Technical Note 12 - Whole Carriageway and Edge Defects

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Introduction

Section 13.2 of Version 1.2 the *Tranche 2 Implementation Guidelines,* 'Calculation of Rating Values', which addresses the calculation of defectiveness, states that:

"'Whole Carriageway' Defects will not now be addressed separately…from a computing perspective, (they) need be of no further concern to Developers. An engineering description of how they are dealt with will be the subject of a future Technical Note."

This note addresses that requirement, and describes the revised approach to Whole Carriageway Defects, in particular how it impacts upon the visual inspection defects and procedures.

Background

The UKPMS Visual Inspection Guide, which details defects and give guidance for inspectors on the recording of those defects, embodies the concept of "whole carriageway" defects. In essence, this provides for a notional area which comprises the "whole carriageway", which excludes an area defined as the "edge". Defects affecting the carriageway surface such as cracking and fretting are termed whole carriageway defects. The guidance aims to eliminate double counting of defectiveness within a 1/2 metre strip of the edge (or of a strip between the edge and the nearside wheel track, if this is less than 1/2 metre), as both edge deterioration, and as some mode of carriageway deterioration. It is believed that the original intention in taking this approach is to eliminate biased assessments of network conditions, which are based upon single physical defects that have been recorded as multiple defect observations. It has also been argued that the prohibition of "double counting" simplifies defect identification and measurement.

In specifying the processing logic for the automatic pass, however, and the approach and associated data for tranche 2, a number of problems with this approach have become evident:

1. It considerably complicates the calculation of defectiveness for whole carriageway defects, where the "full" method of cross section position referencing is being applied. Consider the following example, for a 10m wide 20m DVI sub-section, in cross section position CL1, with a defect of BCRJ, measured at 20m². In order to calculate the "defectiveness" of the defect, as a percentage of the whole carriageway area, it is first necessary to determine the whole carriageway area; this would be determined by subtracting the area of the edge from the area of the lane. However, it is possible that there

could be one "edge" to be accounted for, where CL1 is adjacent to the nearside kerb, two "edges", for example, where CL1 is the single lane of a one-way street, or no "edge", where there is a turning lane between the CL1 and the nearside kerb. Thus the area of the edge to be subtracted to derive the whole carriageway area could be 0, 10 to 20 square metres. Moreover, depending on the position of the wheel tracks, it may not be possible to assume a 0.5m edge width, in determining edge areas. Given that there is no requirement for an inventory, that that inventory may well not have details of individual lanes and that the rules for determining adjacency of the edge to a particular lane would need to be dependent upon the relationship with other lanes, definition of logic for the derivation of whole carriageway defectiveness becomes difficult, if not impossible.

2. In practice, treatments that address "whole carriageway" defectiveness, such as reconstruction or resurfacing include the edge of the carriageway.
3. Evaluation of condition indices to select treatments takes place for an individual cross section position. Since the edge condition index will always occupy a different XSP to the surface and structural indices for the carriageway - edge defects being allocated to the left or right edge of carriageway - there is no mechanism for the consideration of edge and carriageway treatments together. This would prevent, for example, the selection of a treatment that would rectify both edge and structural carriageway defects in instances where both condition indices indicate a possible need for remedial works.
4. It arguably complicates site data collection (witness the 8 pages of examples given in Volume 1 of the UKPMS Visual Inspection Guide given to explain location of defects within the Whole Carriageway), and could therefore lead to inaccuracies and inconsistencies within the data.

Revised Approach

The revised approach to be adopted for comparability testing, designed to avoid the above problems, is as follows:

1. Edge Defects are now recorded against the relevant lane XSP(C, CL1 etc.) rather than the left or right edge XSP, and can therefore be considered in conjunction with other defects affecting the same lane during automatic pass processing.

2. There will now be two Edge Defects - "Left Recorded Edge" and "Right Recorded Edge". This copes with both left and right edge defects that occur in the same cross section position. Typically, this may happen when using "simple" XSP's.

3. These two defects will not be 'reversed'.[1]

4. The condition index calculation rules will reflect this approach and will allow for the accounting of both left and right rated edge defects in the calculation of the condition index. It is suggested that the calculation takes the highest of each and, say, 0.7*(Left

1. [1] This is because the current UKPMS data model does not support the reversal of defects (as opposed to XSP's). Developers may wish to extend their models to support the reversal. This would be acceptable for comparability since both defects are rated identically and the 'edgeness' of a defect is lost in subsequent computations. Of course, If a user is aware that reversal has taken place, then they can determine the side of the deterioration.

Edge + Right Edge Deterioration). The advantage of this approach is that the edge condition index will appear on the XSP that is physically affected, and will be considered in conjunction with the other condition indices in the selection of treatments. (Under the original approach, the edge condition index is associated with edge specific XSP and therefore could not be considered in the generation of, say, strengthening).

Implications for on-site data collection

1. In recording Edge and Whole Carriageway Defects in same location, the area of the Whole Carriageway defect will be recorded to the physical carriageway edge. Where Edge Deterioration exists on its own (i.e. not significantly beyond the 0.5m) edge strip, ONLY record as Edge deterioration.
2. Where Edge defects are recorded using the simple cross section position method, no side parameter will be recorded.
3. Only one severity edge defect can be recorded at the same physical location. The combined length of severity 1 and severity 2 deterioration for a particular side cannot exceed the length of a sub-section.
4. The term "whole carriageway" will be retained for descriptive purposes, since it is well used and understood.
5. Consistent with the simplified approach to coarse visual inspection defects for bituminous surfaced carriageways, there is not distinction of "severity" for block paved carriageways.
6. All carriageway cross section positions will be valid for the recording of edge defects.

*Table 1. New Edge Deterioration Defects**

a. Coarse Visual Inspection

Defect	Construction Type	Defect Code	Parameter
Left Recorded Edge Deterioration	Bituminous Surface, Unknown Construction	BEDL	Extent
Right Recorded Edge Deterioration	Bituminous Surface, Unknown Construction	BEDR	Extent
Left Recorded Edge Deterioration	Block Paved	KEDL	Extent
Right Recorded Edge Deterioration	Block Paved	KEDR	Extent

b. Detailed Visual Inspection

Defect	Construction Type	Defect Code	Parameter
Left Recorded Edge Deterioration - Severity 1	Bituminous Surface, Unknown Construction	BEL1	Length
Right Recorded Edge Deterioration - Severity 1	Bituminous Surface, Unknown Construction	BER1	Length
Left Recorded Edge Deterioration - Severity 2	Bituminous Surface, Unknown Construction	BEL2	Length
Right Recorded Edge Deterioration - Severity 2	Bituminous Surface, Unknown Construction	BER2	Length
Left Recorded Edge Deterioration - Severity 1	Block Paved	KEL1	Length
Right Recorded Edge Deterioration - Severity 1	Block Paved	KER1	Length
Left Recorded Edge Deterioration - Severity 2	Block Paved	KEL2	Length
Right Recorded Edge Deterioration - Severity 2	Block Paved	KER2	Length

**Note: Only defects collected during visual inspections are given. "Transformed Defects", created during processing are not detailed, but are included in the data files supplied to developers.*