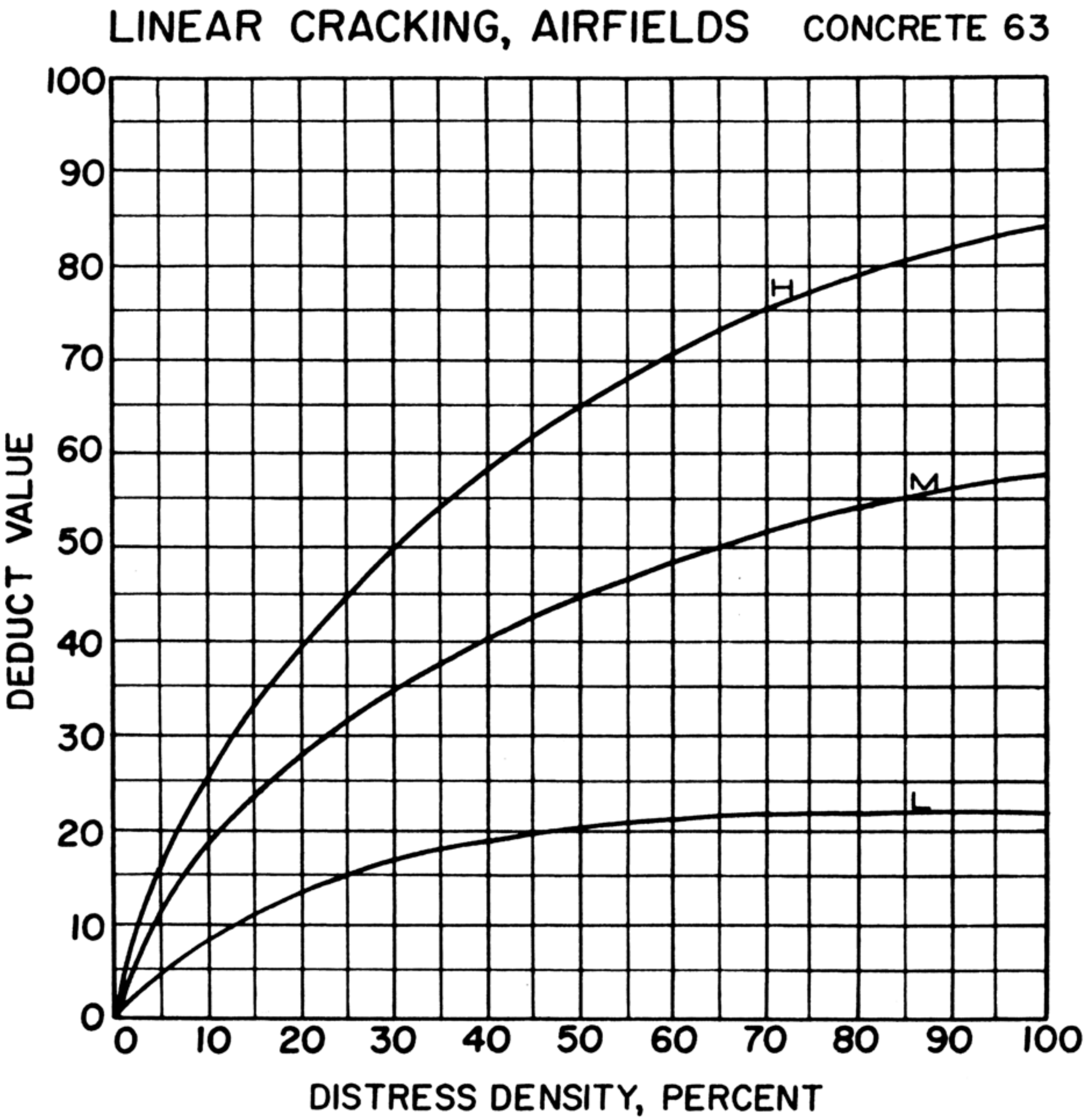

Figure D-3. Linear Cracking, Airfields – Concrete 63

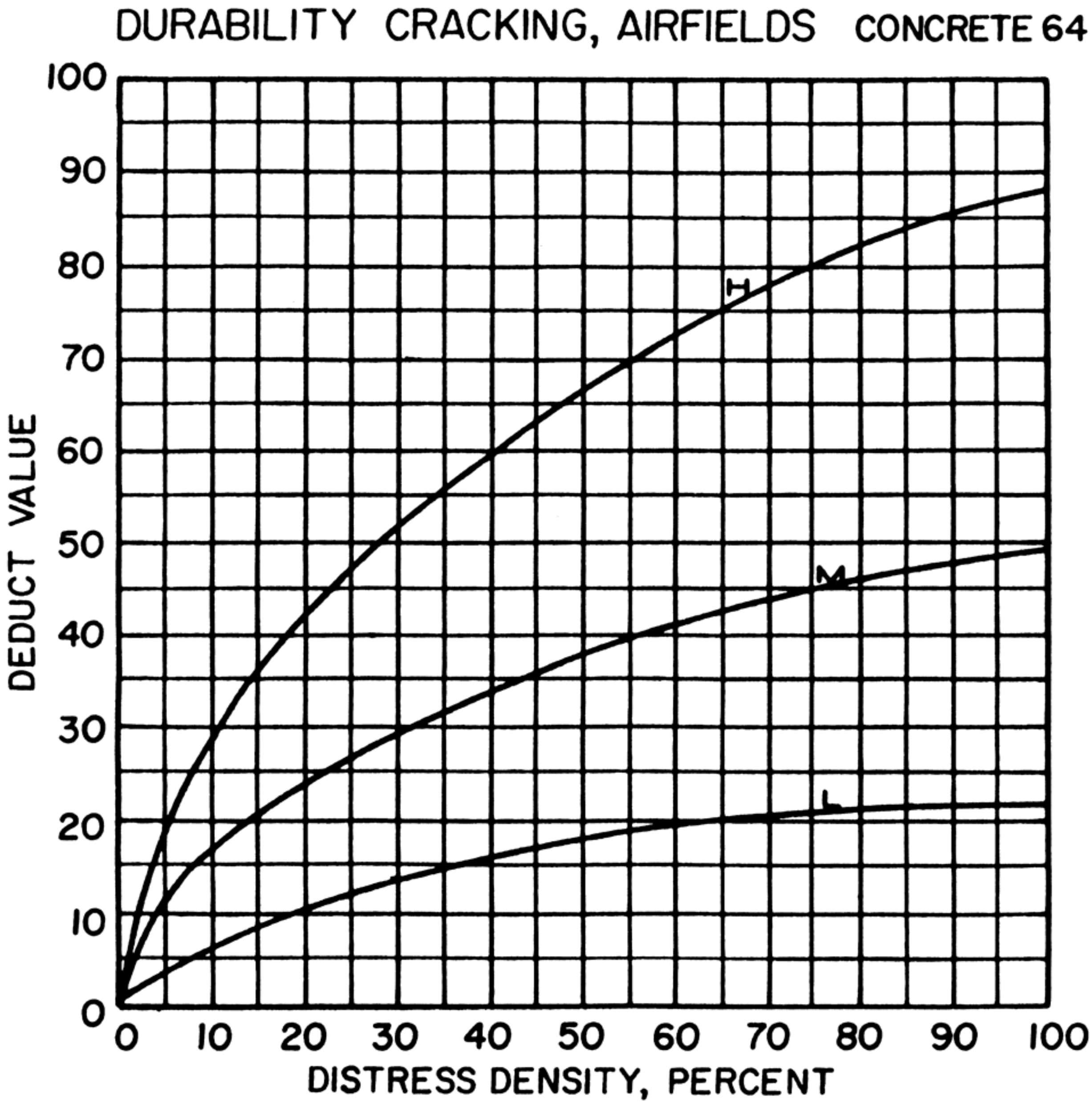

Figure D-4. Durability Cracking, Airfields – Concrete 64

JOINT SEAL DAMAGE **CONCRETE 65**

Joint seal damage is not rated by density. The severity of the distress is determined by the sealant's overall condition for a particular section.

