Guidelines
Respecting
Airport Pavement
Structural Condition Surveys

Available From / For Information Contact:

Transport Canada
International Aviation & Technical Programs Branch (AARJ)
Engineering Division
330 Sparks Street
Tower C, Place de Ville, Floor 7B
Ottawa, Ontario, Canada K1A 0N8

Fax: (613) 990-0508

January 2004

Engineering Reference Document (ERD)

Subject: Guidelines Respecting Airport Pavement Structural Condition Surveys

OPI: AARJ - Ottawa

---

1. Purpose: Transport Canada's TP 312 "Aerodrome Standards and Recommended Practices" (4th Edition, March 1993) contains only very general standards and recommended practices respecting the structural condition (integrity) of airport pavement surfaces. The purpose of this ERD is to provide guidance material for Canadian airport operating authorities and the aviation engineering community respecting airport pavement structural condition surveys.

2. Status: This is the final version of Engineering Reference Document (ERD) Number 121.

3. Cancellation: This ERD is the 4th Edition of Transport Canada's publication on the subject of "Airport Pavement Structural Condition Surveys" and updates earlier versions of the document released as AK-68-32 (TP1849) in October 1979, January 1985 and March 1996.

4. Explanation Of Changes: This ERD contains updated procedures for inspecting and reporting the structural condition of airfield pavement surfaces. Among topics covered are the identification of pavement defects, methods for rating defect severity and extent and forms for reporting condition survey findings. The material contained in this ERD does not have mandatory status and is offered as guidance material only. The practices described herein are based on those followed successfully by Transport Canada as the owner/operator of Canadian airports from the early 1960's to the mid-1990's. The practices are integrally related to Canadian design and construction practices and to the Canadian environment.

5. Copies Of This Document Can Be Obtained From:

Transport Canada
Engineering Division
International Aviation and Technical Programs Branch (AARJ)
330 Sparks Street
Place de Ville, Tower C, Floor 7B
Ottawa, Ontario, Canada K1A 0N8
Facsimile: (613) 990-0508

Guidelines Respecting
Airport Pavement Structural Condition Surveys

Table Of Contents

1.0 Pavement Quality Characteristics

2.0 Pavement Structural Condition (Integrity)

3.0 Objectives of a Pavement Structural Condition Survey

4.0 Pavement Surface Defects

5.0 Pavement Structural Condition Ratings

6.0 The Pavement Condition Survey Procedure

- 6.1 The Inspection Team
- 6.2 Survey Preparations
- 6.3 The Pavement Inspection
  - 6.3.1 General Approach to Inspection
  - 6.3.2 Rating Pavement Defects
  - 6.3.3 Load versus Non-Load Related Defects
  - 6.3.4 Image Recording
- 6.4 Interviews with Airport Staff
- 6.5 Analysis
- 6.6 The Structural Condition Survey Report

7.0 Pavement Condition Survey Scheduling

8.0 Performance Trends in Airport Pavement Structural Condition

9.0 References

Figure 1: Airport Pavement Site Key Plan
Figure 2: "Pavement Condition Ratings Summary" Form
Figure 3: Average Structural Condition Rating versus Pavement Age

Appendix A: Asphalt Pavement Surface Defects and Rating Guidelines
Appendix B: Concrete Pavement Surface Defects and Rating Guidelines
Appendix C: Paved Surface Defects and Rating Guidelines
Appendix D: Gravel Surface Defects and Rating Guidelines
Appendix E: Miscellaneous Pavement Defects & Deficiencies

Acknowledgement

The assistance of Glenn Argue (Transport Canada - Retired) in the development and preparation of the material and photographs included in the manual is acknowledged and greatly appreciated.

Guidelines Respecting
Airport Pavement Structural Condition Surveys

1.0 Pavement Quality Characteristics

Safe aircraft operation can be promoted by providing and maintaining movement area surfaces that have five **pavement quality characteristics**, namely:

1) **Strength** - The pavement should be strong enough to structurally support the aircraft loads it is intended to serve;

2) **Smoothness** - The pavement surface of a runway should not have any irregularities which create roughness that could adversely interfere with operation of aircraft, result in loss of friction or cause structural damage to the aircraft itself;

3) **Skid Resistance** - The runway surface should provide adequate surface friction and texture necessary for the safe braking of aircraft;

4) **Structural Integrity** - The surface should be in good structural condition i.e. structurally intact (no loose pieces) and free of deposits of broken materials lying on the surface which could pose a FOD (Foreign Object Danger) hazard for aircraft, and

5) **Surface Drainage** - Surface transverse and longitudinal slopes should provide for the adequate drainage/runoff of water during rainstorms to ensure the minimization of water depths and standing pools of water.

In addition, the pavement surface must meet standard physical characteristic requirements for geometrics and layout that are intended to provide for safe operation of aircraft.

Reference 1 contains Canadian regulatory requirements respecting the provision, maintenance and reporting of the conditional state of pavement quality characteristics.

2.0 Pavement Structural Condition (Integrity)

Pavement structural condition refers to the intactness or integrity of the pavement surface. This can be seen by the absence of surface fracturing or decomposition. The usual end result of structural deterioration is the pop-out of surface material that creates a Foreign Object Damage (FOD) hazard for aircraft thereby affecting the safety of aircraft operations.

Additionally, the structural integrity of the pavement surface is the quality attribute that most commonly gives rise to the requirement for restoration. As a pavement ages, the surfacing material is weakened by processes such as stripping or oxidation of the asphalt, frost effects or alkali reactions in concrete. Cracking of one type or another usually develops. These defects ultimately weaken the pavement surface to the point where breakdown begins with the rate of breakdown depending on the magnitude and frequency of traffic loads. The breakdown leads to spalling and the presence of loose chunks of surfacing material that can damage aircraft bodies and engines. FOD potential is therefore not only a safety hazard but a major consideration in the majority of restoration decisions.

But structural condition assessment is much wider in scope than the evaluation of FOD potential because poor structural condition can also result in deterioration of the other pavement quality characteristics necessary for safety. A structural condition inspection includes the identification of defects that may suggest poor riding quality, low skid resistance or inadequate bearing strength for current aircraft traffic. Excessive cracking, frost heaving, settlements, or extensive maintenance patching may result in increased levels of surface roughness. Other defects, if present, may suggest construction material deficiencies and the need for sampling and laboratory analysis.

The types of structural defects that can occur in pavements are many and each has its own set of causes. Defects also differ depending on whether the pavement surface is constructed with asphaltic or Portland cement concrete. Some defects can be found in all types of paved surfaces while non-paved gravel surfaces have their own unique set of defects and maintenance requirements.

3.0 Objectives of a Pavement Structural Condition Survey

Airport pavement structural condition surveys consist of the visual inspection of the pavement surfaces to identify the types of defects present and to record the extent and severity of those defects. A pavement inspection should include the following:

a) a general structural condition rating for each distinct pavement facility at the airport;

b) identification of the structural defects present and a rating of their extent and severity;

c) judgements on the cause of defects and their implications for future pavement performance;

d) recommendations on requirements for additional investigations; and

e) recommendations on maintenance and restoration needs.

Pavement structural condition inspections require subjective judgements to a significant degree. However, if performed by well-qualified individuals, structural condition inspections are a most useful tool for both the technical and safety management of pavements.

4.0 Pavement Surface Defects

A wide variety of defects may develop in a pavement structure over time. Many of these defects can be observed by a visual inspection of the pavement surface. The nature of these defects can be highly informative when judging the current and future suitability of the pavement operational characteristics and the ability of the pavement to serve aircraft traffic.

Defects that commonly occur in asphalt and concrete pavement surfaces are described and illustrated in Appendices A and B respectively. Possible causes and treatment options are listed and guidelines are given for rating the severity and extent of each defect. Appendix C identifies defects that may occur in any type of paved surface. Appendix D details gravel surface defects. Appendix E covers a number of miscellaneous defects and deficiencies that do not directly affect structural condition ratings because their occurrence is often less frequent, very localized and/or found in areas adjacent to the paved surface itself.

5.0 Pavement Structural Condition Ratings

During a pavement structural condition inspection, individual defects present in the surface are identified and rated in terms of their extent and severity. An overall Structural Condition Rating (SCR) is assigned to each pavement section based on the extent and severity of the defects found in the section. Pavement Structural Condition Ratings are assigned using a numerical scale of 0 to 10 as shown below.

Structural Condition Rating (SCR)	
Numerical Rating	**Descriptive Rating**
0 - 2	Very Poor
2 - 4	Poor
4 - 6	Fair
6 - 8	Good
8 - 10	Very Good

A pavement structural condition rating reflects the suitability of a pavement structure to serve aircraft traffic as judged from surface defects that develop with age and traffic and that reflect deficiencies with respect to structural integrity and bearing strength attributes. The quality of pavement skid resistance and ride quality attributes is considered separately from structural condition rating when evaluating pavement facilities. Consequently, the presence of defects that affect only skid resistance or ride quality should be noted in the condition survey report, but should not influence the structural condition rating.

A pavement structural condition rating is based on prevailing general conditions and reflects the need for restoration. Isolated defects that can be repaired through maintenance should not have a major influence on the structural condition rating unless the defects portend the development of more severe conditions. Typically, restoration rather than maintenance is needed when areas of major deficiency exceed 10 to 20 percent of the total pavement area. Restoration is generally recommended when the structural condition rating has decreased to a value in the 5 to 4 range, although lower values can be tolerated for secondary facilities serving only small aircraft.

Pavement structural condition ratings are based on the defects present in the pavement surface, and illustrations of commonly encountered defects can be found in Appendices A to E. Possible causes and treatments are outlined, and guidelines are provided for the rating of defect severity and extent. Defect severity is expressed in terms of three descriptive levels: low, medium and high. Defect extent is divided into four levels: minor, moderate, major and extreme. Extent has a quantitative base - usually the percent of wheelpath length or area affected in the case of asphalt pavements, or the percent of panels/joint length affected in the case of concrete pavements. As pavements age, the extent and severity of one type of defect will usually significantly exceed others and this "predominate" defect dictates the structural condition rating.

For defects that directly affect structural condition, a Structural Condition Rating (SCR) for the defect can be determined as a function of defect extent and severity using the SCR vs E/S chart provided for the defect. The charts and how to use them to determine SCR values can be found in the appropriate defect and rating guidelines (Appendices A to E).

In most instances, estimated rather than measured values of defect extent and severity can be used with the guidelines to arrive at defect ratings and SCR values. Computed SCR values may subsequently be modified based on subjective judgement. Well qualified and experienced inspectors may rely solely on visual inspection and subjective judgement to arrive at their condition ratings and this approach will usually be adequate for the purposes of operational safety and the identification of restoration and maintenance needs. The quantitative definitions serve as a guide for inexperienced inspectors and to resolve instances of disagreement. Surveys that incorporate detailed measurement of defect extent provide more consistent results for year to year comparisons, but survey costs and facility downtime are substantially higher.

6.0 The Pavement Condition Survey Procedure

6.1 The Inspection Team

The inspector responsible for the structural condition inspection should have a good background in airport pavement technology including design, construction, evaluation and maintenance practices. Defect recognition and rating skills can be taught but the ability to interpret causes and their implications for future behaviour is more difficult to acquire. The airport maintenance organization should also be represented on the inspection team to provide advice on problem areas and past maintenance undertaken.

6.2 Survey Preparations

The following documents should be obtained and reviewed in preparation for a survey:

a) airside key plans that show pavement facility layout, designations and dimensions (Figure 1),

b) construction histories that identify pavement layer thicknesses, materials and year of construction; and

c) the reports of previous structural condition surveys for the airport.

These documents may be used to divide the pavement facilities into sections for survey purposes. Separate inspection and reporting should be performed for each runway, taxiway and apron. These facilities should be further divided into sections that are relatively homogeneous with respect to surface type, age and condition. Sectioning should be as consistent as possible from one survey to the next.

The following arrangements for the survey need to be made through the office of the airport manager or the manager of airport operations:

a) scheduling the survey for a time that will minimize disturbance to airport operations,

b) arranging for an airside escort or obtaining a site airside vehicle operators permit,

c) obtaining security clearance for airside access, and

d) issuing of appropriate NOTAMS if necessary.

Arrangements should also be made for the participation of an airport staff person who is familiar with site conditions and problem areas. The field maintenance supervisor is usually the best source of such information.

6.3 The Pavement Inspection

6.3.1 General Approach to Inspection

Only a cursory visual inspection is required for pavement facilities that are in good condition. In this case, surfaces may be traversed slowly by car, weaving from one side of the area to the other, with stops made for closer inspection at locations of particular interest. A more detailed examination should be undertaken when facilities reach a structural condition rating of 5 or less. These surfaces should be covered more slowly, by walking or by bicycle, with occasional measurements made on a sampling basis to determine the extent of the predominate defect present.

6.3.2 Rating Pavement Defects

As a survey aid, the extent and severity of defects for each section may be recorded during inspection on forms such as those illustrated in Figure A-7 for asphalt surfaced sections and in Figure B-2 for concrete surfaced sections. A condition rating form for gravel surfaces is given in Figure D-1.

a) Extent should be recorded for each of the defects listed on the inspection form, including a nil indication if the defect is not present. If present and significant, other types of defects should be manually added to the form and described under comments.

b) The value of extent assigned to a defect should be the total extent of the defect regardless of severity. Severity is then recorded as the percent of the total extent that is judged to be present or measured at each level of severity.

c) Defect extent and severity ratings for runway sections should generally reflect conditions prevalent in wheelpath areas, or in the mid-third of the runway width. Outer thirds may be rated separately if conditions are substantially different from the wheelpath areas.

d) Crack sealing, patching and other maintenance needs should be noted.

e) Recording forms should be fully completed after the inspection of each section. The recollection of conditions becomes difficult after looking at other areas.

Rating guidelines for most common pavement defects can be found in Appendices A to E.

6.3.3 Load versus Non-Load Related Defects

An assessment should be made of whether defects observed are load related. Load related defects may suggest an overloading condition and the possible continuous and relatively rapid deterioration of the pavement unless traffic is curtailed. Non-load related defects are normally slower in development and hence are not as critical. Load related defects are generally confined to wheelpath areas, whereas non-load related defects are likely to be found throughout the pavement area. With load related defects, an attempt should be made to clarify whether the problem is one of overloading with respect to the design bearing capacity of the pavement structure, or whether the problem is due to substandard or deteriorated construction materials. These factors will most likely influence the assessment of future performance and possibly the design of restoration measures.

Defect extent should also be noted as being of a localized or general nature. Localized defects can generally be addressed through maintenance. Defects occurring throughout an area will likely require more extensive restoration measures.

6.3.4 Image Recording

During the survey, photographs should be taken of defects that are unusual in nature or severity. A video recording of surface conditions may be useful in support of a recommendation for restoration within the current planning period.

6.4 Interviews with Airport Staff

Following the field inspection, airport staff should be interviewed and site records consulted to determine:

a) the type, operating weight and tire pressure of the most critical aircraft operating at the airport on a scheduled basis;

b) complaints, if any, from pilots or airlines concerning pavement operational characteristics such as roughness or skid resistance;

c) pavement surface and subsurface drainage characteristics;

d) the history of structural maintenance (crack filling and patching) undertaken since the last inspection including procedures and materials used.

6.5 Analysis

An analysis of survey and related site data should follow the pavement field inspection. The analysis should include:

a) a review of the causes of defects observed and the identification of additional investigations that might be needed, such as test-hole investigations, if the cause of major defects is not readily understood;

b) a determination of the need for roughness or friction measurements depending on whether the defects observed or pilot reports suggest possible problems with these quality characteristics and measurements are not available from other monitoring programs;

c) a review of published load ratings if the defects observed suggest that traffic loads are exceeding pavement bearing strength (rutting in asphalt pavements, extensive panel or corner cracking in concrete pavements);

d) an assessment of the current operational suitability of each pavement section and assignment of an overall structural condition rating as outlined in the rating guidelines;

e) recommendations on restoration requirements, including the type of restoration to be undertaken based on the structural defects observed, if the remaining service life is projected to end within the current planning period;

f) recommendations on the type of maintenance needed; and

g) recommendations on changes to design or construction practices if the structural performance and nature of the defects found suggest the need for changes.

6.6 The Structural Condition Survey Report

The structural condition survey report should contain:

a) a written report that summarizes the inspection undertaken, elaborates on the defects observed and provides recommendations resulting from the analysis;

b) a site key plan (as illustrated in Figure 1) showing sub-division of the pavement areas used for inspection and reporting purposes and other pertinent details;

c) a "Pavement Condition Ratings Summary" form (as illustrated in Figure 2) completed in accordance with the rating guidelines;

d) the defect recording forms for each section inspected if recording forms were completed during the survey;

e) photographs mounted, identified as to location and commented as appropriate; videotape recording of those pavements recommended for restoration;

f) a statement of inspector qualification and experience; and

g) an indication of the extent to which measurements were used to arrive at the ratings provided.

7.0 Pavement Condition Survey Scheduling

Aircraft operational surfaces at international airports should receive a structural condition inspection annually. Other airports having scheduled airline services should be inspected at least every two years. Structural condition inspections may be required on a more frequent basis if a pavement structure is subject to aircraft loads that exceed the loads for which the facility was designed or if the pavement is exhibiting load-related distress.

An inspection of pavement facilities at a small, single runway airport can normally be performed in half a day, whereas three to five days may be required for the complete coverage of facilities at a large airport. Two hours to a full day may be required for a major runway depending on the amount of quantitative measurement undertaken. If possible, the inspection of major runways should be scheduled to coincide with closures for maintenance work to avoid the need to NOTAM closure of the facility.

8.0 Performance Trends in Airport Pavement Structural Condition

Figure 3 shows, for various surface types at Canadian airports, the rate at which pavement structural condition ratings will typically deteriorate as pavements age. Such plots of pavement quality characteristics versus time are termed "performance curves".

