

1.1 SCANNER Road Condition Indicator

- 1.1.1 The SCANNER Road Condition Indicator (RCI), which will replace the Scottish SPI from 2007/2008, has been developed to characterise the overall condition of the road carriageway.
- 1.1.2 The RCI is calculated from some of the parameters measured by SCANNER including:
- (a) Ride quality, measured by 3m and 10m longitudinal profile variance, in the nearside wheel path.
 - (b) Average rut depth in the nearside and offside wheel paths.
 - (c) Average texture depth in the nearside wheel path.
 - (d) Whole carriageway cracking intensity.
- 1.1.3 The RCI is calculated in three steps
- (a) Score each 'measured parameter average value' over a 10 metre subsection length on a scale of 0 to 100.
 - (b) Combine the scores to obtain a value for each 10 metre subsection length of the road.
 - (c) Combine the value for each subsection to give an overall figure for the section, the route or the network.
- 1.1.4 In the first stage, each parameter is scored between a lower threshold value (below which it is not counted) and an upper threshold value (above which further increase in the parameter does not increase the score. The basic pattern of thresholds and weightings is the same for each parameter, as illustrated for rut depth in figure 1.
- 1.1.5 Below the lower threshold, the parameter scores zero. Above the upper threshold the parameter scores a maximum value of 100. Between the two thresholds the parameter scores an increasing value. In principle, this could be with proportionally more points allocated the nearer the parameter is to the upper threshold, although in practice only a linear relationship has been used so far.
- 1.1.6 The parameters to be used, and the thresholds and weightings for the SCANNER RCI are detailed in the appendix.
- 1.1.7 In Scotland, the survey results from 2004/2005 will be re-processed using the revised RCI parameters to provide an overlap between the former SPI and the new RCI data.

