Transport Scotland

THE PERFORMANCE OF ROAD SURFACING IN SCOTLAND

Scottish Inspection Panel Report 2023

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EXECUTIVE SUMMARY

This report describes the results of the 2023 Scottish Inspection Panel (SIP) survey. The year-on-year SIP surveys provide an assessment of new materials and maintenance techniques used on the trunk road network. The visual assessment survey considers the quality of materials and their installation, and the collection of data permits the benchmarking of newly introduced materials against previously used surface courses. The SIP also supports the development of corrective action plans through the identification of recurring issues.

The 2023 SIP survey was carried out in the week commencing 4 September 2023. The report provides information on the 49 sites visited and presents results on the condition of the materials assessed and any observations made. The main findings are summarised as follows:

- The panel assessed 87% of the five-year-old surfacing sites to be defect free and performing well. The results are seen to corroborate previous SIP findings that TS2010 will provide enhanced durability compared to previously used Clause 942 materials.
- A trend line based on historical SIP data estimates the average service life of TS2010 to be around 20 years.
- Five of the sites performed less well (Good/Moderate) although mitigating circumstances included the presence of cold load ends and an urban area containing a high density of street furniture.
- Two sites marked below Acceptable related to a failure of material on a roundabout, and inadequate foundation support.
- Issues with carriageway markings were noted including debonding and damage associated with marking removal.

The report makes several recommendations including promoting the need to eradicate cold spots; reviewing the performance of surfacing on roundabouts; ensuring adequate support is provided at the design and maintenance stage; and appraising the performance of carriageway markings.

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Introduction

1 Introduction

The Transport Scotland Pavement Forum (TSPF) was set up in 2007 to improve communication and share best practice across the road industry. As part of this remit, the TSPF introduced an annual monitoring procedure known as the Scottish Inspection Panel (SIP) in 2008. The year-on-year SIP survey provides an assessment of new materials and maintenance techniques used on the trunk road network. The visual assessment survey considers the quality of materials and their installation, and the collection of data permits the benchmarking of newly introduced materials against previously used surface courses. The SIP also supports the development of corrective action plans through the identification of recurring issues. The survey team consists of experienced road engineers who represent Transport Scotland, the Mineral Products Association (MPA) Scotland and engineering consultants.

The 2023 SIP survey (Figure 1-1) was carried out over the week commencing 4 September 2023. The survey was primarily focused on five-year-old materials that had been installed as part of previous road maintenance schemes. This report provides information on the sites visited and presents results on the condition of the materials assessed. The collected data is discussed and compared to other historical information and a summary of the main findings is provided, including recommendations to improve the performance of future road surfacing.

Figure 1-1 – 2023 visual assessment

2

Site Inspections

2 Site Inspections

2.1 Site selection

Transport Scotland's pavement management system, AMPS, was used to provide information on materials selected for the 2023 survey. The approximate site locations are shown in Figure 2-1.

