S2 – Performance Requirements

Researched, compiled and produced by corehard hardcore integrity and ENFIELD Council with support through TFL lane rental funding scheme

Introduction- SROH S2

This advisory document is designed to assist incoming and existing Inspectors as support and refresher material. It will be provided in simple language to aid in understanding and avoiding technical or descriptive explanation.

The current edition (Ed 4) of the Specification for Reinstatement of Openings in the Highway (SROH) has clarified some of the requirements concerning remedial works.

Items such as cracking and guarantee period have been dealt with to clarify requirements.

You will now be taken through the key items within S2 which will enable you to have a better understanding of some of the issues requiring remedial action.

Please note:
This presentation is simply to aid in understanding of the SROH and should not be used for any other purpose. The simplicity of language may detract from certain technical or descriptive requirements and, therefore, the SROH should be consulted for clarity.

SROH S2 – Keeping it simple

The key performance requirements are:

- As laid profile
- Edge depression
- Surface depression
- Surface crowning
- Combined defects

We will clarify the above requirements within this presentation in simple language. Please do not overthink what they describe.

There may be other reasons for potential reinstatement failure which are less apparent (e.g. Insufficient layer thickness), and these will be dealt with in subsequent presentations.

For the purpose of this presentation, items quoted from the SROH will be outlined in green and any descriptions or explanations will be outlined in blue with blue text in some instances.

SROH S2 – Performance requirement defects

What is a performance requirement defect?

A performance requirement defect under S2 of the SROH is simply where a reinstatement is not laid flush and level with the immediate surrounding surface or has not met skid resistance, surface regularity or texture depth requirements

Does that mean that every defective reinstatement has to be repaired ?

No!
It is only repaired if the intervention limits shown in S2 have been exceeded.

Are there other types of defects?

Yes!
There are other types of defects where the SROH has not been adhered to, such as workmanship, insufficient layer thickness's, wrong materials used to name but a few. But some of these are more likely to be non-compliance issues rather than defects.

As laid profile

What it says in the SROH

S2.2.1 1) The reinstatement surface must be flush with the surrounding surfaces. There should be no significant depression or crowning present. The construction tolerance at the edges of a reinstatement is ± 6 mm.
2) Once the reinstatement is registered as completed and opened to traffic, the intervention limits in S2.2.2 to S2.2.7 apply. *

PLEASE NOTE

*

Intervention limits shown in SROH S2.2.2 to S2.2.7 will deal with items such as:

- Edge depression
- Surface depression
- Surface crowning
- Combined defect.

We will discuss these in the following slides

What it means

This means the new flexible reinstatement, modular paving, artificial stone paving or blocks must be flush with surrounding surfaces. Intervention is required if it has created an edge of plus or minus 6mm from existing surface at time of construction or laying. Essentially, this applies whilst works are being undertaken before being opened to traffic.

What it says in the SROH at S2.2.1

4) It can be difficult to match a new surface to adjacent surfaces when using hand tools on reinstatements in restricted areas (e.g. around surface boxes). In such cases, localised variations in the hand-laid surface profile should be acceptable to the authority provided that they are within the specified tolerances.

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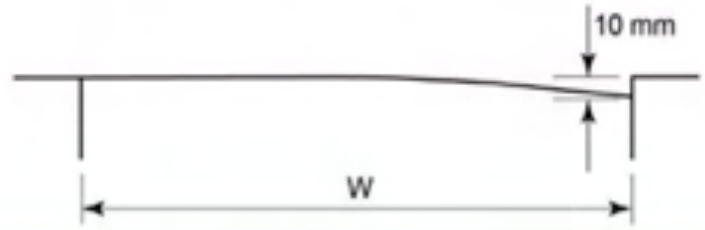
Edge depression

What it says in the SROH

S2.2.2 An edge depression is a level difference at the interface of a reinstatement and the adjacent surface or ironwork. Intervention is required where the edge depression exceeds 10 mm over a continuous length of more than 100 mm in any direction; see Figure S2.2.

Figure S2.2 Edge depression intervention limit



What it means

This simply means where the new reinstatement (flexible, modular, rigid, etc), surface box or chamber cover has sunk over 10mm below existing surface and remember, it needs to be in a continuous length of more than 100mm

You can see from this example that the water box and reinstatement has sunk 40mm from the top of the path edging. This also exceeded the 100mm in length and therefore is confirmed as a defect..

What does Intervention limit mean?

Intervention is point (or limit) beyond which a remedial action will be required…

In other words, there is a requirement to intervene where the limit has been exceeded.

Surface depression

What it says in the SROH

S2.2.3 A surface depression is a depressed area in a reinstatement having generally smooth edges and gently sloping sides; see Figure S2.3.

Figure S2.3 Surface depression intervention limit

Intervention is required where the surface depression spanning more than 100 mm in any plan dimension exceeds the intervention limit X shown in Table S2.1.

