

UK Pavement Management System



Advice Note 8

Use of UKPMS Condition Ranking

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Document Information

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Document History

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1.02	Final	RAC	3/1/05	Finalised following consultation with UKPMS Developers and USG.

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Introduction

This Advice Note explains how UKPMS condition rankings are calculated and used. It points out some of the issues to be aware of when ranking, and offers suggestions for additional ways to rank the results from an Automatic Pass.

Each UKPMS System provides a different interface for UKPMS processes. Developers are therefore encouraged to use this Advice Note as the basis for extended advice, tailored for their own UKPMS system.

The ranking and prioritisation of Automatic Pass results may well be developed further in due course. Feedback on this topic is particularly welcomed.

Background

From November 2002 to May 2003, the Ranking Subgroup (a subgroup of the UKPMS Steering Group) met to consider the use of Condition Ranking in UKPMS. The subgroup produced a report *Progress Report May 2003 v2* which identified a number of problems with condition ranking and provided a strategy for introducing improvements.

The first stage of these improvements, known as ‘Condition Ranking – Immediate Improvements’¹ was approved by the USG for inclusion in the 2004/05 development tasks. Part of the task is to provide this Advice Note.

What is Condition Ranking?

Ranking is the process used by UKPMS to determine the relative importance of parts of the network requiring treatment. Condition Ranking is the method used to provide an objective ‘worst first’ list; the other method of ranking offered by UKPMS, Economic Ranking, evaluates the importance taking account of other factors including the cost of the treatment and the expected implications of delaying the work for one year.

How are Rankings Calculated?

The UKPMS Automatic Pass produces defect lengths, and each of these have an Overall Condition Index and possibly a suggested treatment.

If there is no suggested treatment (because the defect length is considered to be at an acceptable standard) then the ranking is zero. The Condition Ranking for each Defect Length with a suggested treatment is determined from the Treatment, the Overall Condition Index and the Feature Hierarchy.

For example, the Condition Ranking Curve shown in Figure 1 is for the surface improvement treatment for road hierarchy 4a. If the defect length has an Overall Condition Index of 70, the ranking will be 50. (Note that this illustration is based on RP5.01).

¹ As defined on pp3-4 of *Progress Report May 2003 v2*

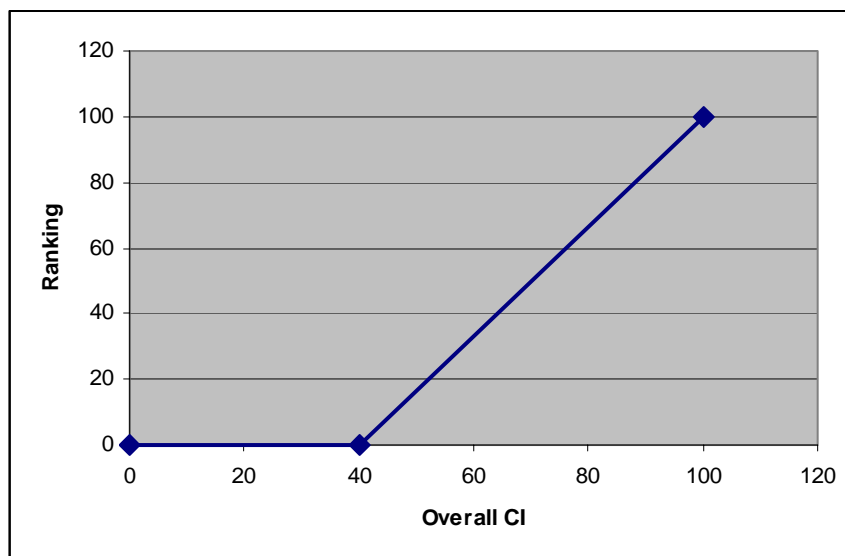


Figure 1 – Condition Ranking Curve for Surface Improvement Treatment, Road Hierarchy 4a

Note that condition rankings lie within the range 0 to 100, and the higher the ranking the worse the condition of the defect length.

If a defect length requires multiple treatments then the ranking is taken to be the highest obtained from any of the treatments.

How are Rankings Used?