The structural condition of concrete surfaces reach unsatisfactory levels after a period of 28 to 35 years while original asphalt surfaces have shorter life spans of 20 to 25 years. Pavement surfaces comprised of an asphalt overlay have typical service lives in the range of 15 to 20 years - 5 years shorter than original asphalt surfaces - which can undoubtedly be attributed to the reflection cracking that occurs in resurfacing overlays.

Restoration measures are generally undertaken when structural condition ratings are in the range of 5 to 4, although lower ratings may be accepted for minor, secondary facilities serving small aircraft.

9.0 References

1. "Aerodrome Standards and Recommended Practices", TP312, 4th Edition, Transport Canada, Civil Aviation, Aerodrome Safety Branch, Ottawa, Ontario, Canada, March 1993.

2. "Airport Pavement Evaluation - Bearing Strength", ERD-120, Transport Canada, Civil Aviation, International Aviation and Technical Programs Branch, Ottawa, Ontario Canada, 2004.

3. "Airport Pavement Evaluation - Surface Roughness", ERD-122, Transport Canada, Civil Aviation, International Aviation and Technical Programs Branch, Ottawa, Ontario Canada, 2004.

4. "Airport Pavement Evaluation - Surface Friction", ERD-123, Transport Canada, Civil Aviation, International Aviation and Technical Programs Branch, Ottawa, Ontario Canada, 2004.

Figure 1: Airport Pavement Site Key Plan

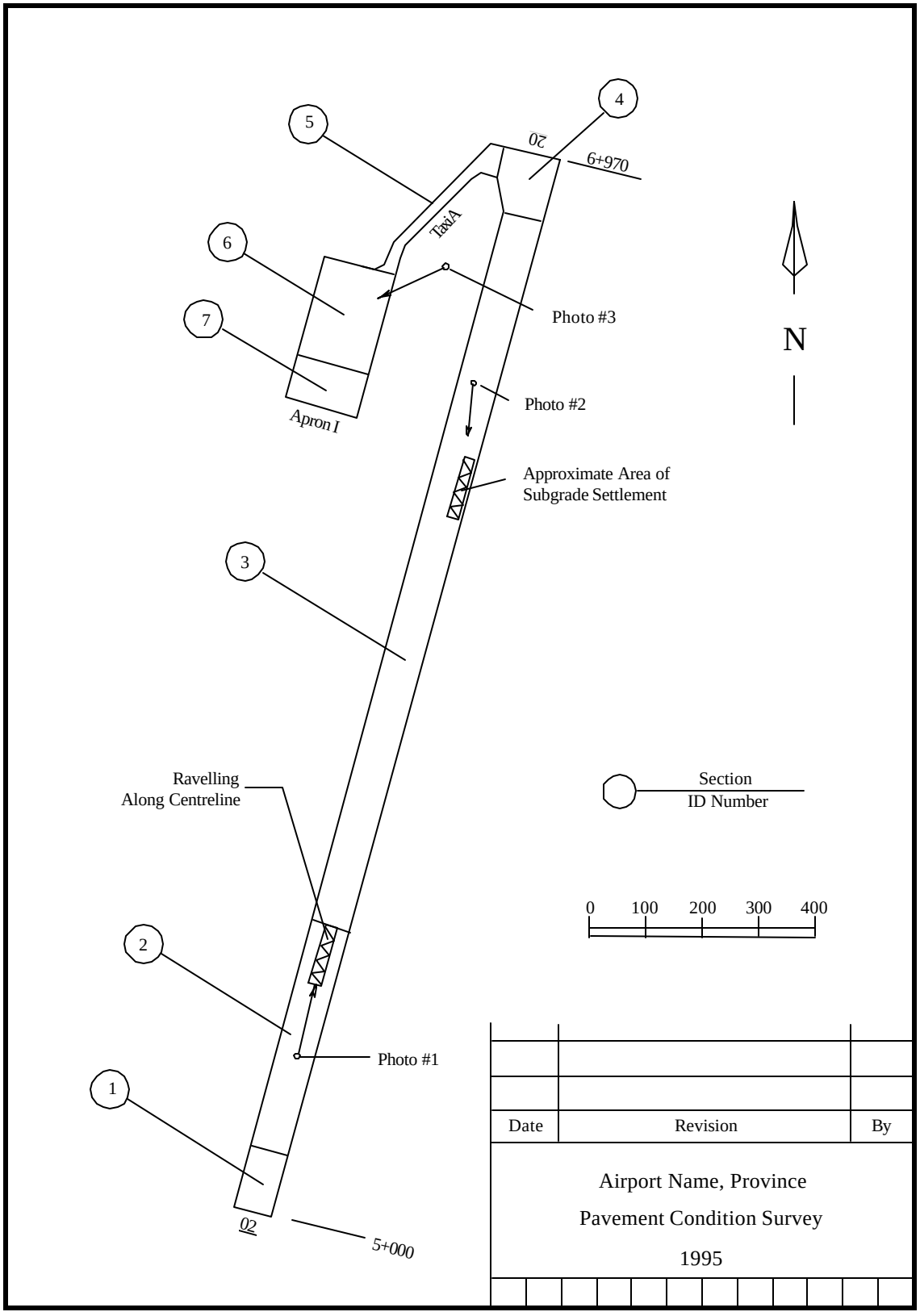


Figure 2: Pavement Condition Ratings Summary

PAVEMENT CONDITION SURVEY

RATINGS SUMMARY

AIRPORT : _____

INSPECTOR : _____

DATE :

PAVEMENT SURFACE DEFECTS

FACILITY	SECTION ID. NO.	AREA (m^2)	Structural Condition Rating	√ Program Restoration	√ Maintenance Req'd	Transverse Cracking	Longitudinal Cracking	Alligator Cracking	Map Cracking	Block Cracking	Ravelling	Rutting			Panel Cracking	Corner Cracking	Edge Cracking	Scaling / Spalling	Joint Faulting	Joint Sealant Failure		

ASPHALT SURFACES

CONCRETE SURFACES

Critical Aircraft :

Name _____

Operating Weight (kN) _____

Tire Pressure (MPa) _____

Aircraft Load Rating (ALR) _____

PAVEMENT DEFECT RATINGS

1: Minor
2: Moderate
3: Major
4: Extreme

Extent of Defect → ← Severity of Defect

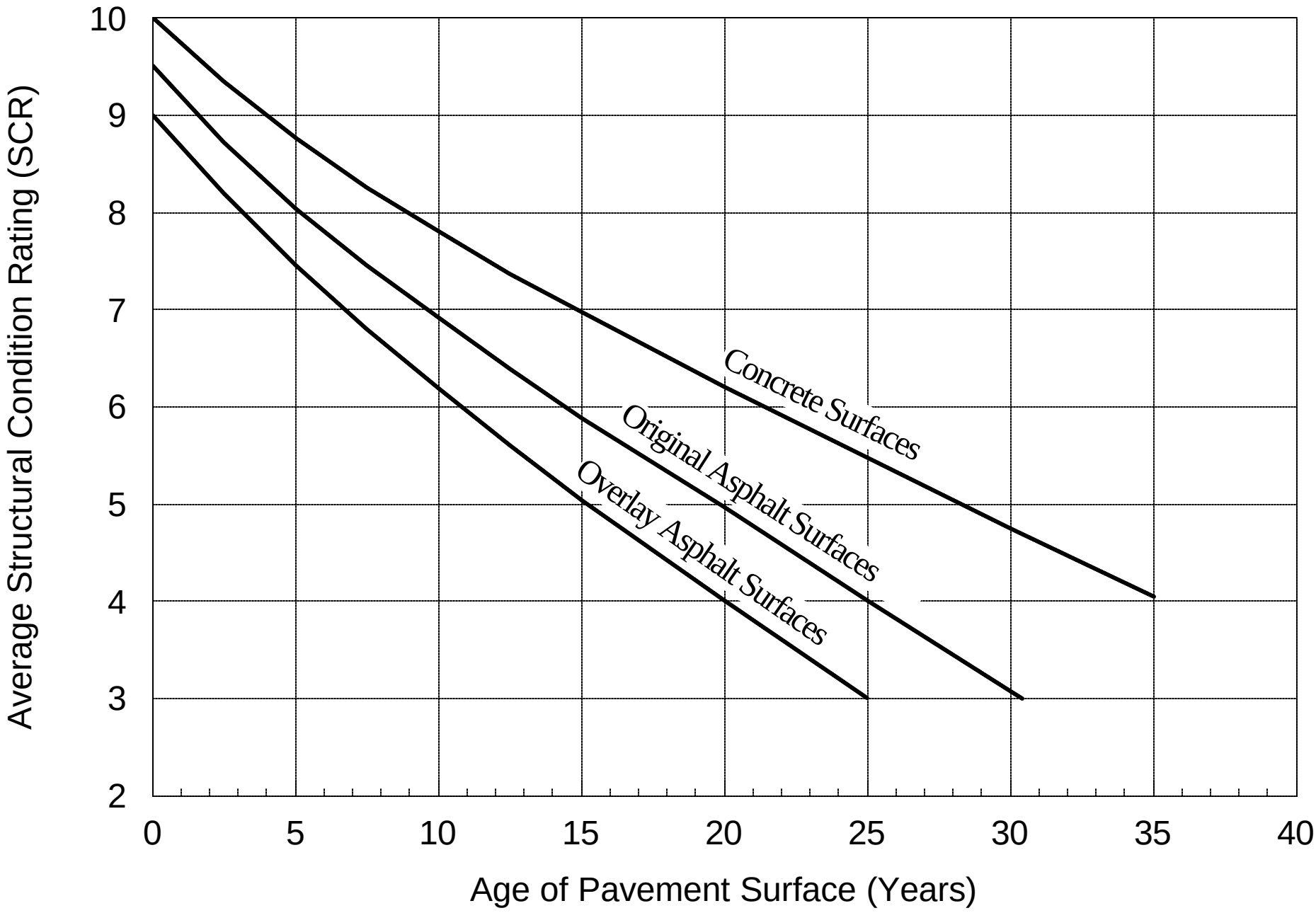
L: Low
M: Medium
H: High

GENERAL CONDITION RATING

10 9 8 7 6 5 4 3 2 1 0

Very Good Good Fair Poor Very Poor

Figure 3: Average Structural Condition Rating versus Pavement Age



Appendix A

Asphalt Pavement Surface Defects and Rating Guidelines

Structural Condition Rating Guidelines for Asphalt Surfaces

1.0 Defect Extent and Severity Recording

During inspection, record the extent (including nil if applicable) of each defect found on the "Defects Recording Form for Asphalt Surfaces" (Figure A-7) if the defect has a significant effect on pavement structural condition. Record the total extent, regardless of severity, using the measurement unit defined under "Extent Levels" in the defect guidelines. Also record the percent of the total extent that is of low, medium and high severity.

2.0 Defect Extent Rating

Classify the total extent as being None (0), Minor (1), Moderate (2), Major (3) or Extreme (4) according to the "Extent Levels" definitions given in the defect guidelines and report the numerical value (0, 1, 2, 3 or 4) on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) under the appropriate defect.

3.0 Defect Severity Rating

Using the recorded percentages, compute the extent of the defect at each level of severity. Determine a separate Structural Condition Rating (SCR) for each level of severity using the SCR vs Extent/Severity chart for the defect. Record on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) the severity level (L, M, H) that gives the lowest SCR.

3.1 Example - Severity Rating of Asphalt Pavement Ravelling

An asphalt surfaced pavement section has 30% of its area affected by ravelling. From the defect guideline page for ravelling, the extent level is determined to be "Major". The severity of ravelling during inspection was recorded as follows:

"Low" Severity - 67% of the extent = 20% of area
"Medium" Severity - 20% of the extent = 6% of area
"High" Severity - 13% of the extent = 4% of area

From the SCR vs E/S chart for asphalt ravelling (Figure A-4):

20% of the area with "Low" severity ravelling gives an SCR = 8.6
6% of the area with "Medium" severity ravelling gives an SCR = 7.8
4% of the area with "High" severity ravelling gives an SCR = 6.2

Report the severity level of the asphalt ravelling as "High" since this level has the greatest impact on the SCR (i.e. select the lowest SCR). On the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) record the extent of ravelling as "3" (Major) and the severity as "H" (High).

4.0 Defect Structural Condition Rating (SCR)

For asphalt surfaced pavements, an SCR value is determined for each defect that has an effect on the structural condition of the pavement. For each defect, convert the extent at each level of severity to an equivalent extent at the medium severity level, where equivalency is based on giving the same structural condition rating. Sum the equivalent medium severity values and use the total to determine the Structural Condition Rating (SCR) for the defect from the medium severity curve on the SCR vs Extent/Severity chart for the defect. Record the SCR calculated for the defect on the "Defects Recording Form for Asphalt Surfaces" (Figure A-7).

4.1 Example - Determination of SCR for Asphalt Pavement Ravelling

An asphalt surfaced pavement section has 30% of its area affected by ravelling. The severity of ravelling during inspection was recorded as follows:

"Low" Severity - 67% of the extent = 20% of area
"Medium" Severity - 20% of the extent = 6% of area
"High" Severity - 13% of the extent = 4% of area

From the SCR vs E/S chart for asphalt ravelling (Figure A-4):

20% of the area with "Low" severity ravelling is equivalent to 3% medium severity
6% of the area with "Medium" severity ravelling is equivalent to 6% medium severity
4% of the area with "High" severity ravelling is equivalent to 25% medium severity

The total equivalent medium severity is 34% which equates to an SCR for ravelling of 5.8. Record this SCR value on the "Defects Recording Form for Asphalt Surfaces" (Figure A-7) under the section on ravelling.

4.2 Example - Determination of SCR for Asphalt Pavement Discrete Cracking

The following example illustrates the method to be used for combining transverse and longitudinal cracking into a single measure of discrete cracking extent and severity. Refer to Table A-1 below and Figure A-6 for an illustration of the SCR determination process.

Table A-1: Example - Structural Condition Rating of Asphalt Pavement Cracking				
Extent	Transverse Cracking	Longitudinal Cracking	Combined	Equivalent Density of Medium Severity
Average Spacing (m)	7.5 Extent is 3 Major	4.5 Extent is 3 Major	----	----
Crack Density (m / m^2)				
Total	0.133	0.222	0.355	----
Low Severity	50% = 0.067 SCR = 8.5	40% = 0.089 SCR = 8.0	0.156	0.035
Medium Severity	30% = 0.040 SCR = 7.2	40% = 0.089 SCR = 6.2	0.129	0.129
High Severity	20% = 0.026 SCR = 5.8	20% = 0.044 SCR = 5.0	0.070	0.330
Total Equivalent Crack Density (m/m^2) of Medium Severity				0.494
Structural Condition Rating for Discrete Cracking				4.0

Note: Crack density in m/m^2 is the inverse of average crack spacing in metres.

Record an SCR value of 4.0 on the "Defects Recording Form for Asphalt Surfaces" (Figure A-7) under the section on Transverse/Longitudinal (Discrete) Cracking. On the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) for both transverse and longitudinal cracking record the extent as "3" (Major) and the severity as "H" (High) (since this level has the lowest SCR).

5.0 Overall Structural Condition Rating (SCR) - Asphalt Pavements

With asphalt surfaces, the various types of defect are considered separately when assigning the ***overall*** Structural Condition Rating (SCR) for a pavement section. This practice is adopted because the various types of defect are dissimilar in cause and effect, and they do not significantly augment one another in terms of operational safety or restoration requirements. Also, it is

characteristic of asphalt surfaces that one type of defect will eventually dominate with respect to structural performance with the extent and severity of other types of defect being largely irrelevant.

The overall Structural Condition Rating (SCR) for an asphalt pavement section is determined by taking the controlling (lowest) SCR value from amongst those calculated for the individual defects on the "Defects Recording Form" for the section (Figure A-7). The overall SCR value should be recorded in the box in the lower right-hand corner of Figure A-7 and under the appropriate column on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report).

6.0 Asphalt Pavement Defects, Rating Guidelines and Photographs

The remaining pages of this Appendix contain descriptions, rating guidelines and photographs for the defects most commonly found in asphalt pavement surfaces.

a) Discrete (Transverse/Longitudinal) Cracking
b) Alligator Cracking
c) Map Cracking
d) Block Cracking
e) Ravelling
f) Rutting
g) Bleeding
h) Distortion
i) Edge Cracking
j) Tear Cracking

Discrete (Transverse &Longitudinal) Cracking

Description:

- Discrete cracks in the pavement surface, normally running perpendicular (transverse) or parallel (longitudinal) to the direction of traffic, but may have segments that meander diagonally.

Causes:

- Contraction of the pavement surface during cold weather.
- Shrinkage of the asphalt, decrease in volume with age.
- Opening of joints between paving lanes.
- Reflection of old surface cracks or joints through a resurfacing course.
- Differential subgrade settlement, frost heaving, or moisture related volume change.
- Settlement of fill over pipes or ducts.

Treatment:

- Seal cracks that remain open during the summer months.
- Cut out and patch spalled cracks and cracks with associated major settlement.

Severity Levels:

L	Low	-	Single, clean cracks with no associated breakdown.
M	Medium	-	Cracks with chipped or ravelling edges, or with secondary cracking.
H	High	-	Cracks with adjacent asphalt fragments loose or spalled, or with major settlement.

Extent Levels:

1	Minor	-	Average crack spacing	> 30	metres
2	Moderate	-	Average crack spacing	10 to 30	metres
3	Major	-	Average crack spacing	3 to 10	metres
4	Extreme	-	Average crack spacing	< 3	metres

Condition Rating:

See Figure A-1.

