MINISTRY OF DEFENCE

Defence Infrastructure Organisation

Inspections of Airfield Pavements

Practitioner Guide 06/11

Estate Management

Document Aim:

This guide provides background information on the mandatory monthly inspection process, monthly and yearly reporting. Information is also provided on the MicroPAVER™ System, its structure and its use to calculate and report the PCI values and findings; determine and recommend the Maintenance and Repair requirements and recommendation of maintenance works to ancillary items not yet covered by the MicroPAVER™ system. It also combines and replaces the associated guidance contained in the following Technical Bulletin:

> TB 00/14 Airfield Pavements – monitoring of condition and maintenance requirements by EWCs at monthly intervals.

Document Information	
DIO SEC Strategy & Policy Sponsor: Ray Dickinson	**Date of Issue: 11 Nov 2011**
Contact if different from above Sponsor: John Cook, Hd Airfield Pavements, PTS/Hard FM, DIO	
Who should read this: CEstOs, Top Level Budget Holders, MOD Project Managers, SETLs & SEATs, Commanding Officers/Heads of Establishment, Defence Infrastructure Organisation (DIO) Deputy Heads (Estates), DIO Intl, DIO Advisors and Maintenance Management Organisations (MMO).	
When it takes effect: Immediate	**When it is due to expire:** September 2016
Equality And Diversity Impact Assessment This policy has been Equality and Diversity Impact Assessed in accordance with the Department's Equality and Diversity Impact Assessment Tool against: **Part 1 Assessment Only (no diversity impact found)**	

Document Control

Distribution

Document Name:	Inspections of Airfield Pavements
Version No:	1.0
Version Date:	September 2011
Author:	Mr C Coley (PTS4)
Reviewed By:	
Review Date:	

Version Control

Date Issued	Version	Author	Reason for Change
September 2011	1.0	Mr C Coley	Initial Issue

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1.0 INTRODUCTION

1.1 Purpose of document

This Practitioner Guide (PG) provides information on the Airfield Pavement Inspection process, roles and responsibilities and reporting procedures. Standard report formats are provided in the Annexes for the surface condition survey findings and the maintenance and repair recommendations. It is important that these formats are followed to ensure that information produced across all the regions remains consistent.

An integral part of the Airfield Pavement Management System (APMS) is the MicroPAVER™ System. Information is provided on the MicroPAVER™ system including its use to calculate and report the PCI values and findings and determine the Maintenance and Repair.

Any maintenance recommendations are to be in accordance with the applicable standards (see References contained within Annex A). Particular attention is drawn to Functional Standard 06: Guide to Airfield Pavement Maintenance.

1.2 Status of document

The contents of this PG sets out the mandatory requirements for the inspection of airfield pavements. No work, involving expenditure on any MOD account, is to be entered into without authority from the DIO Site Representative or the appropriate MOD Officer for that location or facility.

Where military standards are available and extant they are to take precedence over the civil standards unless advised otherwise. Where possible, specifications accord with National and the International Standards and Recommended Practices contained within International Civil Aviation Organisation (ICAO) Annex 14. All questions relating to the status of any of the References are to be addressed to the relevant DIO Technical Authority.

2.0 BACKGROUND

2.1 The need for airfield inspections and the existing Airfield Inspection Process

Aircraft operations are sensitive to the condition of the airfield pavements. A single piece of grit can damage an aircraft and place aircrew at risk of injury.

The timely and quality execution of works services upon airfield pavements reduces the hazard to aircraft and aircrew, reduces maintenance costs and protects the capital investment made in providing the airfield pavement.

The current method of inspecting airfield pavements on MOD airfields and determining maintenance requirements is based on:

- monthly inspections by Maintenance Management Organisations (MMO),
- airfield maintenance inspections by specialist airfield pavement engineers (i.e. Term Consultants working to PTS Airfield Pavements Section)
- and a series of maintenance protocols and standards as evolved over the years by PTS/AP and its predecessors.

Although this strategy has served well and evolved to its current form/procedure over a long period (approx 50 years) it is much dependant on subjective judgement, does not lend itself to interrogation or prioritisation of works or best facilitate consistency or auditing of effectiveness of Station maintenance teams.

2.2 Addition of MicroPAVER*™* to the Airfield Pavement Management System

Several years of research and development in the UK, has led to the decision that the MOD will adopt the MicroPAVER™ system to complement the existing Airfield inspection process.

Much of the development work undertaken in the UK has been to verify and expand the MicroPAVER™ definitions to ensure that UK construction practice is properly covered and to make the identification of UK distress types and severity levels more accurate.

The MicroPAVER™ system relies on the visual observation of a combination of commonly occurring standard airfield pavement distress types and well defined severity levels. Various mathematical algorithms are used to weight and aggregate the observed distresses to produce a Pavement Condition Index (PCI) value. The PCI is then used to report the relative surface condition of the airfield pavement. Protocols for both minor and major maintenance works and project works, dependent upon the distress types, are programmed into the database. This allows maintenance and repair (M&R) schedules to be produced directly from the observed data and shall be used as a guide only in identifying maintenance requirements. Daily and monthly inspections will continue to raise works requirements as occurs presently.

At this time, MicroPAVER™ does not provide distress categories for Rotary Hydraulic Arrestor Gear (RHAG) strips on runways or concrete block paved hardstanding areas so it remains necessary to inspect these areas separately but to include recommendations within the main reports. Pavement markings, drainage, catch pits, box-gutters, French drains, arrestor barriers, tie-down points, hangar door beams and grassed areas should also be inspected and included in the condition reporting cycle. Section 5.0 details the inspection requirements for Ancillary Items. These items are inspected as part of the daily inspection and monthly maintenance inspection routine and any works required are often addressed as immediate and/or short term maintenance items. For completeness, all items should be entered into the Yearly Report and annotated to suit if works have already been instigated and/or completed to ensure that all maintenance works are recorded.

Any maintenance recommendations are to be in accordance with the applicable standards (see References contained within Annex A). Particular attention is drawn to Functional Standard 06: Guide to Airfield Pavement Maintenance.

3.0 ROLES AND RESPONSIBILITIES

It is a requirement that Inspections and Pavement Condition Reports for each MOD airfield shall be produced as follows:

Monthly Inspection and Report (by the PC/MMO) – this will be undertaken by a detailed visual inspection of selected areas each month and monitoring of the remaining pavements surface (in accordance with 4.0). In addition, detailed MicroPAVER™ surveys will be conducted of a few areas, with all assets being surveyed at least once in a three year period. The monthly report will monitor the condition and maintenance requirements of the pavements and recommend any actions to be undertaken.

Annual Report (by the PC/MMA) – this will summarise all maintenance and project works undertaken during the previous twelve months. It will also detail any maintenance works recommended and/or currently planned in the short, medium and long term and track progress made from the work planned in the Airfield Maintenance Inspection Report.

Airfield Maintenance Inspection Report (by DIO PTS AP) – this will provide assurance in the data entered into MicroPAVER™ and ensure outputs shows an accurate reflection of pavement condition. Technical appraisal and interpretation of data is also undertaken to ensure correct maintenance works are being recommended. It will also provide recommendations for strategic major maintenance requirement, both medium and long term.

The inspectors should also ensure any maintenance recommendations and materials are in accordance with the applicable standards (see References contained within Annex A).

Figure 1. Shows the responsibilities within the Airfield Pavement Management System.

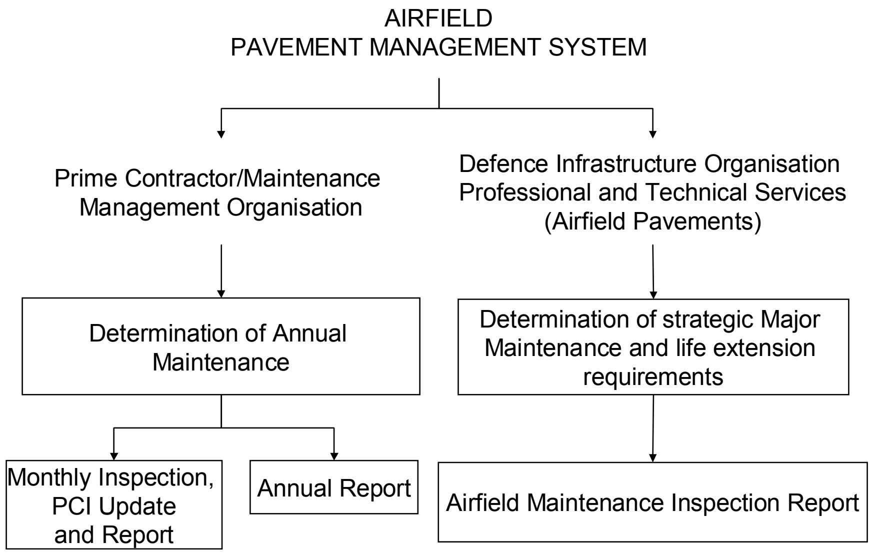


Figure 1. Elements and responsibilities within the Pavement Management System

3.1 Qualifications

A Monthly Airfield Inspection is to be carried out by, and the reports are to be signed by a competent Person. A Competent Person is to:

- Hold a minimum of an ONC or equivalent in Civil or related engineering subject;
- Have a minimum of three years relevant experience in the inspection and construction of Airfield Pavements;
- For undertaking the MicroPAVER™ element: must have successfully completed the initial MicroPAVER™ training course run by DIO PTS AP. (Annex B details the training process and requirements)

These requirements are to be applied in all cases, except where prior agreement is reached with the Subject Contact Point.

4.0 INSPECTION PROCESS

4.1 Monthly Inspection

It is a requirement that the PC/MMO carry out monthly monitoring of airfield pavements and report their findings to the DIO Site Representative.

The monthly monitoring is required to cover all airfield pavements but with detailed inspection confined to:

- Known hazardous and potentially hazardous areas.
- Areas recommended for monitoring within the most recent Specialist Airfield Maintenance Inspection Report.
- Areas advised by Air Traffic Control.
- Works services being undertaken or recently completed.
- Selected areas of the airfield, ensuring all primary assets (runways, helipads etc.) are picked up once every 3 months and secondary (taxiways, aprons etc.) and tertiary (aircraft tow routes, hangar floors etc.) assets picked up once every 12 months. Increased inspections of Primary assets will be required during the winter period.

A PCI survey is required on selected areas of the airfield with a change each month, but ensuring that all the Primary airfield pavements are surveyed at least once yearly and all Secondary and Tertiary pavements are covered at least once over a three year period.

The MicroPAVER^{TM} software is distributed by the Colorado State University (CSU) Civil Engineering Department and will need to be purchased by the MMO prior to undertaking the surveys and kept up to date.

A standard UK MOD format for reporting survey findings, pavement condition indices and work recommendations is provided in Annex D for Monthly Inspections and will need to be provided to the DIO Site representative on a monthly basis.

A standard UK MOD format for the annual digest is provided in Annex E. The report shall be completed at the end of each December with a copy being provided to the DIO Site Representative and DIO Professional and Technical Service Airfield Pavements (DIO PTS AP) team.

An electronic copy of the MicroPAVER^{TM} database will be provided by the PC/MMO in either an e50 or e60 format when requested by DIO PTS AP and a copy shall be provided, at least, on a yearly basis with the annual digest.

4.2 Airfield Maintenance Inspections

Airfield Maintenance Inspections will be arranged by DIO PTS AP, using approved inspectors. Each airfield will currently be inspected at approximately 24 month (2 Yearly) intervals with respect to both pavement and when installed, AGL. However, as each airfield moves to the MicroPAVER^{TM} system the inspection frequency may be reduced to approximately 36 month (3 Yearly) intervals. It should be noted that the inspection frequency for any airfield may vary according to such factors as previously reported conditions and the implementation of works projects.

The inspection will inform the Forward Maintenance Register, Maintenance Plans, Short Term Costings and Assessment Studies for airfield works in addition to ensuring the validity of the data entered into the MicroPAVER^{TM} system.

Runway Friction Classification Surveys are to be undertaken in accordance with MAA Manual: Manual of Aerodrome Design and Safeguarding, generally at 48 month intervals and is included in the Airfield Maintenance Inspection Programme.

5.0 INSPECTION OF ANCILLARY ITEMS NOT COVERED BY MICROPAVER

5.1 Inspection Considerations

Ancillary items should be inspected to ensure that the operational safety of the airfield pavements is maintained. Particular aspects that should be considered are:

- Those that may contribute to FOD potential, such as cracked and spalling concrete box-gutters, loose French drain topping material and broken, spalled or displaced concrete paving blocks. (Ref. Annex A: B - Functional Standard 06)
- Drainage issues, such as blockages that may hinder the flow of surface water from the pavements and may cause ponding to occur.
- Integrity and conspicuousness of pavement markings. (Ref. Annex A: A – MAA Manual)
- Grassed area requirements (apart from grass cutting policy aspects).

.

Airfield Pavement References

A. MAA Manual: Manual of Aerodrome Design and Safeguarding

B. Defence Works Functional Standard 06 – Guide to Airfield Pavement Maintenance

C. Defence Works Functional Standard 09 – Geotechnical Investigations for Design and Construction of Airfield Pavements

D. Defence Works Functional Standard 11 – Guidance notes for the preparation of Specification Preliminaries for Airfield Pavements Works

E. Defence Estates – Design and Maintenance Guide 21 – 'Crack and Seat and Overlay' for refurbishing Airfield Pavements

F. Defence Estates – Design and Maintenance Guide 27 – A Guide to Airfield Pavement Design and Evaluation

G. Defence Estates – Design and Maintenance Guide 33 – Reflection Cracking on Airfield Pavements- a Design Guide for Assessment, Treatment, Selection and future minimisation.

H. Defence Estates – Specification 012 – Hot Rolled Asphalt and Asphalt Concrete (Macadam) for Airfields

I. Defence Estates – Specification 013 – Marshall Asphalt for Airfields

J. Defence Estates – Specification 033 – Pavement Quality Concrete for Airfields

K. Defence Estates – Specification 035 – Concrete Block Paving for Airfields

L. Defence Estates – Specification 040 – Porous Friction Course for Airfields

M. Defence Estates – Specification 045 – Slurry Surfacing (including Slurry Seal and Microsurfacing) for Airfields

N. Defence Estates – Specification 049 – Stone Mastic Asphalt for Airfields

O. Defence Estates – Specification 050 – Recycled Bound Materials for Airfields

P. Defence Estates – Technical Bulletin 97/34 – Grounds Maintenance long-grass management on MOD (RAF) aerodromes

Q. Defence Infrastructure Organisation – Safety Alert 04/11 – Inspection of Runway Surfaces around Rotary Hydraulic Arrester Gear (RHAG) cables

Initial MicroPAVER^{TM} Training and Base Line Surveys

B1. Training Process

The training process will consist of a minimum of one full survey being undertaken in each region by the PC/MMO with training provided by DIO PTS AP or approved trainer. Remaining airfields will be surveyed by the PC/MMO with assistance and advice, as required, from DIO PTS AP. All airfields will require a full base line survey.

It estimated that the initial surveys would take 15 days for a large sized airfield, 12 days for a medium sized airfield and 10 days for a small sized airfield. An additional one day per airfield will be required for data input and analysis.

The software is distributed by the Colorado State University (CSU) Civil Engineering Department and will need to be purchased by the MMO prior to undertaking the surveys.

B2. Equipment Required

The PCI survey is a visual observation of the surface condition of the pavement. However, the following equipment / tools are required:

- Hand odometer (to measure lengths and areas),
- three metre straightedge and wedge,
- PCI distress manual (Annex C of this Practitioner Guide),
- texture depth measuring gauge (accurate to minimum 0.5mm)
- survey sheets (concrete and / or asphalt),
- survey paint and
- digital camera
- Latest Version of MicroPAVER™ (from Colorado State University)

B3. Network, Branches and Sections

The MicroPAVER**™** system is a hierarchical structure based on networks, branches and sections. For UK military airfields:

- NETWORK: will relate to the flying station,
- BRANCHES: will relate to the pavement type, such as runway or taxiway, and
- SECTION: will relate to the various different construction types / locations shown in the biennial maintenance inspection reports.

Each branch and section is allocated a unique reference within the network.

The referencing system does not need to follow a specific pattern but it should be obvious to which section it relates to. It may be desirable to sub-divide areas where there is a distinct difference in usage patterns; in particular, runways and wide taxiways where the centre portion may be significantly more utilised than the edges, individual VTOL pads and aircraft parking areas which contain heavily used taxi-lanes. Typical Branch Designations are given in Table B1.

Pavement Designation	Description	Subdivision	Description
R	Runway	N1	Northern Edge
TS	Southern Taxiway	N	Northern Side
TN	Northern Taxiway	C	Centre Line
AH3	Apron Hangar 3	S	Southern Side
H3	Hangar 3	S1	Southern Edge

Table B1. Typical Branch Designations

Example: A typical reference could be in the following format R0826-03-02C:

Pavement Designation	Section Number	Construction Number	Subdivision
R0826	03	02	C
Runway 08-26	Section 03	Construction 2	Central
BRANCH ID	SECTION ID		

B4. Sample Areas

MicroPAVER™ is a statistical programme based on aggregating and extrapolating data from specific sample areas. Each pavement section is split into a number of sample units for inspection. For asphalt surfaced airfields, a sample area is considered as 450 ± 180 sq m, for concrete pavements with joints at less than 9.1m spacing, a sample area is taken as 20 ± 8 slabs. Not all the sample units have to be the same size but they should fit within these limits to ensure a representative PCI value. Sample unit sizes close to the recommended mean are preferred for accuracy.

To calculate the number of samples in an asphalt section, the area of the section is divided by 450m^2. The answer is rounded either up or down, an example is given below.

Example: *if an asphalt section is 15m wide by 650m long, the area would be 15m*650m = 9750m^2.*

The number of 450m^2 sample areas within the section would be 9750m^2/450m^2 = 21.67 (which could be rounded up to 22 or down to 21).

If rounded to 22, the sample areas would be 650m/22 = 29.545m (rounded to 29.5m). Therefore there would be 21 sample areas 15m by 29.5m and one sample area 15m by 30.5m.

If rounded to 21, the sample areas would be 650m/21 = 30.952m (rounded to 31.0m). Therefore there would be 20 sample areas 15m by 31.0m and one sample area 15m by 30.0m.

To calculate the approximate number of samples within a concrete section, the area of the section is divided by the slab areas. The answer is rounded either up or down, an example is given below.

Example: *if a concrete section is 60m wide by 180m long with 6m by 6m slabs, the estimated total number of slabs would be (60m*180m)/(6m*6m) = 300 slabs.*

Therefore the estimated number of sample areas within this is 300/20 = 15 which can be chosen at random.

The inspection of every sample unit (100 percent survey) can take a large amount of time and resources so a sampling plan has been developed such that a reasonably accurate PCI can be estimated by inspecting only a limited number of sample units. The required degree of sampling depends on the use of the pavement and whether the survey is undertaken at the network or project level.

If the objective of the survey is to make network-level decisions, such as budget planning, then a limited number of sample units per section are sufficient. If the objective is to evaluate specific pavement sections at a project level, then a higher degree of sampling may be required. When the number of sample units surveyed is reduced, it is essential that the sample units surveyed are representative of the whole of that particular section. For the case of monthly inspections and base line surveys, a network level survey is sufficient.

B5. Network Level Survey

Network level pavement management requires a lower confidence level in the accuracy of the reported PCI value and as such, the survey can be performed by surveying only a small number of sample units per section. Typical values adopted for network level sampling criteria are shown in Table B2.

No. of Sample Units in Section (N)	Minimum No. of Units to be Inspected (n)
1 – 5	1
6 – 10	2
11 – 15	3
16 – 40	4
Over 40	10% (round up to next whole sample unit)

Table B2. Network Level Sampling Frequency

This level of sampling is sufficient for developing network-level maintenance work plans, assessing the condition of the pavement and identifying candidate sections that may warrant more detailed project-level inspections. However, a greater sample frequency may be adopted if it is considered necessary to more adequately define the condition of the pavement.

B6. Sample Inspection

B6.1. Random Systematic Sampling

The sample units to be inspected, where possible, should be spaced equally throughout the section with the first one chosen at random. The sample interval ‘i’, rounded down to the nearest whole number, can be determined from the relationship:

$$i = \frac{N}{n}$$

where

N = total number of sample units in the pavement section

n = minimum number of sample units to be surveyed

i = Sample interval, rounded down to the nearest whole number

Example: *if the total number of sample areas in the section (N) equals 25 and the minimum number of sample areas to be surveyed (n) is 4 based upon a network level sample. Then the sampling interval (i) is found to be 6.25 (rounded down to 6). This means that every sixth sample area should be inspected with the first sample being between 1 and 6 (i).*

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

1st sample area to be inspected

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25

3rd sample area to be inspected

B6.2. Additional Sample areas

A potential drawback to the systematic random sampling at project and network level is that sample units in exceptionally bad condition may not necessarily be included in the survey. Similarly, sample units with “one-off” distresses may be inappropriately included as a random sample. To overcome this, the inspection should identify any unusual or unrepresentative sample units and inspect them as “additional” units rather than random samples. When additional sample units are included, the calculation of the section PCI is slightly altered to prevent skewing of the overall PCI value.

B6.3. Survey Sheets

A sample unit is inspected by observing and/or measuring the distress type(s) and severity according to the PCI distress manual, and recording the data on the relevant pavement survey sheet. Figures B1 and B2 present the different sheets for flexible and rigid airfield pavements, respectively.

The distress codes provided on the survey sheets correspond to those used in the MicroPAVER™ system database.

A separate data sheet should be used for each sample unit and each row should represent a single distress type at a given severity level. The quantity of each distress should be recorded in accordance with the measurement criteria for the distress as given in the distress handbook.

Flexible Pavement

Pavement Condition Survey Data Sheet for Sample Unit

Airport		Date		Section ID	
Job Number		Sample 100% Part		Sample Unit of	
Surveyed by	JB		Area of sample		

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

		Existing Distress Types					
Total Severity	L						
	M						
	H						

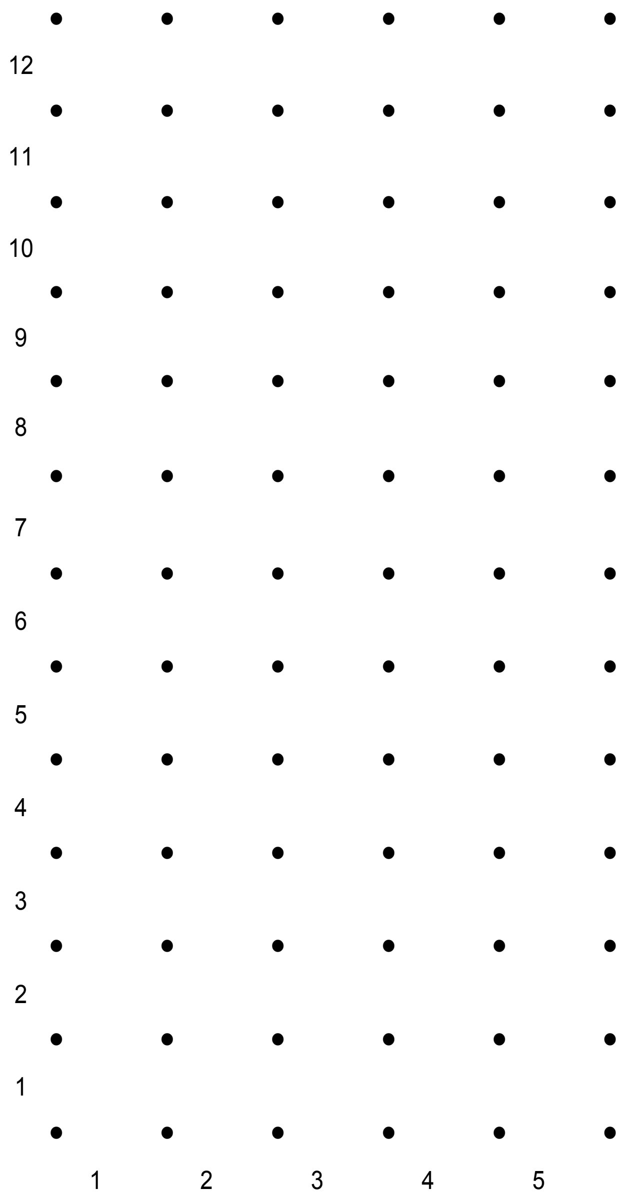
Comments

Data entered into MicroPAVER Software		
Entered by:	Date:	Checked by:

Figure B1. Flexible Pavement Survey Data Sheet

Jointed Rigid Pavement
Pavement Condition Survey Data Sheet for Sample Unit

Network	Date	Section ID
Job Number	Sample 100% Part	Sample Unit of
Surveyed by	Slab Size	No. of Slabs



Distress Types

61. Blow-up
62. Corner Break
63. Long/Trans Diagonal Crack
64. "D" Crack
65. Joint Seal Damage
66. Patching, <5 ft²
67. Patching/Utility Cut
68. Popouts
69. Pumping
70. Sealing/Map Crack/Crazing
71. Settlement /Fault
72. Shattered slab
73. Shrinkage Crack
74. Spalling - Joints
75. Spalling - Corner

Distress Type	Severity	No. of Slabs

Comments

Data entered into MicroPAVER Software

Entered by:	Date:	Checked by:

Figure B2. Rigid Pavement Survey Data Sheet

Condition assessment using PCI values relies on information gathered in relation to standard distress types and defined severity levels. The distress types and severity levels applicable to the MicroPAVER™ system are detailed in Annex C – 'Distress Categories for Asphalt and Concrete Surfaced Military Airfields in the United Kingdom'. Due to differences in construction materials and practices between the UK and the USA, the definitions have been supplemented for UK MOD use.

The distress types defined for both asphalt and concrete airfield pavements are based on the typical MODes in which pavements are known to fail in terms of applied loading, weathering / climate and serviceability. The severity levels have been determined both in terms of what can be observed on the pavement surface as well as considering the appropriate maintenance / refurbishment treatment.

The UK supplementary definitions within Annex C are considered, generally, to be in addition to the original USA requirement. However, additional descriptions have been provided to more easily relate the requirement to the UK airfield pavement scenario.

PCI and FOD Asphalt Distress List*		**PCI and FOD Concrete Distress List***	
Distress Type	**Severity Levels****	**Distress Type**	**Severity Levels****
Alligator Cracking	**L,M,H**	**Blowup**	**L,M,H**
Bleeding	N/A	**Corner break**	**L,M,H**
Block Cracking	**L,M,H**	**Linear cracking**	**L,M,H**
Corrugation	L,M,H	**Durability cracking**	L,**M,H**
Depression	L,M,H	**Joint seal damage**	**L,M,H**
Jet Blast Erosion	**N/A**	**Small patching**	**L,M,H**
Joint-Reflection cracking from PCC	**L,M,H**	**Large patching**	**L,M,H**
Longitudinal and transverse cracking	**L,M,H**	**Popouts**	**N/A**
Oil Spillage	**N/A**	**Pumping**	**N/A**
Patching and Utility cut patch	L,**M,H**	**Scaling, map cracking, crazing and weathering**	**L,M,H**
Polished Aggregate	N/A	Faulting	L,M,H
Ravelling and weathering	**L,M,H**	**Shattered slab**	**L,M,H**
Rutting	L,M,H	Shrinkage cracks	N/A
Shoving of asphalt by PCC slabs	L,**M,H**	**Joint spalling**	**L,M,H**
Slippage cracking	**N/A**	**Corner spalling**	**L,M,H**
Swell	L,M,H		

* FOD distresses are in bold

** Severity levels are defined as (L)ow, (M)edium, (H)igh

Systems are available that make it possible to record the data directly onto a hand held electronic clipboard, however, this is not being adopted by UK MOD at this time.