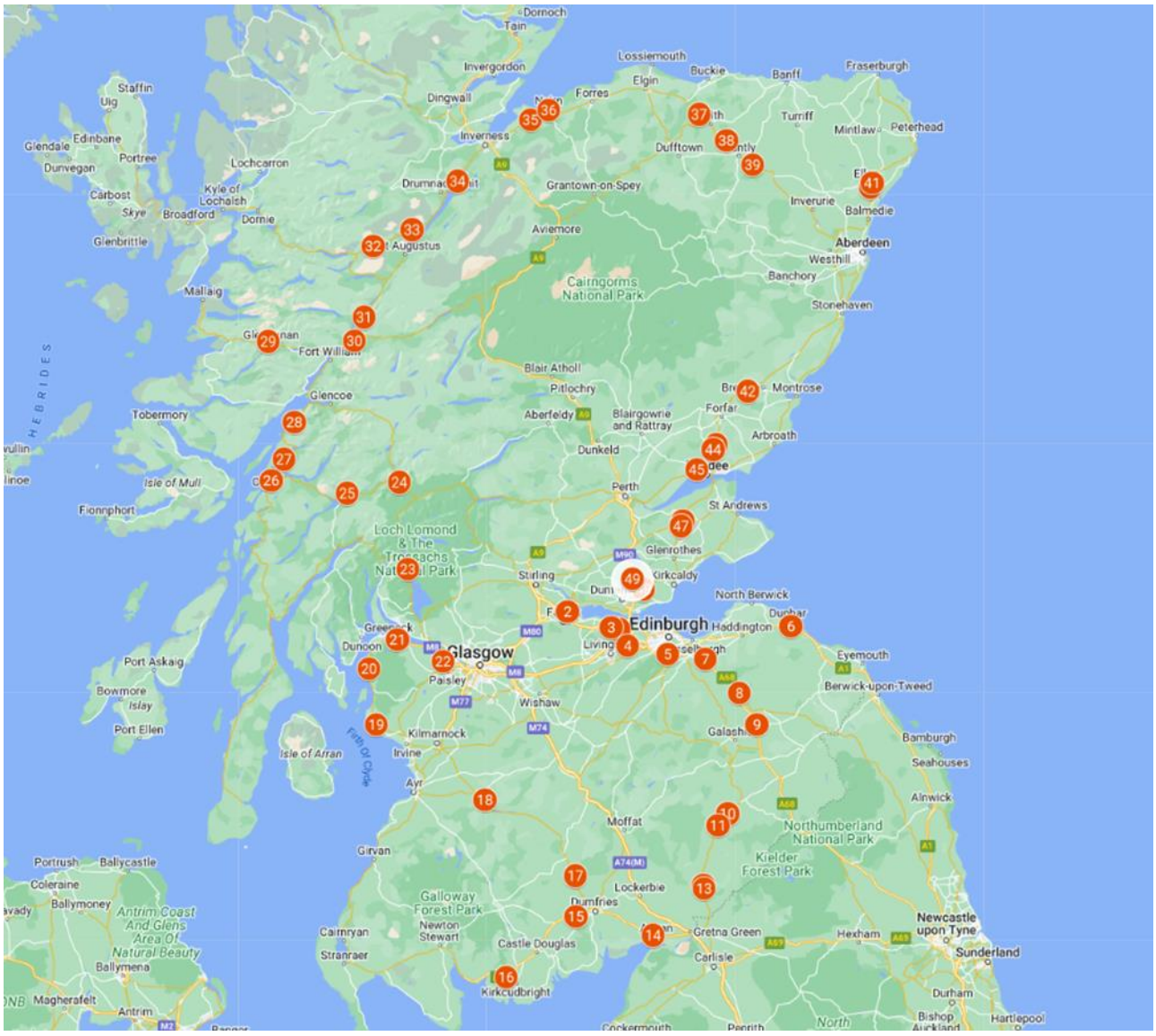


Figure 2-1 : SIP 2023 site locations

A total of 49 sites were visited, which were nominally five years old, i.e. the actual age of the surface course ranged between 4.5 and 5.5 years. The age and material type for all the sites inspected is shown in Table 2-1. The table also includes an estimation of traffic stress based on road layout and type of traffic at the locus of the inspection. All sites inspected were allocated specific acronyms, e.g. IP1, IP2, etc., to retain supplier anonymity throughout the report. Three additional sites of interest were also visited at the request of Transport Scotland. These sites are discussed separately under section 4 and contained new materials or had been reported to be performing poorly.

Table 2-1 : Inspected sites

Site Ref.	Location	Type	Stress Level	Age (yrs.)
IP1	M9 North Bound, West of Kirkliston	TS2010	M	5.2
IP2	M9 North Bound, North of Grangemouth	TS2010	M	5.2
IP3	M9 South Bound, East of Linlithgow	TS2010	M	5.0
IP4	M8 East Bound, River Almond	TS2010	M	5.2
IP5	A720 East Bound, Fairmilehead	TS2010	M	4.6
IP6	A1 North Bound, Dunbar	TS2010	M/H	4.6
IP7	A68 North of Pathead	TS2010	L	4.9
IP8	A68 East of Oxton	TS2010	M	5.3
IP9	A68 North of Earlston	TS2010	L	5.0
IP10	A7 South of Hawick	TS2010	L/M	4.9
IP11	A7 River Teviot	TS2010	L	5.4
IP12	A7 North Langholm	TS2010	H	5.2
IP13	A7 South Langholm	TS2010	H	5.2
IP14	A75 West of Annan	TS2010	L	5.4
IP15	A75 West of Cargenbridge	TS2010	M	5.0
IP16	A75 West of Twynholm	TS2010	L	4.8
IP17	A76 Kilpatrick	TS2010	L	5.1
IP18	A76 South of Cumnock	TS2010	L	4.6
IP19	A78 North of Ardrossan	TS2010	L	5.2
IP20	A78 Skermorlie	TS2010	N/A	5.4
IP21	A8 Greenock	TS2010	M	5.4
IP22	M8 West Bound North of Paisley	TS2010	M	4.5
IP23	A82 North of Inverbeg	CL942	H	5.2
IP24	A85 West of Tyndrum	CL942	L	5.2
IP25	A85 West of Dalmally	CL942	L	5.4
IP26	A85 South of Dunbeg	CL942	M	5.1
IP27	A828 West of Barcaldine	CL942	M	4.8
IP28	A828 North of Ballachulish	TS2010	M	4.5
IP29	A830 West of Glenfinnan	CL942	M	5.1
IP30	A82 West of Spean Bridge	TS2010	L	5.0
IP31	A82 South of Invergloy	CL942	L	4.5

Continued over page.

Table 2-1 Continued

Site Ref.	Locations	Type	Stress Level	Age (yrs.)
IP32	A887 West of Glenmoriston	CL942	L	5.4
IP33a/b	A887 West of Invermoriston	TS2010	L/M	5.3
IP34	A82 North of Drumnadrochit	TS2010	L	5.1
IP35	A96 West of Nairn	TS2010	L	4.6
IP36a/b	A96 Nairn	TS2010	M/H	5.1
IP37	A96 North of Keith	TS2010	L	5.3
IP38	A96 North of Huntly	TS2010	M	4.6
IP39	A96 Hillhead	TS2010	M	5.2
IP40a/b	A90 South of Ellon	TS2010	L/H	4.5
IP41	A90 East of Ellon	TS2010	M	5.0
IP42	A90 North Bound South of Brechin	TS2010	M	4.5
IP43	A90 South Bound Tarbrax	TS2010	M	4.5
IP44	A90 North Bound Petterden	TS2010	M	4.8
IP45	A90 North Bound Dundee	TS2010	M	4.8
IP46	A92 Letham	TS2010	M	4.6
IP47	A92 South of Letham	TS2010	L	5.0
IP48	A92 Cowdenbeath	TS2010	M	5.1
IP49	M90 North Bound Kelty	TS2010	M	4.8

KEY:

Clause 942: Thin surface course systems (MCHW 1,Series 900); TS2010: Stone mastic asphalt with polymer modified bitumen and added fibres (TSIA No 35, 2018).
Stress Level: L- Low stress site; M- Medium stress site; and H – High stress site.