Discrete Cracking Photos (1 of 2)

Transverse and Longitudinal Cracking - Low Severity

Longitudinal Crack - Medium Severity

Transverse Crack - Medium Severity

Discrete Cracking Photos (2 of 2)

Transverse Crack - High Severity

Reflection Cracking
(Cracks Reflected from Joints in the Underlying Concrete Slab)

Longitudinal Crack - High Severity

Alligator Cracking

Description:

- Interconnected cracks forming a series of small polygons resembling the hide of an alligator.
- Spacing between the cracks may vary from approximately 50 to 300 mm.
- Closely spaced cracking may be referred to as chickenwire cracking.
- Occurs only in wheelpath locations (i.e. a load-associated defect).

Causes:

- Movement under wheel loads caused by stripping of subsurface asphalt layers or the presence of an excess fines layer at the surface of the base course due to over-compaction during construction.
- Fatigue of the asphalt layer resulting from a high number of load repetitions, possibly combined with excessive deflections under wheel loads (insufficient bearing strength).

Treatment:

- Replacement patching if confined to limited areas.
- Overlay if alligator cracking exceeds moderate extent.
- Replace asphalt if severely stripped.

Severity Levels:

L	Low	-	Initial stages of development; closely spaced hairline cracks in a longitudinal direction in the wheelpath area.
M	Medium	-	Transverse cracking developed to complete the alligator pattern.
H	High	-	Cracking with asphalt fragments loose or spalled.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 5	percent
2	Moderate	-	Wheelpath length affected	5 to 20	percent
3	Major	-	Wheelpath length affected	20 to 50	percent
4	Extreme	-	Wheelpath length affected	> 50	percent

Condition Rating:

See Figure A-2.

Alligator Cracking Photos

Alligator Cracking - Low Severity
(Longitudinal Cracks Appear Initially - Transverse Cracks to Complete the Alligator Pattern Will Soon Follow)

Alligator Cracking - Medium Severity

Alligator Cracking - High Severity

Map Cracking

Description:

- Large scale patterned cracking with intersecting cracks spaced from 0.5 to 2 metres forming blocks.
- Occurs only in wheelpath locations (load-associated), otherwise the defect is "Block Cracking".
- May be accompanied by settlement.

Causes:

- Excessive deflections of the pavement under traffic loads.
- Similar to alligator cracking, but the yielding layer is at a deeper level in the pavement structure, most likely in the subgrade.
- If limited in area, occurrence may be due to a soft or wet pocket of subgrade soil.

Treatment:

- If confined to limited areas, reconstruct by replacing defective subsurface layers.
- If map cracking exceeds "Moderate" extent, pavement strengthening is required.

Severity Levels:

L	Low	-	Cracking with no associated breakdown.
M	Medium	-	Cracking with chipped or ravelling edges, or with secondary cracking.
H	High	-	Cracking with asphalt fragments loose or spalled.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 5	percent
2	Moderate	-	Wheelpath length affected	5 to 20	percent
3	Major	-	Wheelpath length affected	20 to 50	percent
4	Extreme	-	Wheelpath length affected	> 50	percent

Condition Rating:

See Figure A-2.

Map Cracking Photos

Map Cracking

Low to Medium Severity

Map Cracking

Medium Severity

Map Cracking

Medium to High Severity

Block Cracking

Description:

- Intersecting transverse and longitudinal cracks forming rectangular blocks that may vary in size from 0.1 by 0.1 metres to 3 by 3 metres.
- May appear similar to alligator or map cracking but is not limited to wheelpath locations (not load-related) and will frequently occur throughout the pavement area.
- Occurrence is usually associated with older asphalt surfaces subjected to relatively light traffic loads.

Causes:

- Long-term volume shrinkage of asphalt with age.
- Advanced transverse and longitudinal temperature cracking.

Treatment:

- Crack sealing is not cost-effective.
- Limited spalling may be patched. Otherwise, leave until the spalling becomes extensive or heavier traffic necessitates restoration by asphalt overlay or replacement.

Severity Levels:

L	Low	-	Cracking with no associated breakdown and spacing greater than 2 metres.
M	Medium	-	Cracking with chipped or ravelling edges, or with spacing less than 2 metres.
H	High	-	Cracking with asphalt fragments loose or spalled, or spacing less than one metre.

Extent Levels:

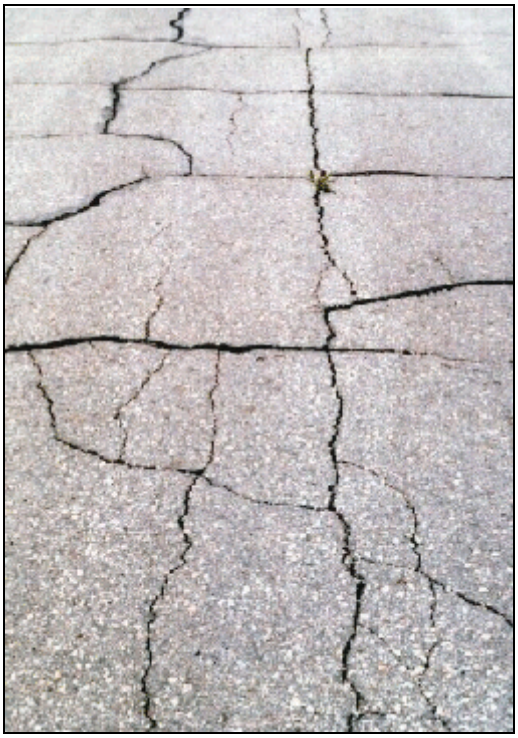
1	Minor	-	Area affected	< 5	percent
2	Moderate	-	Area affected	5 to 20	percent
3	Major	-	Area affected	20 to 50	percent
4	Extreme	-	Area affected	> 50	percent

Condition Rating:

See Figure A-3.

Block Cracking Photos

Block Cracking - Low Severity



Block Cracking
Medium to High Severity

Block Cracking - High Severity
(May Look Like Alligator Cracking
But Is Not Limited to the Wheelpath Area)

Ravelling

Description:

- Disintegration and subsequent loss of the pavement surface.

Causes:

- Loss or lack of bond between asphalt cement and aggregate particles due to stripping or construction-related mix deficiencies such as low asphalt cement content, insufficient mixing or wet or dusty aggregates.
- Inadequate compaction of the asphalt mix during construction.
- Segregation of the mix during construction due to improper handling techniques.
- Disintegration of aggregate particles under wet/dry or freeze/thaw cycles.
- Hardening of the asphalt binder material with age.
- Fuel or oil spills.

Treatment:

- Treatment required for ravelling of "Medium" to "High" severity. Undertake patching if the ravelling is of localized extent. A slurry seal or asphalt resurfacing course may be needed if the ravelling occurs over an extensive area.

Severity Levels:

L	Low	-	Individual coarse aggregate pop-outs, or fines matrix loss to a depth < 3 mm.
M	Medium	-	Depth of surface loss not greater than the maximum aggregate size.
H	High	-	Depth of surface loss greater than the maximum aggregate size.

Extent Levels:

1	Minor	-	Area affected	< 5	percent
2	Moderate	-	Area affected	5 to 20	percent
3	Major	-	Area affected	20 to 50	percent
4	Extreme	-	Area affected	> 50	percent

Condition Rating:

See Figure A-4.

Ravelling Photos

Ravelling - Low Severity

Ravelling - High Severity

Ravelling - Medium Severity

All surfaces will strip to some degree. Surface stripping can be ignored unless it develops into ravelling.

Rutting

Description:

- Load-associated depression in the wheelpath.
- May be referred to as deformation if due to consolidation rather than shearing of sub-layers.

Causes:

- Shearing or consolidation of pavement layers under repeated traffic loadings (shear failure in the upper pavement layers is indicated if accompanied by upheaval adjacent to the wheelpath).
- Shearing may result from the use of sub-standard materials in construction of one or more of the pavement layers, or inadequate pavement thickness for the shear strength of the subgrade soil.
- Consolidation may result from inadequate compaction during construction, or embankment and traffic loads that exceed subgrade pre-consolidation pressures.

Treatment:

- Review pavement bearing capacity and conduct a borehole investigation if warranted.
- If limited in extent, maintain by patching or localized reconstruction.
- If extensive, restore with a strengthening overlay or by reconstruction.

Severity Levels:

L	Low	-	Rut depth less than 20 mm.
M	Medium	-	Rut depth 20 to 40 mm.
H	High	-	Rut depth greater than 40 mm.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 5	percent
2	Moderate	-	Wheelpath length affected	5 to 20	percent
3	Major	-	Wheelpath length affected	20 to 50	percent
4	Extreme	-	Wheelpath length affected	> 50	percent

Condition Rating:

See Figure A-5.

Rutting Photos

Rutting - Low Severity

Rutting - High Severity

Rutting - Medium Severity

Bleeding

Description:

- A film of asphalt binder on the pavement surface in the wheelpath area.
- May also be referred to as flushing.

Causes:

- Excess asphalt cement and/or insufficient voids in the asphalt mix. The excess asphalt is flushed to the pavement surface by wheel loads during hot weather.
- Paving over bleeding asphalt surfaces or excess joint sealant on the pavement surface.

Treatment:

- Apply hot sand and roll to absorb the excess asphalt cement.
- Shot-blast the surface.

Severity Levels:

L	Low	-	Spotty or discontinuous film of asphalt on the pavement surface.
M	Medium	-	Continuous thin film of asphalt in the wheelpaths.
H	High	-	Heavy film, glaze-like surface, sticky when hot.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 5	percent
2	Moderate	-	Wheelpath length affected	5 to 20	percent
3	Major	-	Wheelpath length affected	20 to 50	percent
4	Extreme	-	Wheelpath length affected	> 50	percent

Condition Rating:

Evaluate the operational effect through friction measurement.

Bleeding Photos

Bleeding - Low Severity
(Bleeding of Crack Sealant
Through the Overlay)

Bleeding
Low to Medium Severity

Distortion

Description:

- Displacement of asphalt surfaces horizontally.
- Normally a localized defect which may be accompanied by tear cracks.
- May be referred to as shoving.
- On road surfaces, distortion may develop into corrugation (rippling).

Causes:

- Insufficient asphalt stability to withstand the horizontal shear forces of braking tires.
- Insufficient bond between asphalt lifts or between the asphalt and the underlying surface, possibly due to the application of excessive tack coat material.
- Locked-wheel turn of an aircraft on a relatively new asphalt surface.

Treatment:

- Replacement patching if localized distortion is continuing or causing a problem with ride quality.

Severity Levels:

L	Low	-	Horizontal displacement less than 100 mm.
M	Medium	-	Horizontal displacement 100 to 200 mm.
H	High	-	Horizontal displacement greater than 200 mm.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 2	percent
2	Moderate	-	Wheelpath length affected	2 to 5	percent
3	Major	-	Wheelpath length affected	5 to 10	percent
4	Extreme	-	Wheelpath length affected	> 10	percent

Condition Rating:

Evaluate the operational effect through roughness measurement and/or associated cracking.

Distortion Photos

Distortion - Low to Medium Severity

Distortion - Medium to High Severity

Distortion - High Severity
(With Associated Tear Cracking)

Distortion - High Severity
(Without Associated Tear Cracking)

Edge Cracking

Description:

- Closely spaced parallel cracks or alligator type cracking along the edge of pavement areas.

Causes:

- Maintenance vehicle loads on an area of pavement that is frequently of low bearing strength due to the free edge and moisture reaching the subgrade from the shoulder surface.

Treatment:

- Removal and patching as required to control FOD material.

Severity Levels:

L	Low	-	Hairline cracking only.
M	Medium	-	Cracks open, ravelling at the edges.
H	High	-	Asphalt fragments loose or spalling.

Extent Levels:

1	Minor	-	Edge length affected	< 5	percent
2	Moderate	-	Edge length affected	5 to 20	percent
3	Major	-	Edge length affected	20 to 50	percent
4	Extreme	-	Edge length affected	> 50	percent

Condition Rating:

Generally edge cracking is not a factor in operational safety and structural condition rating.

Edge Cracking Photos

Edge Cracking - Low Severity

Edge Cracking - Medium Severity

Edge Cracking - High Severity

Tear Cracking

Description:

- Cracks of short length, usually no more than one or two metres in length.
- May be of a crescent or "Y" shape.
- May be associated with distortion.

Causes:

- Tearing of the hot asphalt mat during construction by a cold screed or a roller.
- Insufficient asphalt stability to withstand tearing under horizontal forces generated by a braking or turning aircraft.

Treatment:

- Replacement patching if spalling occurs or appears probable, or if the cracks are too wide to seal.

Severity Levels:

L	Low	-	Hairline cracks only.
M	Medium	-	Open cracks, ravelling at the edges.
H	High	-	Asphalt fragments loose or spalling.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 2	percent
2	Moderate	-	Wheelpath length affected	2 to 5	percent
3	Major	-	Wheelpath length affected	5 to 10	percent
4	Extreme	-	Wheelpath length affected	> 10	percent

Condition Rating:

Usually of localized extent. Evaluate with discrete cracking if significant.