The deduct values for the three levels of severity are as follows:

1. High Severity - 12 Points
2. Medium Severity - 7 Points
3. Low Severity - 2 Points

Figure D-5. Joint Seal Damage – Concrete 65

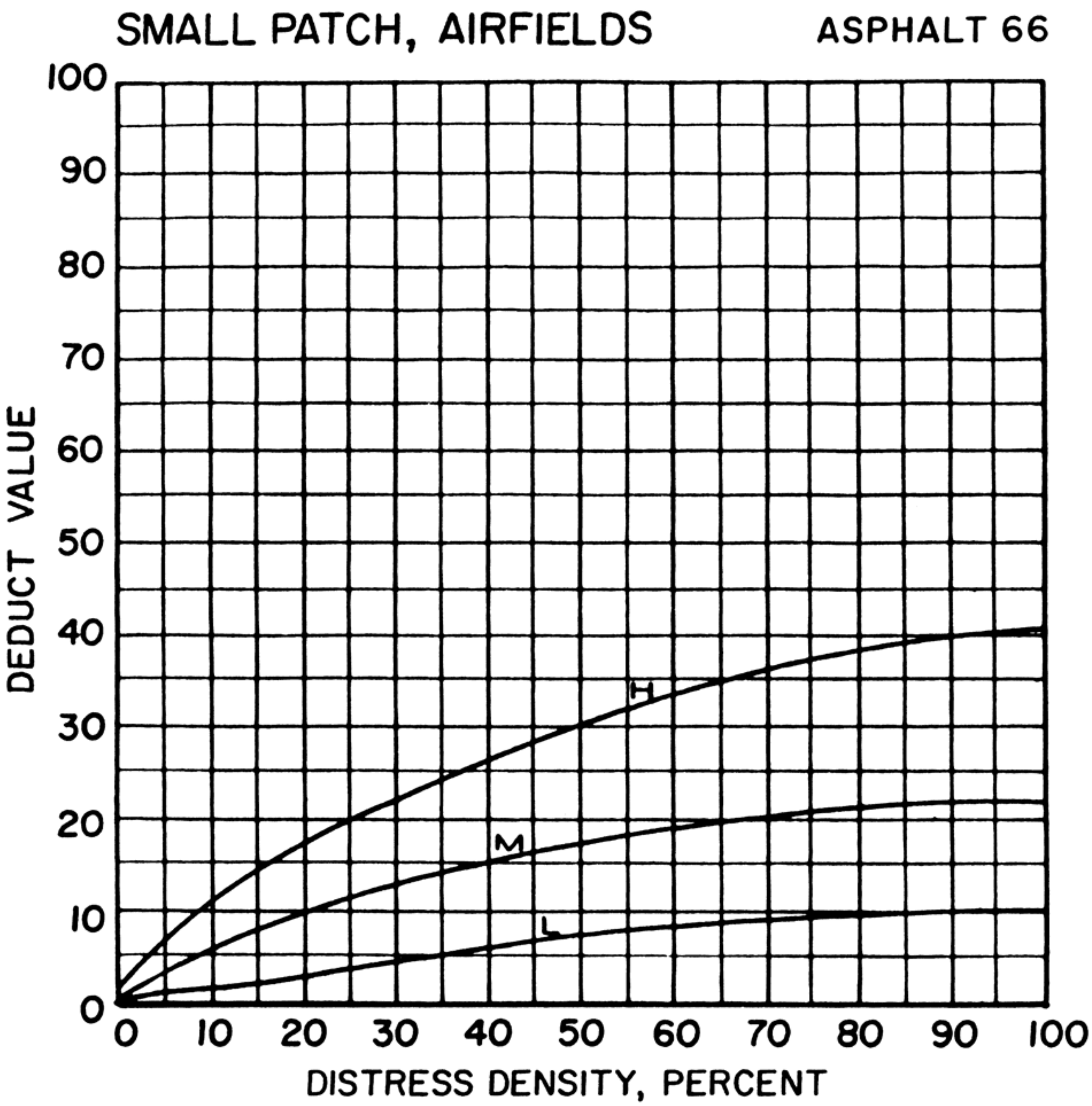