2.2 Inspection method

The sites were assessed visually and ranked in accordance with the TRL Scottish Inspection Panel marking system (McHale et al., 2011). Full details of the method of inspection, including the meaning of each mark and defect suffix, are described in Appendix A.

3

Visual Condition

3 Visual Condition

3.1 Results

Table 3-1 shows the visual assessment results for the 2023 survey. In all instances, the panel marks represent the average of five individual assessments.

Table 3-1: Mean visual assessment results

Site Ref.	Type	*Stress Level*	Agg. Size	Panel Mark	Suffix
IP1	TS2010	M	10	G	J_o
IP2	TS2010	M	10	G	N/A
IP3	TS2010	M	10	E	N/A
IP4	TS2010	M	10	G	N/A
IP5	TS2010	M	6	G	J_o, J_f
IP6a	TS2010	M	10	G	N/A
IP6b	TS2010	H	6	E	N/A
IP7	TS2010	L	10	G	N/A
IP8	TS2010	M	10	E	N/A
IP9	TS2010	L	10	E/G	N/A
IP10	TS2010	L/M	10	E	N/A
IP11	TS2010	L	6	G	N/A
IP12	TS2010	H	6	G	N/A
IP13	TS2010	H	6	G	N/A
IP14	TS2010	L	10	G	N/A
IP15	TS2010	M	10	G	N/A
IP16	TS2010	L	10	G/M	-
IP17	TS2010	L	10	E/G	N/A
IP18	TS2010	L	10	G	J_o
IP19	TS2010	L	10	E	N/A
IP20	TS2010	-	10	-	N/A
IP21	TS2010	M	10	G	N/A
IP22	TS2010	M	10	G	J_o, J_f
IP23	CL942	H	10	G/M	v -
IP24	CL942	L	10	G	N/A
IP25	CL942	L	10	G	N/A
IP26	CL942	M	10	G	J_o

Continued over page.

Table 3-1 continued

Site Ref.	Type	*Stress Level*	Agg. Size	Panel Mark	Suffix
IP27a	CL942	M	*10*	G	J_o
IP27b	CL942	M	*10*	S	c -
IP28	TS2010	M	*10*	E	N/A
IP29	CL942	M	*10*	G	N/A
IP30	TS2010	L	*10*	E	N/A
IP31	CL942	L	*10*	E/G	N/A
IP32	CL942	L	*14*	G	J_o
IP33a	TS2010	L/M	*10*	E	N/A
IP33b	TS2010	L/M	*6*	G	N/A
IP34	TS2010	L	*10*	E	N/A
IP35	TS2010	L	*10*	G	N/A
IP36a	TS2010	M	*10*	G/M	c v
IP36b	TS2010	H	*6*	E/G*	N/A
IP37	TS2010	L	*10*	E	N/A
IP38	TS2010	M	*10*	E	N/A
IP39	TS2010	M	*10*	G	J_o
IP40a	TS2010	L	*10*	G	N/A
IP40b	TS2010	H	*6*	P	c – v t s
IP41	TS2010	M	*10*	E	N/A
IP42	TS2010	M	*10*	G	N/A
IP43a	TS2010	H	*10*	G	N/A
IP43b	TS2010	M	*10*	M	- v
IP44	TS2010	M	*10*	G	N/A
IP45	TS2010	M	*10*	G	J_o
IP46	TS2010	M	*10*	G	N/A
IP47	TS2010	L	*10*	G	N/A
IP48	TS2010	M	*10*	G	N/A
IP49	TS2010	M	*10*	G/M	v -

3.2 Assessment of performance in service

Each panel member mark was converted into an arithmetic value, as follows: Excellent (6); Good (5); Moderate (4); Acceptable (3); Suspect (2); Poor (1); and Bad (0). The mean of the individual arithmetic values was calculated to one decimal place and converted back to a Panel Mark using the transformation given in Table 3-2.

Table 3-2 - Calculation of Panel marks

Arithmetic mean	Panel mark
5.8 to 6.0	E
5.3 to 5.7	E/G
4.8 to 5.2	G
4.3 to 4.7	G/M
3.8 to 4.2	M
3.3 to 3.7	M/A
2.8 to 3.2	A
2.3 to 2.7	A/S
1.8 to 2.2	S
1.3 to 1.7	S/P
0.8 to 1.2	P
0.3 to 0.7	P/B
0.0 to 0.2	B

The average panel marks for the sites are shown in graphical form in Figure 3-1. The sites considered to be performing well lie above or are close to the idealised deterioration line developed by Nicholls *et al*. (2010). The distribution of the average panel marks for the 2023 survey is also shown. The pie chart shows that 87% of the sites were assessed as being Excellent or Good, with 9% (5 sites) Good/Moderate and 4% (2 sites) below acceptable.