Tear Cracking Photos

Tear Cracking - Low to Medium Severity

Tear Cracking - Medium Severity

Tear Cracking - High Severity

Figure A-1: Structural Condition Rating - Discrete Cracking

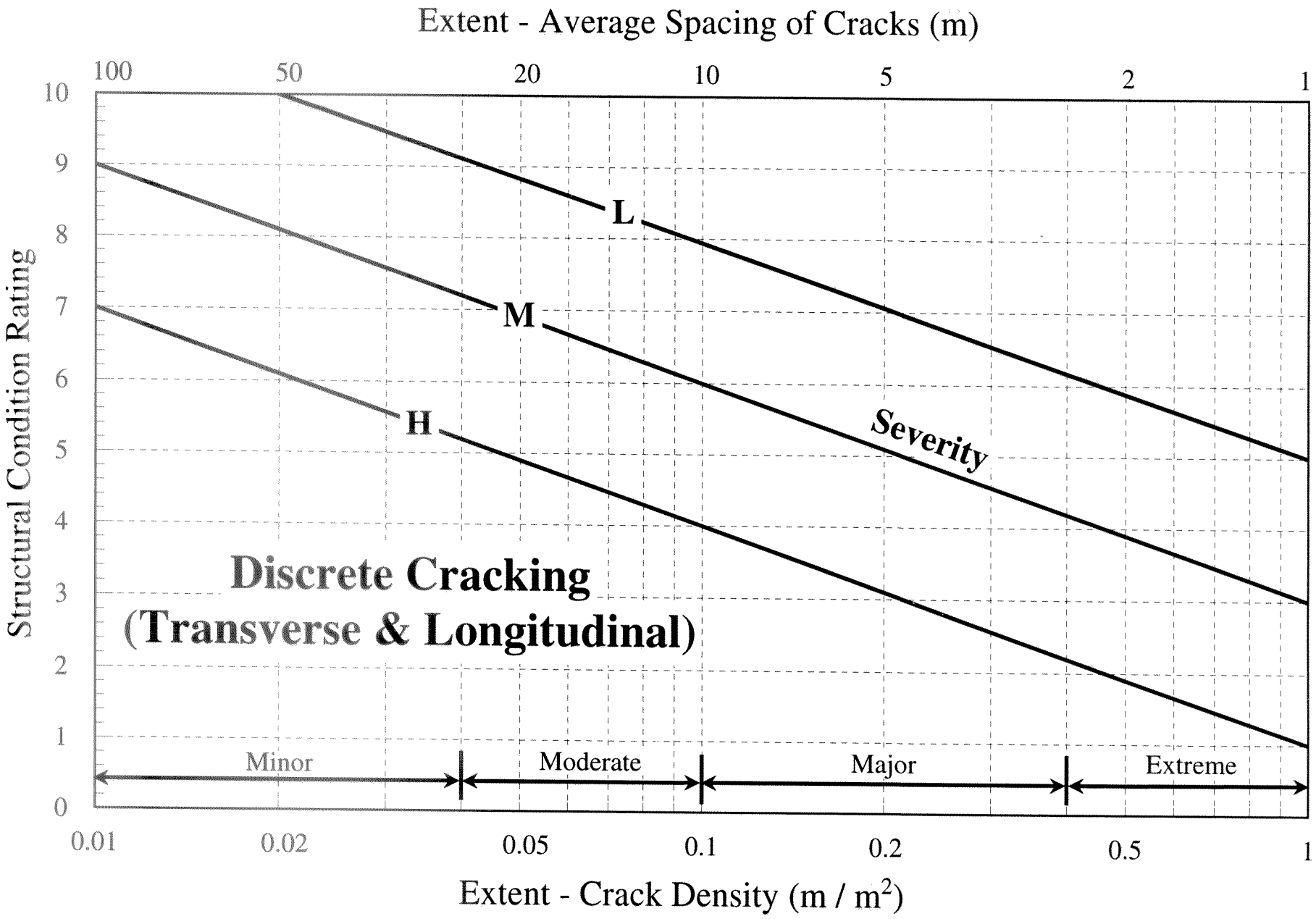


Figure A-2: Structural Condition Rating - Alligator & Map Cracking

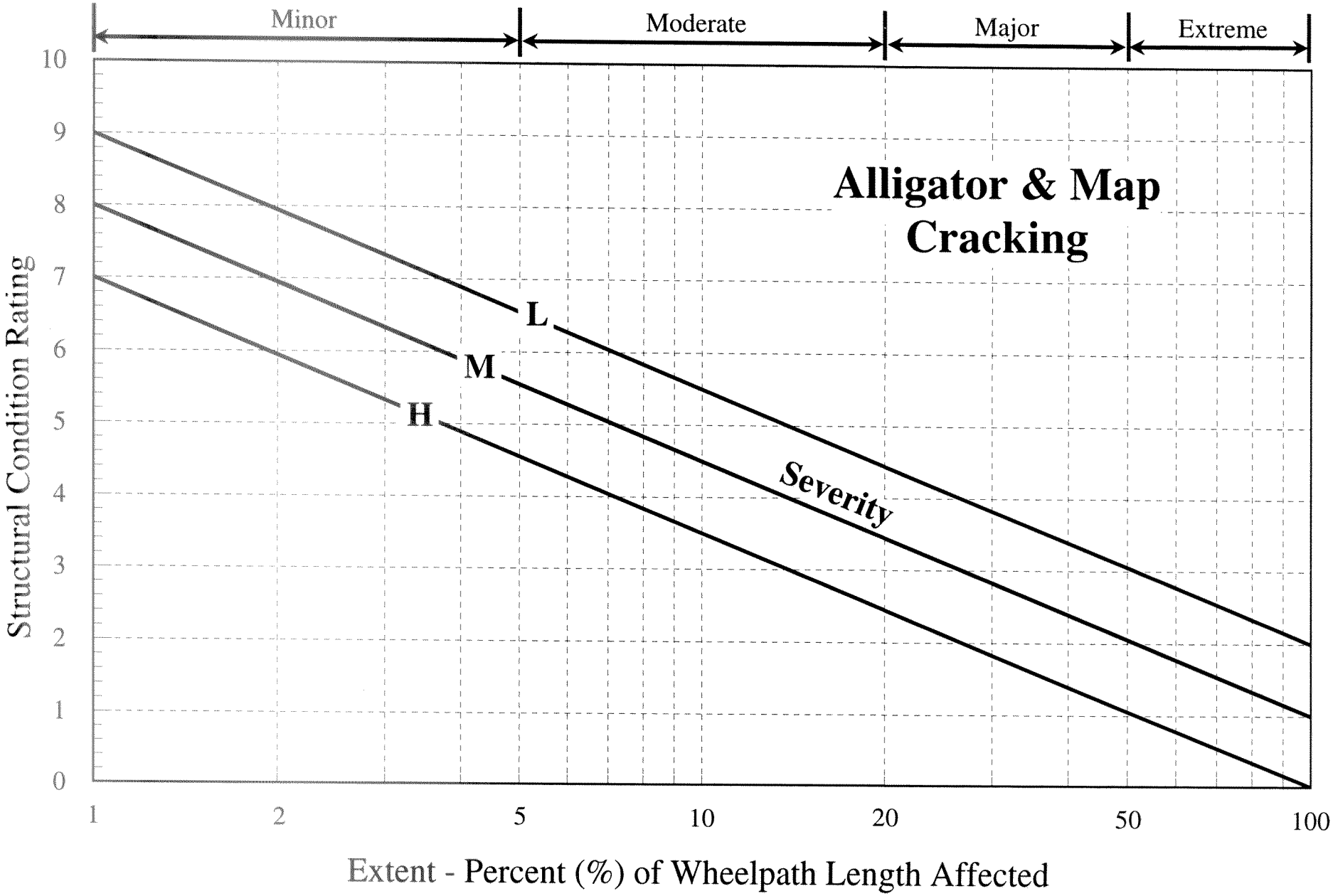


Figure A-3: Structural Condition Rating - Block Cracking

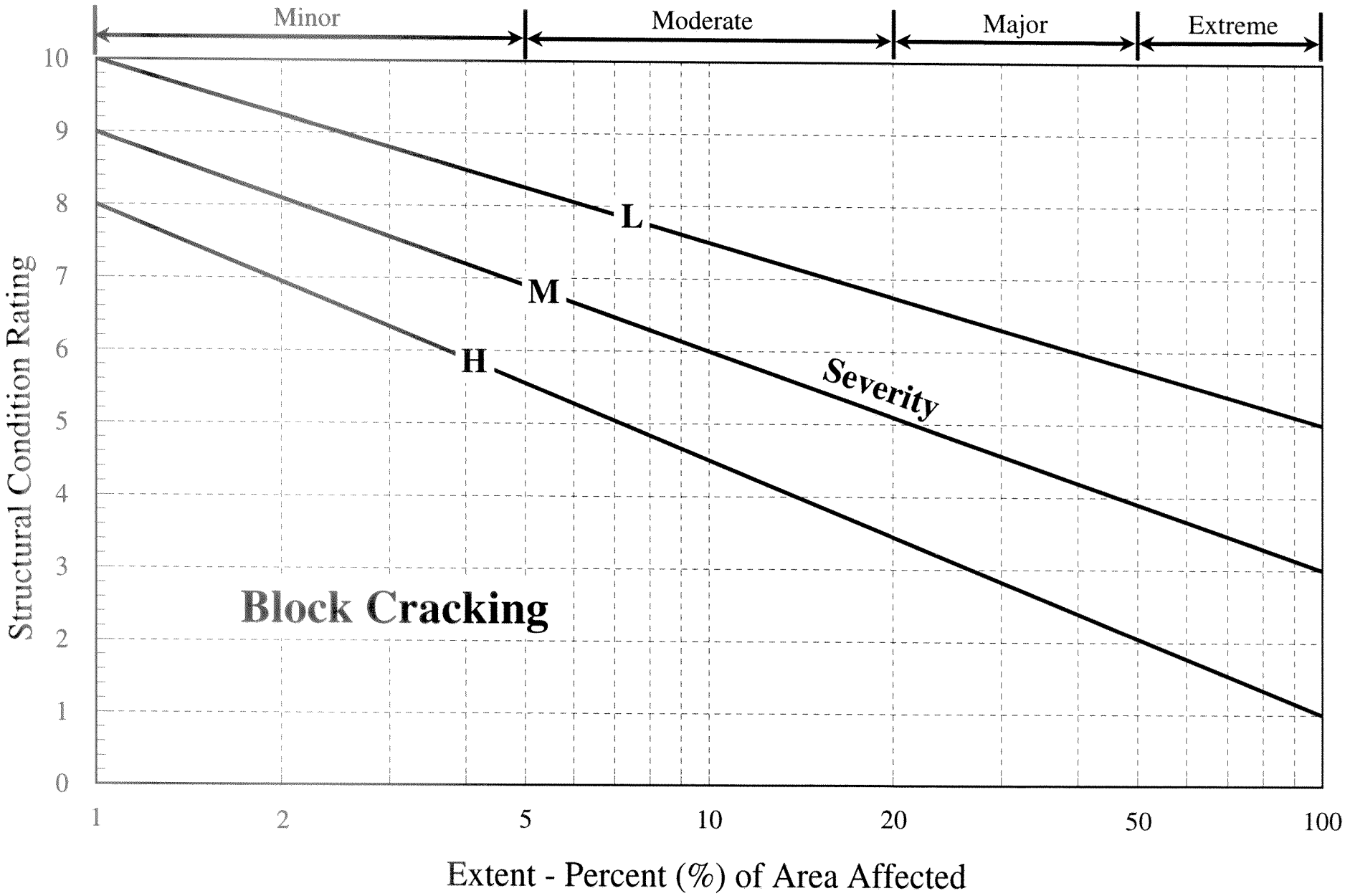


Figure A-4: Structural Condition Rating - Ravelling

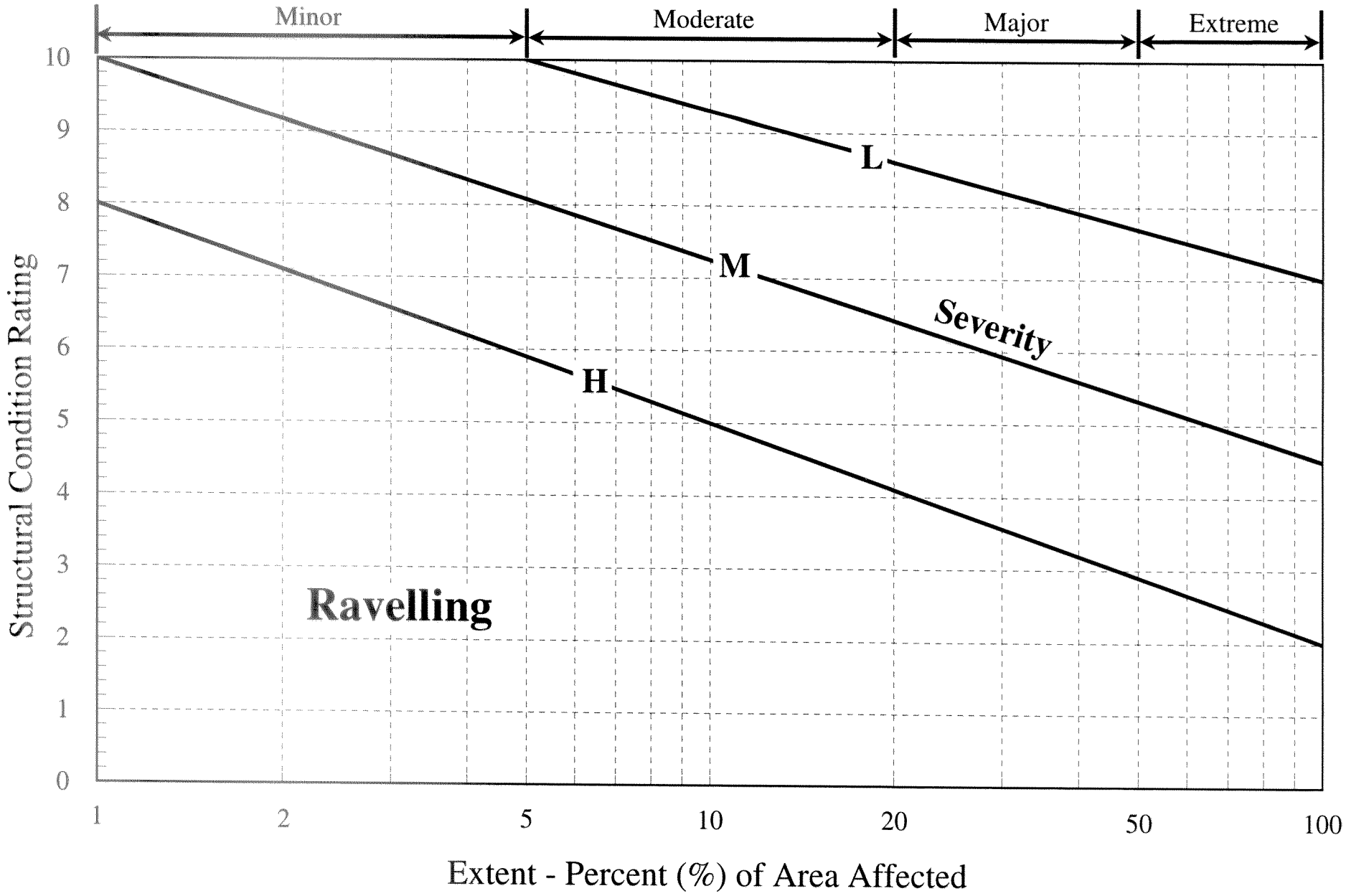


Figure A-5: Structural Condition Rating - Rutting

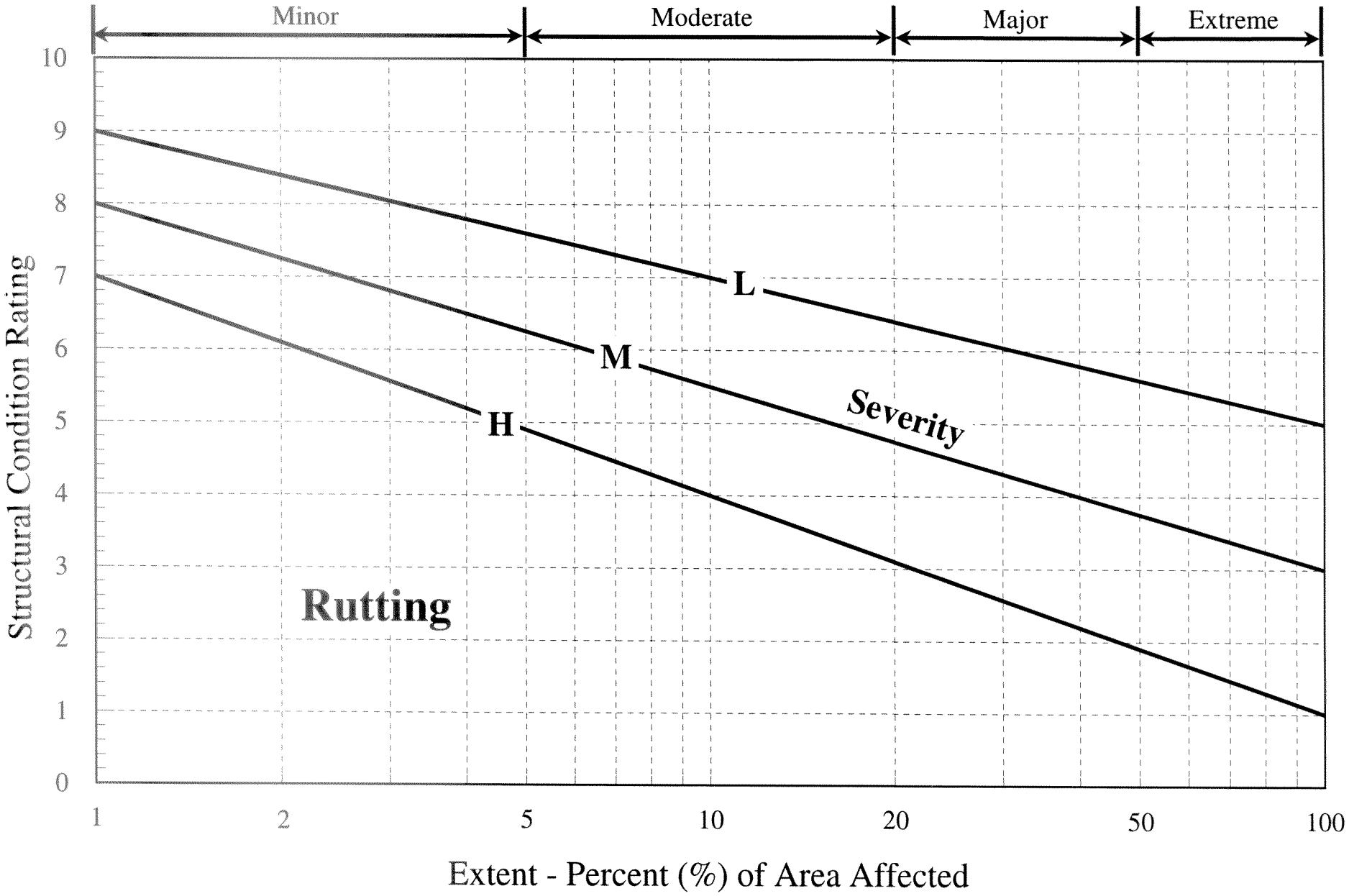


Figure A-6: Example - Structural Condition Rating of Asphalt Pavement Cracking

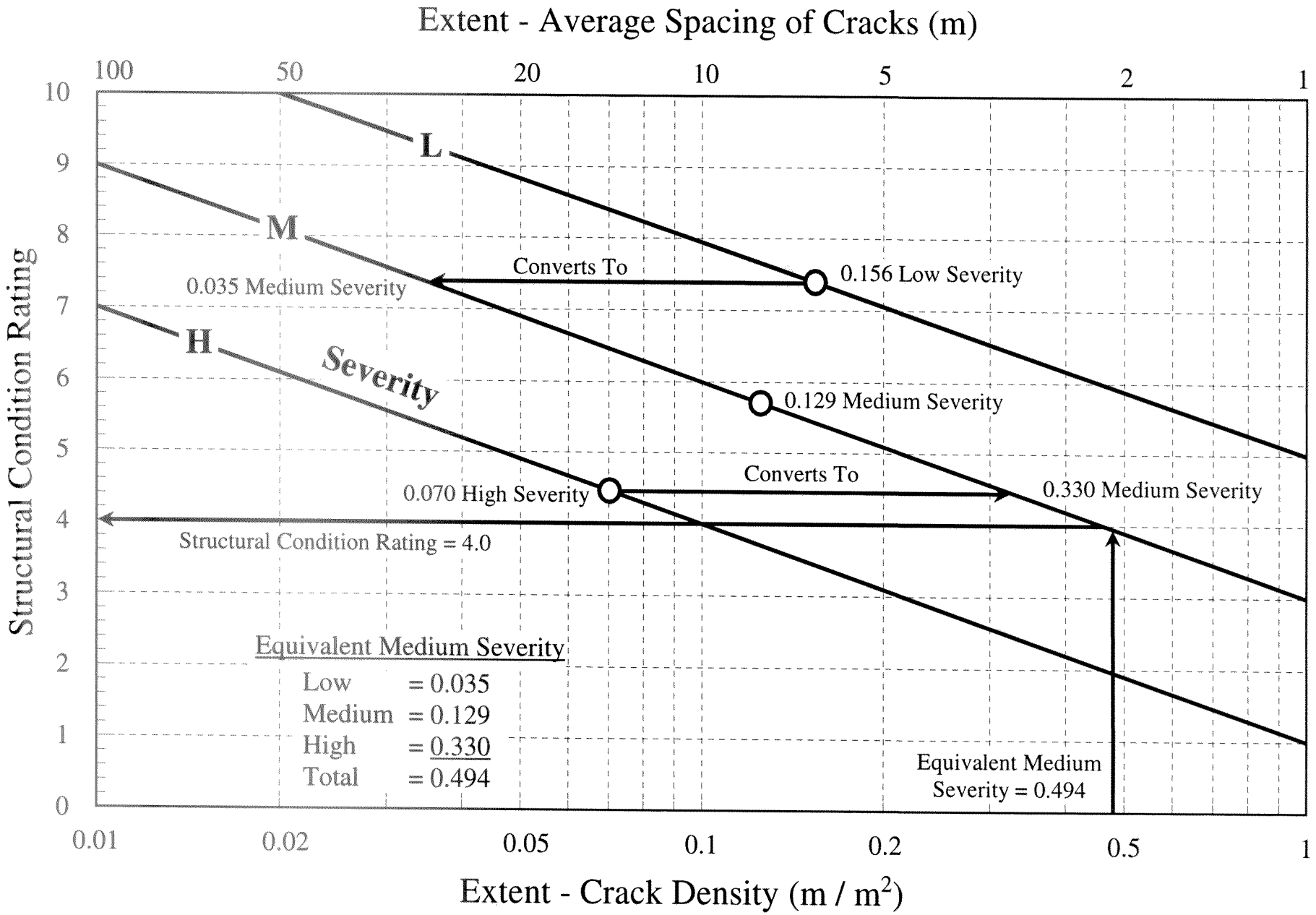


Figure A-7: Defects Recording Form for Asphalt Surfaces

AIRPORT		**FACILITY**	
CHAINAGE	From:	**SECTION**	
	To:	**ID NO.**	
INSPECTOR		**DATE**	

DEFECT RATINGS			
% AT SEVERITY LEVEL			**EXTENT**
HIGH	MEDIUM	LOW	

TRANSVERSE / LONGITUDINAL (DISCRETE) CRACKING		Average Spacing of Cracks (m)	/
Low	Single, clean cracks with no associated breakdown		/
Medium	Cracks with chipped or ravelling edges, or with secondary cracking		/
High	Cracks with adjacent asphalt fragments loose or spalled, or with major settlement	/	