Figure D-6. Small Patch, Airfields – Concrete 66

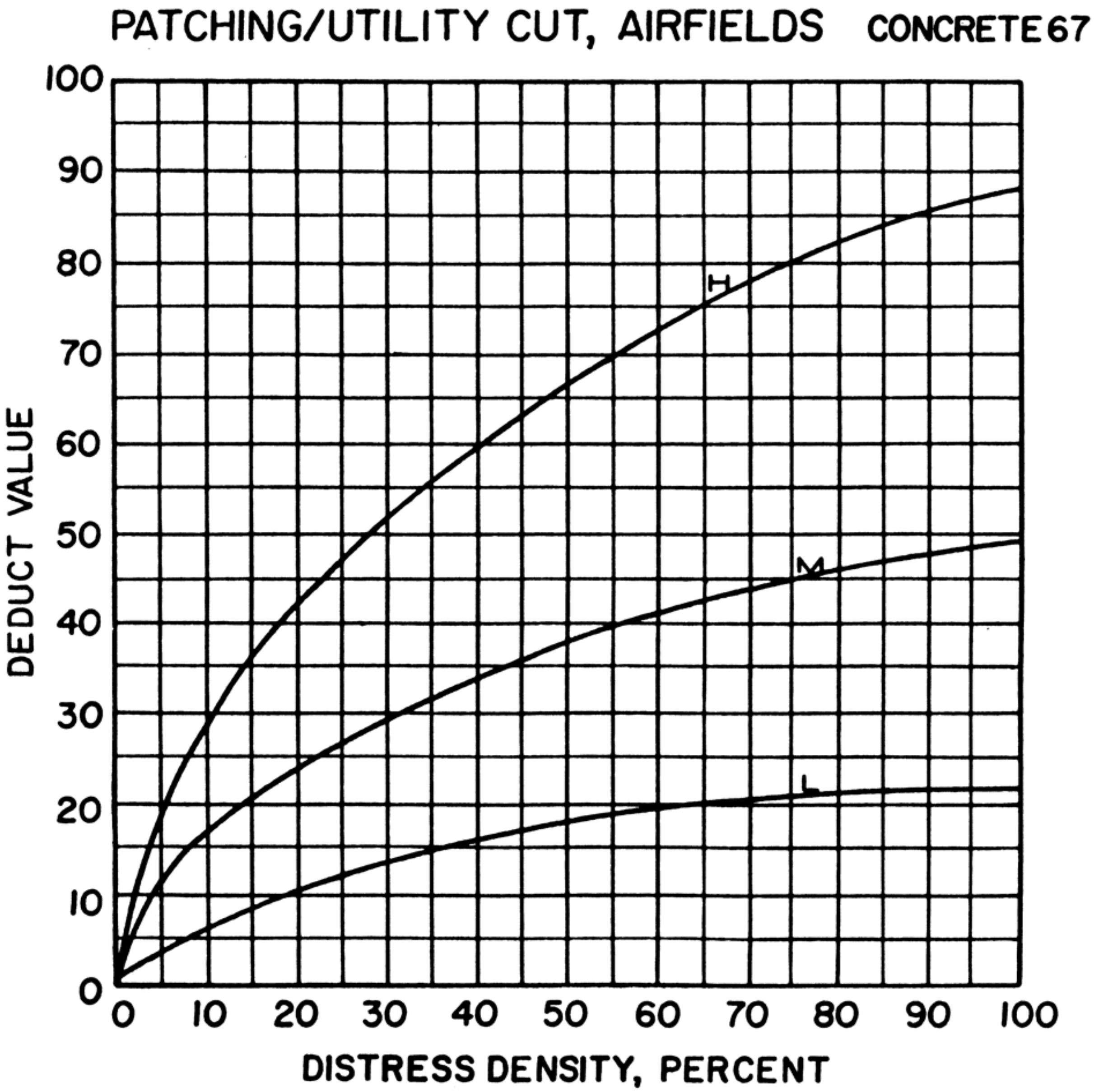

Figure D-7. Patching/Utility Cut, Airfields – Concrete 67

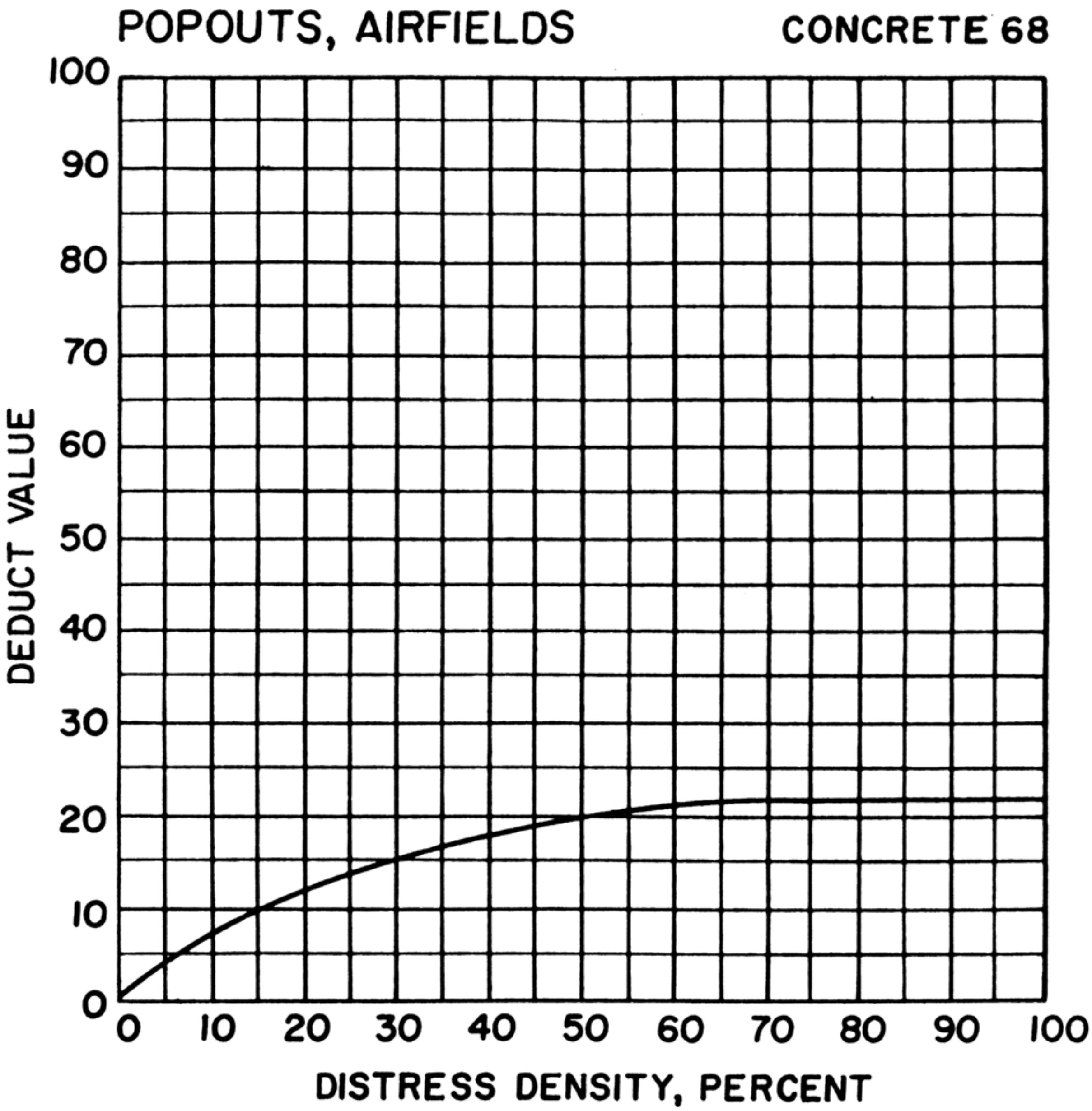

Figure D-8. Popouts, Airfields – Concrete 68

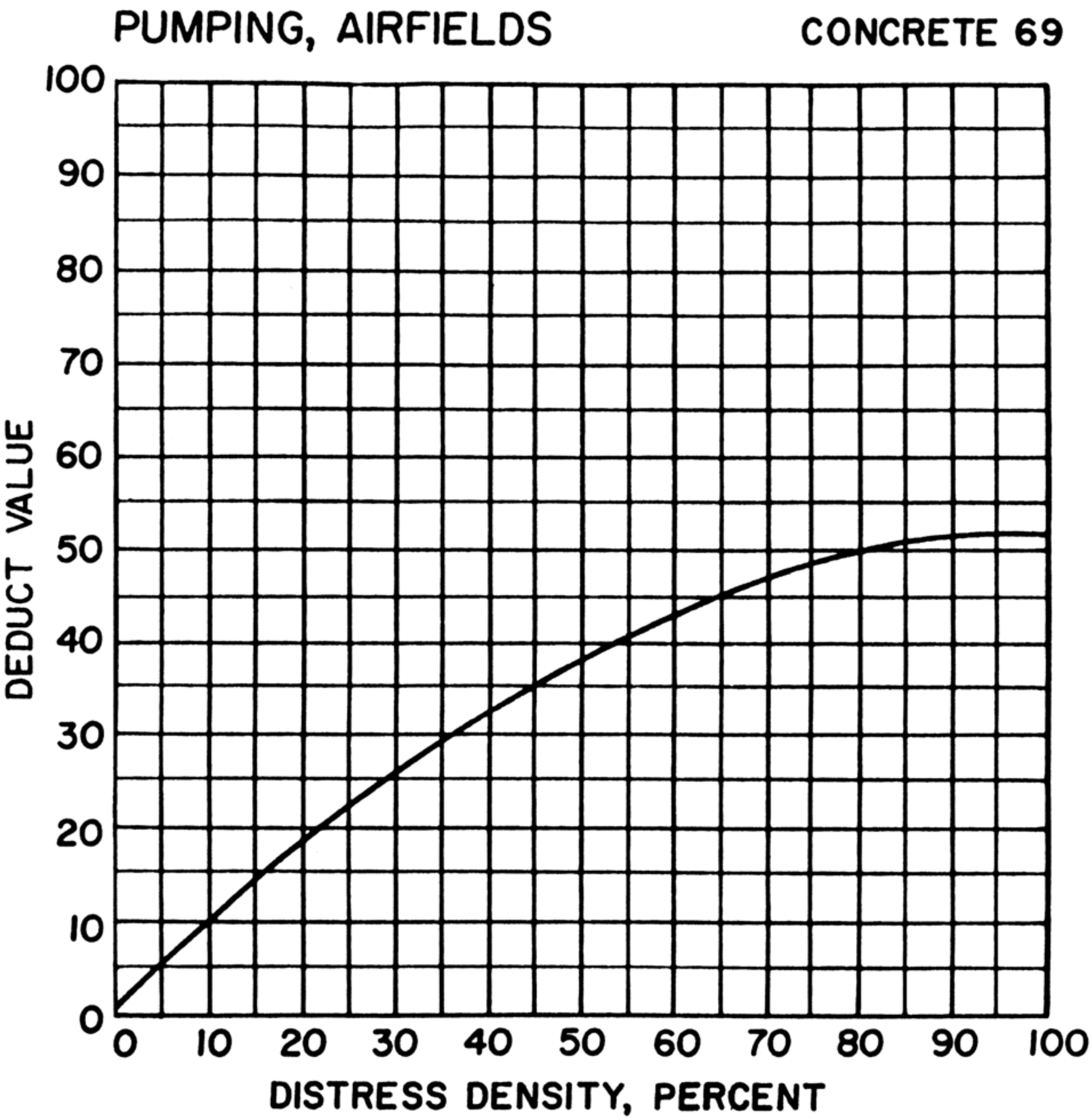