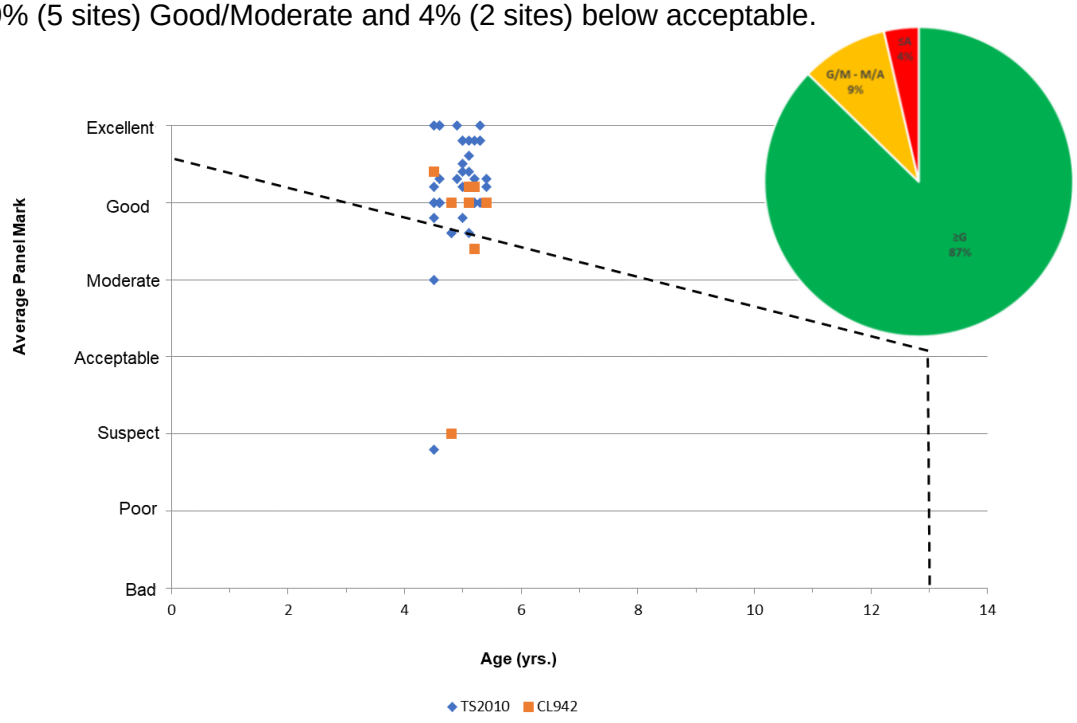


Figure 3-1 - Average condition markings versus performance

The 2023 survey introduced a step change by surveying sites that were nominally five years old rather than two. The decision was made to assess older sites as recent results had consistently shown that two-year-old sites were generally defect free. The 2023 results were mainly positive with 87% of the sites showing little or no defect after five years in service. The incidence of joint defects was higher than previous years at 17% but this could be partly explained by the age of the mats. However, 13% of the sites contained other defects or had received remedial work and the likely reasons are discussed under section 4.

3.3 Predicting the long-term performance of TS2010

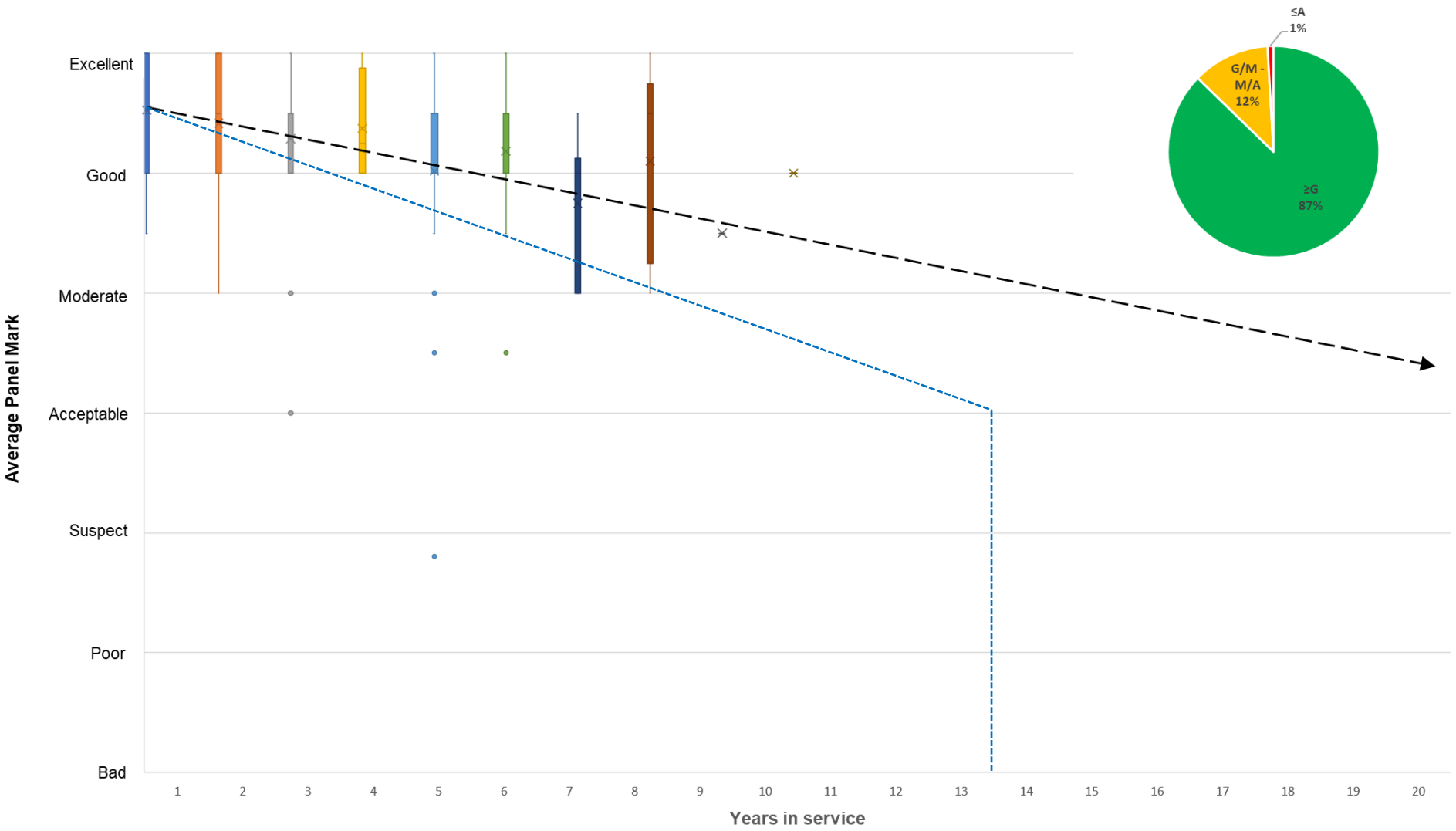
In order to estimate the long-term serviceable life of TS2010, the average visual assessment scores from all SIP surveys conducted on TS2010 have been plotted in Figure 3-2. The figure is based on 220 data points or average scores that have been grouped into years of service. In order to summarise the data, box and whisker plots have been used to show how the data is distributed and also identify statistical outliers. Box and whisker plots, or boxplots, are charts that split data into quartiles. The shape of the boxplot shows how the data is distributed and it also shows any statistical outliers. If the data set has a perfect normal distribution the boxplot will be symmetrical where each whisker will be the same length and represent 25% of the data, and the median will lie in the middle of the box, where each half represents 25%.