SCR =

ALLIGATOR CRACKING		% Wheelpath Length Affected	
Low	Initial stages, closely spaced longitudinal hairline cracks in the wheelpath		
Medium	Transverse cracking fully developed to complete alligator pattern		
High	Cracking with asphalt fragments loose or spalled		

SCR =

MAP CRACKING		% Wheelpath Length Affected	
Low	Cracking with no associated breakdown		
Medium	Cracking with chipped or ravelling edges, or with secondary cracking		
High	Cracking with asphalt fragments loose or spalled		

SCR =

BLOCK CRACKING		% Area Affected	
Low	Cracking with no associated breakdown, spacing > 2 m		
Medium	Cracking with chipped or ravelling edges, spacing < 2 m		
High	Cracking with asphalt fragments loose or spalled, spacing < 1 m		

SCR =

RAVELLING		% Area Affected	
Low	Individual coarse aggregate pop-outs or fines matrix loss to depth < 3 mm		
Medium	Depth of surface loss not greater than maximum aggregate size		
High	Depth of surface loss greater than maximum aggregate size		

SCR =

RUTTING		% Wheelpath Length Affected	
Low	Rut depth less than 20 mm		
Medium	Rut depth 20 to 40 mm		
High	Rut depth greater than 40 mm		

SCR =

	% Wheelpath Length Affected	
Low		
Medium		
High		

SCR =

	% Wheelpath Length Affected	
Low		
Medium		
High		

SCR =

Comments / Maintenance Requirements	Overall Structural Condition Rating:
	Guidelines Controlling SCR = _____
	Subjective Judgement SCR = _____

Note: The "Guidelines Controlling SCR" is the lowest of the defect SCR's calculated above.