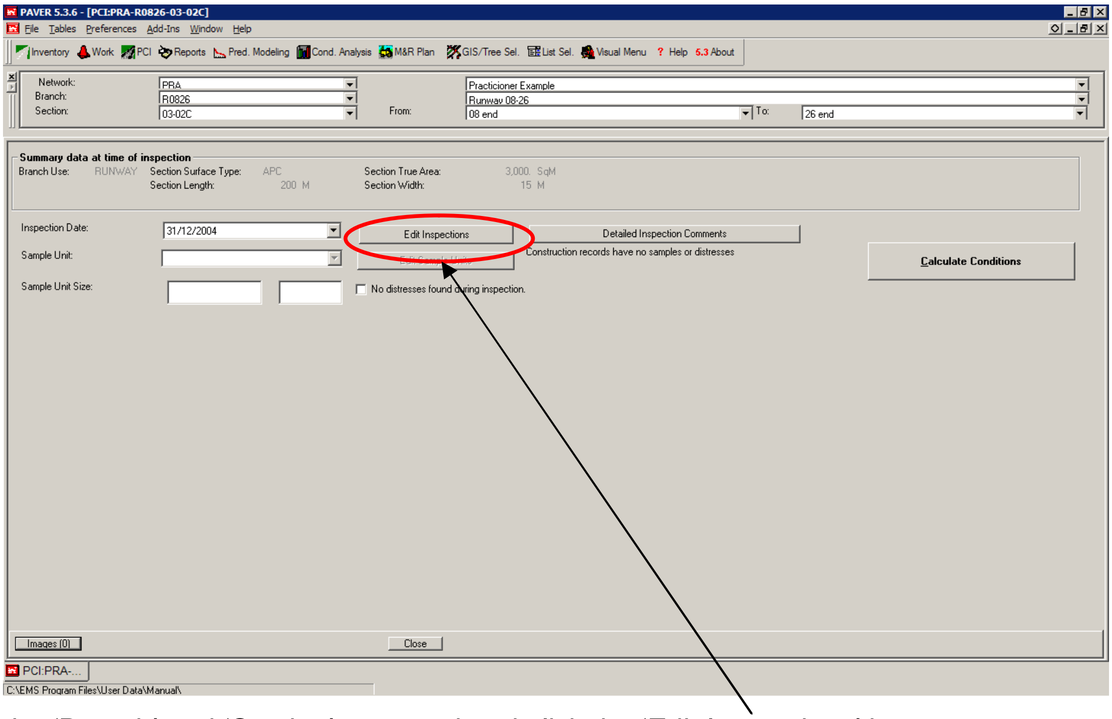
B7. Data Entry and analysis Workshop

B7.1. Data Entry

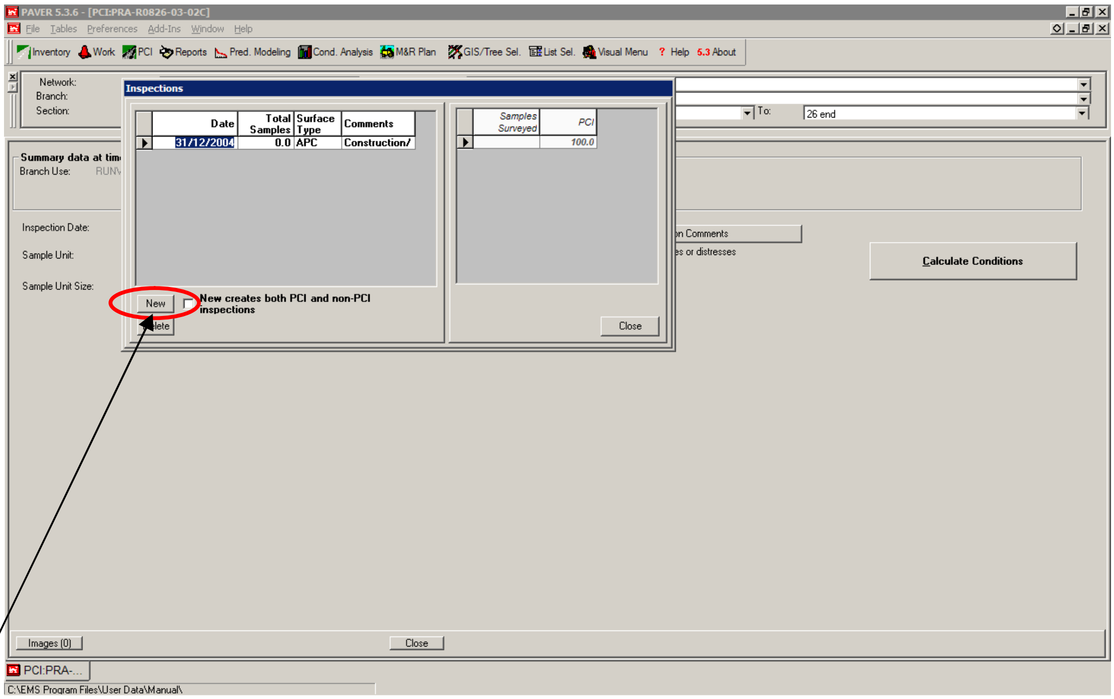
On completion of the initial training survey a one day data entry and analysis workshop will be held to provide training on the data entry and interpretation process. The following section addresses the basics of the workshop.

The survey information is transcribed in the same format onto data entry screens on the MicroPAVER™ system that record the data and populate the network database. This information is then used throughout the program to calculate the various condition indices, predict future condition and deterioration rates and compile maintenance and repair programmes.

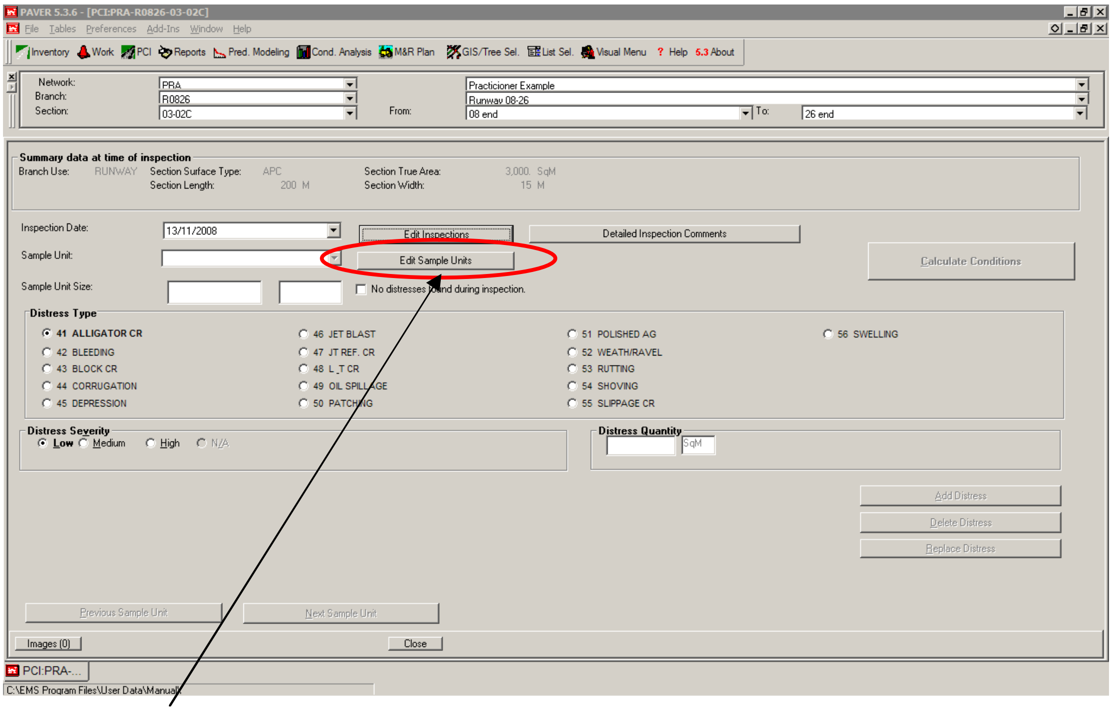
To access the PCI input screen, click 'PCI' button on the MicroPAVER™ Desktop. The following screen will open to allow data input.



Select the 'Branch' and 'Section' surveyed and click the 'Edit Inspections' button.

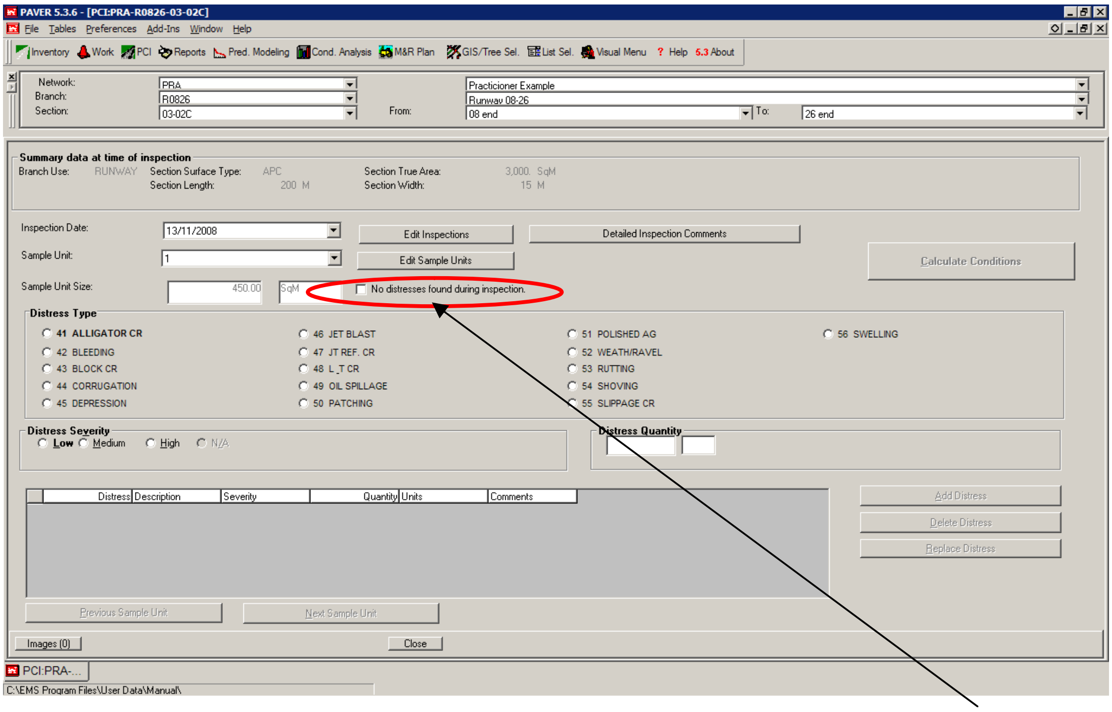


A new window will open with the previous inspection/construction dates, click 'New'. A new line will appear in which you need to enter the survey date, the total number of sample areas within the section. Once complete click close to return to the previous screen.



Now click 'Edit Sample Units' button, a similar window to the previous will open where details on the sample areas inspected are added. These details include sample number, sample type (random or additional) and sample size. When finished, click 'close' to return to the above screen.

Prior to entering the distress data, ensure the correct sample number is selected. The distress data collected from sight can then be entered in the same format i.e. Distress type, severity and quantity.



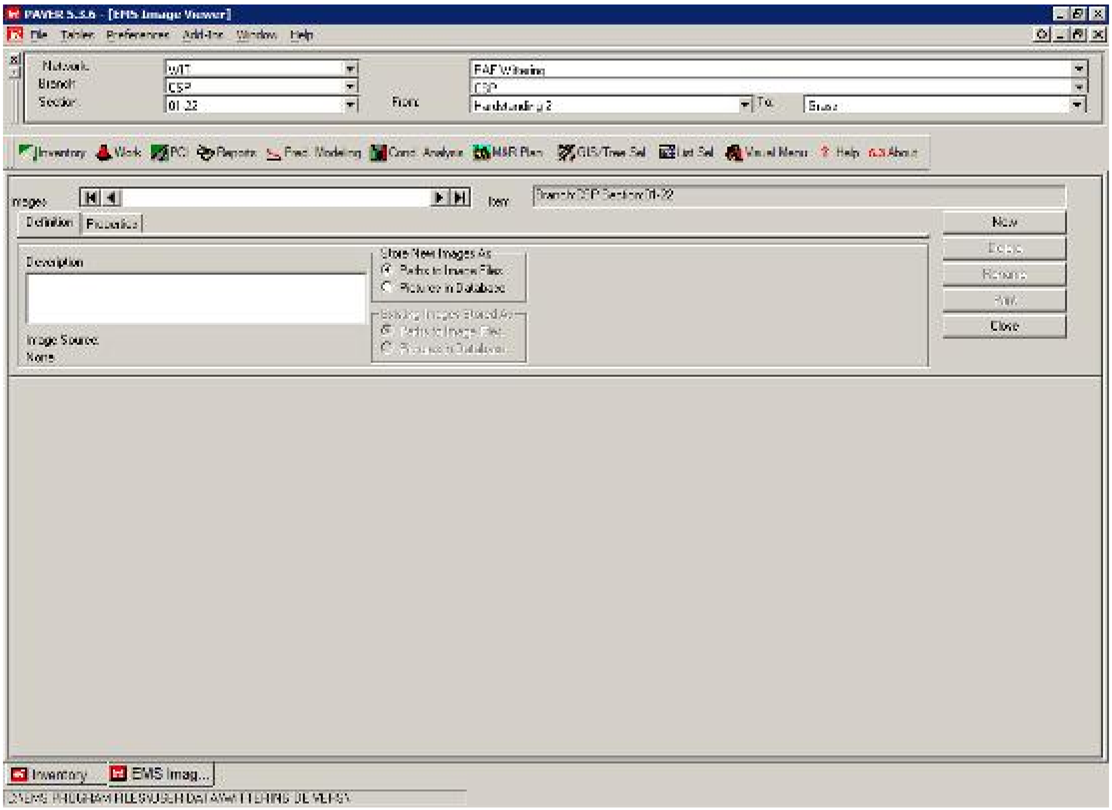
If no distresses are observed in the current sample area, ensure the ‘No distresses found during the inspection’ box is ticked.

B7.2. Image Viewer

MicroPAVER^{TM} Image Viewer allows relevant images to be stored, recalled and viewed. The image viewer can assessed from the Network, Branch and Section Inventory cards and from the PCI input screen.

Within the PCI input screen these images could be of distresses observed, however the description of these images must include Sample Number, Date and a brief description of the defect observed and extent.

Within the Inventory cards screen these images could be of general observations or plans showing locations of sample areas, however the description of these images must include a date and a brief description.



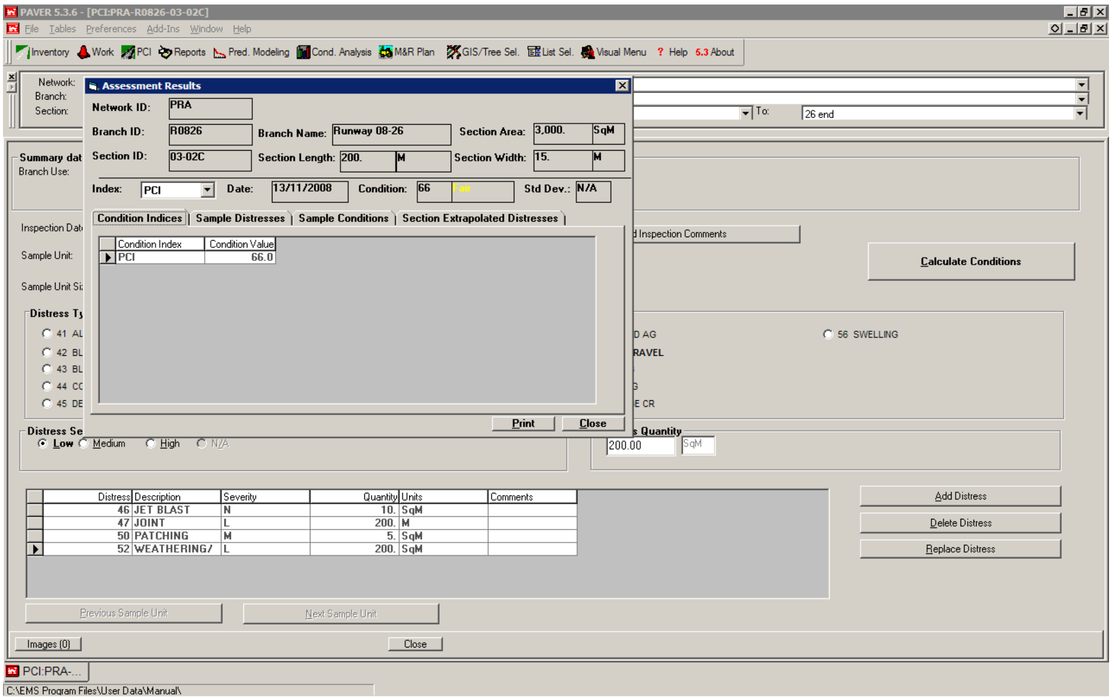
To input images within the database, click the ‘Images’ button, the Image Viewer window is opened. Within the screen there is a box titles ‘Store New Images As’, with the options offered for storage being Paths to Image Files or Pictures in Database. Since image files are typically large, including them within the database will substantially increase the size of the database, it is therefore recommended that images be attached to the database through ‘Paths to Image Files’.

The ‘Paths to Image Files’ would require the images to be stored in a fixed location, and MicroPAVER^{TM} would then create a path to the image.

MicroPAVER^{TM} supports images stored in JPG, TIF, GIF, BMP, TGA, PCX and PCT.

B7.3. Calculating Conditions

When all distress data for each sample area in the current section is complete, click the 'Calculate Condition' box.



A new window is opened with the following tabs:

Tab	Description
Condition Indices	The overall PCI of the section.
Sample Distresses	The individual distresses recorded in each sample area and their respective deduct values.
Sample Conditions	Individual sample area PCI values.
Section Extrapolated Distresses	Extrapolated distress information for complete section based upon distresses found in the sample areas.

A PCI value of 100 represents a pavement in excellent condition while a value of 0 is a pavement in failed condition. It is unnecessary and uneconomic to maintain all the airfield pavements to a very high standard; therefore, UK MOD has decided that the critical PCI values shown in Figure 3 shall be applied to UK MOD airfield pavements.

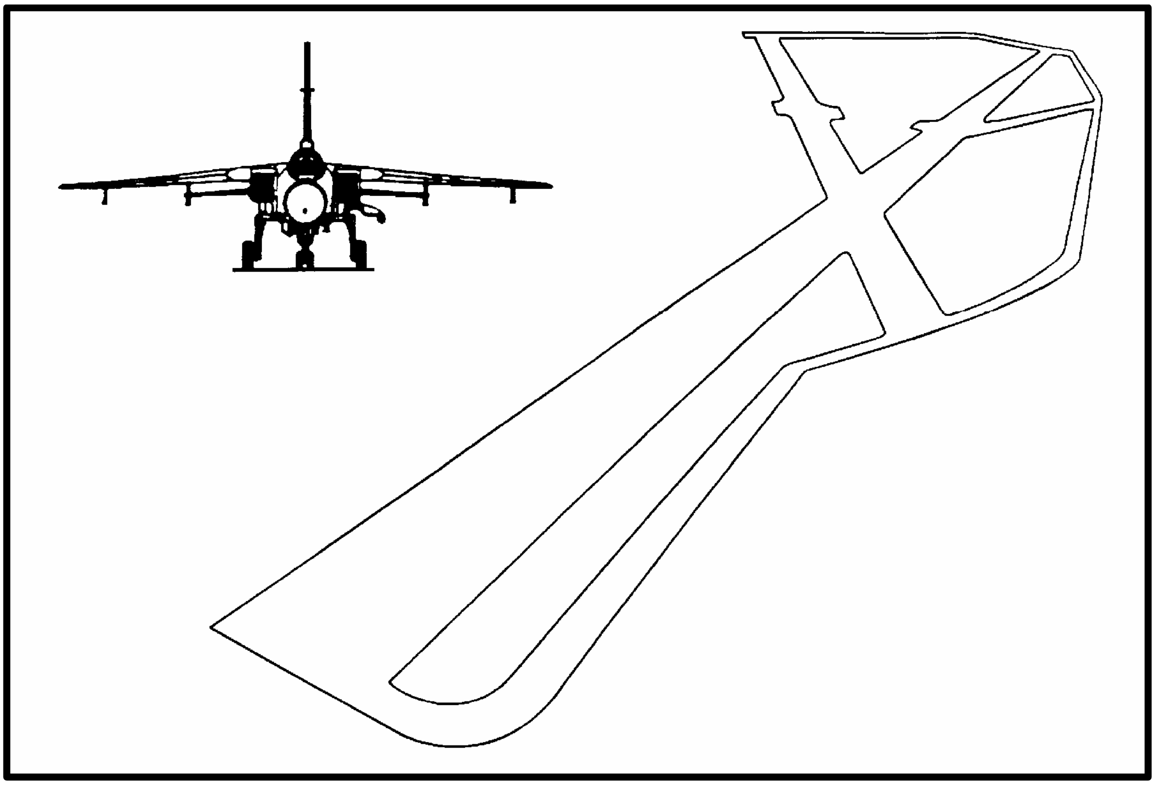
Pavement Category	Pavement Use	Critical PCI Level
P **(Primary)**	Runways, ORP's, VTOL Pads, STOL Strips, Dummy-Deck practice areas, Taxiways designated as emergency or auxiliary runways, Helipads.	70
S **(Secondary)**	Taxiways other than those designated as emergency or auxiliary runways, Aircraft parking and servicing platforms, Hangar Aprons, ERP's and other aircraft test areas, HAS Floors, Compass Swinging Platforms	55
T **(Tertiary)**	Aircraft wash platforms, Hangar Floors, Aircraft towing routes (not used by aircraft under self-power)	40

A PCI Value less than the critical level do not automatically mean that the area is unserviceable for all aircraft operations but that the potential for damage to aircraft is heightened. Any pavement with a PCI value of 35 or less is considered to be highly degraded with a considerable potential for damage to aircraft and its continued use for aircraft operations should be urgently reviewed.

Handbook of distress categories

PAVEMENT CONDITION INDEX

HANDBOOK OF DISTRESS CATEGORIES FOR ASPHALT AND CONCRETE SURFACED MILITARY AIRFIELDS IN THE UNITED KINGDOM



DEFENCE INFRASTRUCTURE ORGANISATION
MINISTRY OF DEFENCE

This Handbook has been developed from the original guidance given by the US Army Corps of Engineers for use of distress type descriptions in association with the MicroPaver Pavement Condition Index System. It has been adapted to include the interpretation of distress types commonly found on United Kingdom Military Airfields such that the MicroPaver PCI System can be effectively used in the UK context.

Acknowledgement for the source material is given to the following:

Dr M Y Shahin, US Army Engineering Research and Development Center – Construction Engineering Research Laboratory, Champaign, IL

US Air Force Civil Engineering Support Agency (AFCESA/CESC), Tyndall Air Force Base, Florida

Table of Contents

This handbook contains distress definitions and measuring methods for both asphalt and concrete surfaced airfield pavements. This information is used to determine the Pavement Condition Index (PCI)

Frequently Occurring Problems in Asphalt Pavement Distress Identification

Asphalt Surfaced Airfields		
Situation	Action	Remarks
Alligator Cracking (41) and Rutting (53) in same area	Record each separately at respective severity level	
Bleeding (42) counted in area	Polished aggregate (51) is not counted in same area	
Polished aggregate (51) in very small amount	Do not count	Polished aggregate is only counted when there is a significant amount
Any distress (including cracking) in a patched area	Do not record	Effect of distress is considered in patch severity level
Block cracking (43) is recorded	No longitudinal and transverse cracking should be recorded	
Asphalt overlay over concrete	Block cracking (43), joint reflection cracking (47) and longitudinal and transverse cracking (48) are recorded separately	AC over PCC could have, for example, 100 percent block cracking, 10 percent joint reflection cracking and 1 percent longitudinal and transverse cracking
Extensive overbanding of cracks	Record as medium or high severity cracking (47 or 48) depending upon FOD potential	Overbanding exceeding 20 percent of the total potential crack length of the area is deemed to be “extensive”.
Surface blistering and “elephant’s footprint” cracking	Record as longitudinal and transverse cracking (48)	The apparent perimeter of the surface blister should be recorded as low severity cracking (48). Elephant’s footprint cracking should be recorded as cracking (48) with the appropriate severity level.

Frequently Occurring Problems in Concrete Pavement Distress Identification

Concrete Surfaced Airfields		
Situation	Action	Remarks
Low severity scaling (i.e. crazing) (70) (USACE)	Count only if possible future scaling will occur within 2 to 3 years	
Low severity scaling (i.e. weathering) (70) (UK Supplementary)	Count only if weathering has exceeded loss of surface texture resulting in exposure of the coarse aggregate	
Joint Seal Damage (65)	This is not counted on a slab-by-slab basis	A severity level based on the overall condition of the joint seal in the sample unit is assigned
Joint spall (74) small enough to be filled during a joint seal repair	Do not record	UK overbanding should be considered as similar to the USA joint seal repair
Medium or high severity intersecting crack (shattered slab) (72)	No other distresses should be counted	
Corner or joint spalling caused by "D" cracking (64)	Only "D" cracking (64) should be recorded	If spalls are caused by factors other than "D" cracking, record each factor separately
Crack repaired by a narrow patch (e.g. 100 to 250 millimetres wide	Record only crack and not patch at appropriate severity level	
Original distress of patch more severe than patch itself	Original distress type should be recorded	If, for example, patch material present on scaled area of slab, only the scaling is counted
Hairline cracks that are only a few feet long and that do not extend across the entire slab	Should be rated as shrinkage cracks (73)	
Extensive overbanding of cracks and spalls	Record as medium or high severity depending upon FOD potential	Overbanding to spalls totalling more than 50 percent of the slab perimeter, or overbanding covering cracks totalling more than the overall width of the slab, is deemed to be "extensive".

ASPHALT SURFACED AIRFIELDS

ALLIGATOR OR FATIGUE CRACKING (41)*

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 stabilised 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 0.6m (2 feet) 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.

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

M Further development of light alligator cracking into a pattern or network of cracks that may be lightly spalled

H Network or pattern cracking progressed so that pieces are well-defined and spalled at the edges; some of the pieces rock under traffic

How to Measure
Alligator cracking is measured in square metres (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.

UK Supplementary
Overbanding applied to areas of alligator or fatigue cracking should not be taken into account when determining the severity level above.