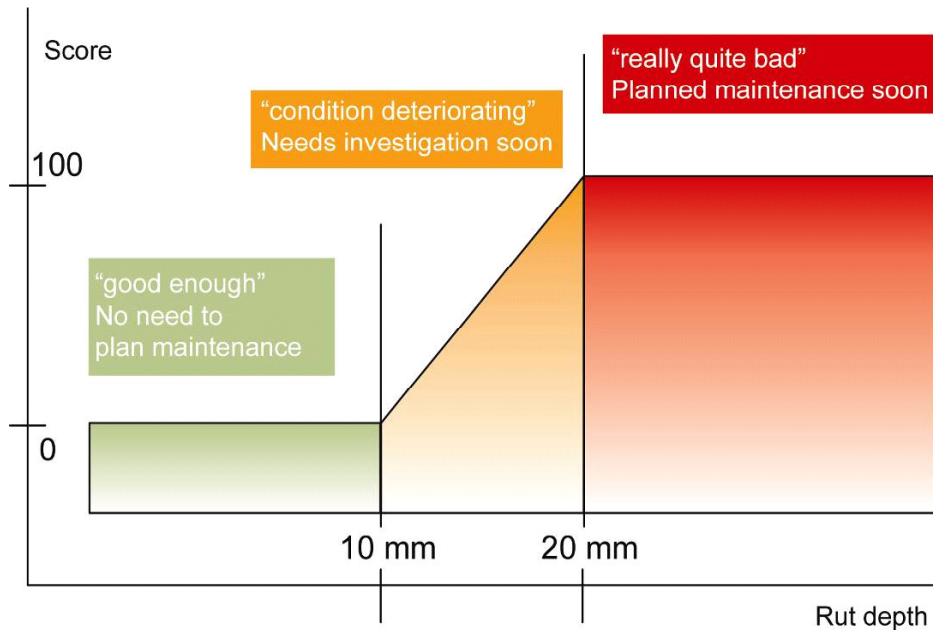


Figure 1 – Stage 1: Scoring SCANNER parameters

- 1.1.8 In the second stage the scores for each parameter are multiplied by two factors to allow for the importance of the factor in assessing road condition and the reliability of the measurement. The individual scores are then added to give an overall score for the subsection.
- 1.1.9 In the third stage the results are combined to give overall percentage lengths in three categories for the road network. Depending on the total points scored each 10m sub section is allocated to one of the categories, with the following definitions:
- Total score less than 40 points designated as "GREEN" = lengths where the carriageway is generally in a good state of repair.
 - Where the total score is greater than 40 but less than 100 designated as "AMBER" = lengths where some deterioration is apparent which should be investigated to determine the optimum time for planned maintenance treatment. (Where there may be justification for carrying out a lesser maintenance treatment sooner, rather than more extensive treatment later, in order to minimise whole life costs. i.e. "economic prioritisation").
 - Sections where the total score is greater than 100 are designated as "RED" = lengths in poor overall condition which are likely to require planned maintenance soon (i.e. within a year or so) on a "worst first" basis (Although there may be justification for postponing major repairs, and only carrying out minor repairs to keep the road safe and serviceable, in order to minimise whole life costs. i.e. "economic prioritisation").

It is the intention that in the future the SCANNER Specification and RCI will become the standard methodology of assessing road condition throughout the UK.

Appendix Recommended parameters, thresholds and weightings

Values (* = family group)								
Defect	Road Class	Units	Defect Value T _L	Defect Value T _U	Importance	Reliability	Weighting	Maximum score
Rut depth (maximum)	A	mm	10	20	1	1	1	100
Rut depth (maximum)	B	mm	10	20	1	1	1	100
Rut depth (maximum)	C	mm	10	20	1	1	1	100
Rut depth (maximum)	U	mm	10	20	1	1	1	100
*LPV 3m	A	mm ²	4	10	0.8	1	0.8	80
*LPV 3m	B	mm ²	5	13	0.8	1	0.8	80
*LPV 3m	C	mm ²	7	17	0.8	1	0.8	80
*LPV 3m	U	mm ²	8	20	0.8	1	0.8	80
*LPV 10m	A	mm ²	21	56	0.6	1	0.6	60
*LPV 10m	B	mm ²	27	71	0.6	1	0.6	60
*LPV 10m	C	mm ²	35	93	0.6	1	0.6	60
*LPV 10m	U	mm ²	41	110	0.6	1	0.6	60
Whole carriageway cracking	A	%	0.15	2	1	0.6	0.6	60
Whole carriageway cracking	B	%	0.15	2	1	0.6	0.6	60
Whole carriageway cracking	C	%	0.15	2	1	0.6	0.6	60
Whole carriageway cracking	U	%	0.15	2	1	0.6	0.6	60
Texture	A (non built-up)	mm	0.7	0.4	0.75	1	0.75	75
Texture	A (built-up)	mm	0.6	0.3	0.5	1	0.5	50

Values (* = family group)								
Defect	Road Class	Units	Defect Value T _L	Defect Value T _U	Importance	Reliability	Weighting	Maximum score
Texture	B (non built-up)	mm	0.6	0.3	0.75	1	0.75	75
Texture	B (built-up)	mm	0.6	0.3	0.5	1	0.5	50
Texture	C, U (non built-up)	mm	0.6	0.3	0.5	1	0.5	50
Texture	C, U (built-up)	mm	0.6	0.3	0.3	1	0.3	30
Totals	A (non built-up)							315
Totals	A (built-up)							290
Totals	B (non built-up)							315
Totals	B (built-up)							290
Totals	C, U (non built-up)							290
Totals	C, U (built-up)							270

Built-up implies local speed limit of 40mph or less.
Non built-up implies local speed limit above 40mph.

Summary of reasons for changes from ORIGINAL, as adopted in England in 2005/2006, to REVISED values to be implemented across the UK in 2006/2007

Rut Depth

1. The same upper and lower thresholds for all road classes:
 - 1.1. A rut has the same significance for safety and maintenance on any carriageway.
 - 1.2. There are relatively few lengths with measured rut depths greater than 10mm on any carriageway, so there will be relatively little impact on the overall SCANNER RCI.
2. Importance of rut depth increased from 90 to 100 points:
 - 2.1. Ruts are a very clear and obvious sign of road deterioration.
 - 2.2. There are relatively few lengths with measured rut depths greater than 20mm on any carriageway, so there will be relatively little impact on the overall SCANNER RCI.