Rankings are used within UKPMS during the Budgeting process. Each UKPMS Budget is made up of a number of Budget Headings, and each of these Budget Headings has a definition and a monetary limit. So for example, the UKPMS system might contain a Budget called '2004 Budget' which has three Budget Headings; 'Edge works', 'Surface improvements' and 'Resurfacing'. The definitions for each of these Budget Headings would be set up to assign defect lengths according to treatment. During the Budgeting process the defect lengths are assigned to one of these Budget Headings, or to the 'Unassigned' heading. They are sorted into descending ranking order within each Budget Heading, and then designated as 'funded' or 'not funded' depending on whether the cumulative treatment costs exceed the limit for that Budget Heading.

Limitations

In addition to increasing awareness of Condition Ranking, one of the aims of this Advice Note is to list the limitations identified by the Ranking subgroup, so that Condition Rankings may be interpreted appropriately. The Toolbox approach outlined below will address these limitations.

1. Minor treatments ranked more highly than major

In the current Rules & Parameters (RP5.01) each Condition Ranking Curve consists of a straight line from a 'trigger' Overall Condition Index which has a ranking of zero, up to a maximum ranking of 100 for an Overall CI of 100. (See Figure 1 above which has a trigger Overall CI of 40).



Generally the trigger CI is lower for more minor treatments, and so these have a higher ranking for any given Overall CI than a more major treatment.

Figure 2 illustrates this point.

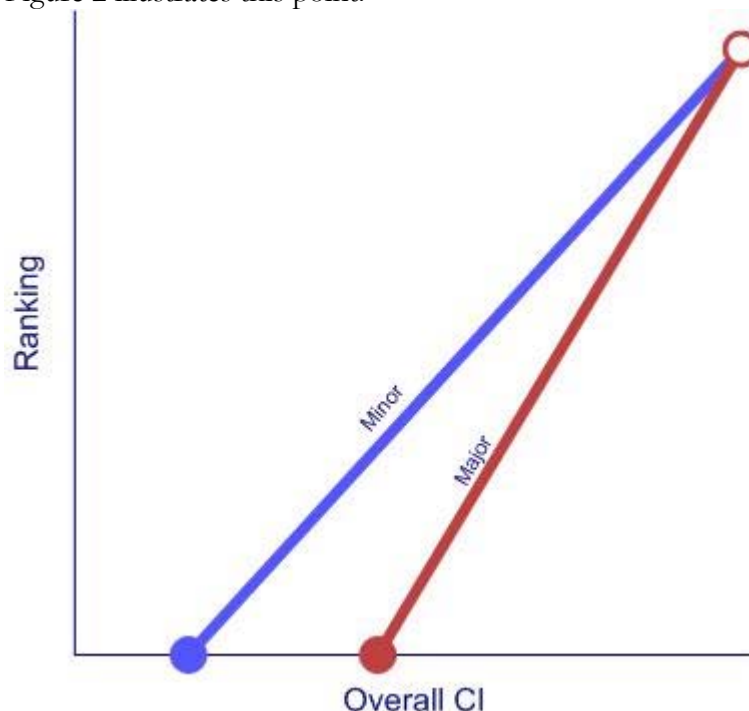


Figure 2 – Typical Condition Ranking Curves

2. Multiple treatments ranked inappropriately

When multiple treatments are required then the ranking may be higher than expected. This is because the Overall CI is set to the highest of the constituent CIs, which is often the CI driving the more major treatment, yet the ranking curve used is normally that for the more minor treatment.

3. Treatments can have a zero ranking

There are some treatment and hierarchy combinations which result in a zero ranking.

4. Treatments can start with a ranking greater than zero

In some circumstances the condition indices are at a level to just trigger a treatment, yet the ranking for that treatment starts at a level greater than zero.

5. Overall Condition Index calculation

The Overall Condition Index is based on the highest of any of the individual condition indices or of certain combinations of them. This means that a defect length with a high surface properties condition index would have the same Overall Condition Index as one with a high structural condition index. The calculation assigns equal importance to each condition index.

6. BVPI defect lengths can have a zero ranking

A defect length can contribute to BVPI 97 or BVPI 187, yet have a zero ranking.



7. Clustering of defect lengths

The condition ranking process does not always discriminate between defect lengths, and so many defect lengths can have the same ranking (often 100).

Due in part to the above limitations care must be taken when comparing rankings across different treatments, and hence when using Budget Headings which group together defects lengths with different treatments.