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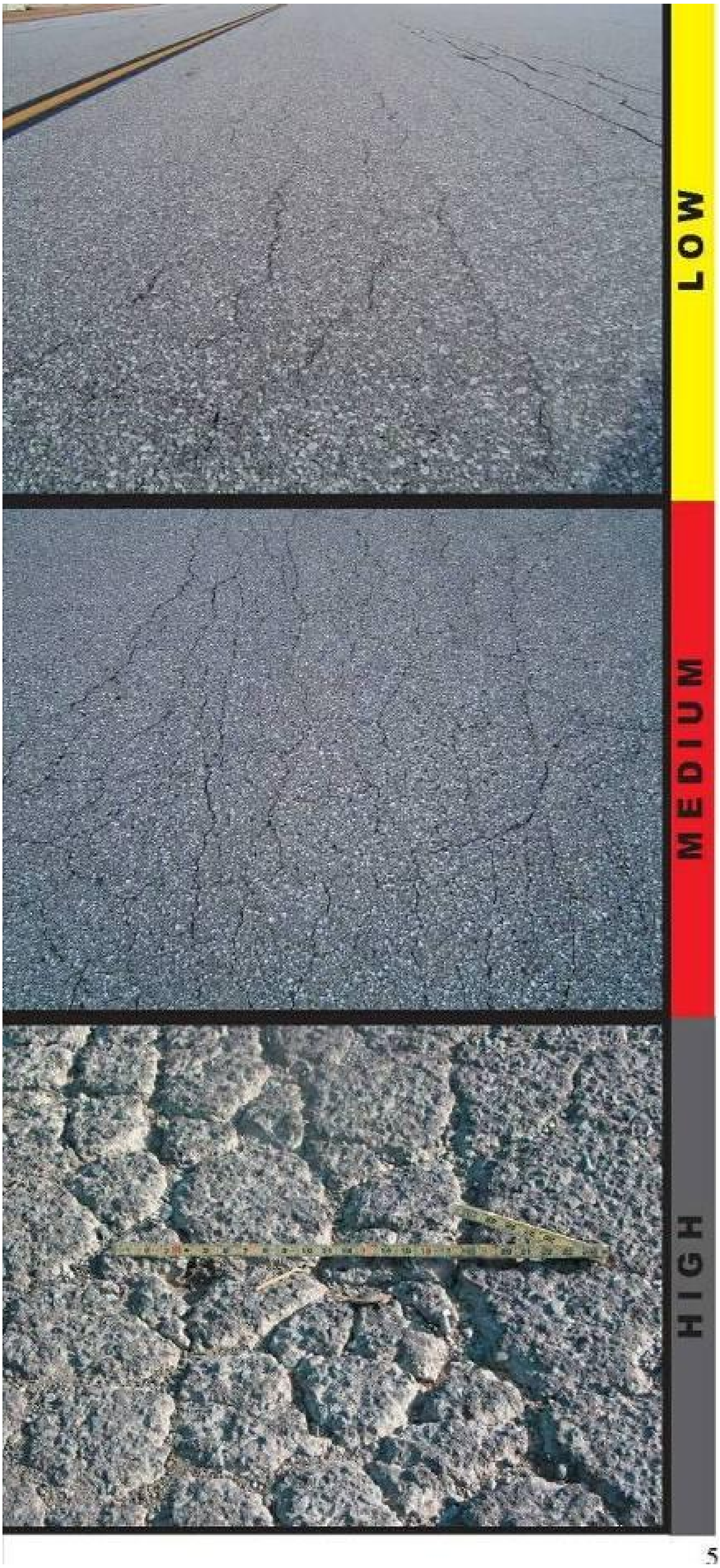
* MicroPaver Distress Code


LOW
MEDIUM
HIGH
5

BLEEDING (42)

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.

Severity Levels
No degrees of severity are defined. Bleeding should be noted when it is extensive enough to cause a reduction in skid resistance.

How to Measure
Bleeding is measured in square metres (square feet) of surface area. If bleeding is counted, polished aggregate is not counted for the same area.

BLOCK CRACKING (43)

Description

Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks range in size from approximately 0.3m by 0.3m to 3m by 3m (1 by 1 feet to 10 by 10 feet). 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 portion 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)

Severity Levels

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

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 6mm (1/4 inch); or (3) filled cracks that are not spalled or have only minor spalling (some FOD potential), but have filler in unsatisfactory condition.

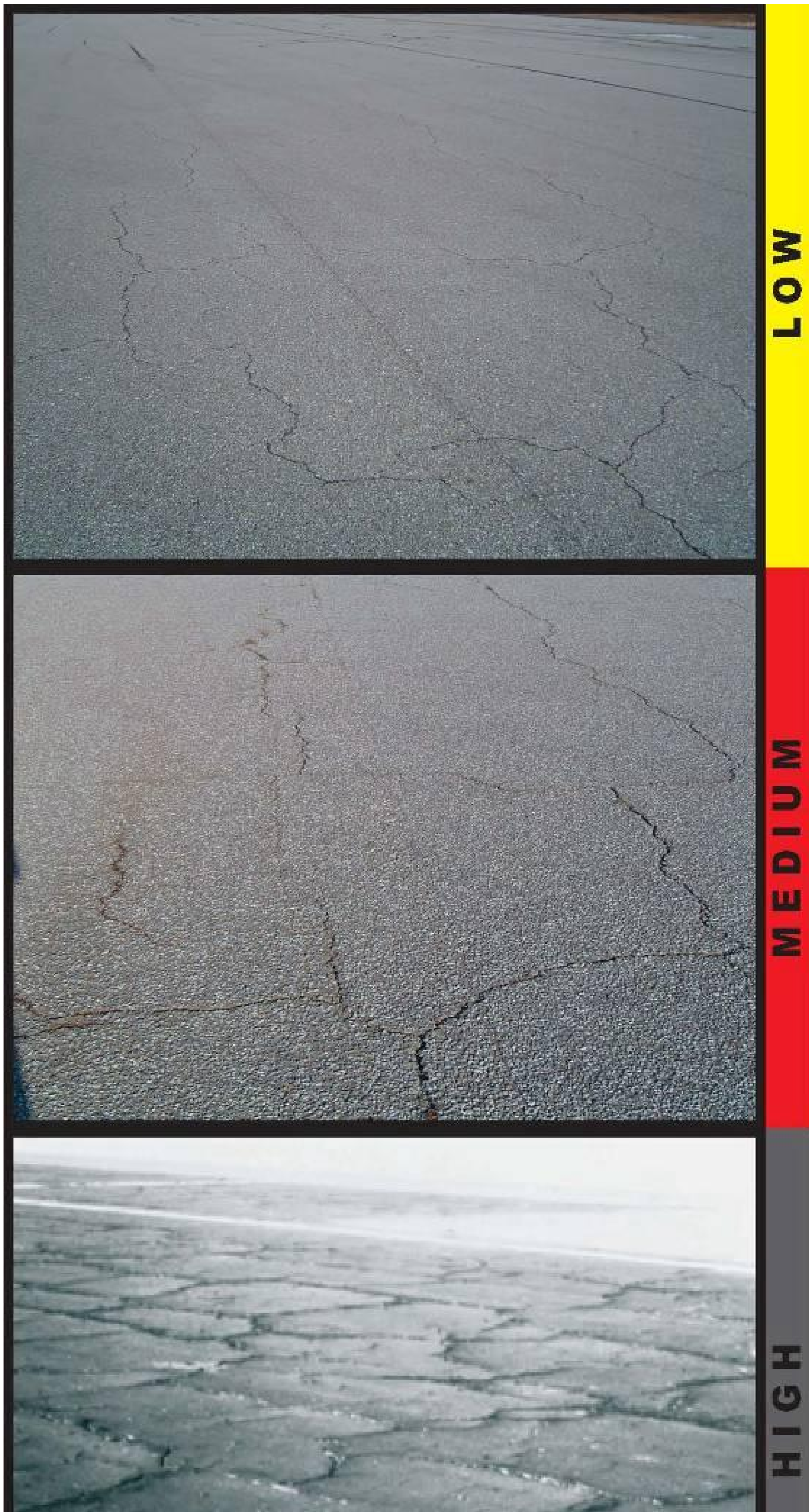
H Blocks are well-defined by cracks that are severely spalled, causing a definite FOD potential

How to Measure

Block cracking is measured in square metres (square feet) of surface area. It usually occurs at one severity level in a given 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

UK Supplementary

Overbanding applied to areas of block cracking should not be taken into account when determining the severity level above.


LOW
MEDIUM
HIGH

CORRUGATION (44)

Description
Corrugation is a series of closely spaced ridges and valleys (ripples) occurring at fairly regular intervals, usually less than 1.5m (5 feet) 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.

Severity Levels

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

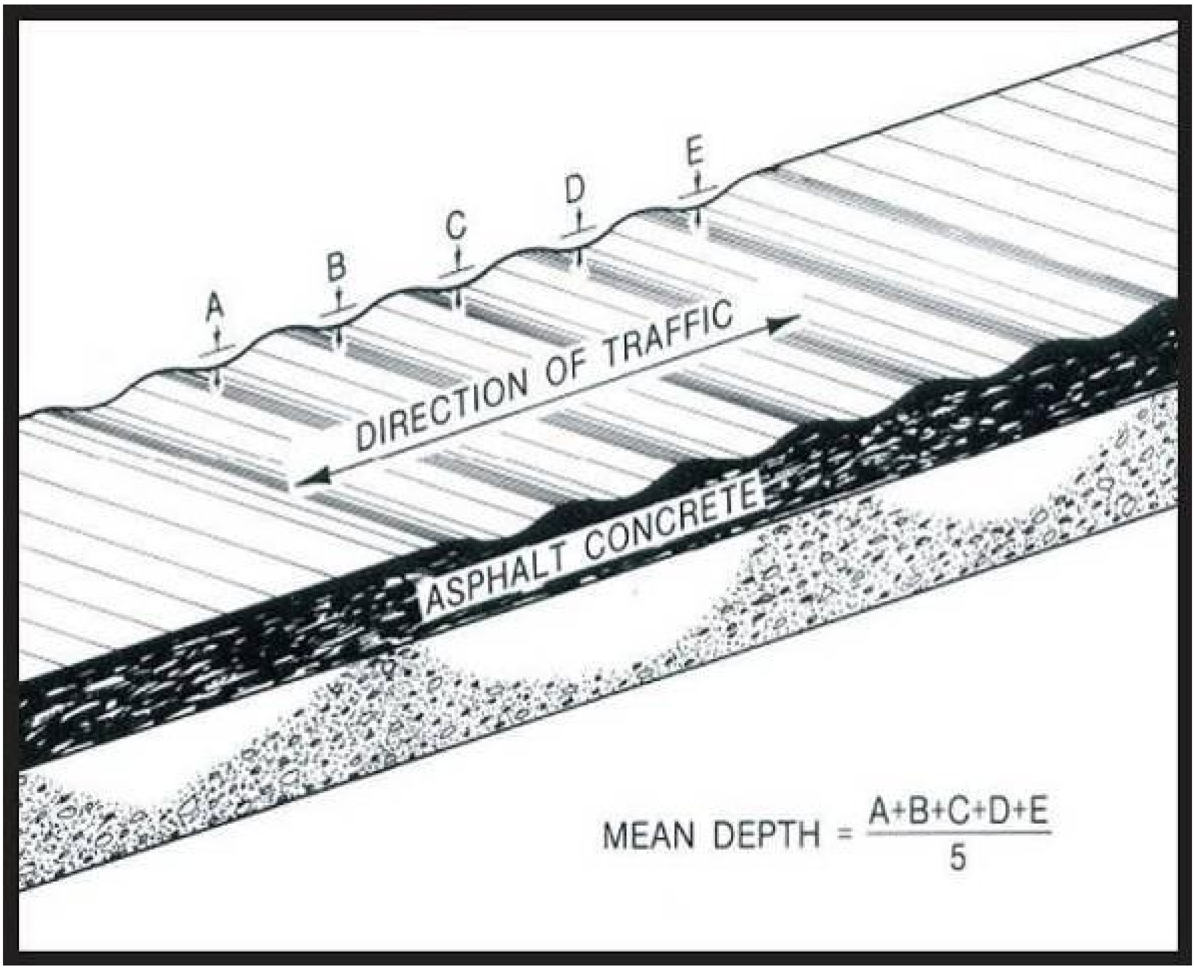
M Corrugations are noticeable and significantly affect ride quality (see measurement criteria below)

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

How to Measure
Corrugation is measured in square metres (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 metre (10 feet) straightedge should be placed perpendicular to the corrugations so that the depth of the valleys can be measured in millimetres. The mean depth is calculated from five such measurements.

Measurement Criteria

Severity	Runways and High-Speed Taxiways	Taxiways and Aprons
L	Less than 6.4mm (1/4 inch)	Less than 12.7mm (1/2 inch)
M	6.4 to 12.7mm (1/4 to 1/2 inch)	12.7 to 25.4mm (1/2 to 1 inch)
H	Greater than 12.7mm (1/2 inch)	Greater than 25.4mm (1 inch)


A
B
C
D
E
DIRECTION OF TRAFFIC
ASPHALT CONCRETE
MEAN DEPTH = A+B+C+D+E / 5

DEPRESSION (45)

Description
Depressions are localised pavement surface areas having elevations slightly lower than those of the surrounding pavement. In many instances, light depressions are not noticeable until after 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.

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)

M The depression can be observed, MODerately affects pavement riding quality and causes hydroplaning potential on runways (see measurement criteria below)

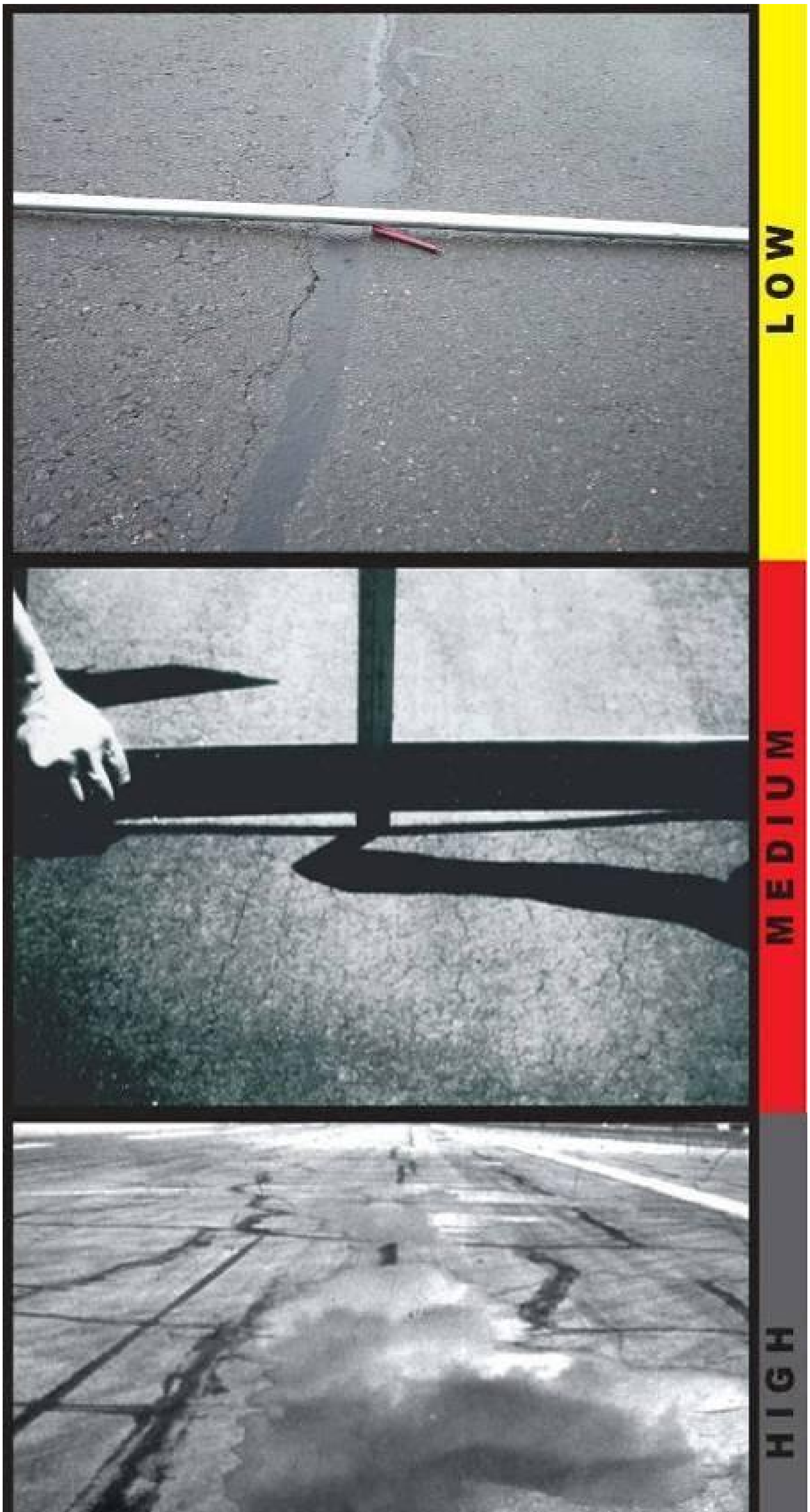
H The depression can be readily observed, severely affects pavement riding quality and causes definite hydroplaning potential (see measurement criteria below)

How to Measure
Depressions are measured in square metres (square feet) of surface area. The maximum depth of the depression determines the level of severity. This depth can be measured by placing a 3 metre (10 feet) straightedge across the depressed area and measuring the maximum depth in millimetres. Depressions larger than 3 metres across must be measured by either visual estimation or direct measurement when filled with water.

Measurement Criteria

Severity	Runways and High-Speed Taxiways	Taxiways and Aprons
L	Less than 6.4mm (1/4 inch)	Less than 12.7mm (1/2 inch)
M	6.4 to 12.7mm (1/4 to 1/2 inch)	12.7 to 25.4mm (1/2 to 1 inch)
H	Greater than 12.7mm (1/2 inch)	Greater than 25.4mm (1 inch)

UK Supplementary
Ponding may be caused by a build up of overbanding treatments interrupting the normal drainage characteristics of the surface and causing water to remain on the pavement. In this instance the area should be recorded as an area of Depression (45) according to the severity levels above and a note entered on the survey sheet to highlight that the distress has been recorded due to the overbanding build up.


LOW
MEDIUM
HIGH

JET BLAST EROSION (46)

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

Severity Levels
No degrees of severity are defined. It is sufficient to indicate that jet blast erosion exists.

How to Measure
Jet blast erosion is measured in square metres (square feet) of surface area.

JOINT-REFLECTION CRACKING FROM PCC (47) (USACE)

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 stabilised, lime stabilised); 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. Knowledge of slab dimensions beneath the AC surface will help to identify these cracks.

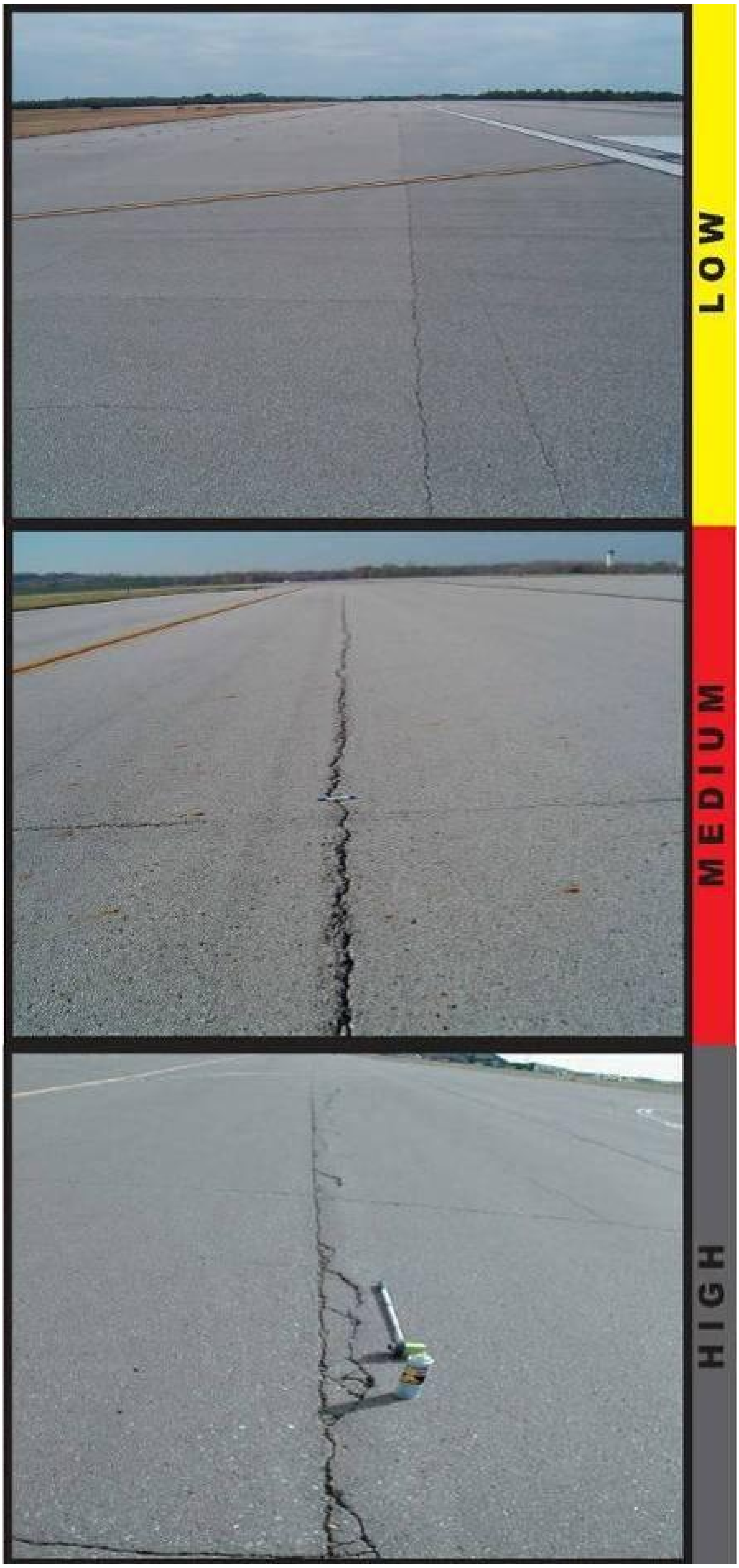
Severity Levels

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 inch) or less. Filled cracks are of any width, but their filler is in satisfactory condition.

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 6mm (1/4 inch); or (4) light random cracking exists near the crack or at the corner of intersecting cracks.

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

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


LOW
MEDIUM
HIGH

JOINT-REFLECTION CRACKING FROM PCC (47)

UK MILITARY AIRFIELDS SUPPLEMENTARY

Description

The nature of the development of UK military airfields from 1940 onwards has resulted in many UK military airfields having several layers of asphalt or tar surfacing placed over the original concrete slab runways. The consequence of this is that joint-reflection cracking is a major problem on many military airfields. Additionally, UK practice is generally to apply over-banding to joint-reflection cracks rather than filling the cracks with sealant. The following supplementary severity level definitions are provided to more easily identify the category applicable to UK military airfields. It is intended that they are used alongside the USACE definitions rather than replace them.

Severity Levels – UK Military Airfields

L In addition to the USACE definitions:
(2) Evidence of moisture vapour blistering and / or bubbling can be observed in the over-banding; (3) No de-lamination of the over-banding is evident; (4) Single or bifurcated cracks are over-banded and have no FOD potential; or (5) Single cracks are reappearing through the overbanding but have no FOD potential.

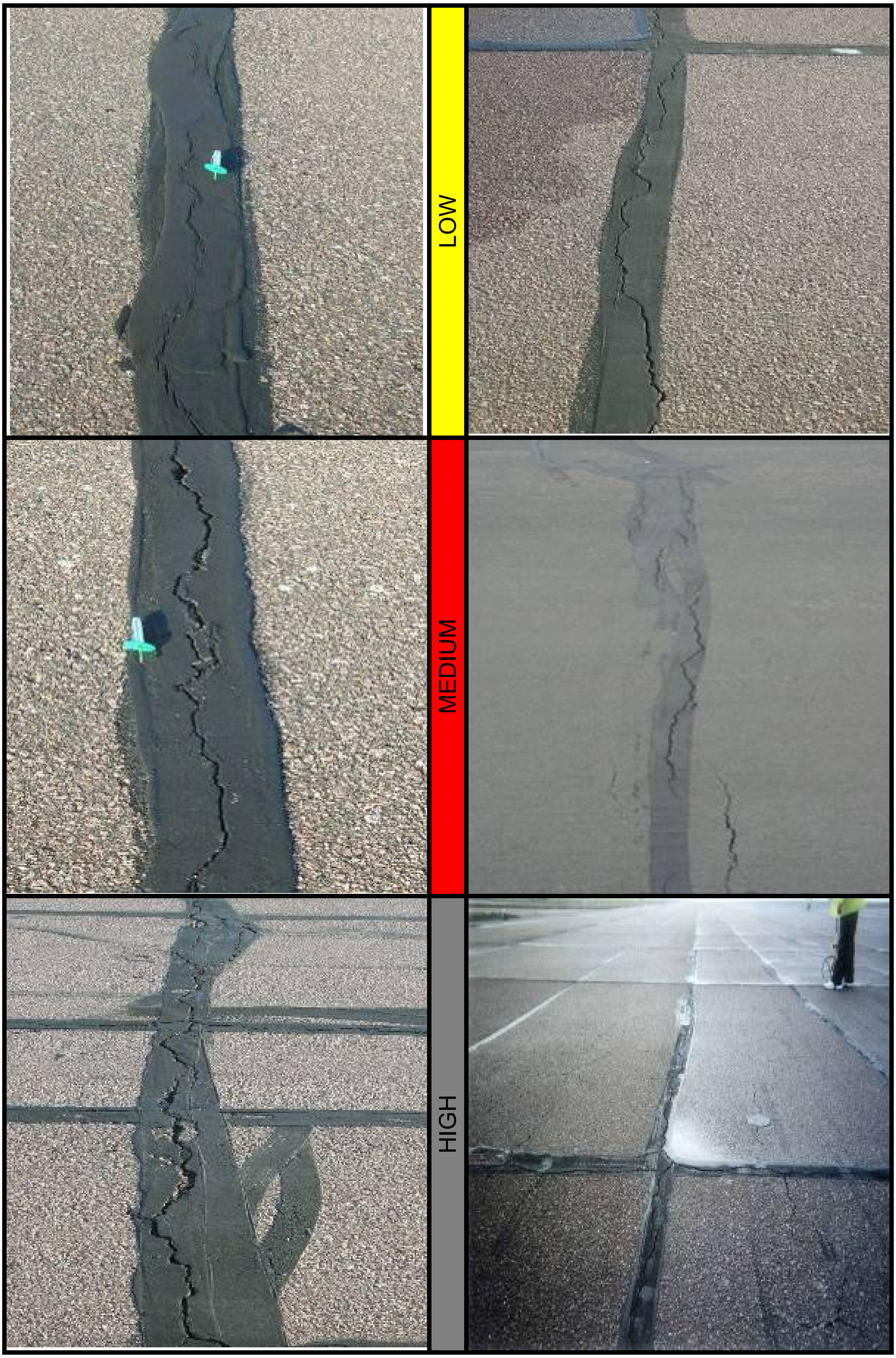
M In addition to the USACE definitions:
(5) Extensive moisture vapour blistering and / or bubbling can be observed in the over-banding; (6) Small areas of over-banding, generally less than 100 by 100mm (4 by 4 inches), are de-laminated and / or missing with a potential for FOD creation; (7) Untreated bifurcated cracks are not spalled but have some FOD potential; or (8) Overbanded bifurcated cracks are reappearing through the overbanding with some FOD potential.

H In addition to the USACE definitions:
(2) Significant areas of over-banding, generally greater than 100 by 100mm (4 by 4 inches), are de-laminated or missing with a high potential for FOD creation; (3) Overbanded bifurcated cracks are reappearing through the overbanding with definite FOD potential (this condition requires fairly close intersection of bifurcated cracks resulting in the creation of small FOD pieces).