It can be seen from some of the boxplots that the annual data is often skewed, e.g. the first couple of boxplots do not contain an upper whisker. This is due to a bias of *Excellent/Good* scores and in these instances the box represents 75% of the data. As the material ages the distribution becomes more symmetrical. Statistical outliers are defined as data points that are significantly different to the rest of the data. On these boxplots, the standard rule has been used, i.e. Q1-1.5×IQR. It can be seen that data for years 3, 5 and 6 have been identified as containing outliers as they are 1.5 times the interquartile range below the lower quartile.

Figure 3-2 also shows the distribution of the average panel marks over the eleven years of service. The pie chart shows that 87% of the 222 SIP observations were assessed as being *Excellent* or *Good*, with 12% *Good/Moderate* and 1% below *Acceptable*.

In an attempt to predict the long-term service life of TS2010, a trend line (black dash) has been inserted based on the yearly average result for service years 1 to 9. The properties of the trendline include a correlation coefficient (R^2) of 0.76, slope of -0.106 and an intercept with *Acceptable* at 25 years. It should be noted that the latter value of 25 years is an extrapolated value which is beyond the maximum age of the data collected. It should therefore be treated with caution. It is also generally acknowledged that the final failure mechanism for surface courses is to accelerate exponentially, rather than linearly, as the material reaches a failure condition.

In summary, the annual SIP survey observations of TS2010 suggest a deterioration trend that has greater durability than the trend line (blue dash) reported for TSMA and TAC to reach an *Acceptable* visual condition. The latter estimate, carried out by the Highways Agency (Nicholls *et al*., 2010), predicted TAC and TSMA to reach *Acceptable* after 13 and 14 years, respectively. The trend line for TS2010 estimates the average service life of TS2010 to be around, or in excess of 20 years.



Key: ------ Nicholls *et al*. (2010); - - - -▶ TS2010 based on 222 SIP observations

Figure 3-2 - Trendline for TS2010

4

Discussion

4 Discussion

4.1 General observations

4.1.1 Cold load ends

If asphalt is allowed to cool to too low a temperature, then adequate compaction will not be achieved on site. The affected material will possess a lower density and higher air voids content when compared to the rest of the mat. These areas are often referred to as '*cold spots*' and are known to retain water following rainfall and take longer to dry out. Moisture damage is known to cause ravelling or disintegration of the asphalt mortar leading to aggregate loss. Figure 4-1 shows two distinct areas where cold spots have been replaced at site IP16. The bottom right-hand corner of the image shows material with an open texture that is continuing to deteriorate. The PMS system AMPS, shows that IP16 received a structural inlay containing 220mm of base and binder material, and supports the observation that the defects are confined to the surfacing.

It is intended that the recent introduction and use of digital technology (McHale, *et al*) will be used to monitor and improve the quality of asphalt paving in Scotland.

Figure 4-1 – Cold load ends at IP16

4.1.2 Roundabouts

Figure 4-2 - Roundabout surfacing failure at IP40b

Figure 4.2 shows that a 6mm TS2010 surface course at IP40b has stripped under the braking and turning stresses imposed by HGVs. A recommendation of the 2021 SIP survey was to review the performance of surfacing on roundabouts to ensure that the optimum mixtures were being selected and installed correctly. A second roundabout site (IP36) also contained a 6mm TS2010 and was reported to have been replaced after only two years in service. It has been speculated that the surface characteristics of 6mm mixtures may provide enhanced grip that renders them vulnerable to high shear stresses and subsequent stripping und heavy traffic. Anecdotal evidence suggests that 10mm mixtures may perform better that 6mm mixtures. Where particularly high turning stresses are anticipated, it is possible that an HRA surface course may provide the most durable solution.