Table S2.1 Intervention limits for surface depression

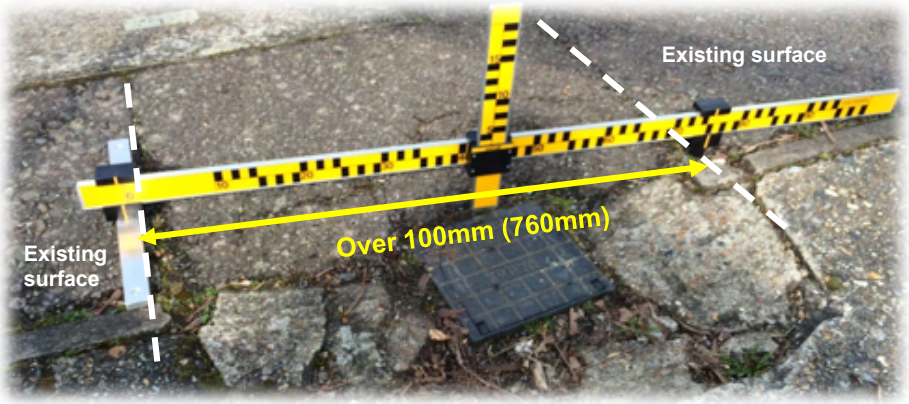
Reinstatement width W (mm)	Intervention limit X (mm)	Combined defect intervention limit (mm)
Up to 400	10	10
Over 400 to 500	12	10
Over 500 to 600	14	12
Over 600 to 700	17	14
Over 700 to 800	19	16
Over 800 to 900	22	18
Over 900	25	20

Not this column

What it means

This simply means where the width (W) of the new reinstatement surface has sunk below existing surface for longer than 100mm in any direction beyond the intervention limit. The wider the reinstatement, the greater the intervention limit is (X) as shown in Table S2.1 above

In this example the reinstatement has sunk 35mm from the existing adjacent surface over a width of 760mm. Table S2.1 shows that the intervention limit for between 700 and 800 is 19mm and therefore is a defect requiring remedial action



How is measurement taken?

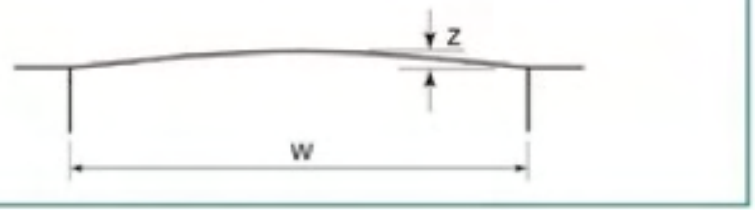
It is essential to take correct measurements for intervention limits. This should only be done from edge of existing adjacent surfaces as can be seen in the image.

Surface crowning

What it says in the SROH

S2.2.5 Surface crowning is where the reinstatement lies above the mean level of the adjacent surfaces; see Figure S2.4.

Figure S2.4 Surface crowning intervention limit



Intervention is required where the surface crowning spanning more than 100 mm in any plan dimension exceeds the intervention limit Z shown in Table S2.2.

Table S2.2 Intervention limits for surface crowning

Reinstatement width W (mm)	Intervention limit Z (mm)	Combined defect intervention limit (mm)
Up to 400	10	10
Over 400 to 500	12	10
Over 500 to 600	14	12
Over 600 to 700	17	14
Over 700 to 800	19	16
Over 800 to 900	22	18
Over 900	25	20

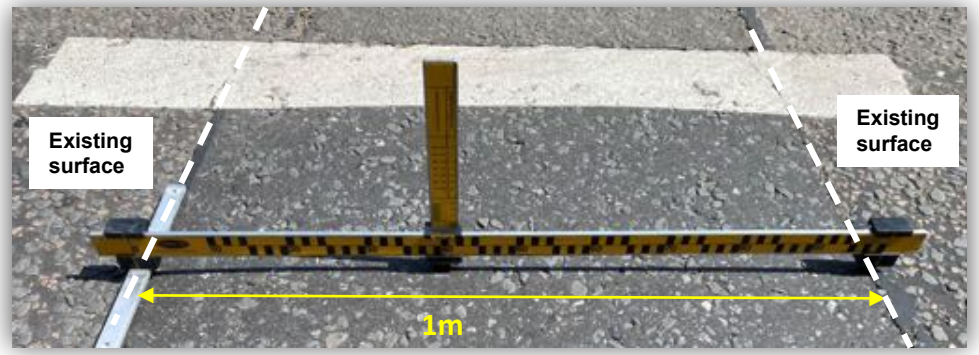
Not this column

You will notice this is essentially the mirror image of surface depression

What it means

This simply means where the width (W) of the new reinstatement surface is raised above the existing surface for longer than 100mm in any direction. The wider the reinstatement, the greater the intervention allowance (Z) as described in Table S2.2 above

The image shows surface crowning of only 11mm.
Table S2.2 shows a reinstatement width over 900mm has an intervention limit of 25mm (marked in red above)
Therefore, this example is not a defect



What causes surface crowning?