How to Measure

As USACE definition.

Additionally, where the extent of overbanding exceeds 20 percent of the total length of potential cracking over the sample area (or part thereof), that area (or part) should be recorded as medium or high severity cracking depending on the FOD potential. For example, medium severity where there is extensive overbanding but little FOD potential, and high severity where there is extensive overbanding and definite FOD potential.


LOW
MEDIUM
HIGH

LONGITUDINAL AND TRANSVERSE CRACKING (48) (NON-PCC JOINT-REFLECTIVE) (USACE)

Description

Longitudinal cracks are parallel to the pavement's centreline 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 centreline 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.

Severity Levels

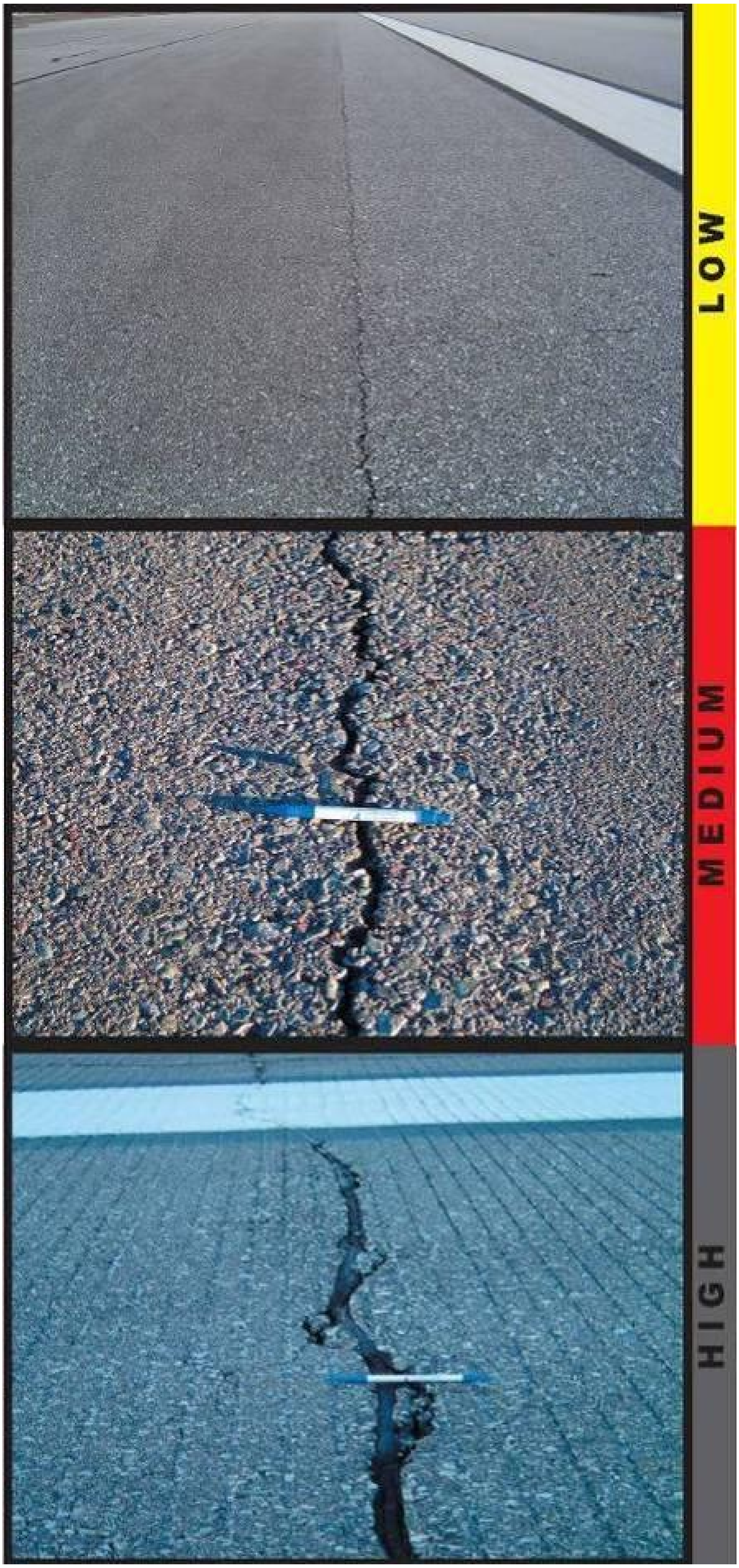
L Cracks have either minor spalling (little or no FOD potential) or no spalling. The cracks can be filled or non-filled. Non-filled cracks have a mean width of 6mm (1/4 inch) or less; filled cracks are of any width, but their filler material is in satisfactory condition.

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 6mm (1/4 inch); or (4) light random cracking exists near the crack or at the corners of intersecting cracks.

H Cracks are severely spalled, causing definite FOD potential. They can be either filled or non-filled of any width.

How to Measure

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


LOW
MEDIUM
HIGH

LONGITUDINAL AND TRANSVERSE CRACKING (48) (NON-PCC JOINT-REFLECTIVE) UK MILITARY AIRFIELDS SUPPLEMENTARY

Description
UK practice is generally to apply over-banding to joint-reflection cracks rather than filling the cracks with sealant. The following supplementary severity level definitions are provided to more easily identify the category applicable to UK military airfields. It is intended that they are used alongside the USACE definitions rather than replace them.

Severity Levels

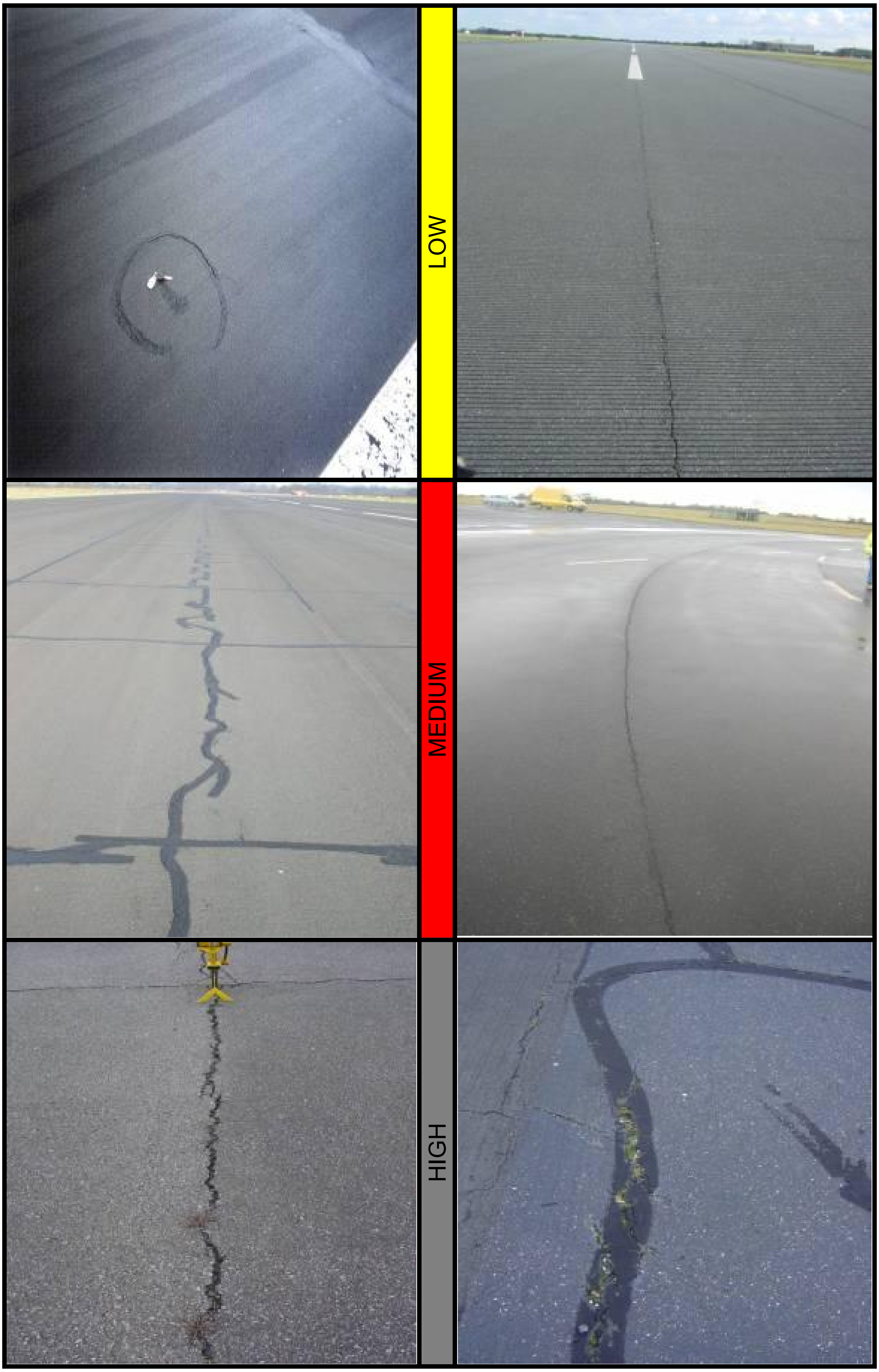
L In addition to the USACE definitions:
(2) Evidence of moisture vapour blistering and / or bubbling can be observed in the over-banding; (3) No de-lamination of the over-banding is evident; (4) Single or bifurcated cracks are over-banded and have no FOD potential; or (5) Single cracks are reappearing through the overbanding but have no FOD potential.

M In addition to the USACE definitions:
(5) Extensive moisture vapour blistering and / or bubbling can be observed in the over-banding; (6) Small areas of over-banding, generally less than 100 by 100mm (4 by 4 inches), are de-laminated and / or missing with a potential for FOD creation; (7) Untreated bifurcated cracks are not spalled but have some FOD potential; or (8) Overbanded bifurcated cracks are reappearing through the overbanding with some FOD potential.

H In addition to the USACE definitions:
(2) Significant areas of over-banding, generally greater than 100 by 100mm (4 by 4 inches), are de-laminated or missing with a high potential for FOD creation; (3) Overbanded bifurcated cracks are reappearing through the overbanding with definite FOD potential (this condition requires fairly close intersection of bifurcated cracks resulting in the creation of small FOD pieces).

How to Measure
As USACE definition.
Where the extent of overbanding exceeds 20 percent of the total length of potential cracking over the sample area (or part thereof), that area (or part) should be recorded as medium or high severity cracking depending on the FOD potential. For example, medium severity where there is extensive overbanding but little FOD potential, and high severity where there is extensive overbanding and definite FOD potential.

Where blistering of the surface is observed the apparent perimeter of the surface blister should be recorded as low severity cracking (48). Where the blistering has developed into “Elephant’s footprint” cracking, it should be recorded as cracking (48) with the appropriate severity level.


LOW
MEDIUM
HIGH

LONGITUDINAL AND TRANSVERSE CRACKING (48) (NON-PCC JOINT-REFLECTIVE) *Continued* (USACE)

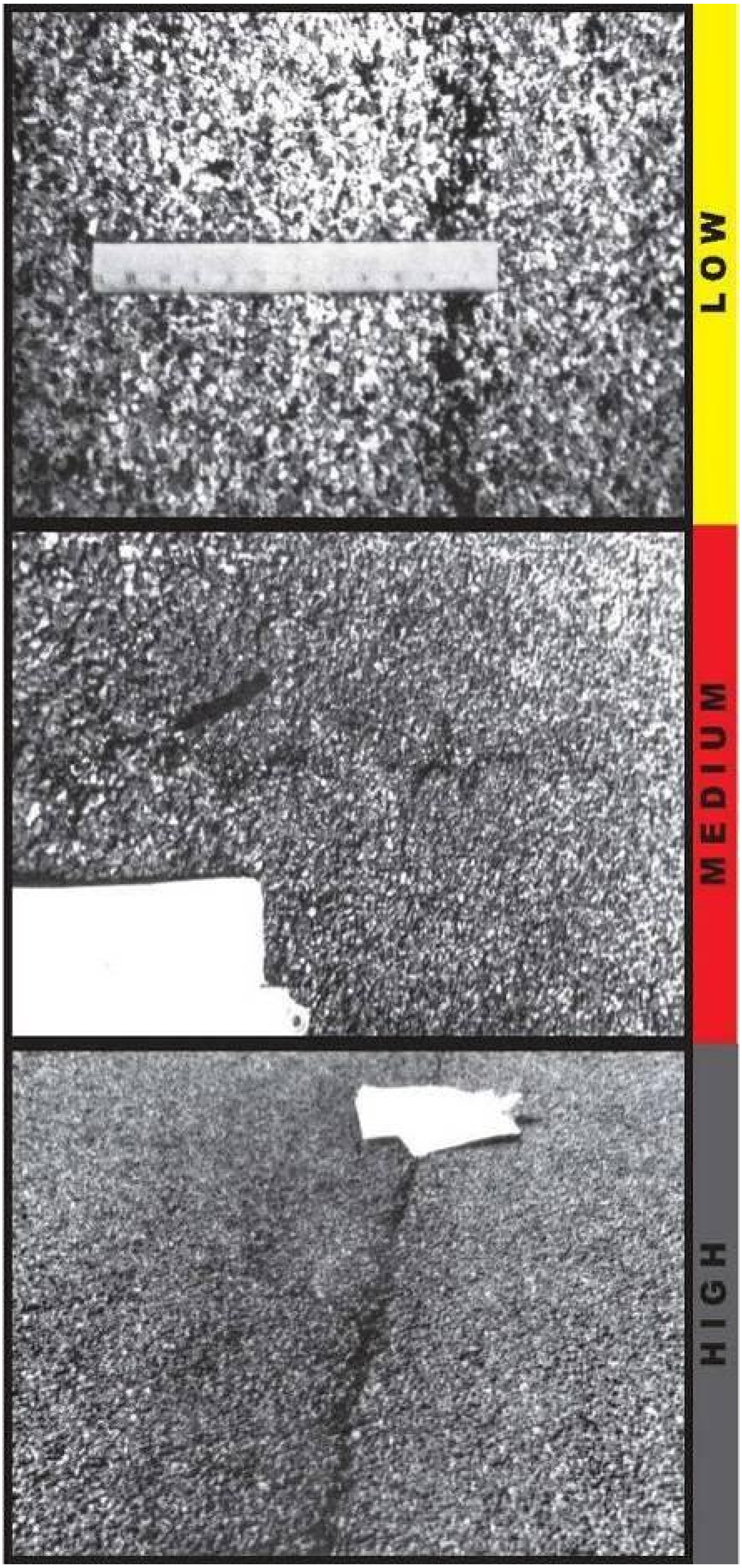
Porous Friction Course Severity Levels
Note: these severity levels are in addition to the existing definitions.

L Average ravelled area around the crack is less than 6mm (1/4 inch) wide.

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

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

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


LOW
MEDIUM
HIGH

OIL SPILLAGE (49)

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

Severity Levels
No degrees of severity are defined. It is sufficient to indicate that oil spillage exists.

How to Measure
Oil spillage is measured in square metres (square feet) of surface area.

PATCHING AND UTILITY CUT PATCH (50)

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

Severity Levels

L Patch is in good condition and is performing satisfactorily. Little or no FOD potential.

M Patch is somewhat deteriorated and affects riding quality to some extent. Some FOD potential.

H Patch is badly deteriorated and affects riding quality significantly or has high FOD potential. Patch needs replacement.

Porous Friction Course
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.

How to Measure
Patching is measured in square metres (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 metre (25 square feet) patch may have 1 square metre (10 square feet) of medium severity and 1.5 square metres (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 effect on the patch will be considered when determining the patch’s severity level.

LOW

MEDIUM

HIGH

POLISHED AGGREGATE (51)

Description
Aggregate polishing is caused by repeated traffic applications. Polished aggregate is present when close examination of a pavement reveals that the proportion 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.

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.

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

RAVELLING AND WEATHERING (52) (USACE)

Description
Ravelling 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.

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

L Low severity occurs if any of these conditions exist: (1) The surface is generally in 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 metre (square yard) representative sample, the number of coarse aggregate pieces missing is between 5 and 20; (3) In a square metre (square yard) representative sample, brushing one's foot across the surface dislodges no more than 20 coarse aggregate pieces.

M (1) In a square metre (square yard) representative sample, the number of coarse aggregate pieces missing is between 21 and 40; (2) In a square metre (square yard) representative sample, brushing one's foot across the surface dislodges between 21 and 40 coarse aggregate pieces.

H (1) In a square metre (square yard) representative sample, the number of coarse aggregate pieces missing is over 40; (2) In a square metre (square yard) representative sample, brushing one's foot across the surface dislodges between more than 40 coarse aggregate pieces.

How to Measure
Ravelling and weathering are measured in square metres (square yards) of surface area. Mechanical damage caused by hook drags, tyre rims or snowploughs is counted as areas of high-severity ravelling and weathering.

LOW (1)

LOW (2)

MEDIUM

HIGH

RAVELLING AND WEATHERING (52)
UK MILITARY AIRFIELDS SUPPLEMENTARY
UNGROOVED (MARSHALL) ASPHALT SURFACES

Description
Due to the climatic conditions in the UK and factors such as the airfield sweeping regime employed on the UK military airfields, it is possible for different levels of weathering severity to occur without either significant loss of coarse aggregate or the ability to remove coarse aggregate by brushing a foot across the surface. The following supplementary severity level definitions are provided to more easily identify the category applicable to UK military airfields. It is intended that they are used alongside the USACE definitions rather than replace them.

Severity Levels

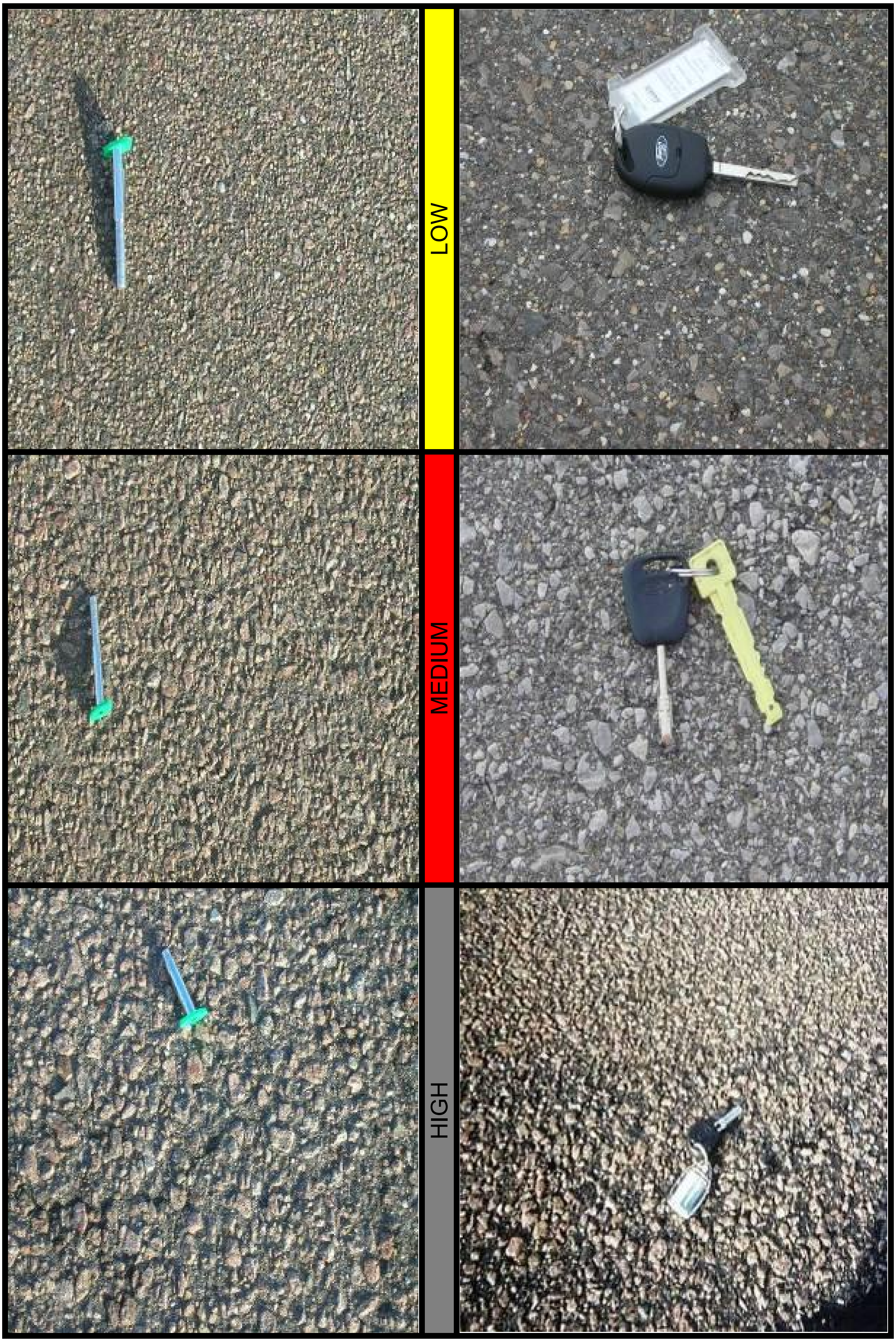
L In addition to the USACE definition:
(4) The surface is generally in good condition, but fine aggregate and binder have worn away exposing the coarse aggregate resulting in the coarse aggregate protruding by less than 1.0 mm from the general surface level. The coarse aggregate is still firmly embedded in the mix.

M In addition to the USACE definition:
(3) The fine aggregate and binder have worn away exposing the coarse aggregate resulting in the coarse aggregate protruding by 1.0mm to 2.0mm from the general surface level. A potential for some FOD risk is evident.

H In addition to the USACE definition:
(3) The fine aggregate and binder have worn away exposing the coarse aggregate resulting in the coarse aggregate protruding in excess of 2.0mm from the general surface level. A potential for significant FOD risk is evident.

How to Measure
As USACE definition

The degree of coarse aggregate protrusion may be measured using a simple depth gauge with a narrow ended pointer, accurate to within ± 0.2 mm. Several measurements should be taken over a representative section of the area to ascertain the appropriate severity level for that section. Sections with different levels of severity may be present within the same sample area and should be recorded separately at the appropriate severity level.


LOW
MEDIUM
HIGH

RAVELLING AND WEATHERING (52)
UK MILITARY AIRFIELDS SUPPLEMENTARY
GROOVED (MARSHALL) ASPHALT SURFACES

Description
Grooved Marshall Asphalt (MA) has been the preferred surface for UK military airfields for many years. Due to the climatic conditions in the UK and factors such as the airfield sweeping regime employed on the UK military airfields, it is possible for different levels of weathering severity to occur without either significant loss of coarse aggregate or the ability to remove coarse aggregate by brushing a foot across the surface. The following supplementary severity level definitions are provided to more easily identify the category applicable to UK military airfields. It is intended that they are used alongside the USACE definitions rather than replace them.

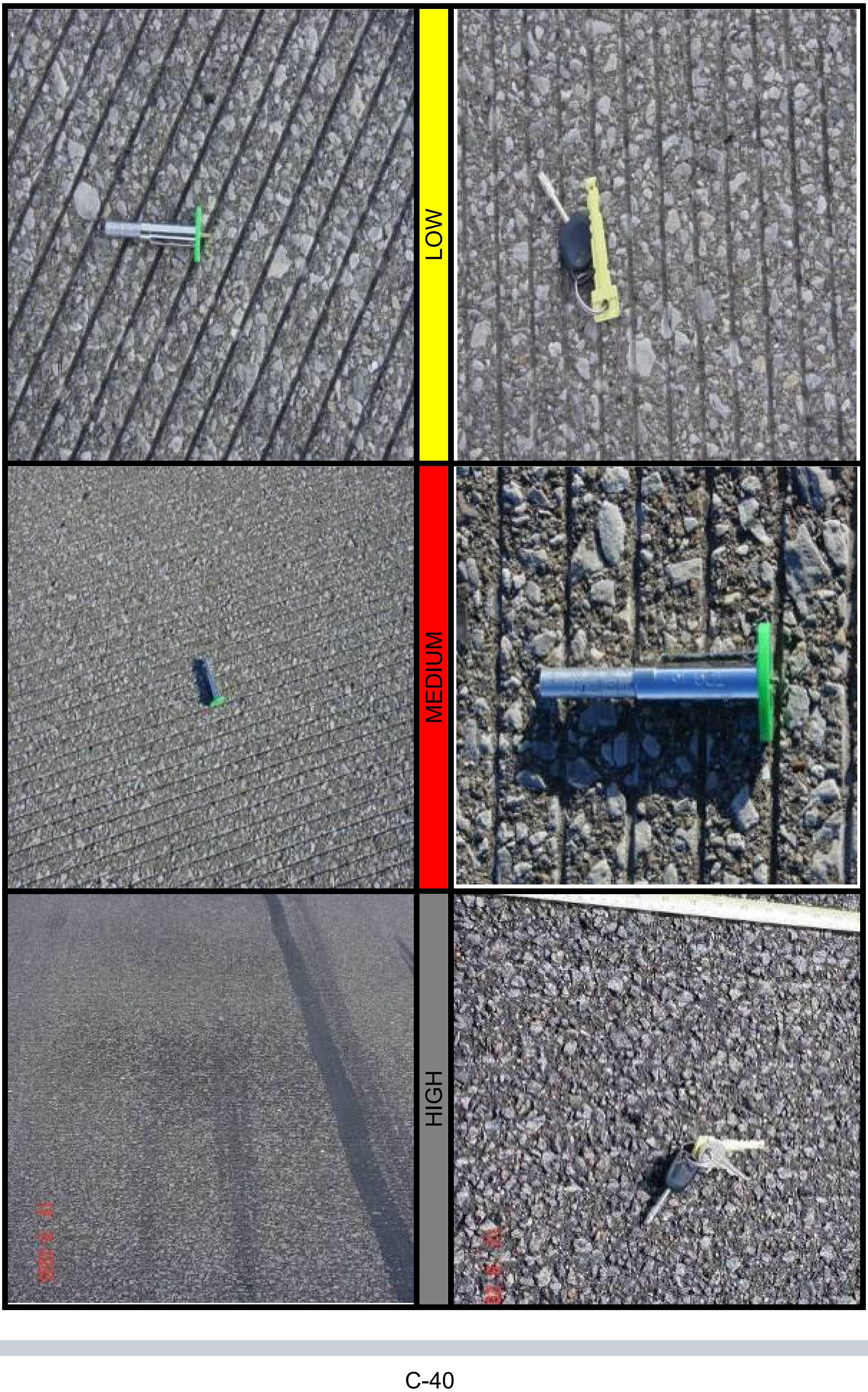
Severity Levels

The determination of severity levels should consider both the weathering of the general surface of the material and the deterioration of the grooving pattern. The variability of the initial groove cut depth makes a quantitative measurement of the depth of grooving remaining difficult so a qualitative assessment based on the deterioration of the grooving pattern and the FOD potential is adopted.

	General surface weathering	Deterioration of grooving pattern
L	See Ungrooved (Marshall) Asphalt Surfaces.	Low severity weathering of the surface has taken place but the grooving pattern remains well defined with only minor loss of edge definition. There is little potential for coarse aggregate loss along the groove edges.
M	See Ungrooved (Marshall) Asphalt Surfaces.	Noticeable loss of grooving depth and edge definition across the area with loss of surfacing material between the grooves. There is potential for further coarse aggregate loss particularly along the groove edges.
H	See Ungrooved (Marshall) Asphalt Surfaces.	Little evidence of grooving remains across the area with a high degree of material loss between the grooves. There is a high potential for FOD production.