Figure A-1: Structural Condition Rating - Discrete Cracking

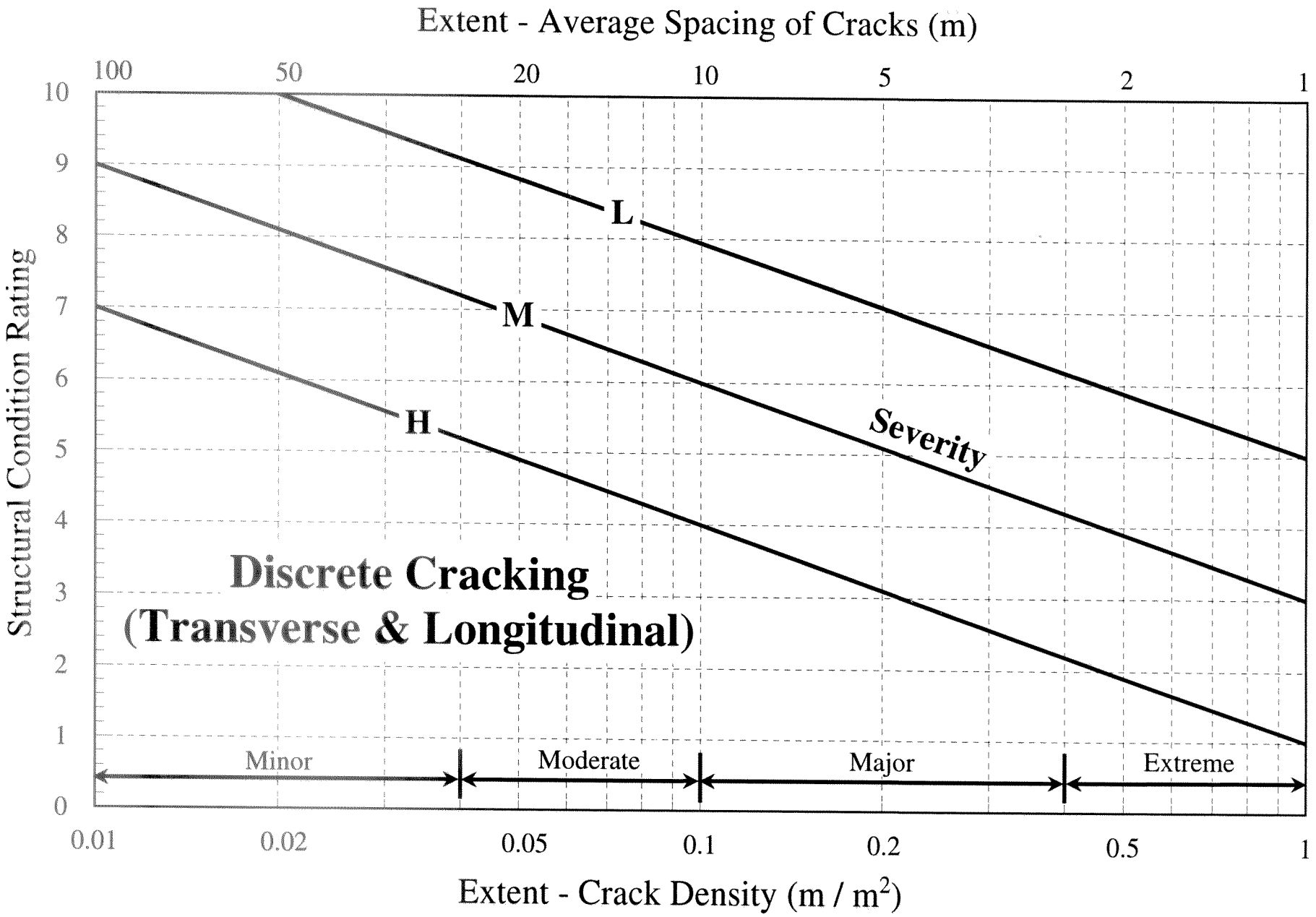


Figure A-2: Structural Condition Rating - Alligator & Map Cracking

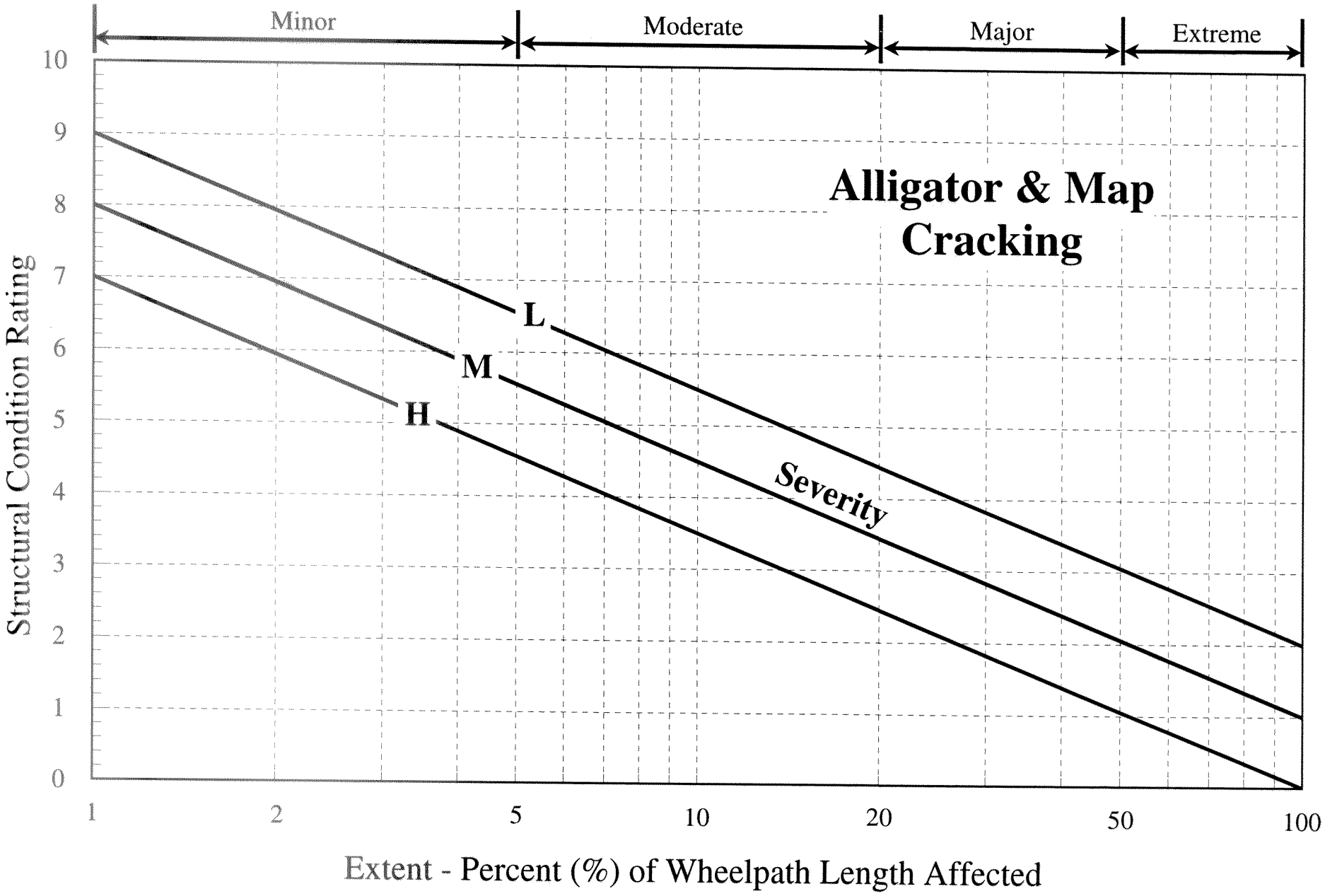


Figure A-3: Structural Condition Rating - Block Cracking

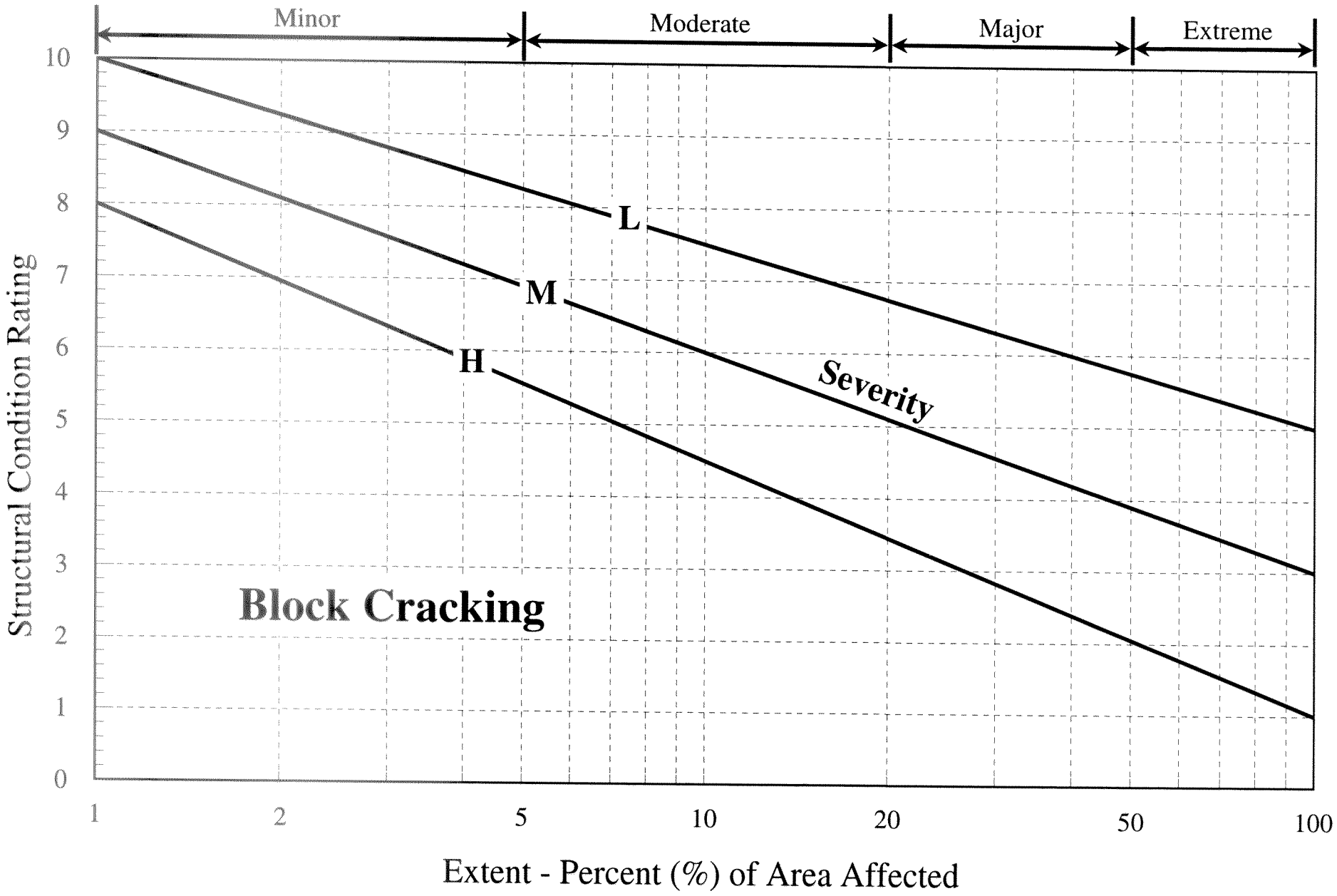


Figure A-4: Structural Condition Rating - Ravelling

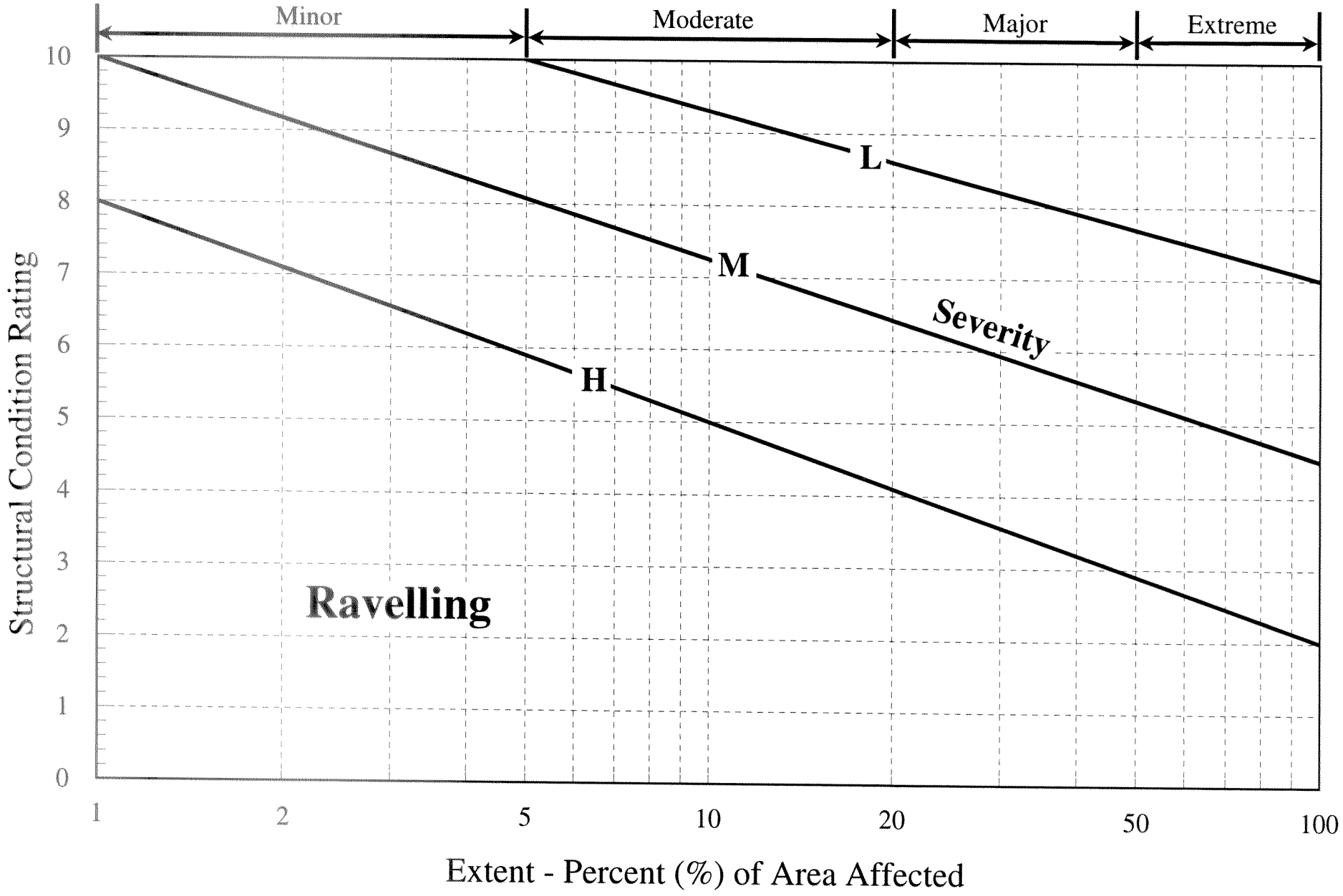


Figure A-5: Structural Condition Rating - Rutting

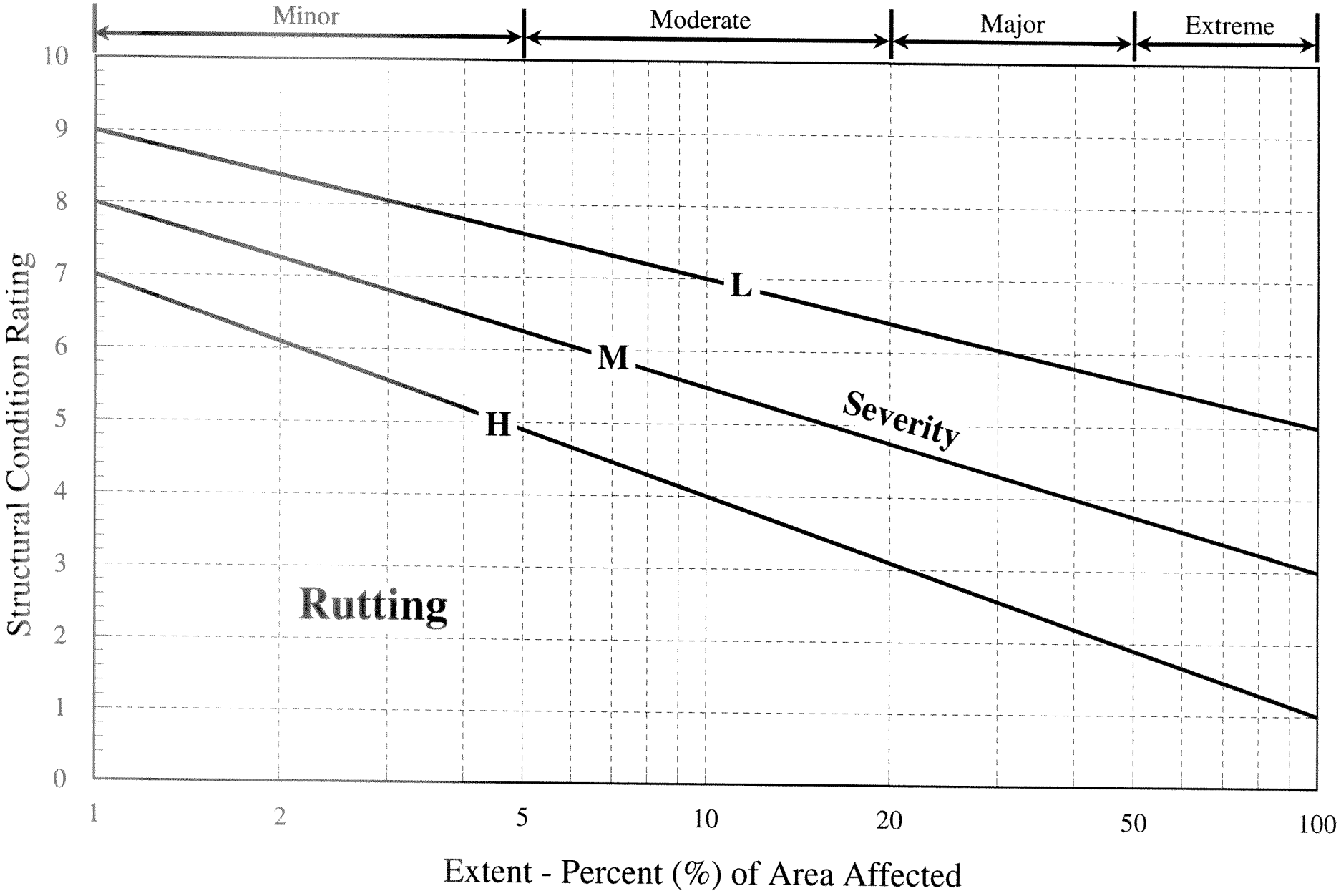


Figure A-6: Example - Structural Condition Rating of Asphalt Pavement Cracking

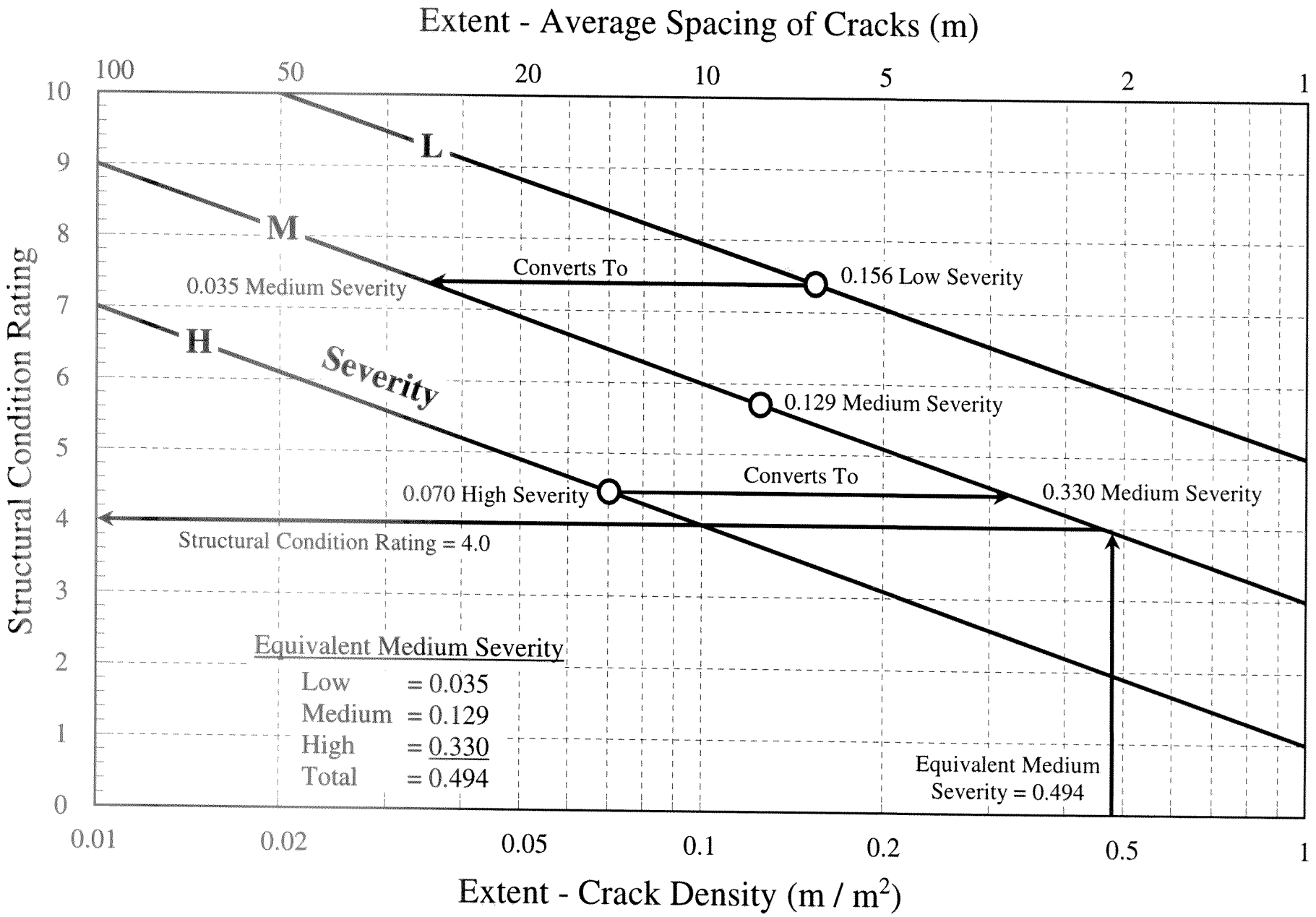


Figure A-7: Defects Recording Form for Asphalt Surfaces

AIRPORT	_____	**FACILITY**	_____
CHAINAGE	From: _____	**SECTION**	_____
	To: _____	**ID NO.**	_____
INSPECTOR	_____	**DATE**	_____

DEFECT RATINGS			
% AT SEVERITY LEVEL			**EXTENT**
HIGH	MEDIUM	LOW	

TRANSVERSE / LONGITUDINAL (DISCRETE) CRACKING		Average Spacing of Cracks (m)	/
Low	Single, clean cracks with no associated breakdown		/
Medium	Cracks with chipped or ravelling edges, or with secondary cracking		/
High	Cracks with adjacent asphalt fragments loose or spalled, or with major settlement		/

SCR =

ALLIGATOR CRACKING		% Wheelpath Length Affected	
Low	Initial stages, closely spaced longitudinal hairline cracks in the wheelpath		
Medium	Transverse cracking fully developed to complete alligator pattern		
High	Cracking with asphalt fragments loose or spalled		

SCR =

MAP CRACKING		% Wheelpath Length Affected	
Low	Cracking with no associated breakdown		
Medium	Cracking with chipped or ravelling edges, or with secondary cracking		
High	Cracking with asphalt fragments loose or spalled		

SCR =

BLOCK CRACKING		% Area Affected	
Low	Cracking with no associated breakdown, spacing > 2 m		
Medium	Cracking with chipped or ravelling edges, spacing < 2 m		
High	Cracking with asphalt fragments loose or spalled, spacing < 1 m		

SCR =

RAVELLING		% Area Affected	
Low	Individual coarse aggregate pop-outs or fines matrix loss to depth < 3 mm		
Medium	Depth of surface loss not greater than maximum aggregate size		
High	Depth of surface loss greater than maximum aggregate size		

SCR =

RUTTING		% Wheelpath Length Affected	
Low	Rut depth less than 20 mm		
Medium	Rut depth 20 to 40 mm		
High	Rut depth greater than 40 mm		

SCR =

		% Wheelpath Length Affected	
Low			
Medium			
High			

SCR =

		% Wheelpath Length Affected	
Low			
Medium			
High			

SCR =

Comments / Maintenance Requirements	Overall Structural Condition Rating:
_____	Guidelines Controlling SCR = _____
_____	Subjective Judgement SCR = _____
_____	
_____	

Note: The "Guidelines Controlling SCR" is the lowest of the defect SCR's calculated above.

Appendix B

Concrete Pavement Surface Defects and Rating Guidelines

Structural Condition Rating Guidelines for Concrete Surfaces

1.0 Defect Extent and Severity Recording

During inspection, record the extent (including nil if applicable) of each defect found on the "Defects Recording Form for Concrete Surfaces" (Figure B-2) if the defect has a significant effect on pavement structural condition. Record the total extent, regardless of severity, using the measurement unit defined under "Extent Levels" in the defect guidelines. Also record the percent of the total extent that is of low, medium and high severity.

During the survey also maintain a separate count of all concrete panels that are defective for any reason related to a structural deficiency such as panel, corner, edge cracking or scaling/spalling. Defects such as joint sealant failure and joint faulting are not included because sealant deficiencies are a maintenance problem and joint faulting affects only ride quality, not surface integrity or bearing capacity. Rate the severity of the defective panels as low, medium or high (L, M, H) according to the severity definitions given for the defect(s) found in the panel. The following should be recorded at the bottom of the "Defects Recording Form for Concrete Surfaces" (Figure B-2):

a) Total Number/Percent of Panels with Defect(s),
b) Number/Percent of Panels with Defect(s) of "Low" Severity,
c) Number/Percent of Panels with Defect(s) of "Medium" Severity,
d) Number/Percent of Panels with Defect(s) of "High" Severity.

2.0 Defect Extent Rating

Classify the total extent as being None (0), Minor (1), Moderate (2), Major (3) or Extreme (4) according to the "Extent Levels" definitions given in the defect guidelines and report the numerical value (0, 1, 2, 3 or 4) on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) under the appropriate defect.

3.0 Defect Severity Rating

Using the recorded percentages, compute the extent of the defect at each level of severity. Determine a separate Structural Condition Rating (SCR) for each level of severity using the SCR vs Extent/Severity chart for concrete pavements (Figure B-1). Record on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) the severity level (L, M, H) that gives the lowest SCR.

3.1 Example - Severity Rating of a Concrete Surface with Panel Cracking

A concrete surfaced pavement section has 11% of its panels affected by "panel cracking". From the defect guideline page for panel cracking, the extent level is determined to be "Major". The severity of panel cracking during inspection was recorded as follows:

"Low" Severity - 60% of the extent = 6.6% of panels
"Medium" Severity - 30% of the extent = 3.3% of panels
"High" Severity - 10% of the extent = 1.1% of panels

From the SCR vs E/S chart for concrete pavements (Figure B-1):

6.6% of the panels with "Low" severity cracking gives an SCR = 8.0
3.3% of the panels with "Medium" severity cracking gives an SCR = 7.1
1.1% of the panels with "High" severity cracking gives an SCR = 6.9

Report the severity level of the concrete panel cracking as "High" because this level has the greatest impact on the SCR (i.e. select the lowest SCR). On the "Pavement Condition Ratings Summary" form (Figure 2 of the main report) record the extent of panel cracking as "3" (Major) and the severity as "H" (High).

4.0 Overall Structural Condition Rating (SCR) - Concrete Pavements

The ***overall*** Structural Condition Rating (SCR) for a concrete pavement section reflects the total extent and severity of panels affected by structurally significant defects (i.e. panel, corner, edge cracking and scaling/spalling). The overall SCR is calculated using the survey's separate count of defective panels and the corresponding assignment of critical severity levels.

To determine the overall SCR for a concrete surfaced section, the different levels of defect severity must be "added". Convert the extent at low and high levels of severity to an equivalent extent at the medium severity level, where equivalency is based on giving the same structural condition rating. Sum the equivalent medium severity values and use the total to determine the overall SCR for the pavement section from the medium severity curve on the "SCR vs E/S" chart for concrete pavements (Figure B-1). Record the calculated overall SCR for the concrete pavement section on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report).

4.1 Example of Overall SCR Calculation for Concrete Pavements

Percentage of Panels with Defects = 13%
Percentage of Defective Panels at "Low" Severity = 58% ---> 7.5% of panels
Percentage of Defective Panels at "Medium" Severity = 32% ---> 4.2% of panels
Percentage of Defective Panels at "High" Severity = 10% ---> 1.3% of panels

7.5% of panels are "Low" severity which converts to 2.0% Medium Severity *
4.2% of panels are "Medium" severity which converts to 4.2% Medium Severity
1.3% of panels are "High" severity which converts to 5.2% Medium Severity *
Total Equivalent Extent of Medium Severity = 11.4%

Overall SCR for the Concrete Section = 5.6 *

Record an SCR of 5.6 on the "Pavement Condition Ratings Summary" form (Figure 2 of the main report).

* From Figure B-1

5.0 Concrete Pavement Defects, Rating Guidelines and Photographs

The remaining pages of this Appendix contain descriptions, rating guidelines and photographs for the defects most commonly found in concrete pavement surfaces.

a) Panel Cracking
b) Corner Cracking
c) Edge Cracking
d) Surface Scaling and Spalling
e) Joint Faulting
f) Joint Sealant Failure
g) Surface Crazing
h) "D" Cracking
i) Pumping
j) Compression Buckling

Panel Cracking

Description:

- Full-depth cracking through a concrete panel in a transverse, longitudinal or diagonal direction that divides the panel into two or more parts.

Causes:

- Aircraft loads that exceed the slab bearing strength. If this is the only factor, corner cracking will likely appear first.
- Differential bearing loss beneath the slab due to subgrade erosion, settlement or heaving.
- Late sawing of contraction joints during construction.
- Sympathetic cracking (extension of cracks or mismatched joints into adjacent panels as a result of thermal expansion/contraction movements).
- Seizing of thermal joints by dowels or tie-bars.

Treatment:

- Seal cracks of medium severity.
- Partial or full panel replacement if significant spalling or settlement/stepping occurs or if the panel is broken into four or more pieces.

Severity Levels:

L	Low	-	Single hairline crack.
M	Medium	-	Open crack with little or no spalling, or panel cracked into three or more pieces.
H	High	-	Spalled crack or panel cracked into four or more sections.

Extent Levels:

1	Minor	-	Panels affected < 3	percent
2	Moderate	-	Panels affected 3 to 10	percent
3	Major	-	Panels affected 10 to 30	percent
4	Extreme	-	Panels affected > 30	percent

Condition Rating:

See Figure B-1.

Panel Cracking Photos

Panel Cracking - Low Severity

Panel Cracking - Medium to High Severity

Panel Cracking - High Severity

Corner Cracking

Description:

- A full-depth crack at the corner of a panel running from contraction to construction joint.
- Distinctive semi-circular cracking pattern about the corner distinguishes corner from edge cracking.

Causes:

- Aircraft loads that exceed the slab bearing capacity.
- Loss of foundation support at the corner due to subgrade erosion, settlement or heaving.

Treatment:

- Partial panel replacement for corner cracking of minor extent if spalling or stepping occurs.
- Corner cracking greater than minor in extent suggests an overloading condition and the need for pavement strengthening or traffic restrictions. The pavement bearing capacity and published load ratings should be reviewed.