4.1.3 Inadequate support

Some of the schemes visited exhibited defects in areas where a shallow inlay had been selected in preference to a deeper inlay. Figure 4-3 shows defects at Site IP27 which are associated with inadequate structural support. According to AMPS, Site IP27 was treated with a 50mm inlay. In this particular instance, the SIP team had access to video footage of the scheme prior to treatment being

carried out. The video footage clearly showed that the foundation in this area was weak. This site highlights the importance of conducting a rigorous pavement assessment as part of the design process and the need to address areas identified as providing poor foundation support.

Figure 4-3 - Poor structural support at IP27

4.1.4 Carriageway markings

Two observations were made in association with carriageway markings: delamination and mechanical scouring. The former related to new carriageway markings that had failed to bond with the previous marking material that had not been removed. Figure 4-4 shows a significant length of material that had debonded, and the insert shows a close-up of some of the new material that was retained. The latter observation concerned the mechanical technique employed to remove existing carriageway markings. As shown in Figure 4-5, the method resulted in the diagonal abrasion or scouring of the existing surface course material. In some instances, the road surfacing material had been damaged with the removal material.

Figure 4-4 - Delamination of new marking material at IP25

Figure 4-5 - Mechanical damage to surface course at IP28

4.1.5 Excellent performance

Eighty-seven percent of the sites were assessed to be Good or Excellent by the panel and over a third of these sites (16) were assessed as Excellent. The latter mark is only given if the material inspected is assessed to be defect free. Figure 4-6 shows one of the sites that was assessed to be defect free. These positive results confirm that TS2010 provide enhanced durability when compared to some Clause 942 materials and those inspected during previous surveys.

Figure 4-6 - IP37 assessed to be defect free after 5.3 years in service

4.1.6 Sites of interest

At the request of Transport Scotland, three additional sites of interest (SoI) were visited as part of the 2023 survey. One of the sites contained a new surface course that contained a biogenic binder which was being trialled on a section of the A92. The mat shown in Figure 4-7 was assessed as Excellent by the panel and was defect free at the time of the inspection. The second site was located on the M9 and contained a TS2010 which was laid in 2013. The site was given an overall Acceptable mark with faults including cracking, aggregate loss, variability and joint defects. The site is shown in Figure 4-8 and exhibited defects associated with cold loads. However, on closer inspection, longitudinal cracking (insert, bottom right) was noted indicating possible structural issues. The third site contained a four-year-old surface course that contained rubber from recycled tyres. The site was assessed as Medium with faults including aggregate loss, variability and open joint.

Figure 4-7 - Sol4: Biogenic binder, assessed Excellent

Figure 4-8 - Sol1: 10-year-old TS2010 assessed A c v – Jo

5

Conclusions & Recommendations

5 Conclusions & Recommendations

5.1 Conclusions

The AMPS database was used to provide information on trunk road schemes that were nominally five years old. In total 49 sites were assessed by the SIP inspection team. The main findings of the survey were as follows:

- The panel assessed 87% of the five-year-old surfacing sites to be defect free and performing well.
- These results corroborate other SIP survey findings that TS2010 will provide enhanced durability compared to previously used Cluse 942 materials.
- Five of the sites performed less well (Good/Moderate) although mitigating circumstances included the presence of cold load ends and an urban area containing a high density of street furniture.
- Two sites marked below Acceptable related to failure of material on a roundabout and inadequate support beneath the pavement layers.
- Issues with carriageway markings were noted including debonding and some damage associated with marking removal.

5.2 Recommendations

Based on the results and observations made during the 2023 SIP survey, the following recommendations are made:

- The occurrence of cold load ends was witnessed on SIP sites and travel between sites. It is recommended that the causes of cold material and the use of techniques, such as automatic data capture, be promoted to eradicate cold spots happening on future schemes.
- A review on the performance of roundabouts should be undertaken so that guidance on optimum material selection is available.
- Care needs to be taken as part of the design and maintenance process to ensure adequate support is provided to the upper layers.
- A review of the performance of carriageway markings should be considered to address issues associated with debonding and effective removal.

6

Acknowledgements

6 Acknowledgements

The assistance of the Scottish Inspection Panel is greatly appreciated; the members of the 2023 survey were the author and:

Martin McLaughlin	Transport Scotland
Alan Ferguson	Transport Scotland
Scott Buchanan	MPA Scotland
Dr Michael Gordon	WSP

7

References

7 References

Manual of Contract Documents for Highway Works. *Volume 1: Specification for highway works (MCHW 1), Series 0900 - Road Pavements - Bituminous Bound Materials*. https://www.standardsforhighways.co.uk/search?q=0900&pageNumber=1&suite=MCHW&to=2023-09-21&from=2023-09-21

McHale MJ, Gordon M and Ferguson A (2023). *Use of digital technology to improve the way asphalt roads are constructed. ICE Proceedings, Municipal Engineer. https://www.icevirtuallibrary.com/doi/full/10.1680/jmuen.23.00005*

McHale MJ, Carswell I and Roe P (2011). *New surface course specification for Scotland*. TRL Report 670. TRL Limited, Crowthorne.

Nicholls JC, Carswell I, Thomas C and Sexton B (2010). *Durability of thin asphalt surfacing systems. Part 4: Final report after nine years' monitoring*. TRL Report 674. TRL Limited, Crowthorne.