How to Measure
As Ungrooved (Marshall) Asphalt Surfaces.

Weathering and deterioration of the groove pattern should be assessed separately for Grooved (Marshall) Asphalt Surfaces and the higher severity level recorded. Sections with different levels of severity may be present within the same sample area and should be recorded separately at the appropriate severity level.

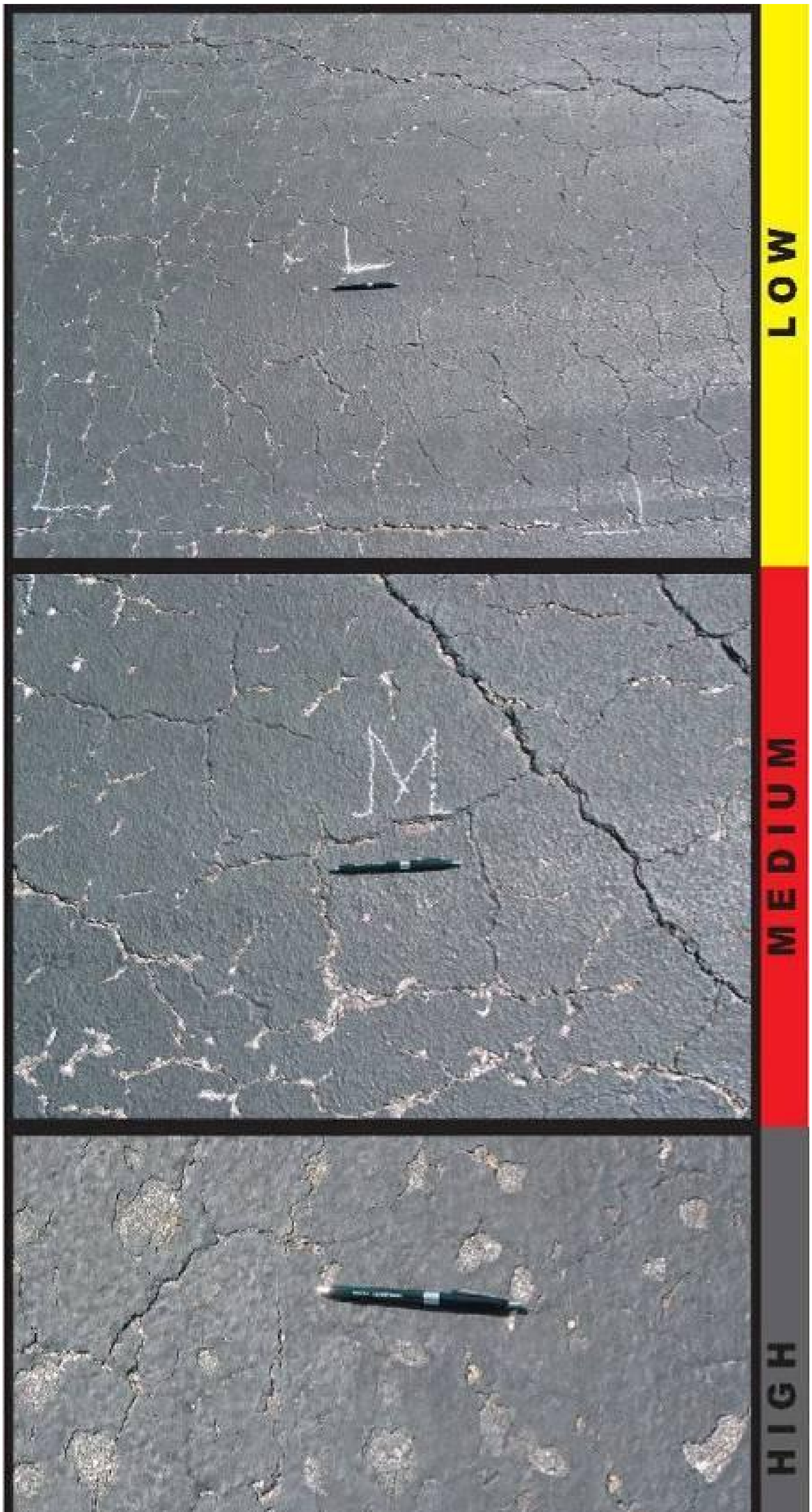

LOW
MEDIUM
HIGH

RAVELLING AND WEATHERING (52) (USACE) *Continued*

Surface Treatment / Tar over Dense Mix Severity Levels

L	(1) Scaled area is less than 1 percent; (2) In the case of coal tar where pattern cracking has developed, the tar surface cracks are less than 6mm (1/4 inch) wide.
M	(1) Scaled area is between 1 and 10 percent; (2) In the case of coal tar where pattern cracking has developed, the tar surface cracks are 6mm (1/4 inch) wide or greater.
H	(1) Scaled area is over 10 percent; (2) In the case of coal tar the surface is peeling off.

How to Measure
Ravelling and weathering are measured in square metres (square yards) of surface area. Mechanical damage caused by hook drags, tyre rims or snowploughs is counted as areas of high-severity ravelling and weathering.


LOW
MEDIUM
HIGH

RAVELLING AND WEATHERING (52) *Continued*
UK MILITARY AIRFIELDS SUPPLEMENTARY

Slurry Seal over Asphalt Severity Levels

Weathering and Abrasion of Surface Treatment

Slurry sealed areas with less than 50 percent loss of slurry seal material should be recorded as Low severity weathering (52) but the percentage sample area (sq m) should be adjusted according to the amount of slurry seal material loss in line with the following table.

L	Up to 25 percent loss of slurry seal material (includes new and/or recently applied treatments)	Record at Low severity over 25 percent of the sample area. (i.e. one quarter of the area of the sample)
	25 to 50 percent loss of slurry seal material	Record at Low severity over 100 percent of the sample area.
M	Greater than 50 percent loss of slurry seal material	Revert to severity levels defined for Ravelling and weathering of ungrooved asphalt surfaces
H		

De-lamination of Surface Treatment

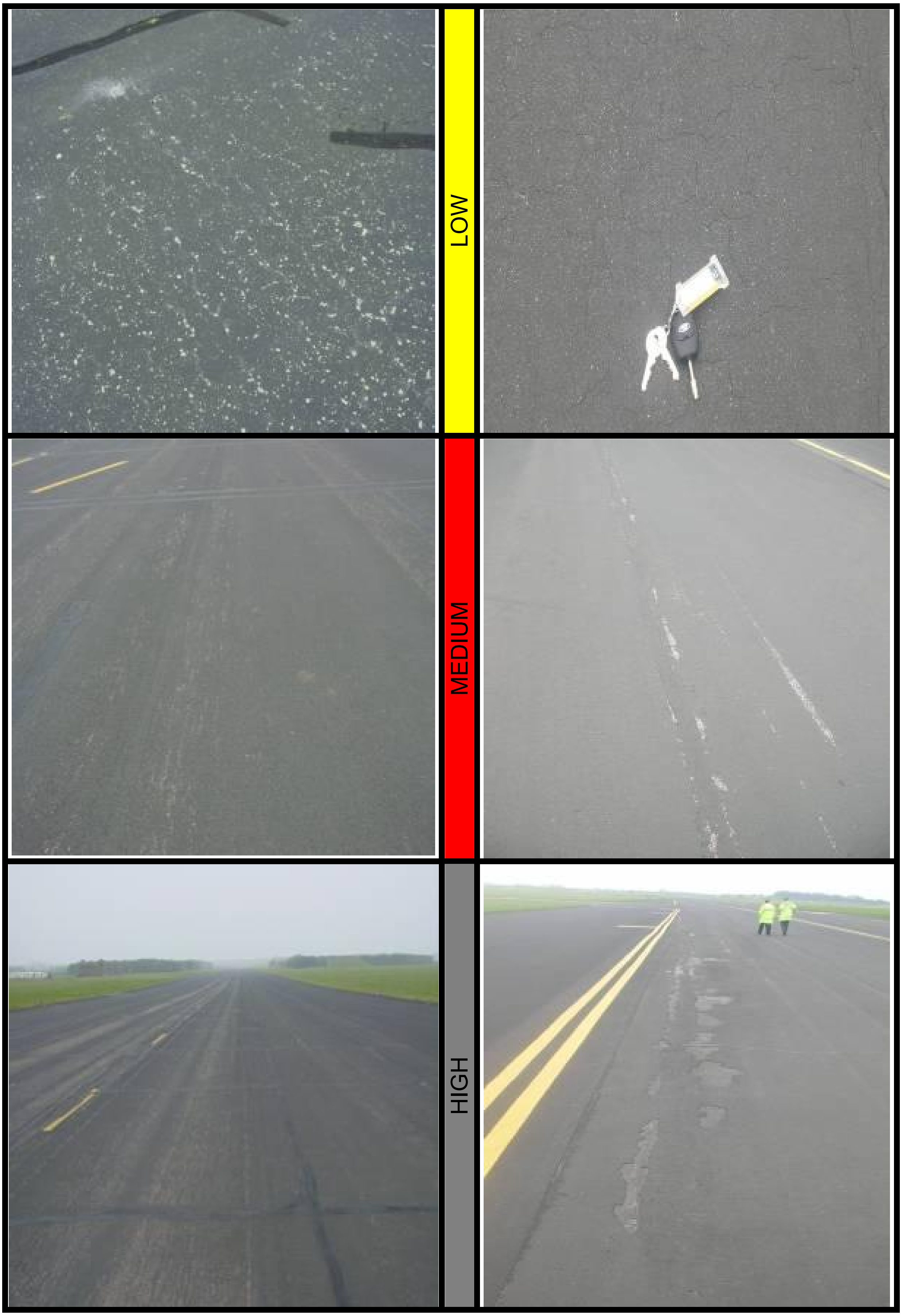
De-lamination of slurry seal treatments can occur. Where this has happened the following severity levels for Ravelling and Weathering (52) should be recorded.

L Crazing of the slurry seal treatment has occurred but no loss or de-lamination of the treatment occurs over less than 1 percent of the sample area with little or no potential for FOD creation.

M De-lamination of the treatment occurs over 1 to 10 percent of the sample area with some potential for FOD creation.

H De-lamination of the treatment occurs over more than 10 percent of the sample area with definite potential for FOD creation or there are large areas, in excess of 1 square metre in total, where complete de-lamination has occurred.

How to Measure
Ravelling and weathering are measured in square metres (square yards) of surface area. Mechanical damage caused by hook drags, tyre rims or snowploughs is counted as areas of high-severity ravelling and weathering.


LOW
MEDIUM
HIGH

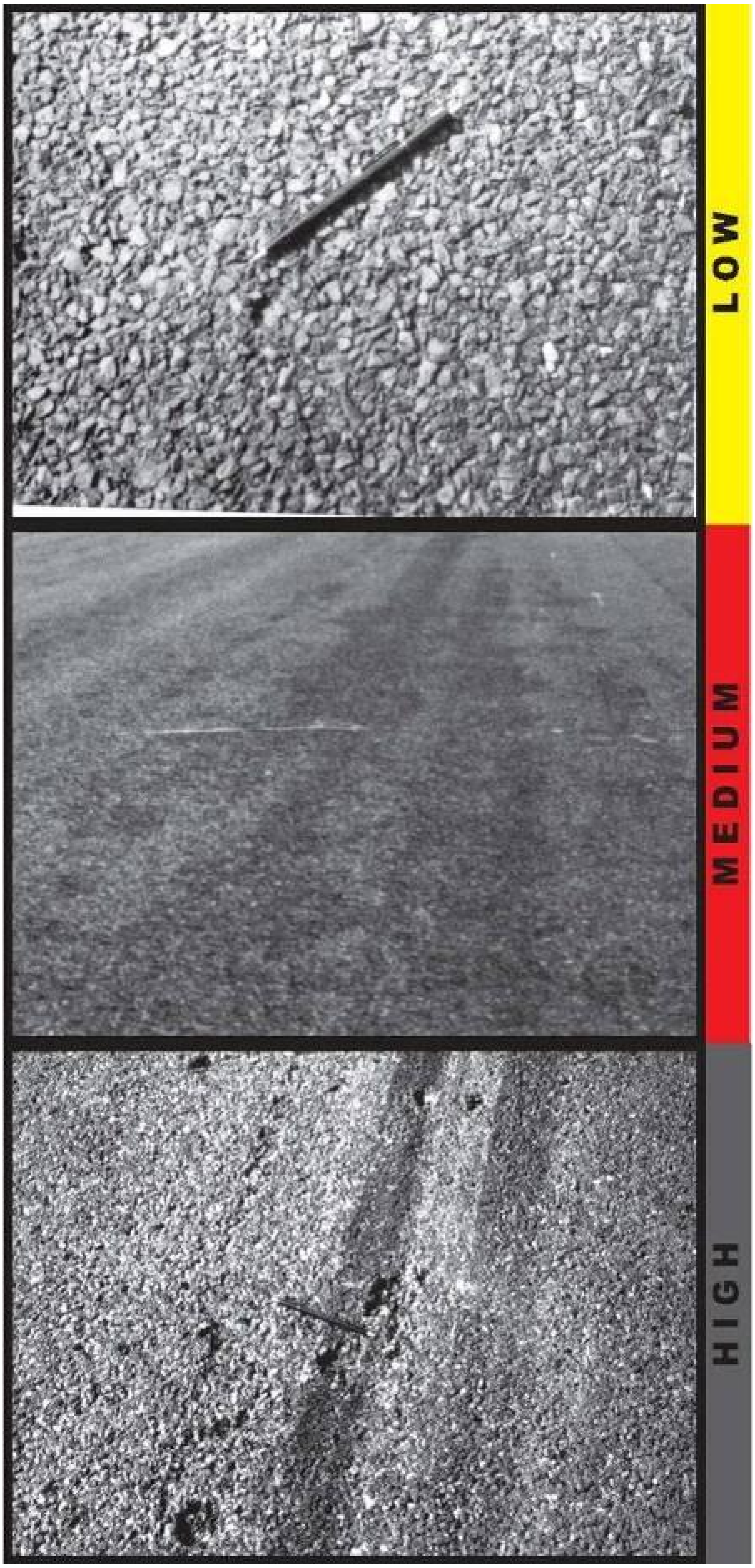
RAVELLING AND WEATHERING (52) (USACE) *Continued*

Porous Friction Course Severity Levels

- L In a square foot (300mm square) 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.
- M In a square foot (300mm square) 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 sample (square foot) area.
- H In a square foot (300mm square) 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 sample (square foot) area.

How to Measure

Ravelling and weathering are measured in square metres (square yards) of surface area. Mechanical damage caused by hook drags, tyre rims or snowploughs is counted as areas of high-severity ravelling and weathering.


LOW
MEDIUM
HIGH

RAVELLING AND WEATHERING (52) *Continued*
UK MILITARY AIRFIELDS SUPPLEMENTARY

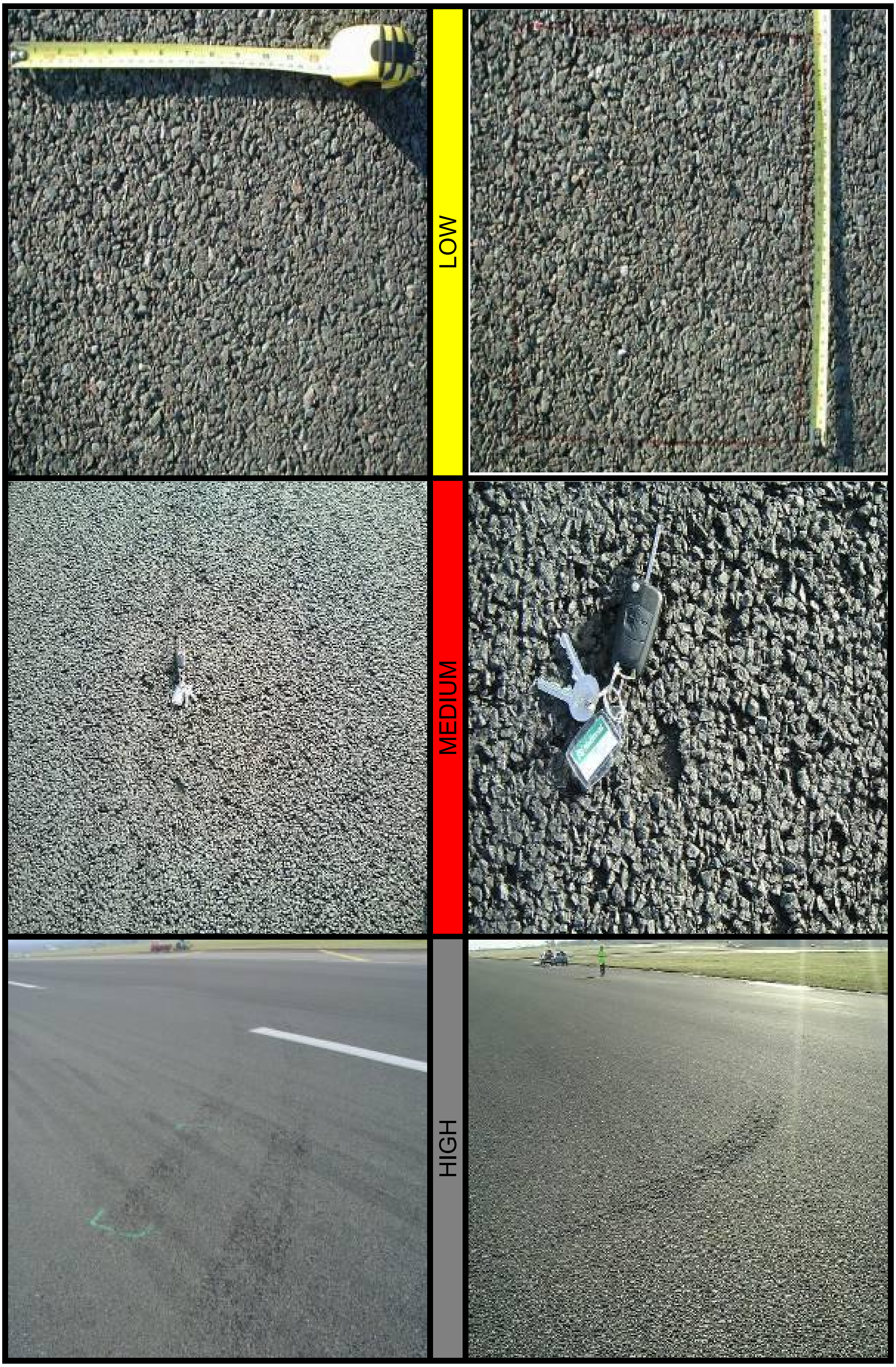
Porous Friction Course Severity Levels

L In a 300mm square (square foot) 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.

M In a 300mm square (square foot) 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 sample (square foot) area.

H In a 300mm square (square foot) 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 sample (square foot) area.

How to Measure
Ravelling and weathering are measured in square metres (square yards) of surface area. Mechanical damage caused by hook drags, tyre rims or snowploughs is counted as areas of high-severity ravelling and weathering.


LOW
MEDIUM
HIGH

RUTTING (53)

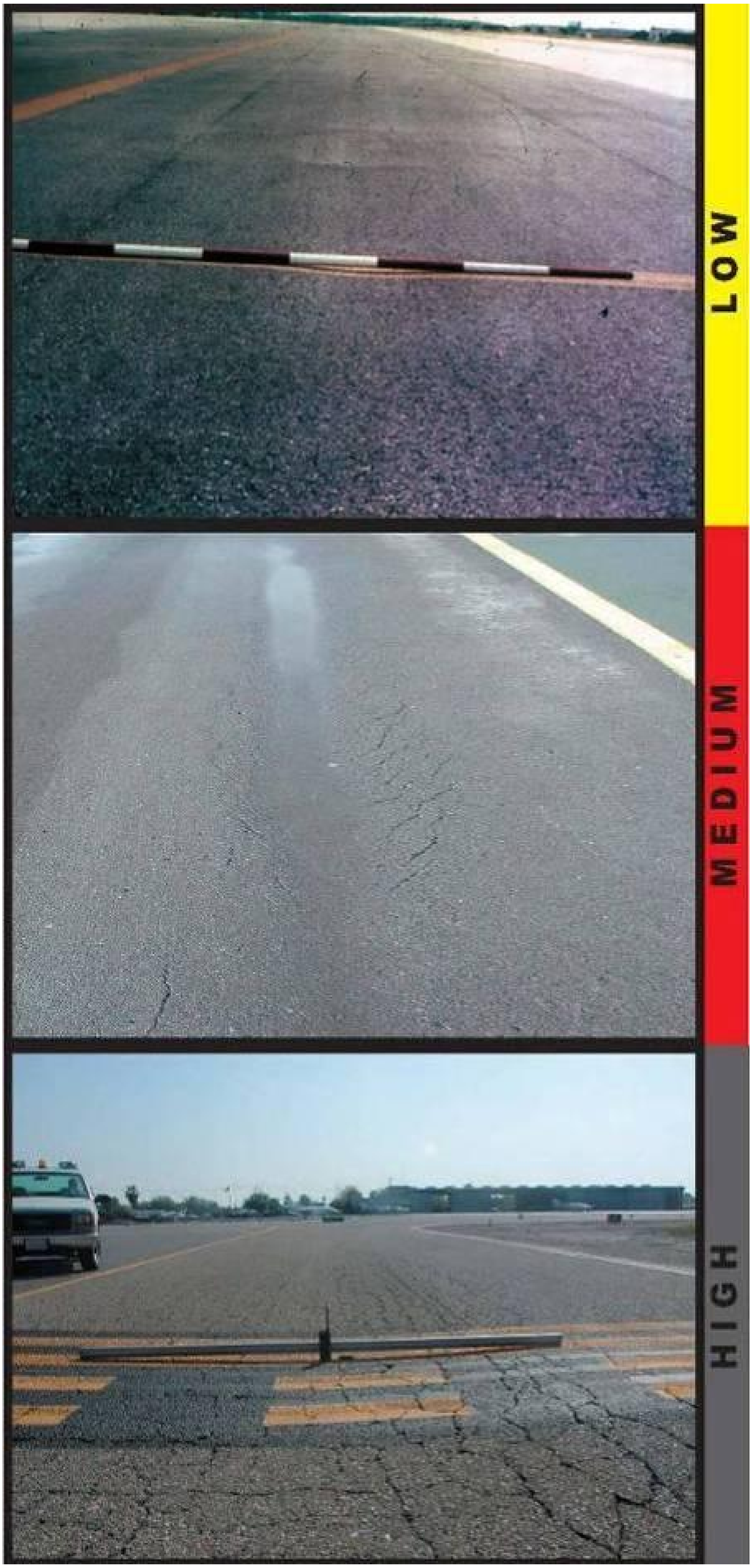
Description
A rut is a surface depression in the wheel path. Pavement uplift may occur along the sides of the rut; however, in many instances ruts are noticeable only after rainfall, when the wheel paths are filled with water. Rutting stems from a permanent deformation in any of the pavement layers or 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.

Severity Levels

Mean Rut Depth Criteria – All Sections

L	6 to 13 mm (1/4 to 1/2 inch)
M	13 to 25 mm (1/2 to 1 inch)
H	Greater than 25 mm (1 inch)

How to Measure
Rutting is measured in square metres (square yards) of surface area and it's 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.


LOW
MEDIUM
HIGH

SHOVING OF ASPHALT BY PCC SLABS (54)

Description
PCC pavements occasionally increase in length at the 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 the gradual opening of the joints as they are filled with incompressible materials that prevent them from re-closing.

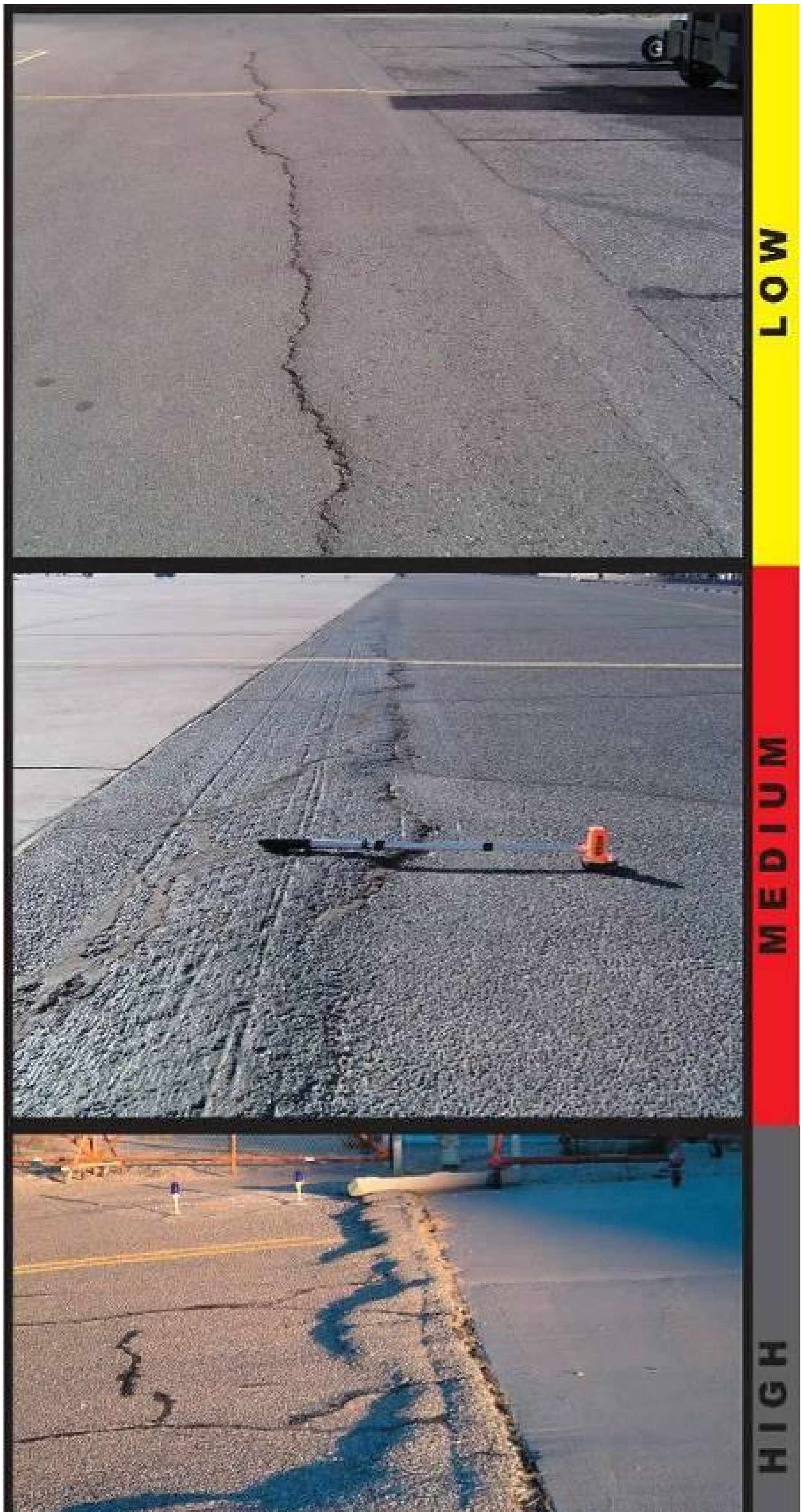
Severity Levels

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

M A significant amount of shoving has occurred, causing MODerate roughness or break-up of the asphalt pavement.