Severity Levels:

L	Low	-	Single corner, hairline crack.
M	Medium	-	Open crack with little or no spalling.
H	High	-	Concrete spalling or multiple adjacent corners cracked.

Extent Levels:

1	Minor	-	Panels affected < 3	percent
2	Moderate	-	Panels affected 3 to 10	percent
3	Major	-	Panels affected 10 to 30	percent
4	Extreme	-	Panels affected > 30	percent

Condition Rating:

See Figure B-1.

Corner Cracking Photos

Corner Cracking

Low Severity

Corner Cracking

Medium Severity

Corner Cracking

High Severity

Edge Cracking

Description:

- A crack at the edge of a panel running more or less parallel to the joint (most frequently a construction joint) at an offset usually in the range of 100 to 750 mm from the joint.
- The crack usually does not extend to the full depth of the slab but runs from the surface diagonally or subsurface horizontally to intersect the joint at partial slab depth.

Causes:

- Overloading of the construction joint keyway, possibly combined with inadequate keyway design.
- Damage during construction causing micro-cracking in the uncured concrete (possibly related to form removal methods).
- Late sawing of contraction joints during construction resulting in cracking ahead of the saw.
- Infiltration of joints by incompressible solids.
- Patching with rigid materials without re-establishing the joint.

Treatment:

- Partial depth patching or partial panel replacement for spalling edge cracks.

Severity Levels:

L	Low	-	Edge cracking with no associated spalling.
M	Medium	-	Concrete spalling along partial panel length only.
H	High	-	Concrete spalling full panel length along one or more edges.

Extent Levels:

1	Minor	-	Panels affected < 3	percent
2	Moderate	-	Panels affected 3 to 10	percent
3	Major	-	Panels affected 10 to 30	percent
4	Extreme	-	Panels affected > 30	percent

Condition Rating:

See Figure B-1.

Edge Cracking Photos

Edge Cracking - Low Severity

Edge Cracking - Medium Severity

Edge Cracking - High Severity

Surface Scaling / Spalling

Description:

- Disintegration, ravelling or break-up with the subsequent loss of material from the concrete surface.
- Peeling of a relatively thin layer from the surface is referred to as scaling.

Causes:

- A weak layer of fine aggregate at the surface resulting from over-finishing during construction.
- Poor curing practices during construction.
- Poor quality aggregates or concrete mix, possibly combined with freeze-thaw cycles and the action of de-icing chemicals.
- Surface crazing reaching a high level of severity.

Treatment:

- For high severity surface spalling, surface patch if localized or resurface/reconstruct if extensive.

Severity Levels:

L	Low	-	Scaling depth of surface loss less than 10 mm or extensive discrete pop-outs.
M	Medium	-	Depth of surface loss less than the maximum aggregate size.
H	High	-	Depth of surface loss greater than the maximum aggregate size.

Extent Levels:

1	Minor	-	Panels affected < 3	percent
2	Moderate	-	Panels affected 3 to 10	percent
3	Major	-	Panels affected 10 to 30	percent
4	Extreme	-	Panels affected > 30	percent

Condition Rating:

See Figure B-1.

Surface Scaling / Spalling Photos

Surface
Scaling/Spalling

Low to Medium
Severity

Surface Spalling

Medium Severity

Surface Spalling

High Severity

Joint Faulting

Description:

- Elevation or depression of a concrete panel relative to an adjacent panel that results in a step at the joint between the panels.
- May be referred to as joint-stepping.

Causes:

- Differential settlement or heaving of adjacent panels due to subgrade settlement or frost heaving.
- Settlement resulting from the pumping of fines from beneath the slab as traffic crosses a joint when the base is saturated.
- High levels of load repetition from slow moving aircraft crossing the joint (the step is downward in the direction of traffic).

Treatment:

- Slab jacking or diamond grinding for high severity joint faulting of limited extent.
- Resurfacing overlay or reconstruction if extensive faulting causes excessively poor riding quality.

Severity Levels:

L	Low	-	Step height is less than 10 mm.
M	Medium	-	Step height is from 10 to 20 mm.
H	High	-	Step height is greater than 20 mm.

Extent Levels:

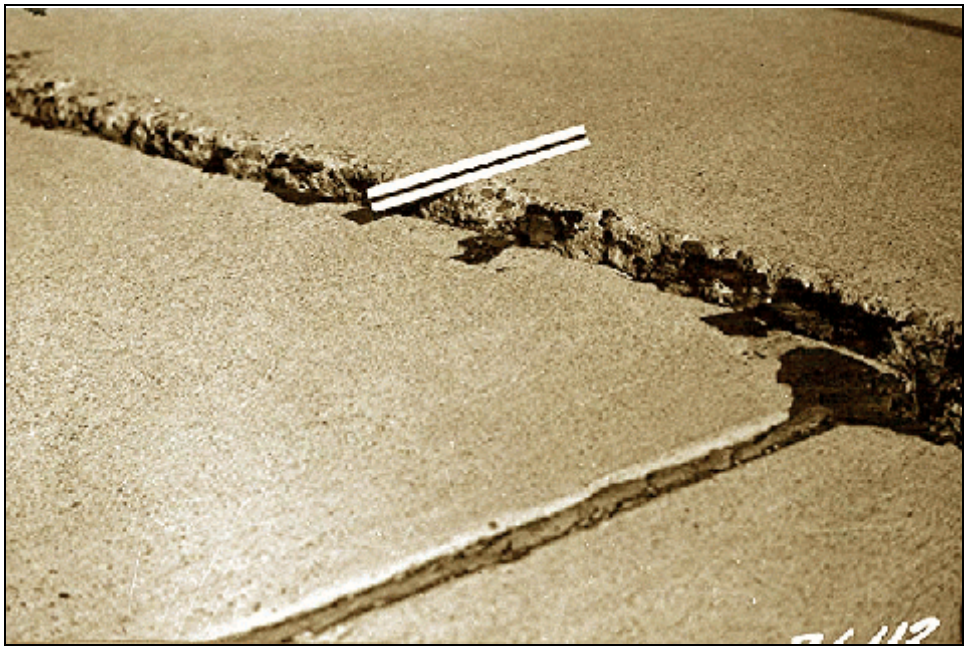
1	Minor	-	Panels affected < 3	percent
2	Moderate	-	Panels affected 3 to 10	percent
3	Major	-	Panels affected 10 to 30	percent
4	Extreme	-	Panels affected > 30	percent

Condition Rating:

Evaluate operational effect through ride quality measurement.

Joint Faulting Photos

Joint Faulting - Medium Severity



Joint Faulting - High Severity

Joint Sealant Failure

Description:

- Adhesion failure - loss of bond with the concrete along joint kerf walls.
- Cohesion failure - vertical split through the sealant material.
- Joint edge chipping - small chips of concrete pulled from adjacent kerf walls.
- Loss of sealant material from the joint kerf.

Causes:

- Deficient sealant material or installation procedure.
- Design details of the joint kerf.

Treatment:

- Empty joint kerfs and kerfs with loose sealant material should be cleaned and resealed with a proven sealant material.

Severity Levels:

L	Low	-	Adhesion loss on one side or cohesion failure.
M	Medium	-	Adhesion loss on both sides; sealant loose.
H	High	-	Sealant lost from the joint or joint kerf edge chipping.

Extent Levels:

1	Minor	-	Joint length affected	< 3	percent
2	Moderate	-	Joint length affected	3 to 10	percent
3	Major	-	Joint length affected	10 to 30	percent
4	Extreme	-	Joint length affected	> 30	percent

Condition Rating:

Not a direct factor in operational condition.

Joint Sealant Failure Photos

Joint Sealant Failure - Medium Severity
(Sealant Adhesion Loss on Both Sides)

Joint Sealant Failure - High Severity
(Joint Edge Chipping)

Surface Crazing

Description:

- A network of fine cracks in the concrete surface.

Causes:

- Concrete expansion due to an alkali-aggregate reaction.
- Construction related deficiencies such as over-finishing of the surface or improper operation of vibrators.

Treatment:

- No maintenance unless surface spalling develops.

Severity Levels:

L	Low	-	Cracking pattern visible but surface intact and sound.
M	Medium	-	Not applicable.
H	High	-	Surface spalling developing.

Extent Levels:

1	Minor	-	Panels affected	< 3	percent
2	Moderate	-	Panels affected	3 to 10	percent
3	Major	-	Panels affected	10 to 30	percent
4	Extreme	-	Panels affected	> 30	percent

Condition Rating:

Rate under surface scaling and spalling.

Surface Crazing Photos

Surface Crazing

Low Severity

Surface Crazing

High Severity

"D" Cracking

Description:

- A network of fine cracks running along panel edges and around the corners, generally within a 300 to 500 mm width adjacent to the joint.

Causes:

- Cracking of coarse aggregate particles under freeze-thaw action with the eventual extension of the cracks into the mortar and throughout the concrete. Certain types of calcitic and dolomitic limestone found in the Canadian Prairie Provinces are susceptible to "D" cracking.

Treatment:

- Asphalt overlay or panel replacement once spalling develops.

Severity Levels:

L	Low	-	Not applicable.
M	Medium	-	Cracking pattern visible but the concrete is still intact.
H	High	-	Surface/joint spalling occurring.

Extent Levels:

1	Minor	-	Panels affected	< 3	percent
2	Moderate	-	Panels affected	3 to 10	percent
3	Major	-	Panels affected	10 to 30	percent
4	Extreme	-	Panels affected	> 30	percent

Condition Rating:

Rate as a defective panel.

"D" Cracking Photos

"D" Cracking
Medium to High Severity

"D" Cracking
(Characteristic Curve Pattern Around Slab Corners)

Pumping

Description:

- Subsurface fines suspended in water are ejected from beneath a concrete slab as aircraft traffic crosses a joint or crack during periods of rain or saturated base/subbase conditions.
- During dry weather, evidence of pumping may be provided by stains left on the concrete surface.

Causes:

- Joint sealant failure allowing entry of water to the subsurface combined with significant deflection of the concrete slab under aircraft loads.

Treatment:

- Generally, treatment is not required unless cracking develops.
- Raising and levelling of settled panels by means of subsurface injection (slab jacking) may be appropriate in some situations.

Severity Levels:

Not applicable.

Extent Levels:

1	Minor	-	Panels affected	< 3	percent
2	Moderate	-	Panels affected	3 to 10	percent
3	Major	-	Panels affected	10 to 30	percent
4	Extreme	-	Panels affected	> 30	percent

Condition Rating:

Not a direct influence on operational condition.
Rate associated settlement and cracking if they occur.

Concrete Slab Pumping Photos

Concrete Slab Pumping
(Evidenced by Surface Staining at the Joints)

Compression Buckling

Description:

- Crushing, shattering and upward buckling of concrete slabs along a joint line.

Causes:

- High compressive forces caused by insufficient width of joint gap for slabs to expand in hot weather (more likely to occur with thinner slabs).
- Insufficient joint spacing may be the result of paving in cold weather, incompressible material plugging the joints, patching without re-establishing the joints or utility cuts.

Treatment:

- Partial or full replacement of damaged panels with possible cutting of an expansion joint to relieve compressive forces.

Severity Levels:

Not applicable - the nature of the defect implies high severity.

Extent Levels:

Not applicable - normally very localized.

Condition Rating:

Not a factor in general structural condition due to the localized nature of the defect.

Compression Buckling Photos

Compression Buckling at an Inserted Surface Drainage Line

Compression Buckling

Figure B-1: Structural Condition Ratings - Concrete Pavements

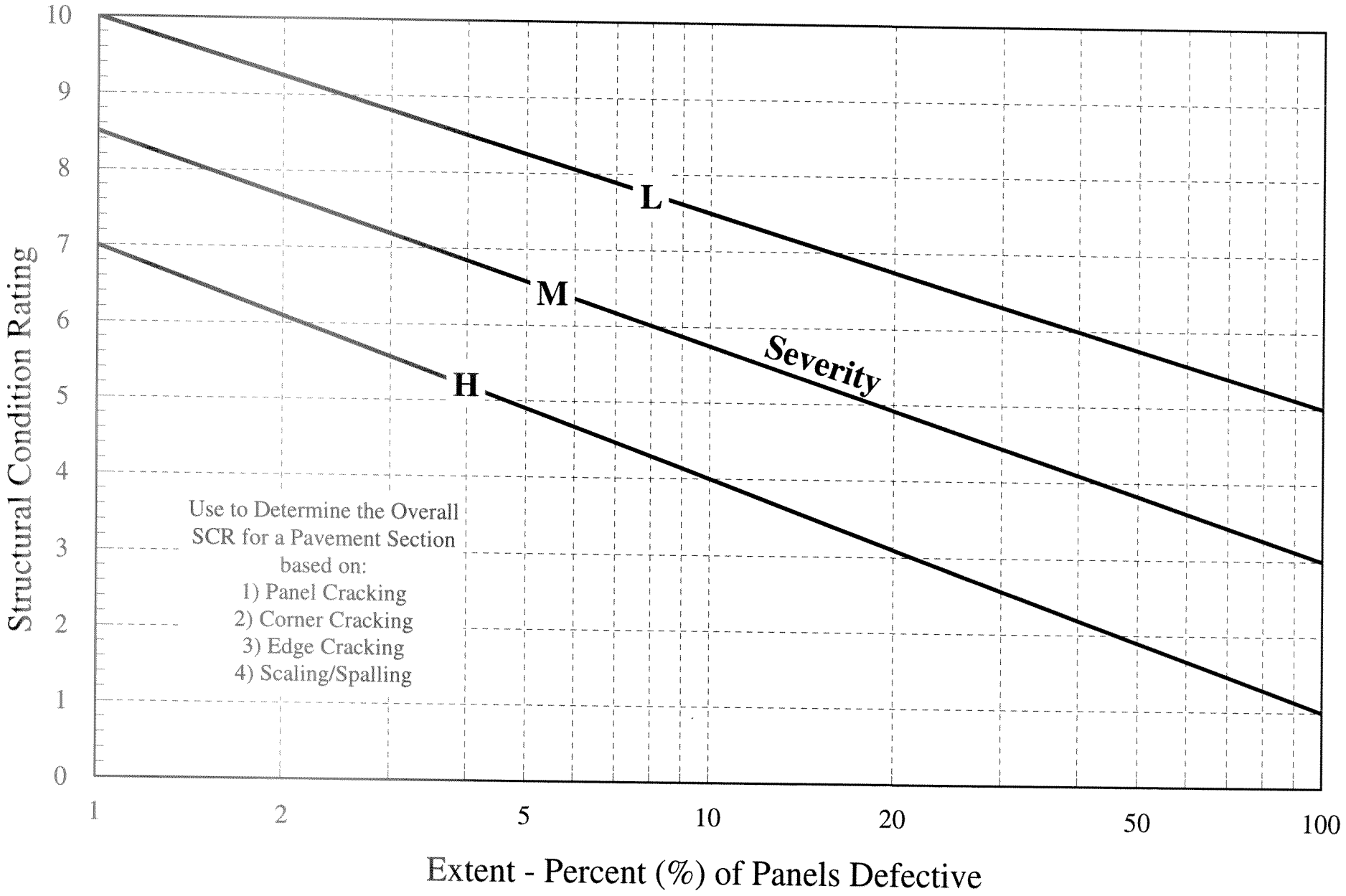


Figure B-2: Defects Recording Form for Concrete Surfaces

AIRPORT _____	**FACILITY** _____	**DEFECT RATINGS**	
CHAINAGE From: _____	**SECTION** _____	**% AT SEVERITY LEVEL**	**EXTENT**
To: _____	**ID NO.** _____	HIGH / MEDIUM / LOW	
INSPECTOR _____	**DATE** _____		

		% Panels Affected
PANEL CRACKING *		
Low	Hairline crack	
Medium	Open crack with little or no spalling	
High	Spalled crack or panel cracked into 3 or more pieces	
CORNER CRACKING *		% Panels Affected
Low	Single corner, hairline crack	
Medium	Open crack with little or no spalling	
High	Concrete spalling or multiple adjacent corners cracked	
EDGE CRACKING *		% Panels Affected
Low	Edge cracking with no associated spalling	
Medium	Concrete spalling along partial length only	
High	Concrete spalling along 20% or more of panel perimeter	
SURFACE SCALING & SPALLING *		% Panels Affected
Low	Scaling depth of surface loss less than 10 mm or extensive discrete pop-outs	
Medium	Depth of surface loss less than maximum aggregate size	
High	Depth of surface loss greater than maximum aggregate size	
JOINT FAULTING		% Panels Affected
Low	Step height less than 10 mm	
Medium	Step height 10 mm to 20 mm	
High	Step height greater than 20 mm	
JOINT SEALANT FAILURE		% Joint Length Affected
Low	Adhesion loss one side, or cohesion failure	
Medium	Adhesion loss both sides, sealant loose or lost	
High	Slab edge chipping with tension failure in surrounding concrete	
		% Panels Affected
Low		
Medium		
High		
DEFECTIVE PANELS (* Due to Cracking or Surface Spalling)		% Panels Affected
Low	As indicated above for the defect type involved	
Medium	As indicated above for the defect type involved	
High	As indicated above for the defect type involved	

SCR =

Comments / Maintenance Requirements:	Overall Structural Condition Rating:
_____	Guidelines SCR = _____
_____	Subjective Judgement SCR = _____
_____	
_____	

Note: The "Guidelines SCR" is the SCR value calculated above for all defective panels.