Figure D-9. Pumping, Airfields – Concrete 69

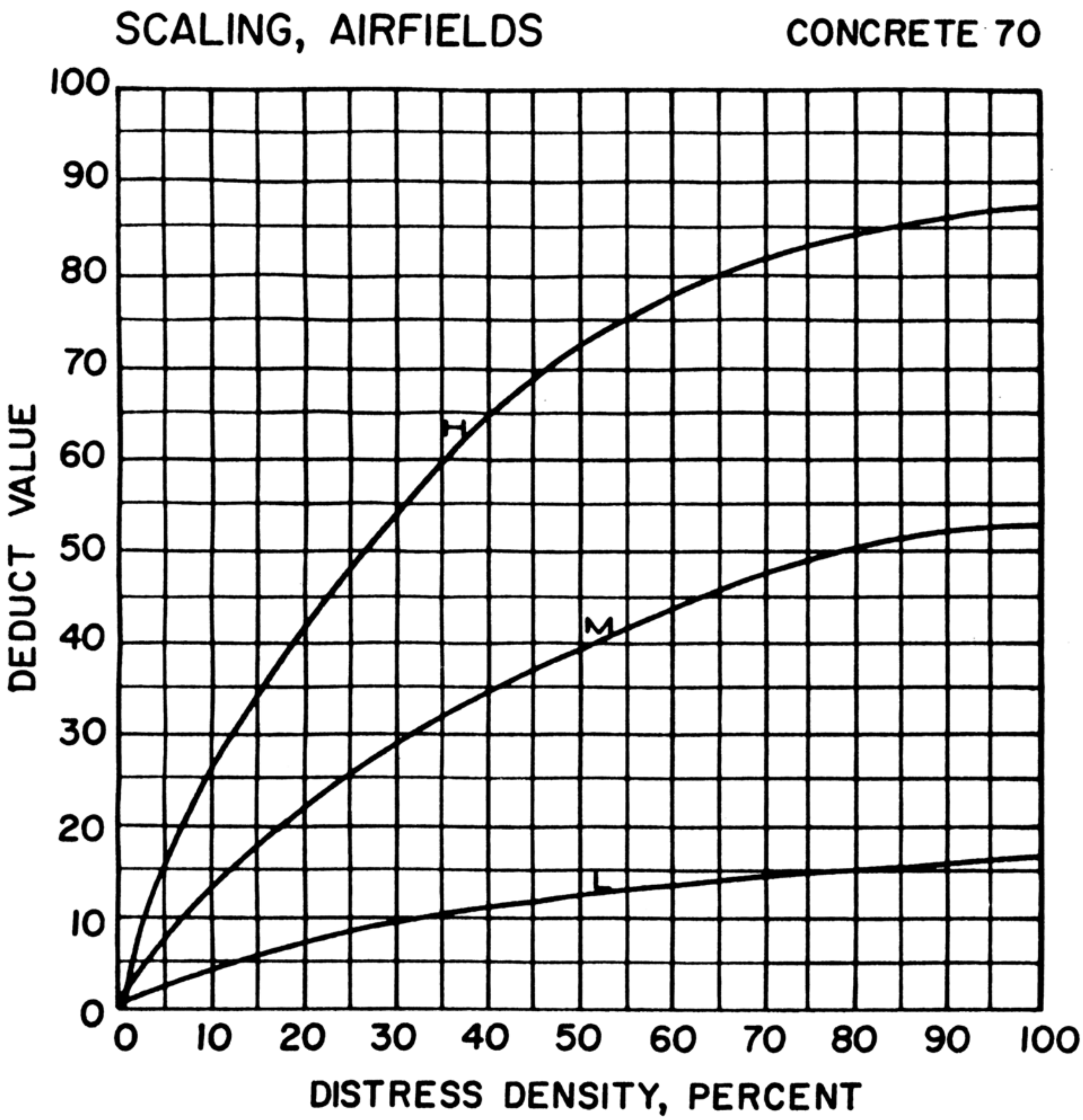

Figure D-10. Scaling, Airfields – Concrete 70

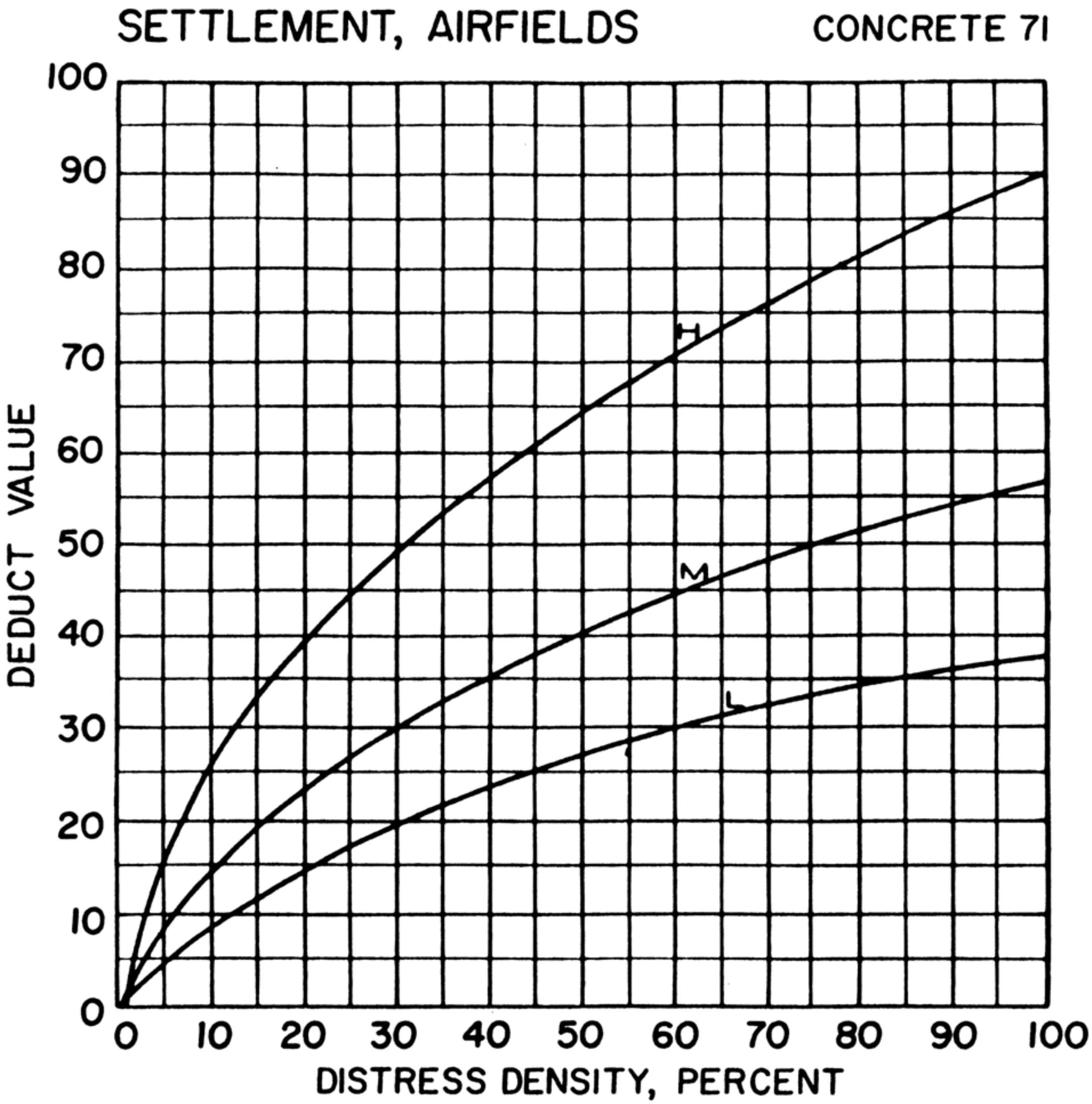

Figure D-11. Settlement, Airfields – Concrete 71

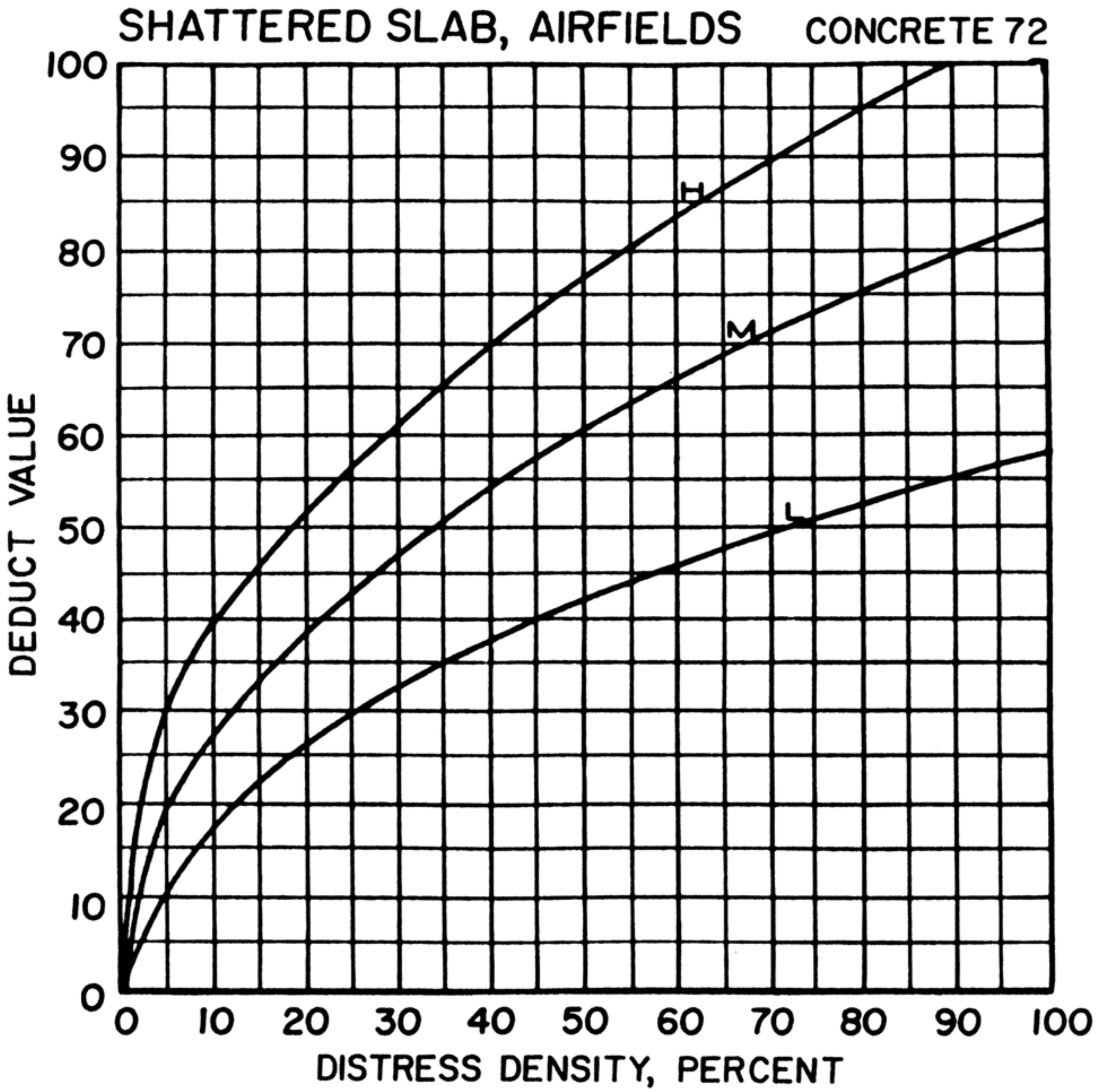