TSIA 35/18. *Transport Scotland Interim Amendment No 35/18 - TS2010 Surface Course Specification and Guidance. https://www.transport.gov.scot/media/43503/tsia-35-18-combined.pdf*

Appendix A

Inspection Panel Methodology

8 Inspection Panel Methodology

8.1 Selection of sites

8.1.1. The sites shall be selected using the AMPS database and in consultation with Transport Scotland to obtain a selection of sites laid across the whole Transport Scotland trunk road network that are coming up to their warranty period. In addition, further sites may be added at the discretion of Transport Scotland. Prior to the day of any visits, or during the visit if the site has not been visited before, the Convenor or Panel representative shall carry out a dynamic risk assessment for the sites to be visited and be responsible for making arrangements for the provision of any road closures and other precautions necessary to ensure that the inspections can be carried out in a safe and orderly manner. The route of the visit, methodology and risk assessment shall be sent electronically to all panel members in advance of the visits.

8.2 Inspection panel

8.2.1. The Inspection Panel shall consist of members agreed with Transport Scotland and, if appropriate, a local representative from either the Agent Authority and/or a representative from the client or Contracting/supplier side appropriate for the sites(s) to be inspected. The agreed members shall include a representative from WSP, who will act as Convenor. All members shall act in a personal capacity.

8.2.2. Members of Panel shall provide details of H&S training they have undergone related to working on or near a highway. Where necessary the Panel Members shall undertake an induction with the Regional Authority responsible for maintaining the highway on behalf of Transport Scotland. Panel members will require a letter of authority permitting access to motorways for inspection. Transport Scotland or their representative shall assess whether there are any deficiencies in the training that will inhibit the Member from being allowed on any or all of the sites and advise accordingly. In addition to the information provided in this document a separate H&S and Environmental Risk assessment is provided for all members of the Inspection team. All members are to confirm that both of these documents have been understood and that they are content with the Risks Assessments prior to commencing inspections.

8.2.3. Transport Scotland or their representative, after fixing the date for an inspection, shall inform other members as soon as possible before the inspection. A copy of this method of inspecting road trial sites shall be sent to any potential panel members who have not taken part before so that they can familiarise themselves with it.

8.2.4. No Panel Member shall take part in the inspection of a site if they have had an alcoholic drink that day.

8.3 Initial project briefing

8.3.1. Once the Inspection Panel has assembled, members shall be given an Inspection Panel Member's Report Forms. The itinerary of inspections and layout of each site will be provided in a separate document in advance to each of the panel members. The Convenor shall have an Inspection Panel Convenor's Report Form in addition to his/her Inspection Panel Member's Report Form.

8.3.2. If appropriate, the Convenor shall brief members on particular aims of the trial and any implications on the emphasis of that inspection. In particular, the Convenor shall supply a list of any project specific suffixes to be used and their interpretation.

8.3.3. The Panel shall agree on the weather conditions prevailing, and record it on their report forms. It is important to note both the weather (e.g. Sunny, Overcast, Raining) and surface condition (e.g. Wet, Drying, Dry) of the site.

8.3.4. The panel shall agree on the 'stress' level for each site and categorised as Low (L), Medium (M) or High (H). As an example, H will be commensurate with very heavy traffic flows, long uphill sections (with a high level of HGV traffic) and Junctions with high levels of turning traffic.

8.4 Site health and safety and risk assessment

8.4.1. The panel does not generally use closures for the inspections as these are of less than 15 minutes duration. However, if there is a closure in place on the site, not more than two vehicles shall be permitted to park in any closure, with personnel changing vehicles prior to entry when necessary. The preference is for as many people as practicable to be in each vehicle to minimise the number of vehicles in any closure. Inspection vehicles will be marked and equipped in accordance with Traffic Signs Manual, Chapter 8, Part 2: Operations, Section 05. When inspecting any site without a closure the site shall be inspected into the direction of oncoming traffic. Moving onto to the live carriageway shall not be permitted unless a spotter has been arranged whilst the member is in the live carriageway. Note: *it is not permitted to go onto any live carriageway on motorways and high speed dual carriageways.*

8.4.2. Where an inspection is to be undertaken from a hard shoulder of a motorway, without a closure, only two vehicles will be permitted, and they shall park with wheels facing the verge and no more than 100m apart. The inspection shall take place from the hard shoulder between the two vehicles. The panel shall inspect the site from the forward vehicle towards the rear vehicle (i.e. facing the traffic).

8.4.3. Motorway site inspections should take place when the traffic flows are at reduced levels. These surveys should therefore be planned to take place outside peak hour traffic. Should the traffic flows be considered very high at the time of arrival on site the inspection should be deferred.

8.4.4. Where parking availability is not known prior to arrival on site a suitable location off carriageway shall be sought so that access/egress from vehicles is safe and the vehicles do not inhibit the safety of other motorists or pedestrians.

8.4.5. When sites have been visited previously, the previous risk assessment may be used but should be reassessed in case circumstances have changed. When visiting sites for the first time, the general risk assessment can be used, but any specific points noted and kept for future reference. Any amendment to specific risk assessments shall be recorded.

8.4.6. All panel members shall confirm their agreement and register their understanding of the risk assessment and H&S requirements.

8.5 Personal protection equipment

8.5.1. All Panel Members shall wear a high visibility long-sleeved vest or coat and trousers to BS EN 471, Table 1: Class 3 or better. Note: the coat/vest shall be done up during all inspections.

8.5.2. All Panel Members shall also wear safety footwear and compliant with the requirements of the Network managements of the region being inspected.

8.5.3. All panel members shall wear a hard hat during inspections.

8.5.4. Any Panel Member not properly attired shall be asked to leave the site until the situation is rectified to the satisfaction of the Client / Convenor.

8.6 Inspection

8.6.1. The Panel shall walk each section in turn, studying the condition as closely as practicable. Where possible, Members shall stop and look back at intervals along each section so as to view the surfacing with the light in a different direction.