The Toolbox Approach

The Ranking subgroup suggested that it could be beneficial to consider a 'toolbox' for condition ranking. The fundamental aim of condition ranking is to provide an objective 'worst first' list, and this has led the development of the following elements of the toolbox:

1. Overall Condition Index:

A ranking list in descending order based on Overall Condition Index.

2. Active Condition Index:

A ranking list split by treatment, based on the 'active' condition index for that treatment. So the rankings for the Edge treatments would be the edge condition index (in descending order).

3. Condition Ranking Curves:

A more sophisticated condition ranking approach similar to the existing condition ranking but overcoming any shortcomings including the limitations listed above. If possible this should be achieved by changes to the Rules & Parameters, and any changes to the UKPMS processing logic should be kept to a minimum.

The first stage in working towards this 'toolbox' is a new report called the *Defect Length Sorted by Condition Index* report. This report would allow us to assess how useful elements 1 and 2 of the toolbox are. This report will be introduced by UKPMS Developers and will be included in the UKPMS Health Check.

Defect Length Sorted by Condition Index report

This report lists defect lengths in descending condition index order, for any specified condition index. It can be filtered to give just a single specified treatment if required.

When the Overall Condition Index is used for this report it provides a proxy for element 1 of the toolbox, and when used for a single treatment with its active condition index it provides a proxy for element 2 of the toolbox.

Note that the report does have limitations:

- It does not provide a fully fledged alternative ranking as it is not used as a basis for Budgeting
- The links between treatment and condition index given below are simplified.



The aim of the report, in addition to any immediate usefulness, is to establish if these suggestions to improve ranking warrant a more sophisticated and costly development in due course.

Treatment / Condition Index Mapping

Treatments are determined by the levels of one or more of the condition indices, but with regard to Step Level, Off-carriageway Tied to Carriageway, Functional Defect and Feature Hierarchy. For example Edge treatments are suggested if the Edge Condition Index is at or above a specified intervention level.

The condition index which drives the treatment is termed the 'active' condition index. It is possible to obtain an indication of the relative importance of two defect lengths which each require the same treatment by comparing the values of the appropriate active condition index. For example, defect lengths which all require Edge works can be sorted by using the EDGE CI, to give a list which is roughly in order of importance.

The tables below give the active condition index for each treatment (based on RP5.01). These are applicable where a treatment is driven by a single condition index. Some of the treatment rules are based on more than one condition index, and some lead to multiple treatments. However, despite this, in many cases there is still a link between a treatment and an active condition index. For example for bituminous carriageways a multiple treatment Edge/Parcon plus Stren/Overlay is suggested if both the EDGE CI and the STRUC CI exceed certain levels. The assumption using the mapping relationships below is that the Edge works are driven by the EDGE CI and the Strengthen works are driven by the STRUC CI.

Some particular cases where the relationship is not appropriate are also identified.

Off-CW features

The off-carriageway features are Cycletrack, Footway, Kerb and Verge. The active condition index for all pavements and all treatments is the Overall CI.

Generic Treatment	Active Condition Index
All treatments	OVRL

CW block paved

Generic Treatment	Active Condition Index
LOCAL	BPALL
RELAY	BPALL
STREN	BPALL
TTSSTREN	TTSST
TSSURIM	TSSU



CW bituminous

Pavements types BSLM, BT, BTCC, COCO and UK

Generic Treatment	Active Condition Index
EDGE	EDGE
JOINTCRK	JTCRK
RESUR	WCRSE
STREN	STRUC
SURIMP	SRPRP
TTSRESUR	TTSWC
TTSSTREN	TTSST
TTSURIM	TTSSU

CW concrete

Pavement types CCR, CU, RCR and UCR

Generic Treatment	Active Condition Index
LONGJT	LJNT
STREN	STRUC
SURIMP	SURF
TRANSJT	TJNT
TTSURIM	TTSSU

Exceptions

There are three main exceptions to the above relationships.

1. The covered concrete (COCO) resurface treatment is triggered by the EDGE and SRPRP condition indices in some circumstances.
2. The concrete (CCR, CU, RCR and UCR) strengthen treatment is triggered by the LJNT and TJNT condition indices in some circumstances.
3. Functional defects (from SCRIM) have an impact on suggested treatments. In this case the relationship between treatment and active CI is no longer valid.