Figure D-12. Shattered Slab, Airfields – Concrete 72

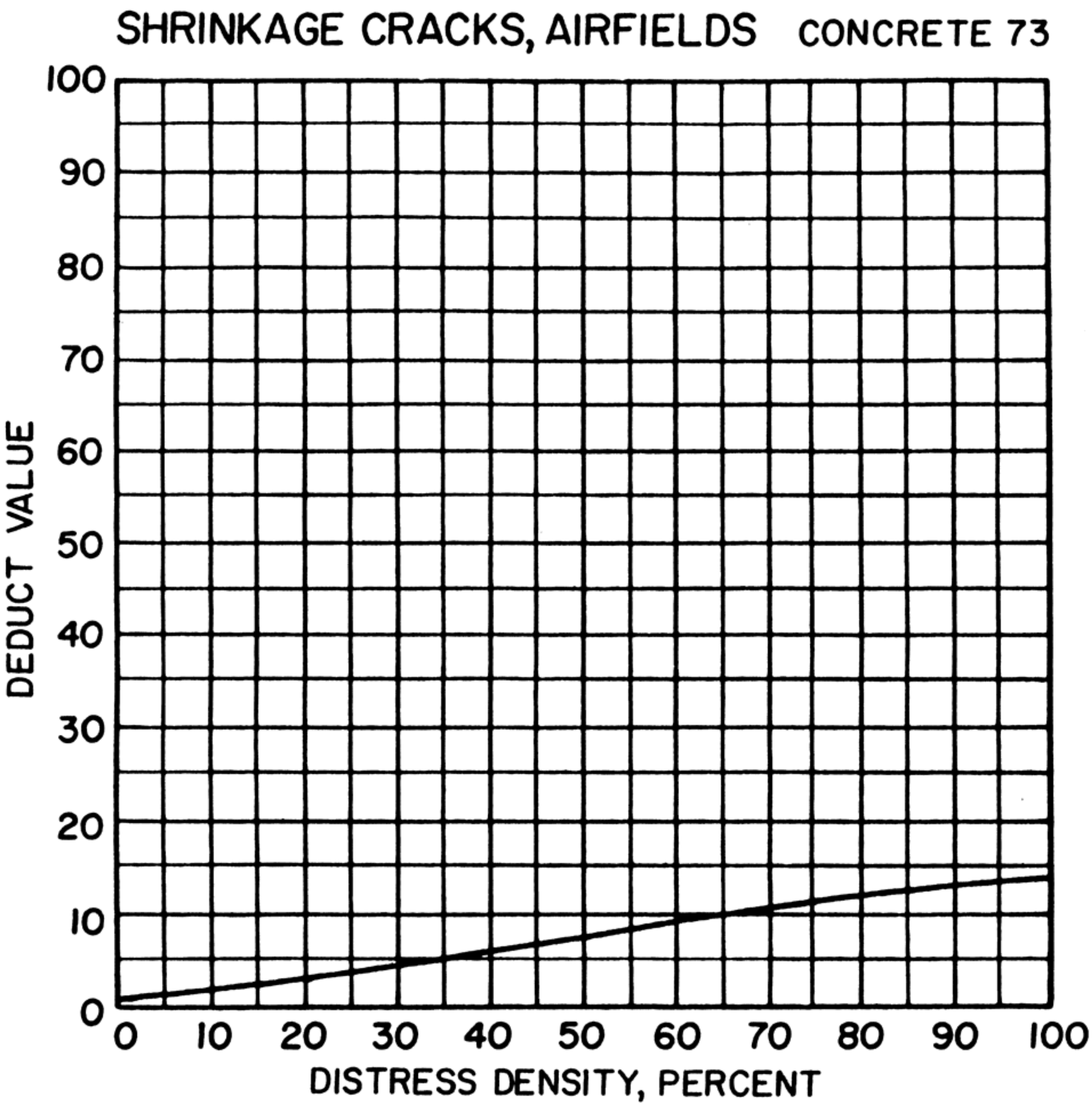

Figure D-13. Shrinkage Cracks, Airfields – Concrete 73

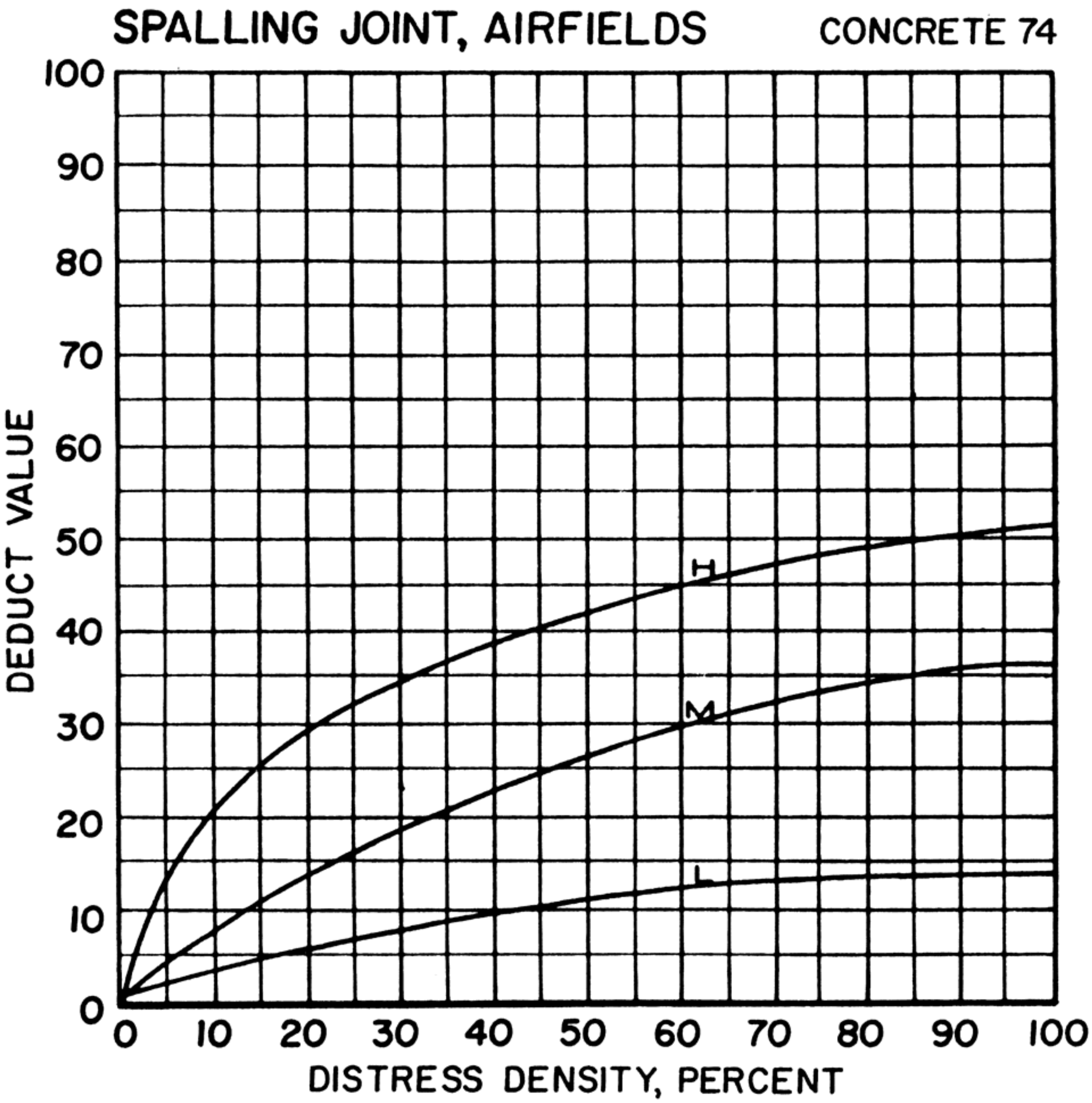

Figure D-14. Spalling Joint, Airfields – Concrete 74