8.6.2. As far as practicable, Panel Members shall stay together as a group when inspecting and not get extended which could be distracting to road users. The Panel shall walk, in order of preference if available:

- behind any barrier in close proximity to the section of road being inspected;
- on a footpath alongside the section of the road being inspected;
- with a lay-by alongside the section of the road being inspected;
- on the verge alongside the section of the road being inspected; or
- along the road being inspected.

Panel Members shall walk towards the oncoming traffic wherever practicable.

8.6.3. Localised areas that have been subject to untypical mechanical or chemical actions (e.g. damage caused by a vehicle running on its wheel-rim or by a diesel spillage) shall be ignored. If variations are on a larger scale, such as between wagon loads when laid, the section shall be assessed in sub-sections. WSP shall try to establish the reasons for any large differences by checking the laying records and the compositional analysis at the appropriate time.

8.6.4. Members shall record on their Inspection Panel Member's Report Form a mark for each section soon after inspecting it. Whilst members can discuss points of interest noted along the section, they shall not reveal how they intend to mark that section until all members have recorded their individual mark.

8.6.5. Marks will generally be collected by the convener after each site has been inspected. Where the inspections are from the hard shoulder of the motorway the marks will be collected after moving off site to minimise the time on the hard shoulder.

8.7 Marking

8.7.1. Each section shall be assessed on the basis of its current serviceability irrespective of the elapsed time since it was laid. A detailed marking table is provided for reference on site, Table A-1. In considering the serviceability of the surfacing, the aspects in Table A-1 for the specific type of surfacing shall be considered, together with any project related aspects given in the initial briefing. If any of the aspects are evident to a significant degree on the section, the relevant suffix from Table A-1 shall be applied to the basic marking. Suffix v shall not be applied to a section marked as t, nor + to one marked –.

8.7.2. Joints are a particular issue with respect to initiation of fretting and subsequent failure of the surfacing so additional suffices have been added to record the presence of open joints and joints where fretting and ravelling have occurred. Note: an open joint (jo) refers to joints that are clearly susceptible to the ingress of water and have been inadequately sealed at the time of construction

8.7.3. A second overall assessment table is also proved for reference on site, Table A-2. Once any appropriate fault suffixes have been assigned, the basic mark shall be allocated from the 7-point scale in Table A-2. Intermediate markings between scales shall not be given. When considering the markings, any sections that warrant a suffix cannot have a basic mark of G or better (one exception is G jo where the mat itself is considered to be in a good condition but the joint considered open (see above).

Table A-1 – Revised Fault Suffixes

Suffix	Description	Material type	Notes
v	variable	all	Random variations from point to point within the section only, not "traffic laning" or of obvious variations from load to load.
t	variability with traffic intensity	all	Marked transverse differences caused by variations in traffic intensity between lanes.
+	fatting up	macadam, surface dressing	
–	loss of chippings	hot rolled asphalt	
	loss of aggregate	porous asphalt, macadam, thin surfacings, slurry surfacing	
	loose chippings	surface dressing	
	wearing causing substrate to "grin" through	high-friction surfacings	
j_o / j_f	Joint issue	j_o = *open joint* /* j_f = fretting at joint *f*	
	fretting of mortar	hot rolled asphalt	
g	growth of vegetation	porous asphalt	
p	ponding	porous asphalt	
d	de-lamination from substrate	porous asphalt, thin surfacings, surface dressing, high-friction surfacings, slurry surfacing	
s	stripping	all except high-friction surfacings	
c	cracking	hot rolled asphalt, macadam, thin surfacing, high-friction surfacings	
** applies to a poorly constructed joint, susceptible to the ingress of water and potential for early life failure*			

Table A-1 The marking suffixes table, giving details of classification of surface failure type, which is referred to on site when assessing road surfaces.

8.8 Overall assessment

8.8.1. When each member has reported his individual result, the Convenor shall convert them using the transformation:

$$E = 6; G = 5; M = 4; A = 3; S = 2; P = 1; \text{ and } B = 0.$$

Table A-2 – Basic 7-Point Scale

Mark		Description	
E	(excellent)	no discernible fault	Termed satisfactory
G	(good)	no significant fault	
M	(moderate)	some faults but insufficient for serious problem	
A	(acceptable)	several faults but would usually be just acceptable	
S	(suspect)	seriously faulted but still serviceable in the short term	Termed unsatisfactory
P	(poor)	requires remedial treatment	
B	(bad)	requires immediate remedial treatment	

Table A-2 The main marking table referred to on site, giving descriptors of general road surface condition.

8.8.2. The mean of the individual results shall be calculated to one decimal place and converted back into the Panel marking, rounding off as follows:

.8 to .2 Basic marking with symbol/s; and

.3 to .7 Intermediate marking with symbol/s.

8.8.3. Suffixes shall be applied to the Panel marking when at least a third of the Panel members, rounded up, give it on their individual markings provided:

- the basic Panel marking is not G or better, as then no suffixes can be applied (with the exception of jo); and
- both v and t, or both + and –, are given, when only one of each pair can be applied to the basic Panel marking. The choice shall be based on the number of times the different suffixes occur on individual markings (in the case of a tie, the Convenor shall decide).

8.8.4. The number of panel members shall be noted when reporting the results.

8.9 Confidentiality

8.9.1. Whilst the Panel marking can be reported, the individual marks allocated by members of the Panel shall be treated in confidence. This limitation is to allow members to make judgements as to the condition of the trial sections without consideration of the commercial interests of their organisation.

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