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

How to Measure
Shoving is measured by determining the area in square metres (square yards) of the swell caused by shoving.


LOW
MEDIUM
HIGH

SLIPPAGE CRACKING (55)

Description
Slippage cracks are crescent or half-moon shaped cracks having two ends pointing 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.

Severity Levels
No degrees of severity are defined. It is sufficient to indicate that a slippage crack exists.

How to Measure
Slippage cracking is measured in square metres (square feet) of surface area.

SWELL (56)

Description
A swell is characterised 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.

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.

How to Measure
The surface area of the swell is measured in square metres (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:

Swell Criteria

Severity	Height Differential
L	Less than 19mm (3/4 inch)
M	19 to 40mm (3/4 to 1-1/2 inch)
H	Greater than 40mm (1-1/2 inch)

CONCRETE SURFACED AIRFIELDS

BLOWUP (61)

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 localised 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 evaluated for reopening.

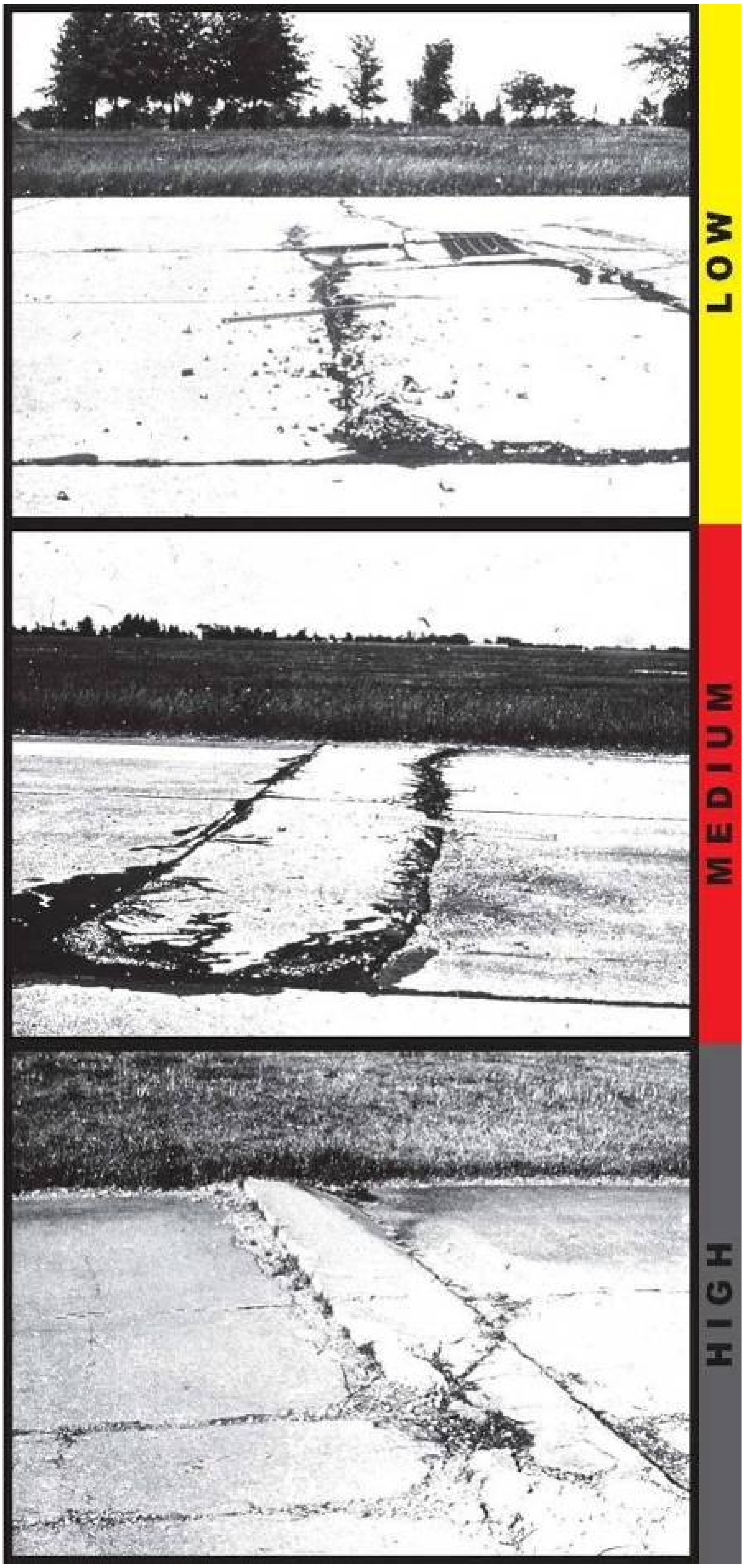
Severity Levels

L Buckling or shattering has not rendered the pavement inoperative and only a slight amount of roughness exists.

M Buckling or shattering has not rendered the pavement inoperative but a significant amount of roughness exists.

H Buckling or shattering has rendered the pavement inoperative.

How to Count
A blow-up 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.


LOW
MEDIUM
HIGH

CORNER BREAK (62)

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 7.5 by 7.5 metres (25 by 25 feet) that has a crack intersecting the joint 1.5 metres (5 feet) from the corner on one side and 5 metres (17 feet) on the other side is not considered a corner break; it is a diagonal crack. However, a crack that intersects 2.1 metres (7 feet) on one side and 3 metres (10 feet) 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 cause corner breaks.

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 3mm (1/8 inch); a filled crack can be of any width but the filler material must be satisfactory condition. The area between the corner break and the joints is not cracked.

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 3mm (1/8 inch) and 25mm (1 inch); (3) A filled crack is not spalled or only lightly spalled, but the filler material is in unsatisfactory condition; (4) The area between the corner break and the joints is lightly cracked with loose or missing particles.

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 25mm (1 inch), creating a tyre damage potential; or (3) The area between the corner break and the joints is severely cracked.

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

UK Supplementary
Overbanding rather than crack filling is generally undertaken in the UK but should be treated as described above.


LOW
MEDIUM
HIGH

CRACKS (LONGITUDINAL, TRANSVERSE AND DIAGONAL) (63)

Description
These cracks, which usually 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.

Non-Reinforced PCC Severity Levels

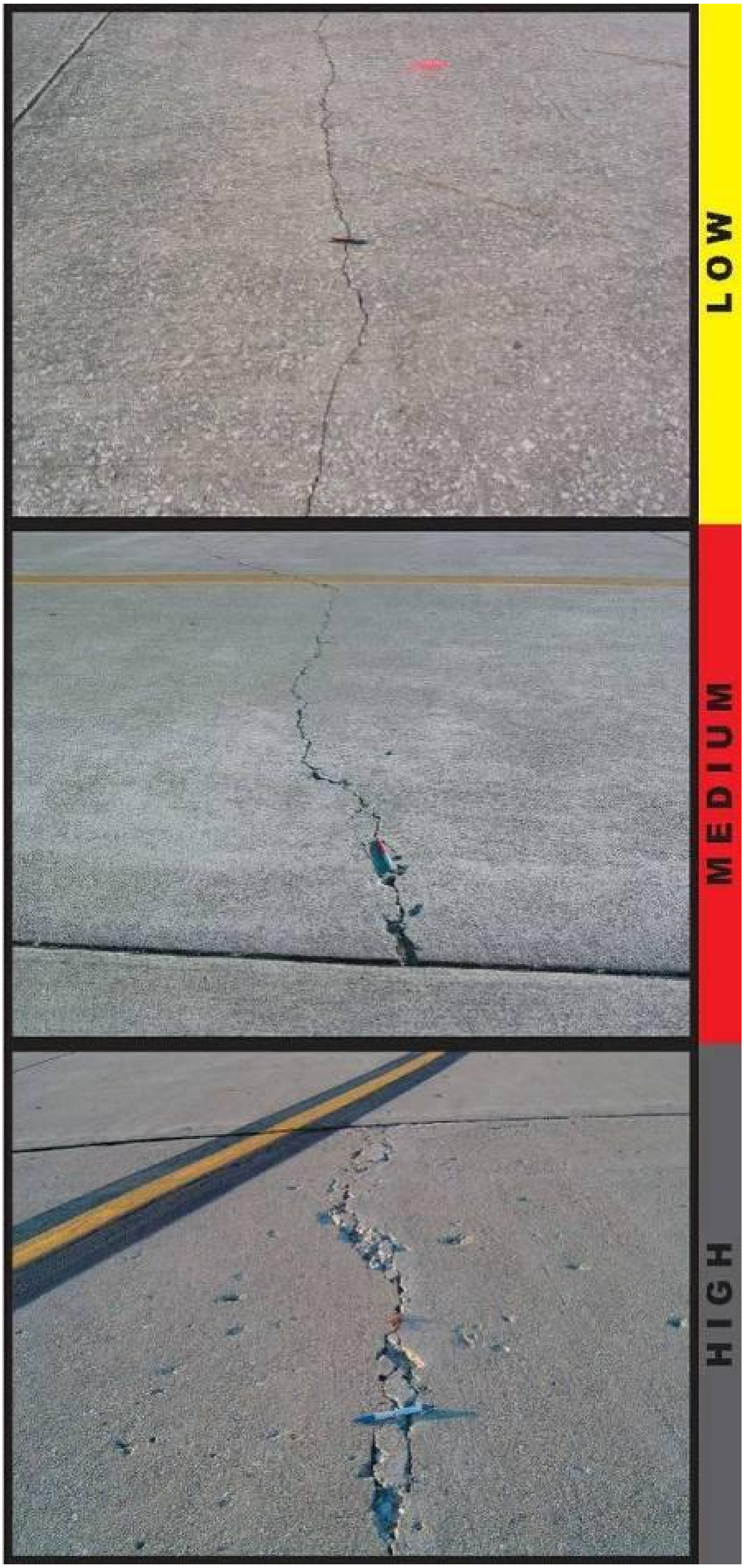
L Crack has no spalling or minor spalling (no FOD potential). If non-filled it is less than 3mm (1/8 inch) wide; a filled crack can be of any width but the filler material must be satisfactory condition.

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 3mm (1/8 inch) and 25mm (1 inch); (3) A filled crack has no spalling or minor spalling but the filler material is in unsatisfactory condition; or (4) The slab is divided into three pieces by two or more cracks.

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 greater than 25mm (1 inch) creating tyre damage potential; or (3) The slab is divided into three pieces by two or more cracks, one of which is at least medium severity.

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 250mm wide (4 to 10 inches)), only the crack and not the patch should be recorded at the appropriate severity level.

UK Supplementary
Overbanding rather than crack filling is generally undertaken in the UK but should be treated as described above. However, where the length of the crack sealed exceeds 75 percent of the slab width the crack should be recorded as medium or high severity cracking depending on the FOD potential. For example, medium severity where there is extensive overbanding but little FOD potential, and high severity where there is extensive overbanding and definite FOD potential.


LOW
MEDIUM
HIGH

CRACKS (LONGITUDINAL, TRANSVERSE AND DIAGONAL) (63) *Continued*

Reinforced Concrete Severity Levels

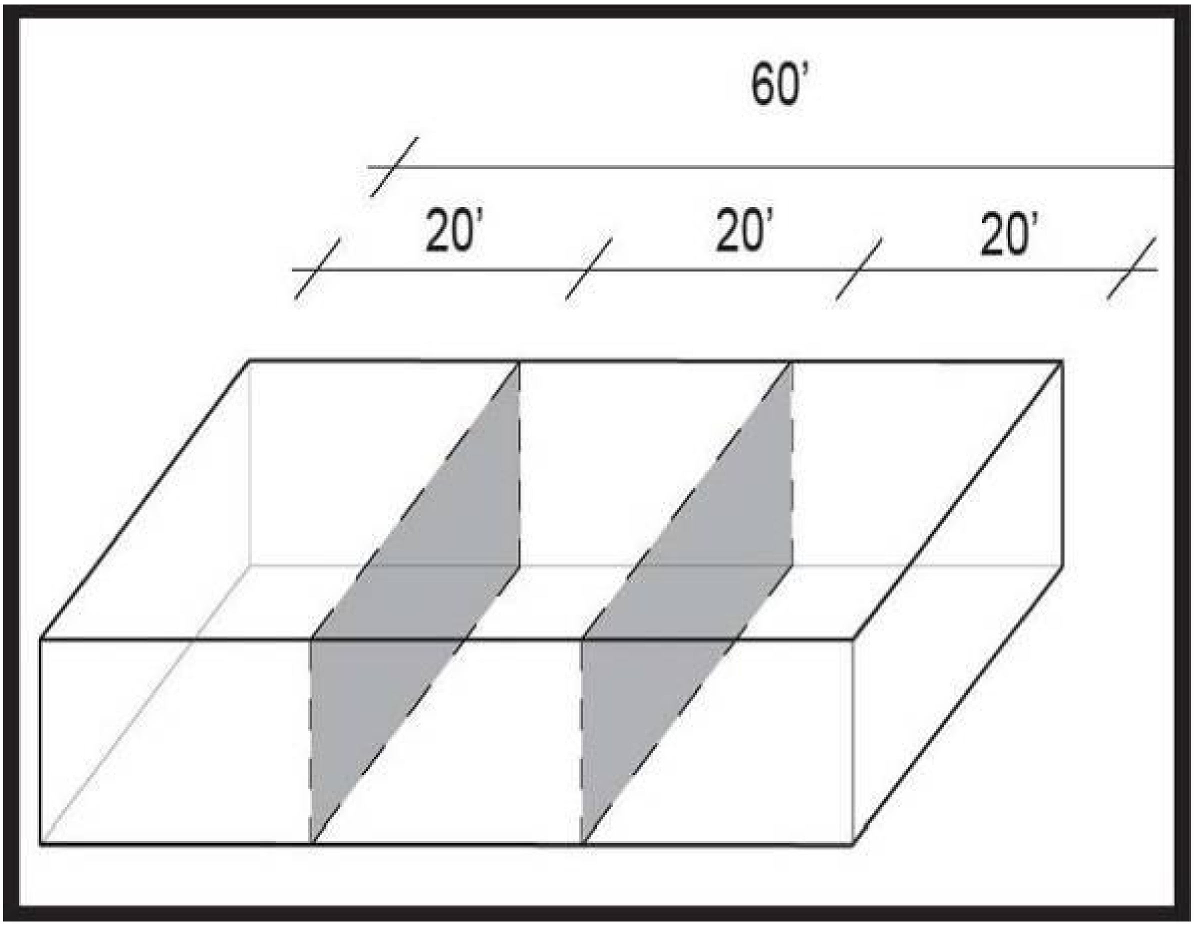
L (1) Non-filled crack, 3mm to 13mm (1/8 to 1/2 inch) wide, with no faulting or spalling; (2) filled or non-filled cracks less than 13mm (1/2 inch) wide with low-severity spalling; or (3) filled cracks of any width (filler satisfactory) with no faulting or spalling. (Note: crack less than 3mm (1/8 inch)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

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

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

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 250mm wide (4 to 10 inches)), only the crack and not the patch should be recorded at the appropriate severity level. Slabs longer than 9.1 metres (30 feet) are divided into approximately equal length “slabs” having imaginary joints assumed to be in perfect condition (see example graphic on the following page.


60’
20’
20’
20’

DURABILITY "D" CRACKING (64)

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 colouring can usually be seen around the fine durability cracks. This type of cracking may eventually lead to disintegration of the concrete within 300 to 600 mm (1 to 2 feet) of the joint or crack.

Severity Levels

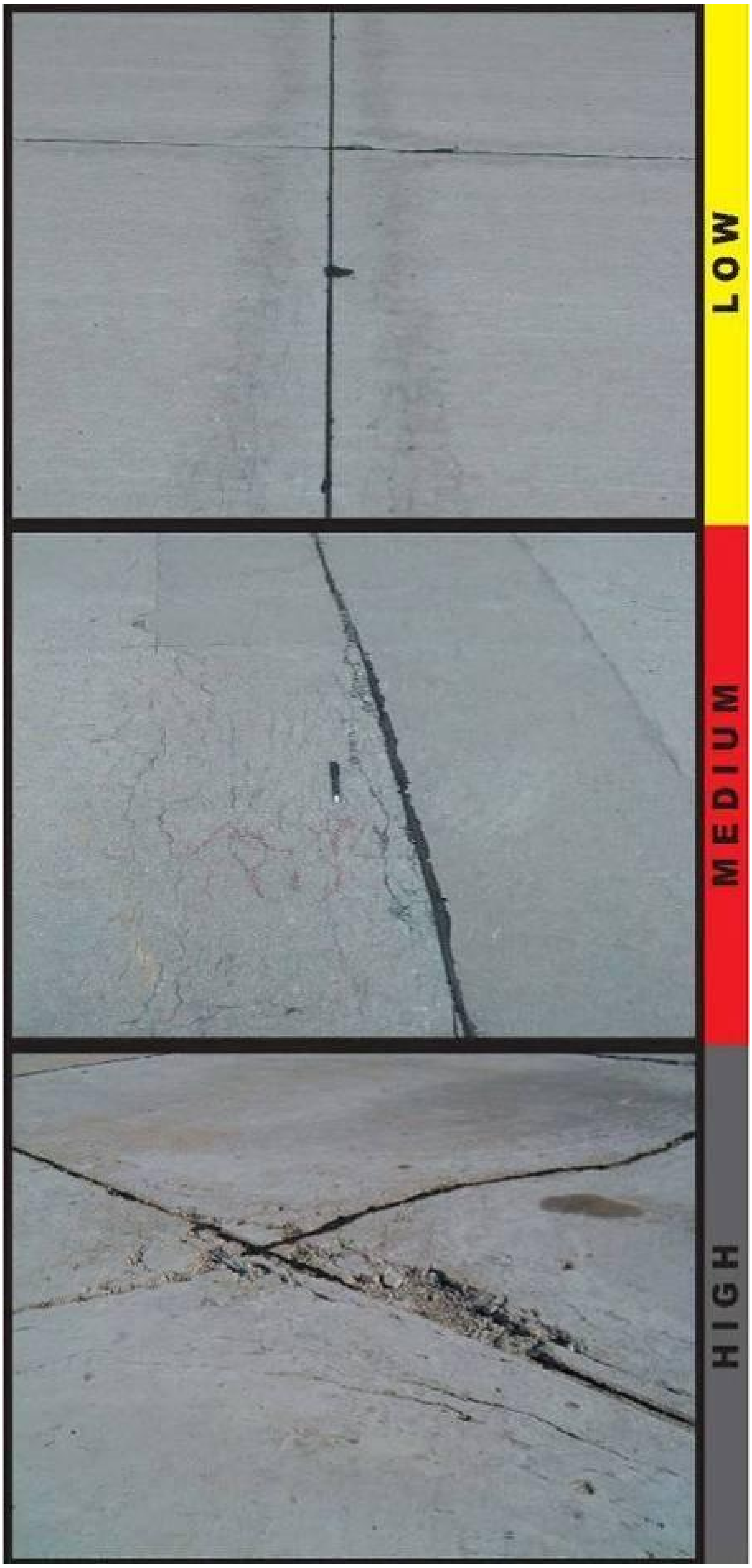
L "D" cracking is defined by hairline cracks occurring in a limited area of the slab, such as one or two corners or along one joint. Little or no disintegration has occurred. No FOD potential.

M (1) "D" cracking has developed over a considerable amount of the 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.

H "D" cracking has developed over a considerable amount of slab area with disintegration and FOD potential.

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.

UK Supplementary
Overbanding is often applied to these areas in the UK to mitigate the FOD potential. However, where the length of the crack sealed exceeds 75 percent of the slab width the crack should be recorded as medium or high severity cracking depending on the FOD potential. For example, medium severity where there is extensive overbanding but little FOD potential, and high severity where there is extensive overbanding and definite FOD potential.


LOW
MEDIUM
HIGH

JOINT SEAL DAMAGE (65)

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 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.

Severity Levels

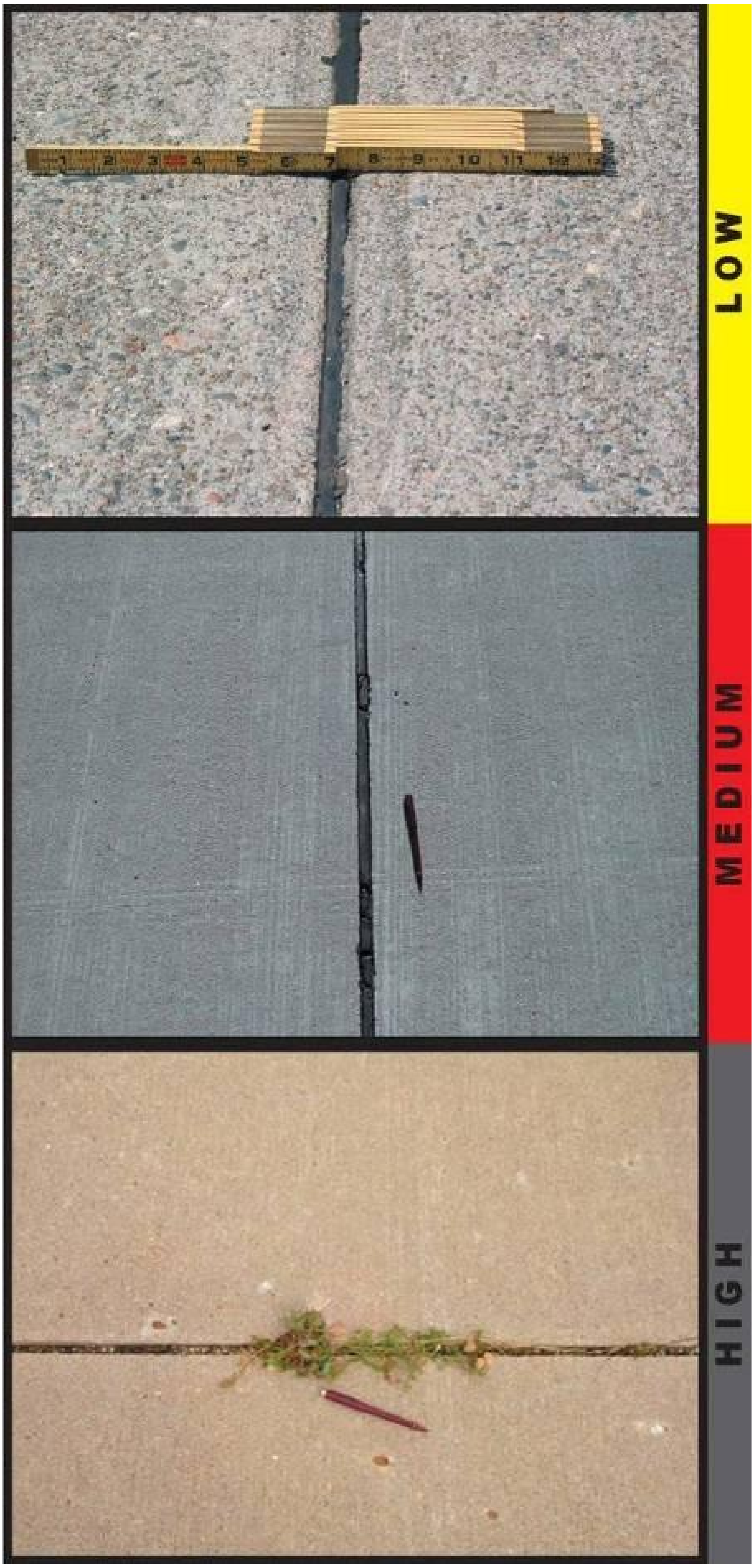
L Joint sealer is generally in good condition throughout the section. Sealant is performing well, with only a minor amount of any of the above types of damage present.

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.

H Joint sealer is in generally poor condition over the surveyed section, with one or more of the above types of damage occurring to a severe degree. Sealant needs immediate replacement.

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.

UK Supplementary
Currently joint sealing is not generally undertaken in the UK but there are areas of pavement where this procedure has been adopted either historically or as part of a maintenance treatment. The above criteria should be applied in these situations.


LOW
MEDIUM
HIGH

PATCHING, SMALL (LESS THAN 0.5 SQUARE METRES (5 SQUARE FEET)) (66)

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 square metres (5 square feet)) and large (over 0.5 square metres (5 square feet)). Large patches are described in the next section.

Severity Levels

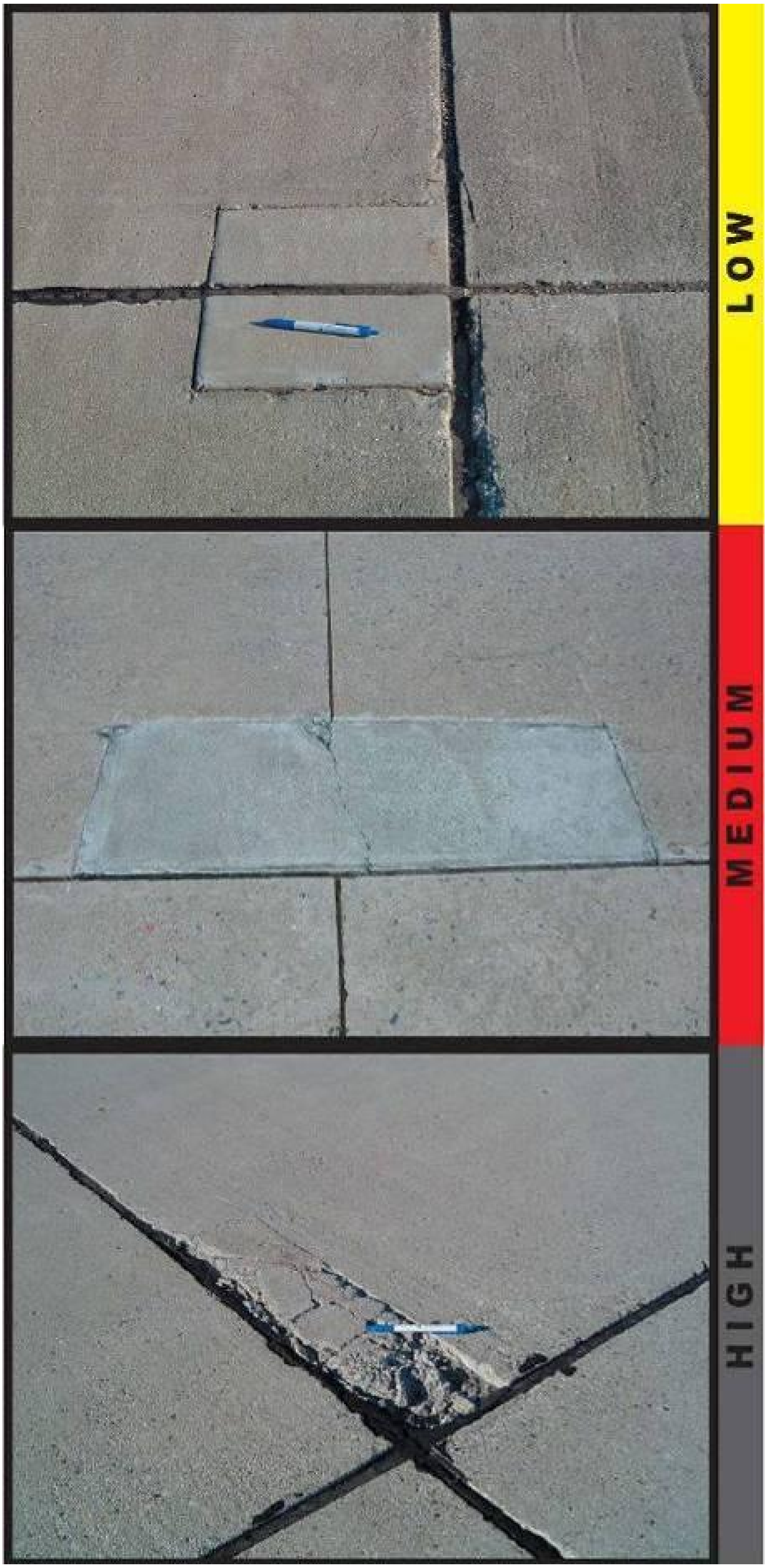
L Patch is functioning well, with little or no deterioration.