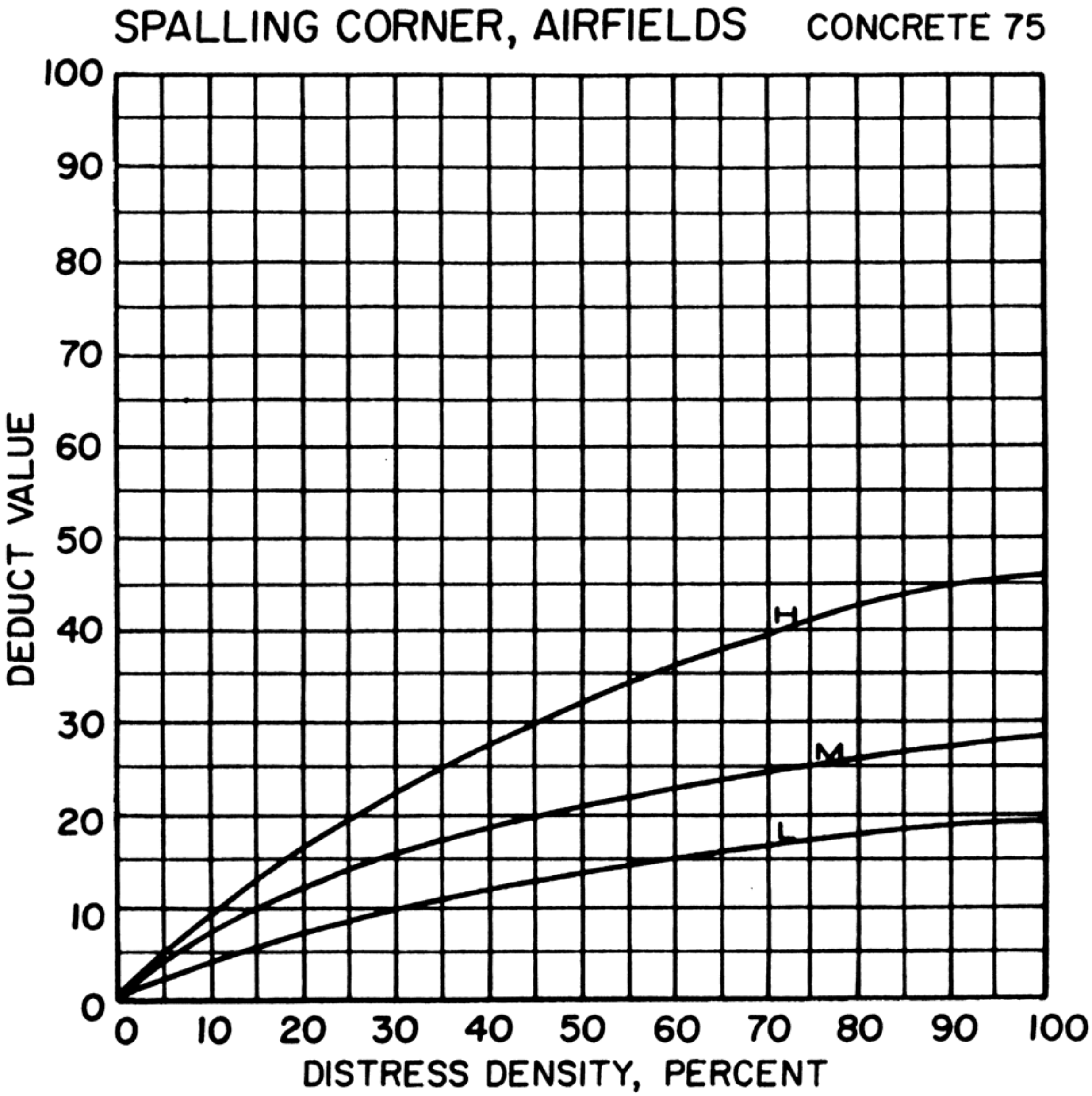

Figure D-15. Spalling Corner, Airfields – Concrete 75

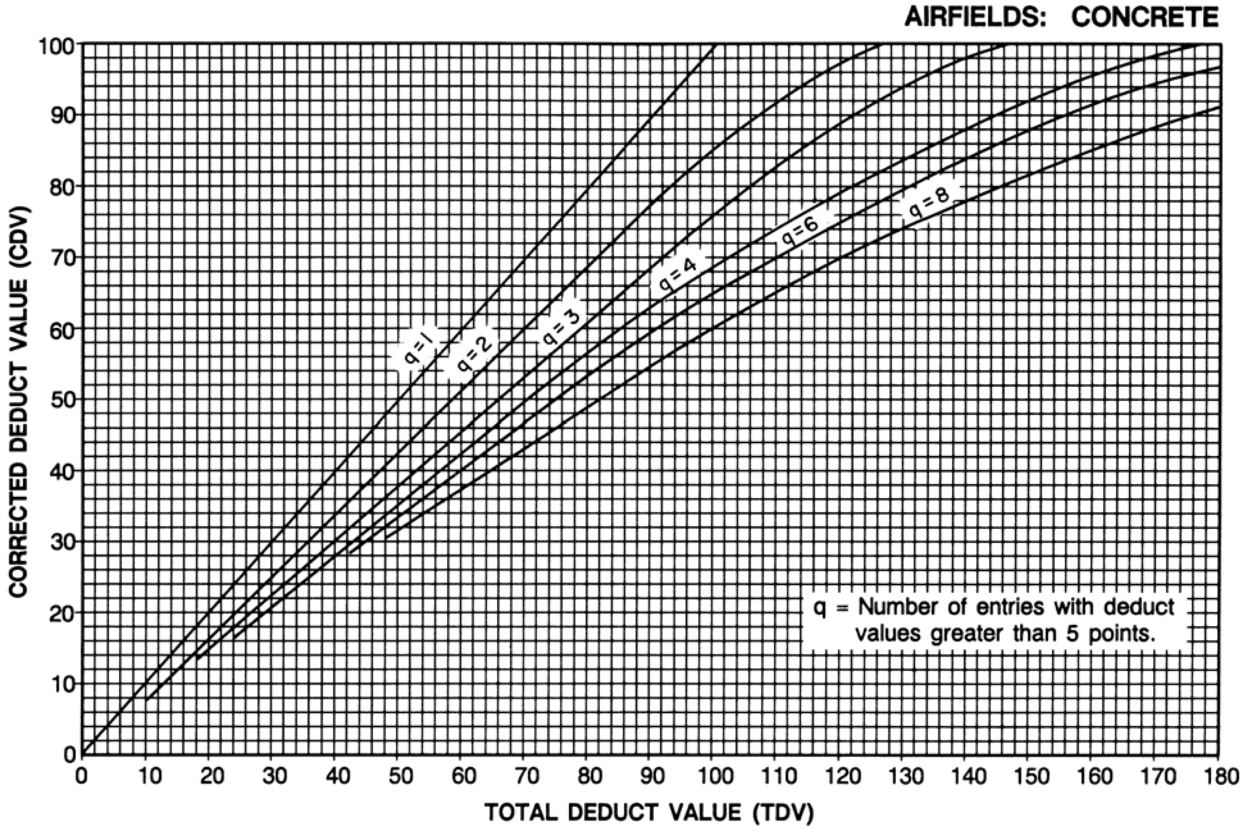

Figure D-16. Airfields: Concrete

Annex E

Blank Forms

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Figure E-2a -	Joint Rigid Pavement Condition Survey Data Sheet for Sample Unit - Manual Calculation	E - 5
Figure E-2b -	Joint Rigid Pavement Condition Survey Data Sheet for Sample Unit - Automated Calculation	E - 6
Figure E-3 -	PCI calculation form	E - 7