Transverse profile

3. Combine 3m and 10m variance as a “family group” and take only the higher scoring one.
 - 3.1. Ride quality is important, but 3m and 10m variance are not independent variables. Adding 3m and 10m variance scores over-emphasises the importance of ride quality in relation to other parameters.
 - 3.2. There are places where one is high and the other low. Therefore either should be able to contribute independently, depending which is the more important.
4. Retain current weightings for 3m and 10m variance. (80 points and 60 points).
 - 4.1. Retains continuity with existing measurements.
 - 4.2. Acknowledges that 3m variance is relatively more important on local roads than 10m variance, for meeting road user requirements, and that engineers are more likely to repair local roads where 3m profile is bad than where 10m profile is bad.
5. Increase threshold values on B roads closer to thresholds on C roads.
 - 5.1. The distribution of profile values on B roads is more like the distribution on C and U roads than on A roads. Local authorities are unlikely to reconstruct and re-profile B roads to match current A road standards. Therefore use the current B road condition as a guide to what is generally acceptable current practice.
6. Eliminate difference in thresholds between urban and rural thresholds for C and U roads.
 - 6.1. The distributions of values on urban and rural minor roads are generally similar. No evidence that one is more or less acceptable than the other, so treat both the same.
7. Differentiate thresholds between C and U roads.
 - 7.1. Results of research by TRL on “user perception” of profile suggest that C roads are constructed and maintained to a slightly higher standard of profile than unclassified roads. Therefore require a slightly higher standard for C roads than for U roads.

Wheel track cracking

8. Exclude wheel track cracking from the revised SCANNER RCI.
 - 8.1. Because of the way it is measured, wheel track cracking is essentially a sub-set of whole carriageway cracking. Adding the scores for both tends to double count cracking intensity.
 - 8.2. Wheel track cracking tends to suffer from more false positives than whole carriageway cracking.
 - 8.3. Wheel track cracking measured by SCANNER is not a good representation of wheel track cracking reported from CHART or DVI surveys.
9. Investigate wheel track cracking further, as part of the development of the extended SCANNER RCI, with a view to including it with whole carriageway cracking as a family group.

Whole carriageway cracking

10. Increase weighting from 0.5 to 0.6.
 - 10.1. Gives slightly more weighting to cracking, to offset some of the reduction from excluding wheel track cracking.

Texture

11. Differentiate thresholds between non built-up A and all other roads.
 - 11.1. Good texture is important for high speed skidding resistance and reduction in texture depth is more important on national speed limit (non built-up) A roads than other roads.
12. Differentiate weightings between A and B non built-up; A and B built-up with C and U non built-up; and C and U built-up roads.
 - 12.1. Good texture depth is important for high speed skidding resistance and reduction in texture depth is more important on national speed limit (non built-up) A and B roads than other roads. Increased weighting to 0.75 (75 points) reflects importance of texture depth on these roads where average speeds are likely to be higher and there is a greater risk of high speed skidding accidents.
 - 12.2. Good texture depth is also important on A and B built-up roads and higher speed (non built-up) C and U roads. Maintaining weighting at 0.5 (50 points) reflects this.
 - 12.3. Texture depth is least important on lower speed minor urban roads. Reducing weighting to 0.3 (30 points) reflects this.

Total scores

13. Overall the maximum total was 370 points on all road classes. The new totals vary by road class, depending on texture depth.
 - 13.1. On A and B non built-up roads the maximum becomes 315 points.
 - 13.2. On A and B built-up roads and C and U non built-up roads the maximum becomes 290 points.
 - 13.3. On C and U built-up roads the maximum becomes 270 points.
14. There are relatively few lengths are above 100 points, less above 200, even less above 300 points. Compressing the scale from 370 to about 290 points has relatively little effect on the priority ranking above 100 points.

Changes

15. Combining 3m LPV and 10m LPV has subtracted 60 points from the total.
16. Removing wheel track cracking has subtracted 40 points from the total.
17. Increasing rut depth weighting has added 10 points to the total.
18. Increasing whole carriageway cracking weighting has added 10 points to the total.
19. Changing texture depth weighting has either added 25 points, left the score unchanged or taken away 20 points.

Overall thresholds

20. Thresholds for **green / amber** to **become 40 points** and for and **amber / red** to remain at 100 points respectively.
 - 20.1. increasing the amber threshold for ALL roads classes will focus attention on the worse amber sections, where further investigation is more likely to reveal a need for planned maintenance.
21. The revised parameters, thresholds and weightings will tend to identify more accurately those lengths where maintenance or further investigation is necessary or appropriate.