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)

H Patch has deteriorated, either by spalling around the patch or cracking within the patch, to a state which warrants replacement.

How to Count
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 250mm wide (4 to 10 inches)), 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.

UK Supplementary
Overbanding may have been applied to the edges of these areas to mitigate potential FOD problems but the effect of the overbanding should not be considered when assessing the severity levels described above.


LOW
MEDIUM
HIGH

PATCHING, LARGE (OVER 0.5 SQUARE METRES (5 SQUARE FEET)) AND UTILITY CUT (67)

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 the placement of underground utilities. The severity levels of a utility cut are the same as those for regular patching.

Severity Levels

L Patch is functioning well, with little or no deterioration.

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.

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.

How to Count
The criteria are the same as for small patches.

UK Supplementary
Overbanding may have been applied to the edges of these areas to mitigate potential FOD problems but the effect of the overbanding should not be considered when assessing the severity levels described above.


LOW
MEDIUM
HIGH

POPOUTS (68)

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 25mm (1 inch) to 100m (4 inches) in diameter and from 13mm (1/2 inch) to 50mm (2 inches) deep.

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 metre over the entire slab area.

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 metre (per square yard), at least three, random 1 square metre (1 square yard) areas should be checked. When the average is greater than this density, the slab is counted.

PUMPING (69)

Description
Pumping is the ejection of material by water through joints or cracks caused by the 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 the 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.

Severity Levels
No degrees of severity are defined. It is sufficient to indicate that pumping exists.

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.

SCALING, MAP CRACKING AND CRAZING (70)

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 6 to 13mm (1/4 to 1/2 inch). Scaling may also be caused by de-icing salts, improper construction, freeze-thaw cycles and poor aggregates. Another recognised source of distress is Alkali Silica Reaction (ASR) which is the reaction between the alkalis (Na_2O and K_2O). In some cements and certain minerals in some aggregates the gel from the reaction is white. Products formed by the reaction between the alkalis and aggregate result in expansions that cause a breakdown in the concrete and may affect adjacent structures. Cracks near the joints also tend to be perpendicular to the joints as compared to “D” cracking which is parallel to the joints.

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 (Note: The low-severity level is an indicator that scaling may develop in the future. A slab should only be counted if, in the judgement of the inspector, future scaling is likely to occur within 2 to 3 years)

M Scaling covers approximately 5 percent or less of the surface, causing some FOD potential.

H Slab is severely scaled, causing a high FOD potential. Usually more than 5 percent of the surface is affected.

Severity Levels Applicable to Alkali Silica Reaction

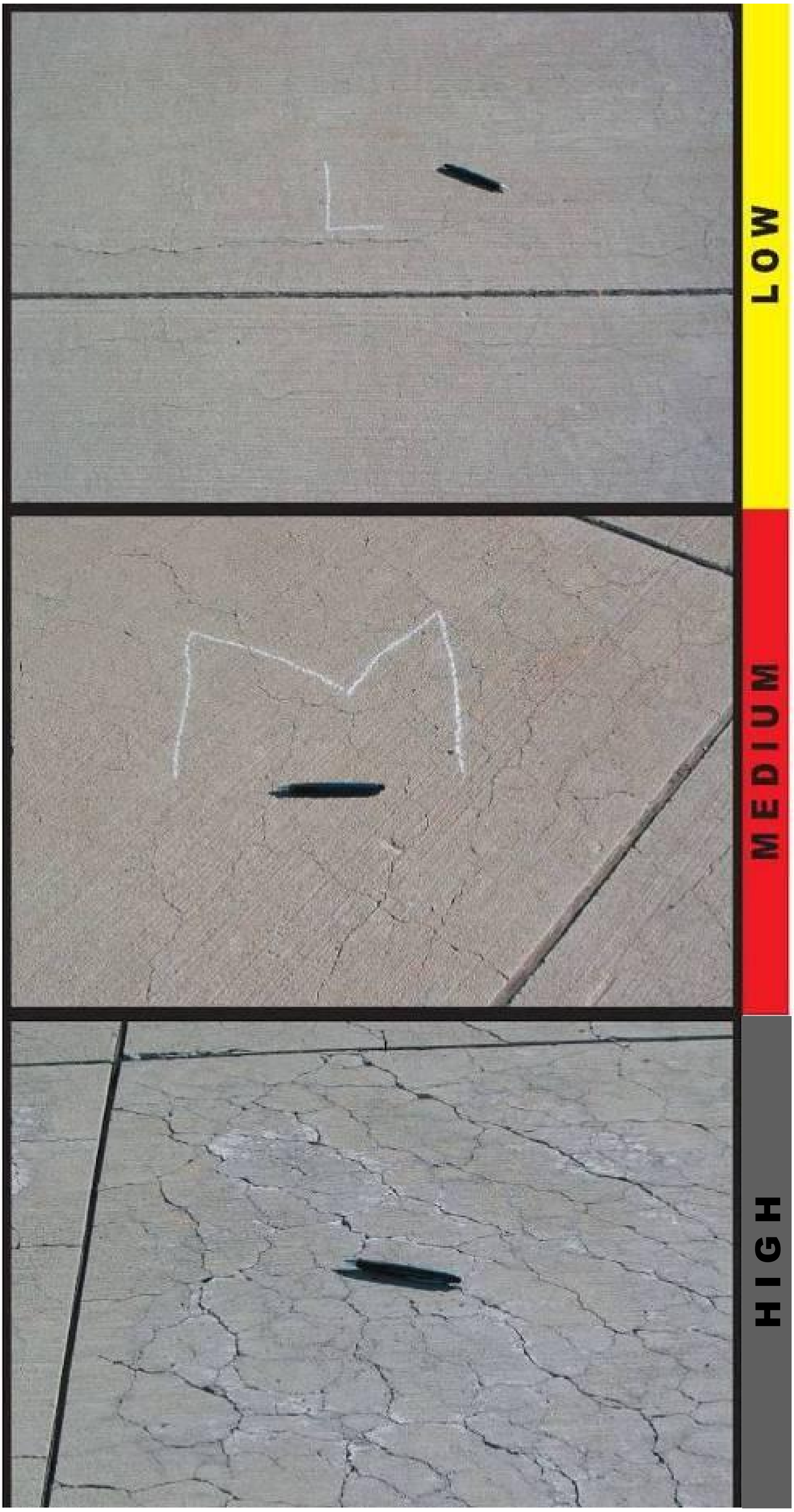
L ASR is noted on only a small portion of the slab and produces no FOD

M ASR is noted over the entire slab, but cracks are light and no loose aggregate exists; or ASR covers 5 percent or less of the surface and causes some FOD potential.

H ASR covers more than 5 percent of the surface and causes high FOD potential

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. If “D” cracking is counted, scaling is not counted.


LOW
MEDIUM
HIGH

CONCRETE WEATHERING (RECORDED AS SCALING) (70) UK MILITARY AIRFIELDS SUPPLEMENTARY

Description

The UK military airfield pavements inventory includes many areas / sections where concrete surfaces in excess of thirty years old are still in use. These areas have suffered varying degrees of weathering with loss of the fine material from the surface and exposure of the coarse aggregate. The loss of the surface material is not generally due to construction defects or ASR. The FOD potential is usually limited to individual coarse aggregate pieces generally at the edges of the slabs where the severity of the weathering effect tends to be greater. The MicroPaver system does not have a separate distress code for concrete weathering so the distress is recorded as scaling (70) but with the following severity level definitions.

Severity Levels

L The surface of the slab is weathered such that the originally constructed textured surface is no longer apparent over the majority of the slab AND loss of fine material from the surface is sufficient to expose the top of the coarse aggregate resulting in the coarse aggregate protruding by less than 3.0 mm from the general surface level **but there is no FOD potential**. (Note: A slab should not be counted if the surface texture is no longer apparent but weathering has not yet exposed the coarse aggregate.

M (1) The surface of the slab is weathered such that the coarse aggregate protrudes by more than 3.0mm from the general surface level and presents a potential for FOD creation, particularly along the edges of the slab; or (2) between 30 and 50 percent of the slab edges have significant potential for, or are subject to, loss of coarse aggregate (this does not include areas subject to edge spalling).

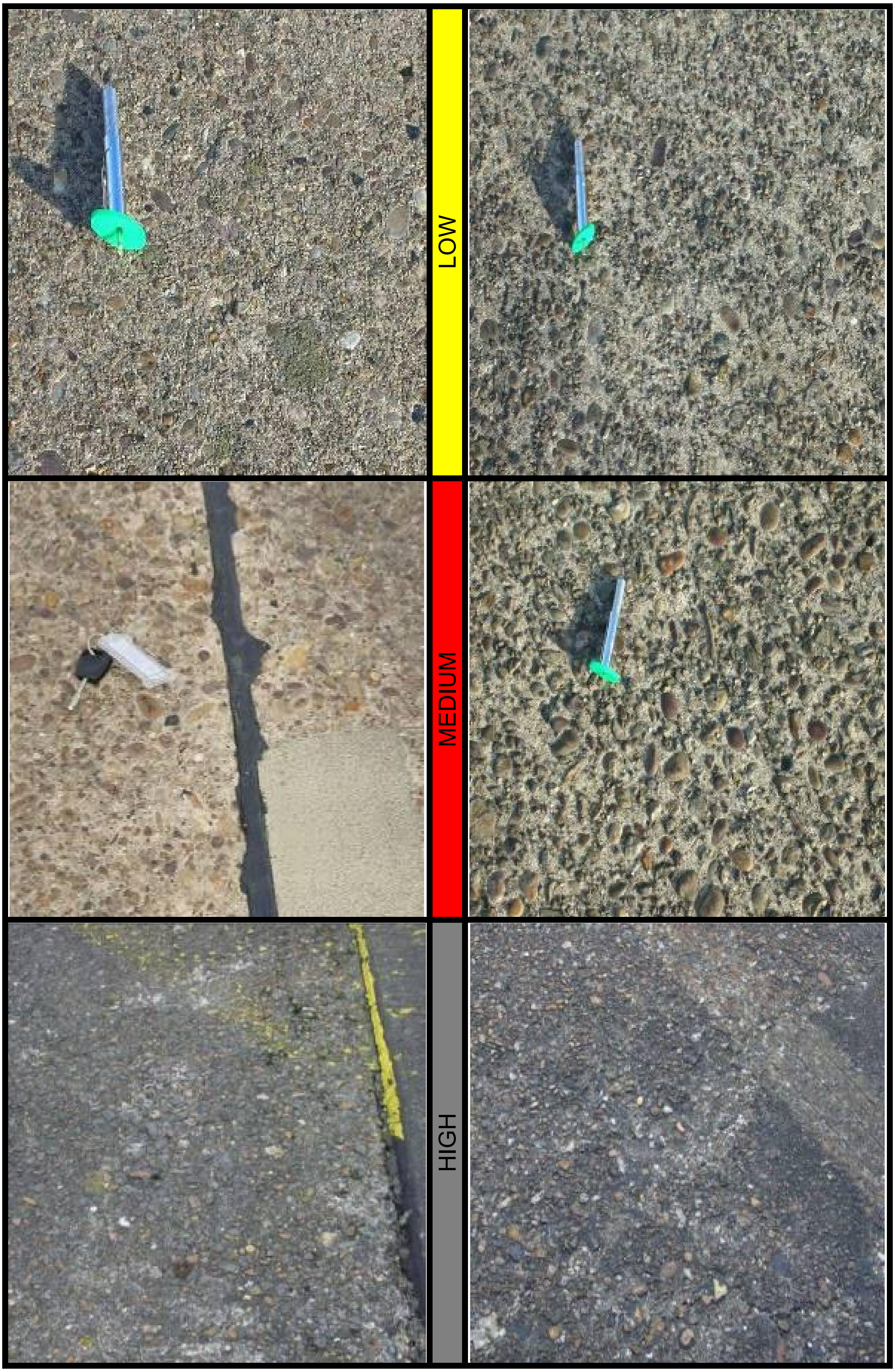
H (1) The surface of the slab is weathered such that the coarse aggregate protrudes by more than 3mm with a high potential for FOD creation over a large percentage of the slab. This may be particularly evident along the edges of the slab; or (2) greater than 50 percent of the slab edges have significant potential for, or are subject to, loss of coarse aggregate (this does not include areas subject to edge spalling).

How to Count

The degree of coarse aggregate protrusion may be measured using a simple depth gauge with a narrow ended pointer, accurate to within ± 0.2 mm. Several measurements should be taken across the slab to ascertain the appropriate severity level.

A slab generally considered as Low severity but containing patches of Medium severity totalling more than 30 percent of the slab area should be recorded as one slab with Medium severity scaling.

A slab generally considered as Medium severity but with patches of High severity totalling more than 10 percent of the slab area should be recorded as one slab with High severity scaling. Particular attention should be paid to the severity of weathering distress around the edges of the slab and the potential for FOD creation.


LOW
MEDIUM
HIGH

CONCRETE WEATHERING (RECORDED AS SCALING) (70) UK MILITARY AIRFIELDS SUPPLEMENTARY

Epoxy Resin Surface Treatment (Addagrip) over Concrete Severity Levels

Weathering and Abrasion of Surface Treatment

All slabs that have had an epoxy resin surface treatment applied (including newly treated areas) should be recorded as Low severity weathering (70) except where the weathering (or delamination) of the treatment exceeds the limits given in the tables below.

L	Up to 25 percent loss of surface treatment material (includes new and/or recently applied treatments)	Record as Low severity
M	25 to 50 percent loss of surface treatment material	Record as Medium severity.
H	Greater than 50 percent loss of surface treatment material	Revert to severity levels defined for concrete weathering (70)

De-lamination of Surface Treatment

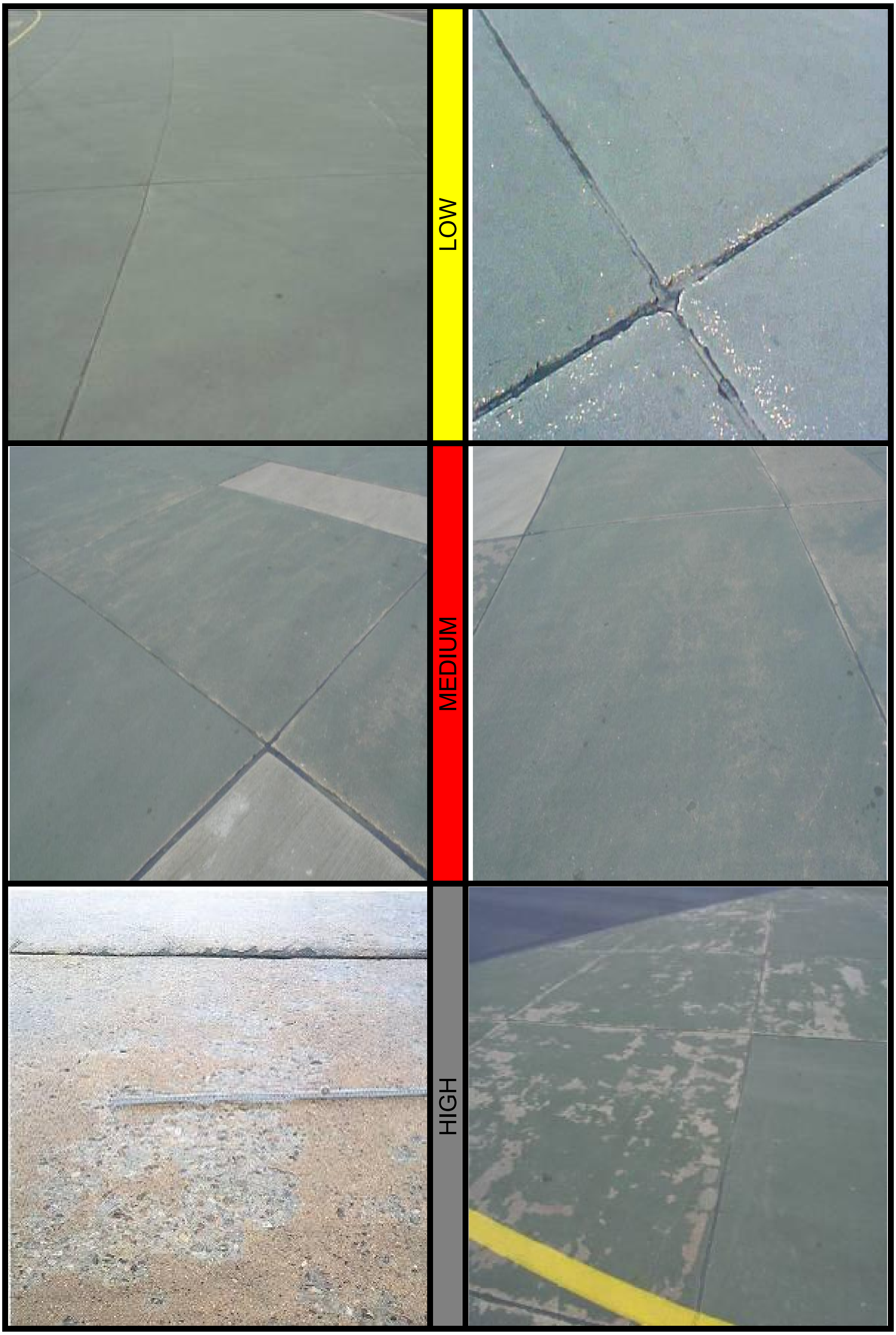
De-lamination of epoxy resin surface treatments can occur. Where this has happened the following severity levels for Concrete Weathering (70) should be recorded.

L De-lamination of the treatment occurs over less than 1 percent of the slab area with little or no potential for FOD creation.

M De-lamination of the treatment occurs over 1 to 10 percent of the slab area with some potential for FOD creation.

H De-lamination of the treatment occurs over more than 10 percent of the slab area with definite potential for FOD creation.

How to Measure
If two or more levels of severity exist on a slab, the slab is counted as one slab having the higher level of severity.
.


LOW
MEDIUM
HIGH

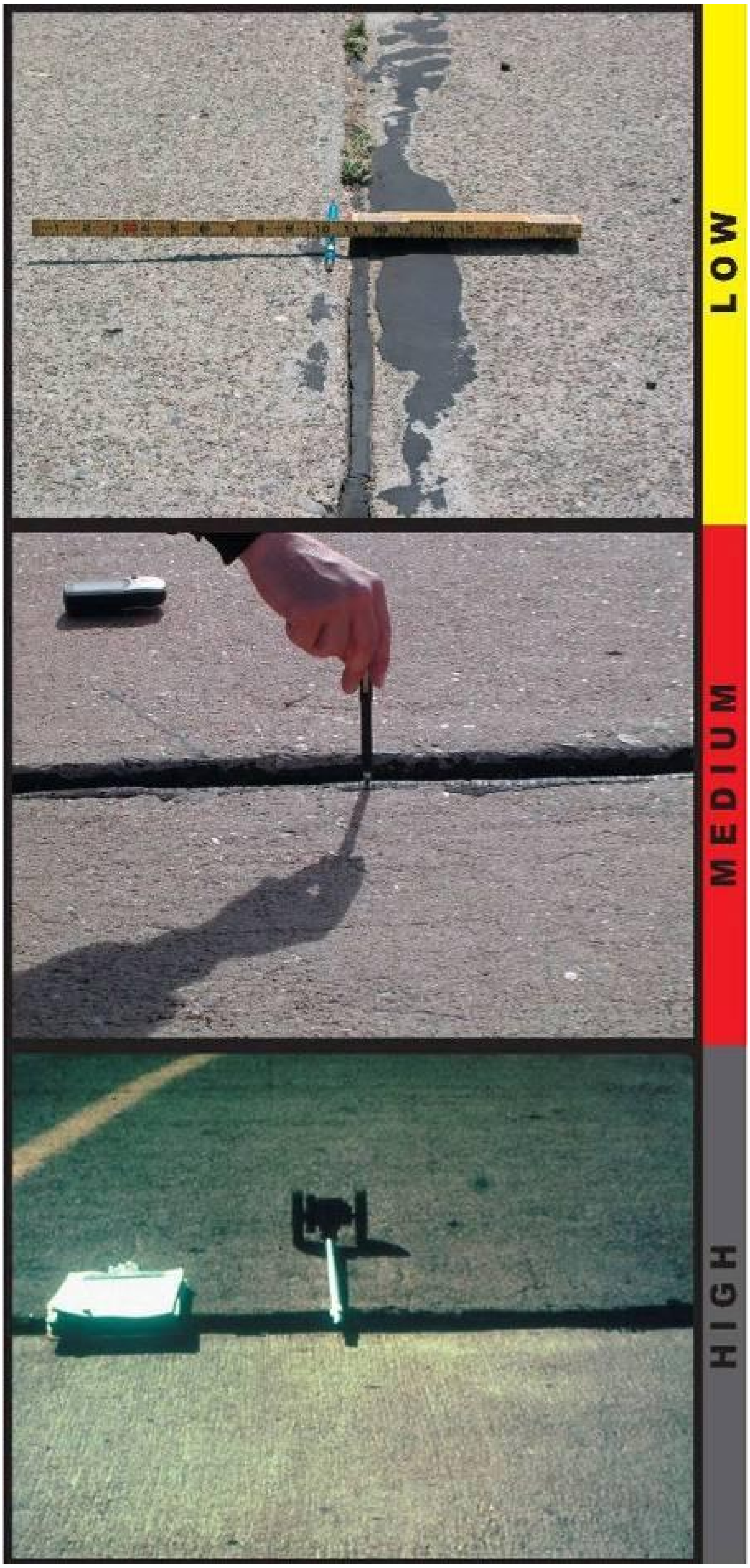
SETTLEMENT OR FAULTING (71)

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

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

	Runways / Taxiways	**Aprons**
L	Less than 6mm (1/4 inch)	3 to 13mm (1/8 to 1/2 inch)
M	6 to 13mm (1/4 to 1/2 inch)	13 to 25mm (1/2 to 1 inch)
H	Greater than 13mm (1/2 inch)	Greater than 25mm (1 inch)

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.


LOW
MEDIUM
HIGH

SHATTERED SLAB / INTERSECTING CRACKS (72)

Description
Intersecting cracks are cracks that break a slab 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 categorised as a severe corner break.

Severity Levels

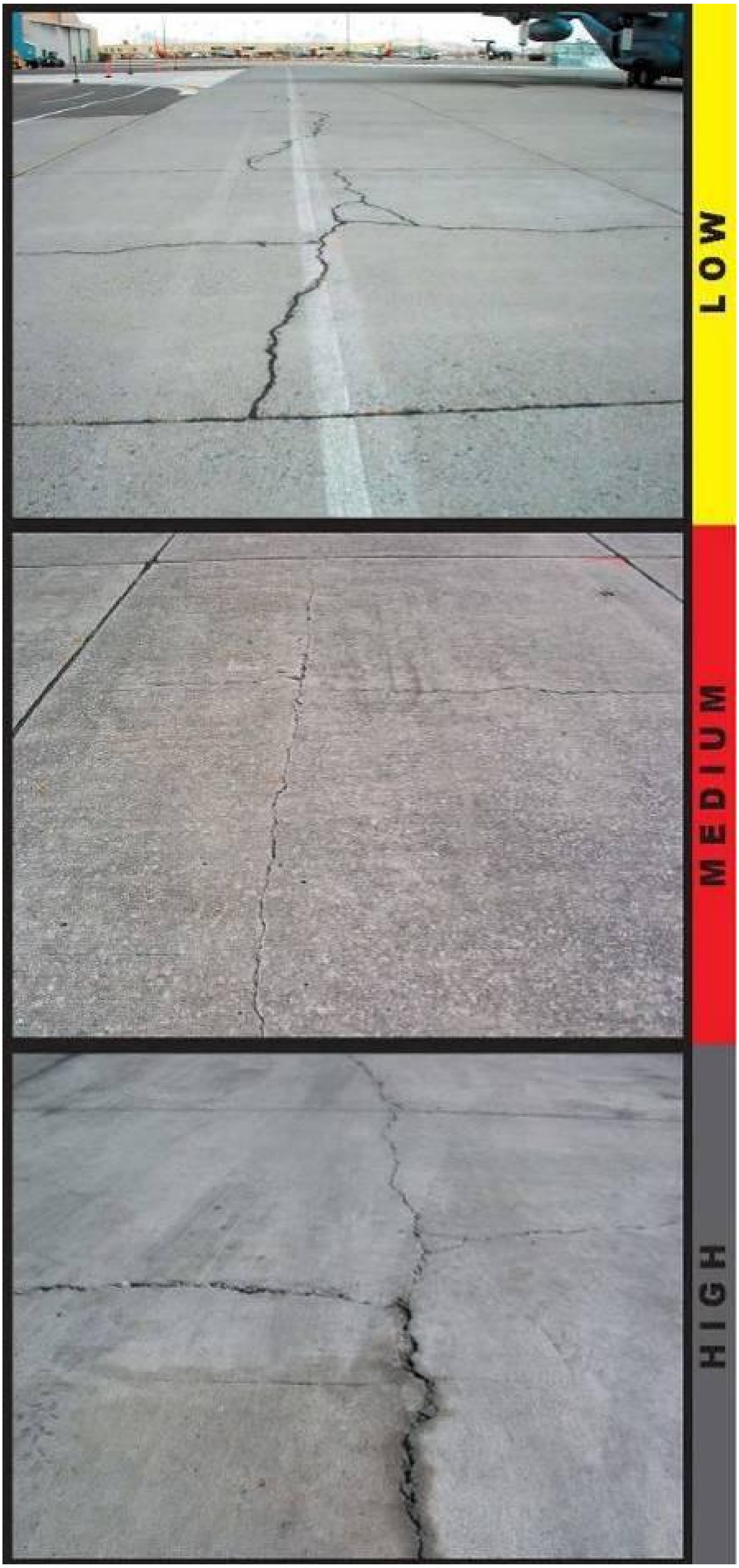
L	Slab is broken into four or five pieces with the vast majority of the cracks (over 85 percent) of low-severity.

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.

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; or (2) slab is broken into six or more pieces with over 15 percent of the medium or high-severity.

How to Count
No other distresses 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.

UK Supplementary
Overbanding may have been applied to mitigate potential FOD problems. No additional benefit shall be derived from this in terms of overall severity except that allowed when assessing the severity of the cracks in line with distress 63 - longitudinal, transverse and diagonal cracks.


LOW
MEDIUM
HIGH

SHRINKAGE CRACKS (73)

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.

Severity Levels
No degrees of severity are defined. It is sufficient to indicate that shrinkage cracks exist.

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

SPALLING (TRANSVERSE AND LONGITUDINAL JOINTS) (74)

Description
Joint spalling is the breakdown of the slab edges within 600mm (2 feet) 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 the infiltration of incompressible materials or traffic loads. Weak concrete at the joint (caused by overworking) combined with traffic loads also causes spalling.