Figure B-1: Structural Condition Ratings - Concrete Pavements

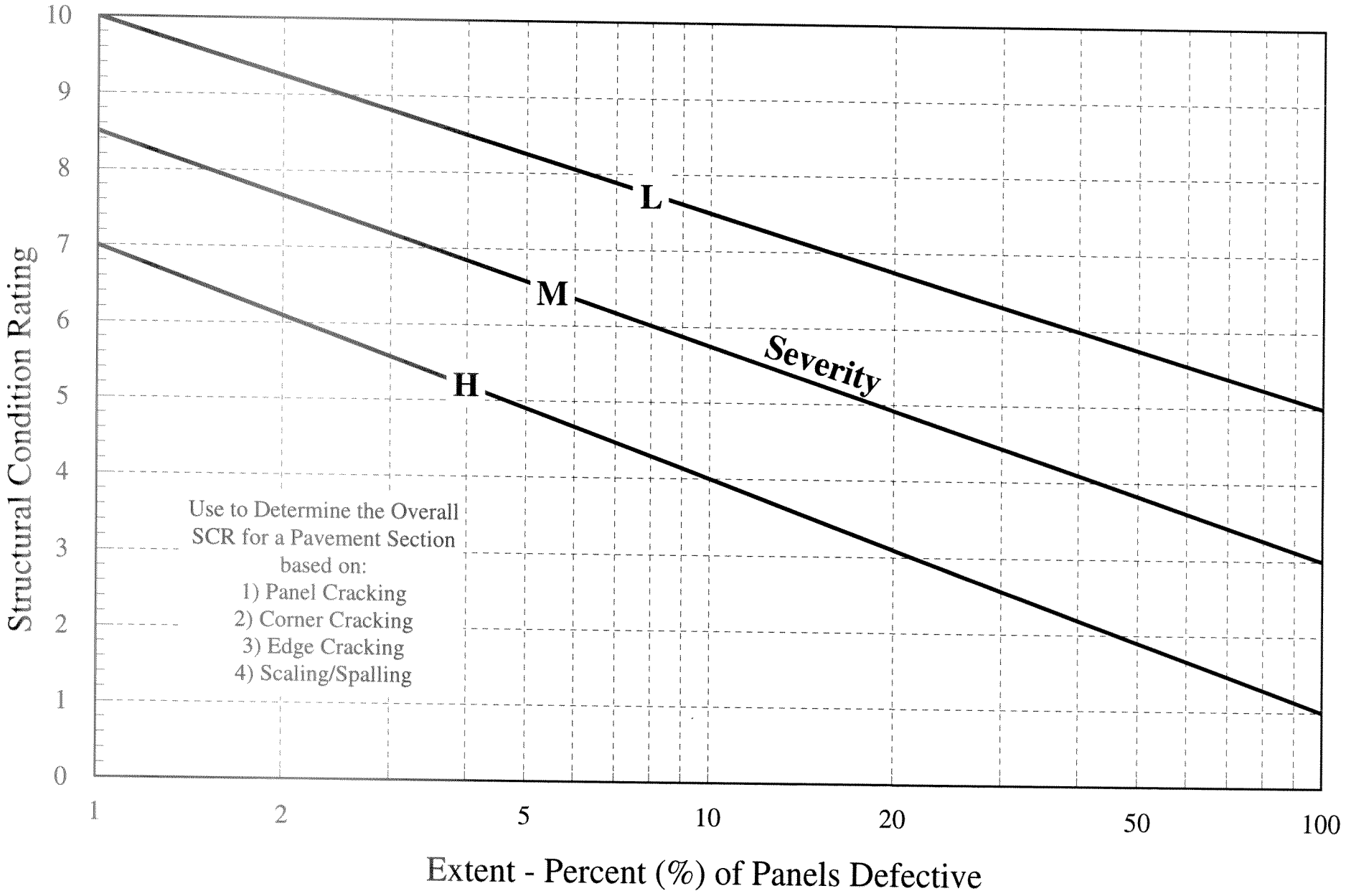


Figure B-2: Defects Recording Form for Concrete Surfaces

AIRPORT _____	**FACILITY** _____	**DEFECT RATINGS**	
CHAINAGE From: _____	**SECTION** _____	**% AT SEVERITY LEVEL**	**EXTENT**
To: _____	**ID NO.** _____	HIGH / MEDIUM / LOW	
INSPECTOR _____	**DATE** _____		

		% Panels Affected
PANEL CRACKING *		
Low	Hairline crack	
Medium	Open crack with little or no spalling	
High	Spalled crack or panel cracked into 3 or more pieces	
CORNER CRACKING *		% Panels Affected
Low	Single corner, hairline crack	
Medium	Open crack with little or no spalling	
High	Concrete spalling or multiple adjacent corners cracked	
EDGE CRACKING *		% Panels Affected
Low	Edge cracking with no associated spalling	
Medium	Concrete spalling along partial length only	
High	Concrete spalling along 20% or more of panel perimeter	
SURFACE SCALING & SPALLING *		% Panels Affected
Low	Scaling depth of surface loss less than 10 mm or extensive discrete pop-outs	
Medium	Depth of surface loss less than maximum aggregate size	
High	Depth of surface loss greater than maximum aggregate size	
JOINT FAULTING		% Panels Affected
Low	Step height less than 10 mm	
Medium	Step height 10 mm to 20 mm	
High	Step height greater than 20 mm	
JOINT SEALANT FAILURE		% Joint Length Affected
Low	Adhesion loss one side, or cohesion failure	
Medium	Adhesion loss both sides, sealant loose or lost	
High	Slab edge chipping with tension failure in surrounding concrete	
		% Panels Affected
Low		
Medium		
High		
DEFECTIVE PANELS (* Due to Cracking or Surface Spalling)		% Panels Affected
Low	As indicated above for the defect type involved	
Medium	As indicated above for the defect type involved	
High	As indicated above for the defect type involved	

SCR =

Comments / Maintenance Requirements:	Overall Structural Condition Rating:
_____	Guidelines SCR = _____
_____	Subjective Judgement SCR = _____
_____	
_____	

Note: The "Guidelines SCR" is the SCR value calculated above for all defective panels.

Appendix C

Paved Surface Defects
and
Rating Guidelines

1.0 Paved Surface Defects, Rating Guidelines and Photographs

This Appendix contains descriptions, rating guidelines and photographs for defects that may occur in any type of paved surface.

a) Bird Bath
b) Subgrade Settlement
c) Frost Heaving
d) Patching
e) Wear and Polish
f) Rubber Deposits

Bird Bath

Description:

- Pooling of water on the pavement surface during and following rainstorms.

Causes:

- Construction paving grade control deficiency.
- Localized subgrade settlement.
- Rutting of asphalt surfaces.

Treatment:

- If of medium or high severity, a paving deficiency and covered by contract warranty, cut out and patch the defective area.
- Drain by grooving if the deficiency is localized.
- Apply a resurfacing overlay if the defect occurs throughout the pavement surface.
- If the defect is caused by settlement or rutting, use the treatments listed for those defects.

Severity Levels:

L	Low	-	Depth less than 10 mm or area less than 1 square metre.
M	Medium	-	Depth less than 20 mm or area less than 5 square metres.
H	High	-	Depth greater than 20 mm or area greater than 5 square metres.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 2	percent
2	Moderate	-	Wheelpath length affected	2 to 5	percent
3	Major	-	Wheelpath length affected	5 to 10	percent
4	Extreme	-	Wheelpath length affected	> 10	percent

Condition Rating:

Evaluate the operational effect through ride quality measurement and/or through pilot reports of hydroplaning or incidents of engine flame-out.

Bird Bath Photos

Bird Bath - Medium Severity

Bird Bath - High Severity

Subgrade Settlement

Description:

- A depression of the pavement surface, usually occurring over a fairly extensive area.
- May be most evident by the presence of bird baths on the pavement surface during rain.

Causes:

- Consolidation of subgrade layers under embankment or traffic loads.
- Insufficient compaction of embankment fill during construction.
- Permafrost degradation.

Treatment:

- Patching or localized reconstruction of the settled area.

Severity Levels:

L	Low	-	Depression less than 20 mm in depth.
M	Medium	-	Depression 20 to 50 mm in depth.
H	High	-	Depression greater than 50 mm in depth.

Extent Levels:

1	Minor	-	Area affected	< 3	percent
2	Moderate	-	Area affected	3 to 10	percent
3	Major	-	Area affected	10 to 30	percent
4	Extreme	-	Area affected	> 30	percent

Condition Rating:

Evaluate through ride quality measurement or the effect on surface drainage.

Subgrade Settlement Photos

Subgrade Settlement - High Severity
(Due to Permafrost Degradation)

Subgrade Settlement - High Severity

Frost Heaving

Description:

- Vertical heaving of the pavement surface during winter or early spring with subsequent resettlement after subsurface thaw. Normally, only differential heaving is of concern.

Causes:

- Ice lenses forming in a frost susceptible soil when a source of subsurface water and freezing temperatures are present.
- Surface water reaching a subsurface frozen zone through open cracks or joints.
- Raising of boulders in the subgrade caused by frost action.

Treatment:

- Localized reconstruction for isolated major heaving.
- Overlay that provides additional frost protection if extensive heaving gives rise to unacceptable levels of ride quality. Subsurface drainage improvements may also be needed.

Severity Levels:

L	Low	-	Bump height less than 20 mm.
M	Medium	-	Bump height 20 to 50 mm.
H	High	-	Bump height greater than 50 mm.

Extent Levels:

1	Minor	-	Area affected	< 3	percent
2	Moderate	-	Area affected	3 to 10	percent
3	Major	-	Area affected	10 to 30	percent
4	Extreme	-	Area affected	> 30	percent

Condition Rating:

Evaluate through ride quality measurement.

Frost Heaving Photos

Frost Heaving - Major Severity

Frost Heaving - Subgrade Boulder Being Raised

Patching

Description:

- The post-construction replacement of the pavement surface in localized areas.
- Patching is not normally noted during a condition survey unless it is extensive in nature, indicative of some type of structural deficiency, or causing some type of problem such as roughness or surface spalling.

Causes:

- Repair of a pavement defect or repaving of a utility cut.

Treatment:

- Not applicable unless the patch causes excessive roughness or is cracking and spalling, in which case the treatment should be selected according to the applicable operational deficiency.

Severity Levels:

Not applicable.

Extent Levels:

Not applicable.

Condition Rating:

Not a direct factor influencing the operational suitability of the surface.

Patching Photos

Replacement Patch

Repair of a
Transverse Crack

Patch is in
Good Condition

Concrete Skin Patch

The Patch is Peeling
and in
Poor Condition

Wear and Polish

Description:

- Wear of the pavement surface to a very smooth condition resulting in little or no texture being apparent under fingertip touch.
- The surface may have a glassy appearance.

Causes:

- Wear caused by wheel spin-up on touchdown and by braking aircraft tires.

Treatment:

- Surface retexturing by shotblasting or other techniques if polishing leads to inadequate levels of skid resistance.

Severity Levels:

L	Low	-	Some texture but smooth compared to the surface outside the wheelpaths.
M	Medium	-	Little texture apparent under fingertip touch.
H	High	-	No texture can be felt; surface has a glassy appearance.

Extent Levels:

1	Minor	-	Wheelpath length affected	< 5	percent
2	Moderate	-	Wheelpath length affected	5 to 20	percent
3	Major	-	Wheelpath length affected	20 to 50	percent
4	Extreme	-	Wheelpath length affected	> 50	percent

Condition Rating:

Evaluate the operational effect through skid resistance measurement.

Wear and Polish Photos

Wear and Polish - Low to Medium Severity

Rubber Deposits

Description:

- Tire rubber deposited on the runway surface in the touchdown zones of heavily trafficked runways.

Causes:

- Spin-up of tires during the landing of large aircraft.

Treatment:

- Periodic removal of the rubber deposits if they result in a low level of skid resistance.

Severity Levels:

L	Low	-	Light rubber deposits only; individual tire tracings are visible.
M	Medium	-	Continuous deposits; pavement surface texture still reflecting through.
H	High	-	Solid rubber surface obliterating all texture.

Extent Levels:

Not applicable.

Make a note in the condition survey report to indicate whether one or both runway ends are affected.

Condition Rating:

Evaluate the operational effect through skid resistance measurements.

Rubber Deposits Photos

Rubber Deposits - Low to Medium Severity

Rubber Deposits - High Severity

Appendix D

Gravel Surface Defects
and
Rating Guidelines

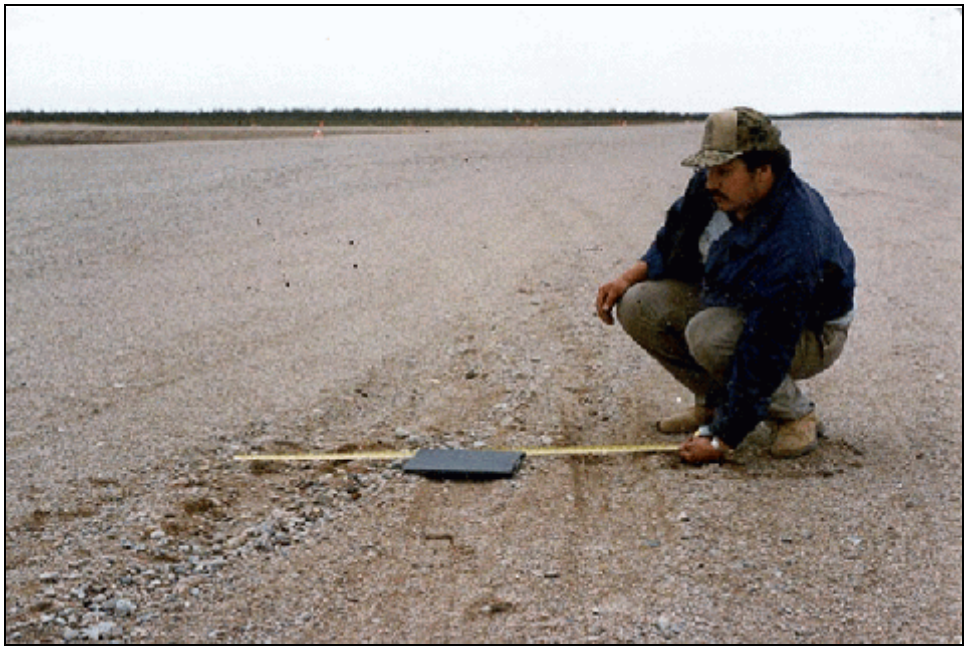
1.0 Gravel Surface Defects, Photographs and Rating Form

This Appendix contains photographs for some of the defects that may occur in gravel surfaced pavements.

Figure D-1 contains a "Condition Rating Form for Gravel Surfaces" which indicates the types of defects commonly found in gravel surfaces and identifies maintenance (regravelling) considerations.

Gravel Surface Photos (Page 1 of 4)

Gravel Surface - Segregation



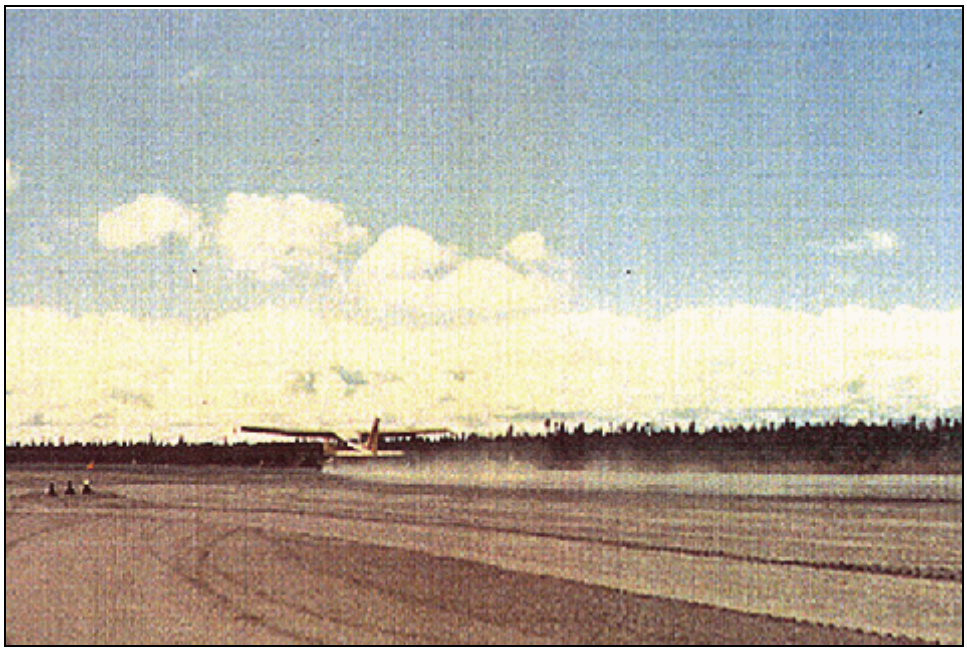
Gravel Surface - Rutting

Gravel Surface Photos (Page 2 of 4)

Gravel Surface - Poor Drainage Due to Loss of Crown

Gravel Surface - Vegetation Encroachment

Gravel Surface Photos (Page 3 of 4)



Gravel Surface - Dust Generation

Gravel Surface - Dust Generation

Gravel Surface Photos (Page 4 of 4)

Gravel Surface - Heavily Oiled

Figure D-1: Condition Rating Form for Gravel Surfaces

Airport:

Date:

Inspector:

Critical Aircraft:

Tire Pressure:

Facility	Chainage		Last Regravelling (Month / Year)	Thickness of Gravel at Last Regravelling (mm)	Present Gravel Thickness (mm)	Last Graded (Date)	Next Regravelling Required (Year)	Surface Condition Rating										General Condition Rating
	From	To						Loss of Material	Seggregation	Rutting	Surface Drainage	Sub-Drainage	Frost Action	Runway Roughness	Vegetation			

Comments:

General Condition Rating

10 9 8 7 6 5 4 3 2 1 0

Very Good Good Fair Poor Very Poor

Pavement Defect Ratings

1: Minor
2: Moderate
3: Major
4: Extreme

Extent of Defect →

← Severity of Defect

L: Low
M: Medium
H: High