**AIRFIELD ASPHALT PAVEMENT
CONDITION SURVEY DATA SHEET
FOR SAMPLE UNIT**

SKETCH:

BRANCH	DATE
SURVEYED BY	SAMPLE UNIT
SECTION	SAMPLE AREA

41. Alligator Cracking Sq Ft	45. Depression Sq Ft	49. Oil Spillage Sq Ft	53. Rutting Sq Ft
42. Bleeding Sq Ft	46. Jet Blast Sq Ft	50. Patching Sq Ft	54. Shoving from PCC Sq Ft
43. Block Cracking Sq Ft	47. Jt. Reflection (PCC) Ft	51. Polished Aggregate Sq Ft	55. Slippage Cracking Sq Ft
44. Corrugation Sq Ft	48. Long. & Trans. Cracking Ft	52. Raveling/Weathering Sq Ft	56. Swell Sq Ft

DISTRESS SEVERITY	QUANTITY								TOTAL	DENSITY %	DEDUCT VALUE

Figure E-1a – Flexible Pavement Condition Survey Data Sheet for Sample Unit – Manual Calculation

AIRFIELD CONCRETE PAVEMENT CONDITION SURVEY DATA SHEET

PID		INSPECTOR NAME	
FROM		BRANCH USE	DATE INSPECTED
TO		SECTION WIDTH	SECTION LENGTH
SLAB WIDTH	SLAB LENGTH	NUMBER OF SLABS	

PCC Surfaced Distress Codes

61. Blow up	65. Joint Seal Damage	69. Pumping	73. Shrinkage Crack
62. Corner Break	66. Patching, ≤ 5f	70. Scaling/Map Crack/Crazing	74. Spalling-Joints
63. Long/Trans/Diagonal Crack	67. Patching/Utility Cut	71. Settlement/Fault	75. Spalling-Corner
64. Durability Crack	68. Popouts	72. Shattered Slab	

SAMPLE NUMBER		SLABS IN SAMPLE	
DISTRESS CODE	L	M	H

Sketch / Comments

SAMPLE NUMBER		SLABS IN SAMPLE		SAMPLE NUMBER		SLABS IN SAMPLE	
DISTRESS CODE	L	M	H	DISTRESS CODE	L	M	H

Figure E-1b – Flexible Pavement Condition Survey Data Sheet for Sample Unit – Automated Calculation

AIRFIELD ASPHALT PAVEMENT
CONDITION SURVEY DATA SHEET FOR SAMPLE UNIT

BRANCH _______________ SECTION ______________ SAMPLE UNIT _________
SURVEYED BY ____________ DATE ______________ SAMPLE AREA _______

Distress Types

61. Blow-up
62. Corner Break
63. Long./Trans. Diagonal Crack
64. Durability Crack
65. Joint Seal Coverage
66. Patching < 5 sq ft
67. Patching/Utility Cut
68. Popouts
69. Pumping
70. Scaling/Map Crack Crazing
71. Settlement/Fault
72. Shattered Slab
73. Shrinkage Crack
74. Spalling - Joints
75. Spalling - Corner

DIST TYPE	SEV	No. SLABS	DENSITY %	DEDUCT VALUE

SKETCH:

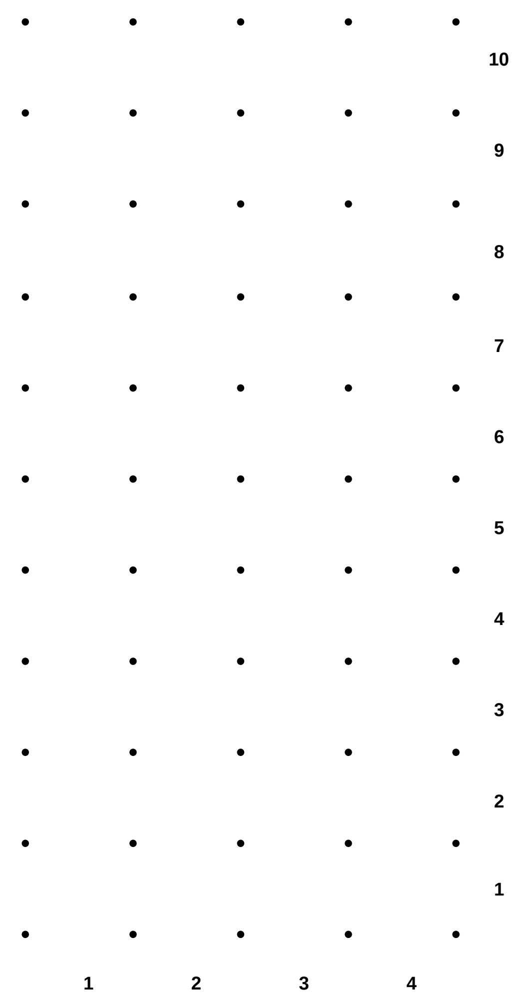

Figure E-2a – Jointed Rigid Pavement Condition Survey Data Sheet for Sample Unit – Manual Calculation

AIRFIELD ASPHALT PAVEMENT CONDITION SURVEY DATA SHEET

PID		INSPECTOR NAME	
FROM		BRANCH USE	DATE INSPECTED
TO		SECTION WIDTH	SECTION LENGTH

AC Surfaced Distress Codes

41. Alligator Cracking Sq Ft	45. Depression Sq Ft	49. Oil Spillage Sq Ft	53. Rutting Sq Ft
42. Bleeding Sq Ft	46. Jet Blast Sq Ft	50. Patching Sq Ft	54. Shoving from PCC Sq Ft
43. Block Cracking Sq Ft	47. Jt. Reflection (PCC) Ft	51. Polished Aggregate Sq Ft	55. Slippage Cracking Sq Ft
44. Corrugation Sq Ft	48. Long. & Trans. Cracking Ft	52. Raveling/Weathering Sq Ft	56. Swell Sq Ft

SAMPLE NUMBER		SAMPLE AREA	
DISTRESS CODE	L	M	H

Sketch / Comments

SAMPLE NUMBER		SAMPLE AREA	
DISTRESS CODE	L	M	H

SAMPLE NUMBER		SAMPLE AREA	
DISTRESS CODE	L	M	H

Figure E-2b – Jointed Rigid Pavement Condition Survey Data Sheet for Sample Unit – Automated Calculation

No.	DEDUCT VALUES											TOTAL	q	CDV
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														

Figure E-3 – PCI calculation form