Severity Levels

	Spall Length	Description
L	< 600mm (2 feet)	Spall is broken into pieces or fragmented; little FOD or tyre damage potential exists
	> 600mm (2 feet)	(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	< 600mm (2 feet)	Spall is broken into pieces or fragmented, with some of the pieces loose or absent, causing considerable FOD or tyre damage potential
	> 600mm (2 feet)	(a) spall is broken into more than three pieces defined by low or medium-severity 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	> 600mm (2 feet)	(a) spall is broken into more than three pieces defined by one or more high-severity cracks with high FOD potential; or (b) joint is severely frayed with high FOD potential (Note: if less than 600mm (2 feet) of the joint is lightly frayed, the spall should not be counted).

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.

UK Supplementary
Overbanding may have been applied to mitigate potential FOD problems. No additional benefit shall be derived from this in terms of overall severity except that allowed when assessing the severity of the cracks in line with distress 63 - longitudinal, transverse and diagonal cracks.

LOW

MEDIUM

HIGH

SPALLING (CORNER) (75)

Description
Corner spalling is the ravelling or breakdown of the slab within approximately 600mm (2 feet) of the corner. A corner spall differs from a corner break in that the spall angles downward to intersect the joint, while a break extends vertically through the slab.

Severity Levels

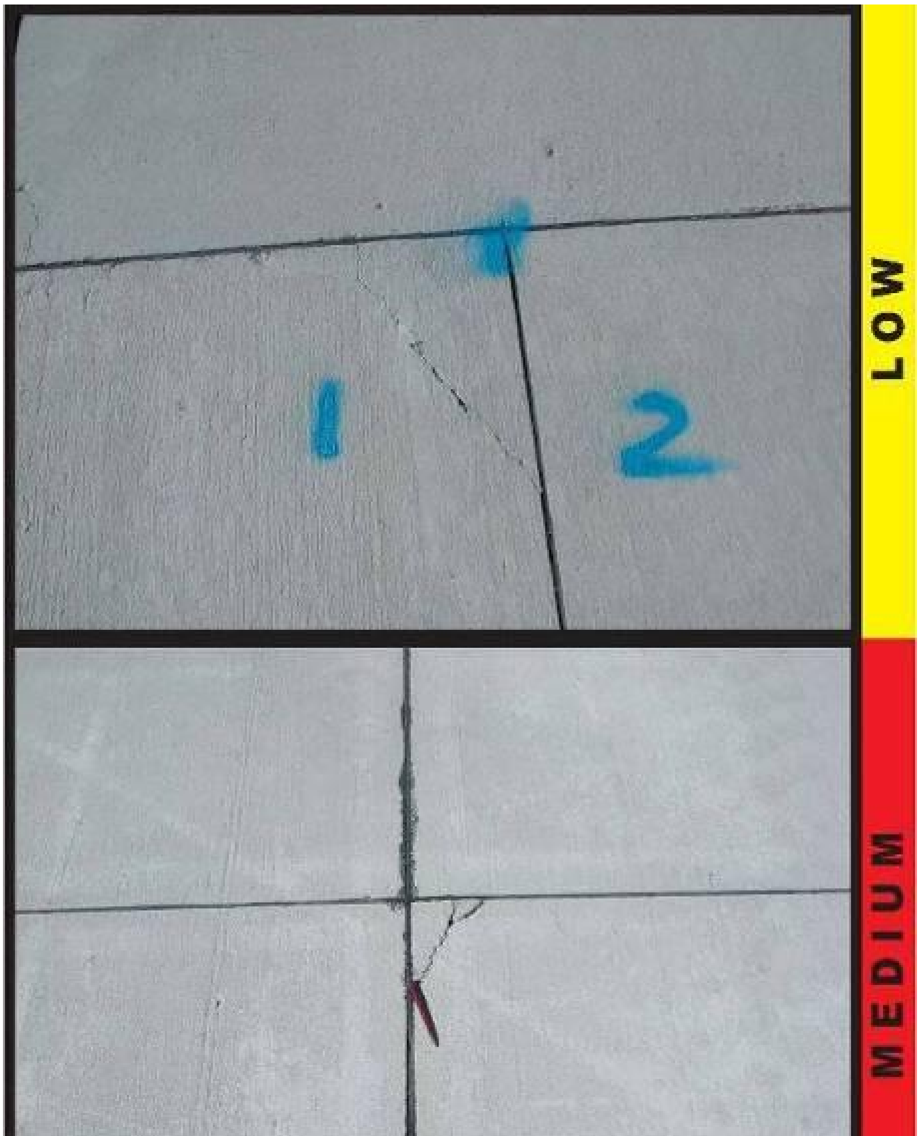
L One of the following conditions exists: (1) spall is broken into one or two pieces defined by low-severity cracks (little or no FOD potential); (2) spall is defined by one medium-severity crack (little or no FOD potential).

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.

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 tyre damage hazard exists; or (3) spall has deteriorated to the point where loose material is causing high FOD potential.

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.

UK Supplementary
Overbanding may have been applied to mitigate potential FOD problems. No additional benefit shall be derived from this in terms of overall severity except that allowed when assessing the severity of the cracks in line with distress 63 - longitudinal, transverse and diagonal cracks.


1
2
LOW
MEDIUM
HIGH

Monthly Report Template

Insert:
(COMPANY LOGO

(STATION NAME)

AIRFIELD INSPECTION REPORT

FOR

ASSET NUMBERS: (NUMBERS)

AIRFIELD PAVEMENTS AND AIRFIELD GENERAL

(month/year)

(Insert airfield photo)

(PHOTO DESCRIPTION)

Insert:
(COMPANY LOGO)

(Station Name)

(Company Name)

MONTHLY CONDITION REPORT AIRFIELD PAVEMENTS INSPECTIONS

FOR

(month/year)

Prepared by:

(Company name)
(Office address)

(Office telephone)

(Company name) REVIEW		
DATE	(date)	
SIGNED		
(Reviewer name)		STO
ACCEPTABLE		

Inspected by:	(Inspectors and titles)
Signatures of Inspector	
Date of Inspection	(dd-mmm-yyyy)
Weather Conditions	(weather conditions)
Date of Issue of Report	(date)

1. Introduction

(Station Name) is located (description of general location) at National Grid co-ordinates (grid ref). The station is administered by (administrating station name).

This monthly PCI reports covers the period (month/year) and has been compiled by (Name) of (Company Name).

The airfield pavements covered for this month are detailed in Table 1.

Table 1. Airfield Pavement Inspection Schedule

PROGRAMME	LOCATIONS COVERED	PCI SECTIONS COVERED
January	Selected areas of the airfield, ensuring all primary assets (runways, helipads etc.) are picked up once every 3 months and secondary (taxiways, aprons etc.) and tertiary (aircraft tow routes, hangar floors etc.) assets picked up once every 12 months. Increased inspections of Primary assets will be required during the winter period.	Selected areas of the airfield with a change each month, but ensuring that all the Primary airfield pavements are surveyed at least once yearly and all Secondary and Tertiary pavements are covered at least once over a three year period.
February		
March		
April		
May		
June		
July		
August		
September		
October		
November		
December		

2. Pavement Condition Index Base Values

The critical Pavement Condition Index (PCI) values specified by Defence Estates for all MOD Airfields are given below. These are based upon providing aircraft operating surfaces which are an acceptable standard in terms of surface condition for the anticipated usage. Figure 1 identifies the primary, secondary and tertiary assets.

Table 2. Pavement Condition Index Base Values

Pavement Category	Pavement Use	Critical PCI Level
P (Primary)	Runways, ORP's, VTOL Pads, STOL Strips, Dummy-Deck practice areas, Taxiways designated as emergency or auxiliary runways, Helipads.	70
S (Secondary)	Taxiways other than those designated as emergency or auxiliary runways, Aircraft parking and servicing platforms, Hangar Aprons, ERP's and other aircraft test areas, HAS Floors, Compass Swinging Platform.	55
T (Tertiary)	Aircraft wash platforms, Hangar Floors, Aircraft towing routes (not used by aircraft under self-power).	40

The tables in Section 3 list the airfield pavements that have a current PCI values approaching or below the critical PCI level criteria. A PCI Value less than the critical level do not automatically mean that the area is unserviceable for all aircraft operations but that the potential for damage to aircraft is heightened. Any pavement with a PCI value of 35 or less is considered to be highly degraded with a considerable potential for damage to aircraft and its continued use for aircraft operations should be urgently reviewed.

3. PCI Survey Findings

All the airfield operational surfaces have been divided up into pavement sections for the purposes of the PCI survey. Unique reference identification is given to each pavement section.

(GIS Shapefile of Airfield showing Primary, Secondary and Tertiary Assets)

Figure 1. (Station name) pavement categories – Primary/Secondary/Tertiary

The average PCI value for each pavement category is shown graphically in Figure 2 below.

(Bar Chart compiled from PAVER with X Axis: Section Rank and Y Axis: Avg Condition)

Figure 2. Average PCI value for each pavement category

A graphical representation showing the calculated PCI values for each pavement section is provided in Appendix A. Annotated photographs illustrating particular areas of concern are included in Appendix B.

Primary Pavements (P) with a PCI equal to or less than 80 (Critical Level 70)

Primary pavements are considered to be operating surfaces where aircraft traverse the surfaces at speeds exceeding their normal taxiing velocity such as during take-off and landing. This includes area used for practice landings, take-offs, roll-throughs and VTOL/STOL operations.

The Category P airfield pavements with a PCI value equal to or less than 80 are detailed in Table 3.

(Word or excel table compiled from PAVER with column headings: Name/Branch ID/Section ID/From/To/Inspection Date/PCI – Row selection of Rank=Primary (P), PCI<=80 – Row order PCI Descending).

Table 3. Primary pavements with a PCI equal to or less than 80

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments (if below critical)

Secondary Pavements (S) with a PCI equal to or less than 60 (Critical Level 55)

Secondary pavements are considered to be operating surfaces where aircraft traverse the surface at speeds not exceeding their normal taxiing velocity and/or areas where aircraft may manoeuvre under their own power. This includes aircraft performance test areas where the aircraft engines are operational although the aircraft may be stationary.

The Category S airfield pavements with a PCI value equal to or less than 60 are detailed in Table 4.

(Word or excel table compiled from PAVER with column headings: Name/Branch ID/Section ID/From/To/Surface/Inspection Date/PCI – Row selection of Rank=Secondary (S), PCI<=60 – Row order PCI Descending).

Table 4. Secondary pavements with a PCI equal to or less than 60

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments (if below critical)

Tertiary Pavements (T) with a PCI equal to or less than 45 (Critical Level 40)

Tertiary pavements are considered to be operating surfaces where aircraft do not traverse the surface under their own power. This will generally include aircraft hangar floors (except for the drive through type hangars) and other areas where aircraft are exclusively manoeuvred by towing equipment or vehicular means.

The Category T airfield pavements with a PCI value equal to or less than 45 are detailed in Table 5.

(Word or excel table compiled from PAVER with column headings: Name/Branch ID/Section ID/From/To/Surface/Inspection Date/PCI – Row selection of Rank=Tertiary (T), PCI<=45 – Row order PCI Descending).

Table 5. Tertiary pavements with a PCI equal to or less than 45

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments (if below critical)

4. Maintenance Works Undertaken in the previous month

The following maintenance and project works have been undertaken in the previous month:

Description	Priority	Date Completed	Approx Cost (£k)

5. Maintenance Works recommended and/or currently planned for next month

The following maintenance and project works are planned to be undertaken next month:

Description	Priority	Date Identified	Approx Cost (£k)
Including any outstanding work from previous months			

Priority Matrix		Description
Obligatory Services	1	Works requiring immediate attention, considered to have a Health & Safety implication or to fulfil a Mandatory or Statutory Requirement.
Essential Services	2	Works recommended within 1 year
Important Services	3	Works necessary to maintain value and utility of estate.
Desirable Services	4	Desirable works e.g. would reduce maintenance/running costs or reduce future costs.

6. Report Findings and Recommendation

(Summary of conditions and recommendations of each area inspected)

Detail Report Sheet follows in Appendix C.

Appendix A – PCI Survey Data: Graphical Representation

(Insert A3 size coloured graphical representation of PCI Values and PAVER bar chart showing PCI condition at last inspection)

Appendix B – Photographs

(Appendix to include A3 size plan showing photography positions and relevant photographs with suitable descriptive comment)

Appendix C – Airfield Inspection Sheets

<table>
<tr><td colspan="5">(NAME OF PC/MMO)</td></tr>
<tr><td colspan="5">AIRFIELD INSPECTION SHEET</td></tr>
<tr><td colspan="3">(STATION)</td><td colspan="2">(DATE)</td></tr>
<tr><td colspan="5">INSPECTION CHECKLIST</td></tr>
<tr><td colspan="3">A. SURFACE
B. JOINTS
C. LINE MARKINGS</td><td colspan="2">D. RUBBER DEPOSITS
E. DRAINAGE
F. OTHER ITEMS</td></tr>
<tr><th>LOCATION</th><th></th><th>FINDINGS AND RECOMMENDATIONS</th><th>PRIORITY</th><th>R.O.C.</th></tr>
<tr><td rowspan="3"><u>EXAMPLE:</u>
DISPERSAL 67 AND ACCESS TAXIWAY</td><td></td><td>The concrete hardstanding at Dispersal 67 was overslabbed in 2002 in 250mm Pavement Quality Concrete laid in 6m x 6m bays. The surface has a good brush texture; joints, generally 10mm wide, are sawn and sealed and are in good condition. The entrance from the Loop taxiway is slurry sealed and remains in fair condition. An area of surface damage by turning vehicles was observed at the entrance to the loop taxiway.
Tie downs, set in pockets which can not drain, are starting to corrode.
Marking, which are in fair condition, comprise a broken, yellow nosewheel guideline marking. There is minor flaking loss from the markings.</td><td></td><td></td></tr>
<tr><td>A.</td><td><u>SURFACE</u>
(i) <u>Repairs</u>
(a) Overband reflective crack on taxiway with a sealant complying with BS EN 14188-1:2004 and the works carried out in accordance with recommendations of DWFS 06 Appendix 6.
(ii) <u>Monitor</u>
(a) Monitor slurry seal at entrance to loop taxiway</td><td>1

4</td><td></td></tr>
<tr><td>B.</td><td><u>JOINTS</u>
(i) <u>Repairs</u>
There are no repairs required.
(ii) <u>Monitor</u>
(a) Monitor minor edge spalls
(b) Monitor expansion joint along r/h side of Dispersal</td><td>4
4</td><td></td></tr>
</table>

	C.	**LINE MARKINGS** (i) **Repairs** (a) Renew taxiway centreline markings compliant with MAA Manual of Aerodrome Design and Safeguarding Chapter 6 Paragraph 11. (ii) **Monitor** (a) Monitor minor flaking loss.	2 4	
	D.	**RUBBER DEPOSITS** NOT APPLICABLE		
	E.	**DRAINAGE** (i) **Repairs** There are no repairs required. (ii) **Monitor** (a) Monitor cracking on gully surround	4	
	F.	**OTHER ITEMS** (i) **Repairs** There are no repairs required. (ii) **Monitor** (a) Monitor corrosion of tie down points	4	

Yearly Report Template

(Station name)

Pavement Classification Index (PCI) Survey Report for the period of (month/year to month/year)

Final Report No: (report reference no)

Prepared by:
(Company Name)
(Office Address)

On behalf of:
Defence Infrastructure Organisation
Ministry of Defence

This report is produced for the advice and guidance of the Airfield Operating Authority. It should not be circulated beyond the distribution list at the back of the report without the prior approval of the Airfield Operating Authority

Contents

1. Introduction

(Station name) is located (description of general location) at National Grid co-ordinates (grid ref). The station is administered by (administrating station name).

This Pavement Condition Index (PCI) survey report covers the period (dd/month/year) to (dd/month/year) and has been compiled by (Name) of (Company Name).

The most recent previous report is the MOD Airfield Maintenance Inspection for (station name), reference (insert reference) dated (insert month/year)

The airfield pavements covered by PCI survey during (year) are detailed in Table 1.1:

Table 1.1. Airfield pavements PCI surveyed during (year)

PAVEMENT DESCRIPTION	MICROPAVER ID	DATE OF INSPECTION	PAVEMENT CATEGORY
RUNWAY 08-26	R0826-01-02N	5TH MAY 2011	PRIMARY
	R0826-01-02C	5TH MAY 2011	PRIMARY
	R0826-01-02S	5TH MAY 2011	PRIMARY
	R0826-02-03N	5TH MAY 2011	PRIMARY
	R0826-02-03C	5TH MAY 2011	PRIMARY
	R0826-02-03S	5TH MAY 2011	PRIMARY
SOUTHERN TAXIWAY	TS-01-09	1ST MAR 2011	SECONDARY
	TS-02-10	10TH FEB 2011	SECONDARY
	TS-03-09	21ST JAN 2011	SECONDARY

Pavement history, construction details and construction locations are provided at Appendices A, B and C respectively.

Extracts from the Air Traffic Control logs showing usage of the airfield by aircraft type for the period of this report are reproduced at Appendix D.

2. Pavement Condition Index Base Values

The critical Pavement Condition Index (PCI) values specified by Defence Infrastructure Organisation (DIO) for all MOD Airfields are given in Table 2.1 below. These are based upon providing aircraft operating surfaces which provide an acceptable standard in terms of surface condition for the anticipated usage.

Table 2.1. Critical Pavement Condition Index Values

Pavement Category	Pavement Use	Critical PCI Level
P **(Primary)**	Runways, ORP's, VTOL Pads, STOL Strips, Dummy-Deck practice areas, Taxiways designated as emergency or auxiliary runways, Helipads.	70
S **(Secondary)**	Taxiways other than those designated as emergency or auxiliary runways, Aircraft parking and servicing platforms, Hangar Aprons, ERP's and other aircraft test areas, HAS Floors, Compass Swinging Platforms	55
T **(Tertiary)**	Aircraft wash platforms, Hangar Floors, Aircraft towing routes (not used by aircraft under self-power)	40

The tables in Section 3 list the airfield pavements that have current PCI values approaching or below the critical PCI level criteria. A PCI Value less than the critical level does not automatically mean that the area is unserviceable for all aircraft operations but that the potential for damage to aircraft is heightened. Any pavement with a PCI value of 35 or less is considered to be highly degraded with a considerable potential for damage to aircraft and its continued use for aircraft operations should be urgently reviewed.

Airfield pavements with PCI values above the boundary values in given in Section 3 for each category are not listed. These pavements are considered to be in an acceptable surface condition for their anticipated use but this does not mean that they may be assumed to be Foreign Object Damage (FOD) free surfaces or that maintenance works are not required. The critical PCI values should be considered to be minimum target values for each of the pavement areas considered.

3. PCI Survey Findings

All the airfield operational surfaces have been divided up into pavement sections for the purposes of the PCI survey. Unique reference identification is given to each pavement section. Full details of the referencing system and pavement sections are provided at Appendix E while Figure 3.1 identifies the primary, secondary and tertiary assets.

(GIS Shapefile of Airfield showing Primary, Secondary and Tertiary Assets)

Figure 3.1. (Station name) pavement categories – Primary/Secondary/Tertiary

A full listing of the calculated PCI Values for all the aircraft operating surfaces is included at Appendix E. Extracts highlighting the pavement areas with PCI values approaching or below the critical level are given in the relevant sections below.

A graphical representation showing the calculated PCI values for each pavement section is provided at Appendix F. The average condition for all Primary, Secondary and Tertiary assets is shown in Figure 3.2.

(Bar Chart compiled from PAVER with X Axis: Section Rank and Y Axis: Avg Condition

Figure 3.2. Average PCI value for each pavement category

Annotated photographs illustrating particular areas of concern are included at Appendix G.

Primary Pavements (P) with PCI equal to or less than 80 (Critical Level 70)

Primary pavements are considered to be operating surfaces where aircraft traverse the surface at speeds exceeding their normal taxiing velocity such as during take-off and landing. This includes areas used for practice landings, take-offs, roll-throughs and VTOL/STOL operations.

The Category P airfield pavements with a PCI value equal to or less than 80 are detailed in Table 3.1.

(Word or excel table compiled from PAVER with column headings: *Name/Branch ID/Section ID/From/To/Inspection Date/PCI* – Row selection of *Rank=Primary (P), PCI<=80* – Row order *PCI Descending)*

Table 3.1. Primary pavements with a PCI equal to or less than 80

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments

Secondary Pavements (S) with PCI equal to or less than 60 (Critical Level 55)

Secondary pavements are considered to be operating surfaces where aircraft traverse the surface at speeds not exceeding their normal taxiing velocity and/or areas where aircraft may manoeuvre under their own power. This includes aircraft performance test areas where the aircraft engines are operational although the aircraft may be stationary.

The Category S airfield pavements with a PCI value equal to or less than 60 are detailed in Table 3.2.

(Word or excel table compiled from PAVER with column headings: *Name/Branch ID/Section ID/From/To/Surface/PCI* – Row selection of *Rank=Secondary (S), PCI<=60* – Row order *PCI Descending)*

Table 3.2. Secondary pavements with a PCI equal to or less than 60

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments

Tertiary Pavements (T) with PCI equal to or less than 45 (Critical Level 40)

Tertiary pavements are considered to be operating surfaces where aircraft do not traverse the surface under their own power. This will generally include aircraft hangar floors (except for drive-thru type hangars) and other areas where aircraft are exclusively manoeuvred by towing equipment or other vehicular means.

The Category T airfield pavements with a PCI value equal to or less than 45 are detailed in Table 3.3.

(Word or excel table compiled from PAVER with column headings: *Name/Branch ID/Section ID/From/To/Surface/PCI* – Row selection of *Rank=Tertiary (T), PCI<=45* – Row order *PCI Descending)*

Table 3.3. Tertiary pavements with a PCI equal to or less than 45

Branch ID	Section ID	Date of last inspection	PCI	Recommended actions/Comments

4. Maintenance and Project Works Undertaken in the Previous Twelve Months

The following maintenance and project works have been undertaken in the previous twelve months:

Description	Priority	Date Completed	Approx Cost £k

(Add in additional descriptive text if required)

5. Maintenance and Project Works Recommended and/or Currently Planned for the Next Twelve Months

The following maintenance and project works are recommended and/or planned to be undertaken in the next twelve months:

Description	Priority	Date Identified	Approx Cost £k
Including any outstanding work from previous months			
Including any work identified in latest 'Airfield Maintenance Inspection Report'			

(Add in additional descriptive text if required)

Priority Matrix		Description
Obligatory Services	1	Works requiring immediate attention, considered to have a Health & Safety implication or to fulfil a Mandatory or Statutory Requirement.
Essential Services	2	Works recommended within 1 year
Important Services	3	Works necessary to maintain value and utility of estate.
Desirable Services	4	Desirable works e.g. would reduce maintenance/running costs or reduce future costs.

6. Exceptional Weather Conditions in the Previous Twelve Months

(Insert descriptive text highlighting any periods of particularly good or poor weather during the previous twelve months as this could be a factor to be considered when assessing pavement deterioration)

7. Snow and Ice Clearance

Snow and ice clearing equipment in use includes:

(Insert table or listing of any snow and ice clearing equipment)

(Insert details and volumes of any de-icing products used on the pavements)

The types of equipment used on the airfield were:

The types of de-icing/anti-icing chemical spread on the airfield was:

Quantities used during the previous winter was:

Appendix A – Pavement History

(Appendix to include descriptive history details from previous report / maintenance inspection plus any additions / changes in this period)

INITIALLY FROM LATEST INSPECTION REPORT

APPENDIX B TO ANNEX E: YEARLY REPORT

Appendix B – Construction Details

(Appendix to include tabular construction details from previous report / maintenance inspection plus any additions / changes in this period)

INITIALLY FROM LATEST INSPECTION REPORT

LOCATION	THICKNESS (mm)	CONSTRUCTION	YEAR	PCN
1		**NOT USED**		
2	20	Friction Course	1996	75
	40	Marshall Asphalt Wearing Course	1996	
	60	Marshall Asphalt Base Course	1996	
	40	Marshall Asphalt Wearing Course	1986	
	60	Marshall Asphalt Regulating Course	1986	
	250	Pavement Quality Concrete	1959	
	25	Asphalt Wearing Course	1949	
	65	Tarmacadam Base Course	1949	
	150	Concrete	1942	
3	20	Friction Course	1996	
	40	Marshall Asphalt Wearing Course	1996	
	60	Marshall Asphalt Base Course	1996	
	40	Marshall Asphalt Wearing Course	1976	
	80	Marshall Asphalt Regulating and Base Course	1976	
	-	Slurry Seal	1970	
	-	Slurry Seal	1966	
	25	Asphalt Wearing Course	1959	
	Max. 225	Asphalt Ramp	1959	
	25	Asphalt Wearing Course	1949	
	50	Tarmacadam Base Course	1949	
	25	Asphalt Wearing Course	?	
	50	Tarmacadam Base Course	?	
	150	Concrete	1942	
4	20	Friction Course	1996	
	40	Marshall Asphalt Wearing Course	1996	
	60	Marshall Asphalt Base Course	1996	
	40	Marshall Asphalt Wearing Course	1976	
	80	Marshall Asphalt Regulating and Base Course	1976	
	-	Slurry Seal	1970	
	-	Slurry Seal	1966	
	25	Asphalt Wearing Course	1959	
	25	Asphalt Wearing Course	1953	
	50	Tarmacadam Base Course	1953	
	25	Asphalt Wearing Course	?	
	50	Tarmacadam Base Course	?	
	150	Concrete	1941	
5	20	Friction Course	1996	
	40	Marshall Asphalt Wearing Course	1996	
	60	Marshall Asphalt Base Course	1996	
	40	Marshall Asphalt Wearing Course	1976	
	80	Marshall Asphalt Regulating & Base Course	1976	
	-	Slurry Seal	1970	
	-	Slurry Seal	1966	
	25	Asphalt Wearing Course	1959	
	Max. 175	Asphalt Ramp	1959	
	25	Asphalt Wearing Course	1953	
	50	Tarmacadam Base Course	1953	
	25	Asphalt Wearing Course	?	
	50	Tarmacadam Base Course	?	
	150	Concrete	1941	

APPENDIX C TO ANNEX E: YEARLY REPORT

Appendix C – Construction Location Plan

(Appendix to include construction location plan from previous report
/ maintenance inspection updated for any additions / changes in this period)

INITIALLY FROM LATEST INSPECTION REPORT

Appendix D – Pavement Usage Details

(Appendix to include details obtained from Air Traffic Control showing airfield aircraft usage statistics for the previous twelve months – may be descriptive or tabular format. This Appendix should include any known future changes to the airfield / aircraft operations and any current dispensations from regulations)

APPENDIX E TO ANNEX E: YEARLY REPORT

Appendix E – PCI Survey Data: Calculated PCI Values

(Word or excel table compiled from PAVER with column headings: *Name/Branch ID/Rank/Section ID/From/To/Surface/Last Inspection Date/PCI* – Row selection (not used) – Row order *Rank Ascending*)

APPENDIX F TO ANNEX E: YEARLY REPORT

Appendix F – PCI Survey Data: Graphical Representation

(A3 size coloured graphical representation of PCI Values and PAVER bar chart showing PCI condition at last inspection (and previous inspection?))

APPENDIX G TO ANNEX E: YEARLY REPORT

Appendix G – Photographs

(Appendix to include A3 size plan showing photography positions and relevant photographs with suitable descriptive comment)

APPENDIX H TO ANNEX E: YEARLY REPORT

Appendix H – Distribution List