Surface crowning is usually caused by either

(i) Insufficient compaction of surface course (SC) material layer or,

(ii) too much reinstatement material (or surcharge) used in surface course layer which cannot be compacted any further

Combined defect

Surface & Edge Depression

What it says in the SROH

S2.2.5 A combined defect is an area in a reinstatement where any combination of edge depression, surface depression or crowning exists. Intervention is required where any of the individual defects, spanning more than 100mm in any plan dimension, exceeds the combined intervention for the relevant defect as defined in Table S2.1 and Table S2.2

Table S2.1 Intervention limits for surface depression

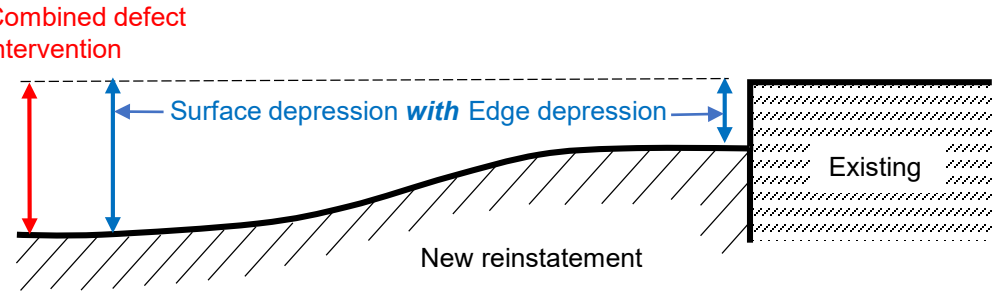
Reinstatement width W (mm)	Intervention limit X (mm)	Combined defect intervention limit (mm)
Up to 400	10	10
Over 400 to 500	12	10
Over 500 to 600	14	12
Over 600 to 700	17	14
Over 700 to 800	19	16
Over 800 to 900	22	18
Over 900	25	20

Not this column

This column only

Remember only refer to the right hand column in relation to combined defect intervention

Diagram to describe combined defect for surface depression and edge depression



What it means

Where you find both edge and surface depression defects within the same reinstatement, (whether they meet intervention or not) this means they are combined, and you simply refer to the third column in Table S2.1 for the relevant measurement of surface depression. (Remember, a defect is something that's not laid flush and level)

Why?

This allows for the inspection to recognise there are two types of defect in existence on the same reinstatement.
Essentially, the only difference is that the surface depression intervention limit will reduce on any reinstatement above 400mm in width.
Therefore, once it is recognised that there is a combined defect in place the combined defect intervention limits shown on Table S2.1 will apply.
Remember, the defect has to be more than 100mm in any plan dimension

Explanation

You will see in the above diagram that there is edge depression and surface depression which confirms that there are two types of defect.
the surface depression intervention measurement will change on any reinstatement with a width greater than 400mm.
Any reinstatement width less than 400mm will still maintain an intervention limit of 10mm regardless of whether there is a combination defect or not.
It is not a defect requiring intervention if it is below 100mm in any plan dimension.

Combined defect
Crowning & Edge Depression

What it says in the SROH

S2.2.5 A combined defect is an area in a reinstatement where any combination of edge depression, surface depression or crowning exists. Intervention is required where any of the individual defects, spanning more than 100mm in any plan dimension, exceeds the combined intervention for the relevant defect as defined in Table S2.1 and Table S2.2

Remember only refer to the right hand column in relation to combined defect intervention

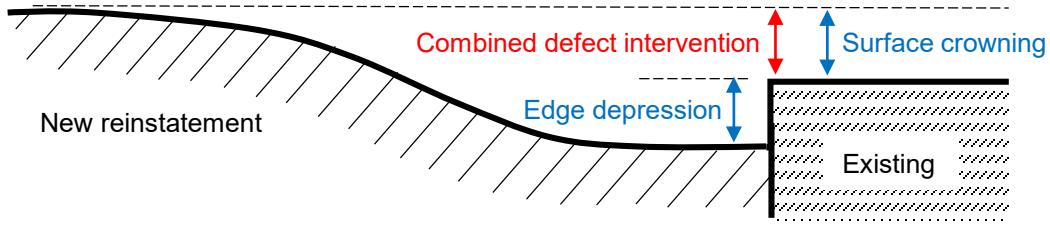
Table S2.2 Intervention limits for surface crowning

Reinstatement width W (mm)	Intervention limit Z (mm)	Combined defect intervention limit (mm)
Up to 400	10	10
Over 400 to 500	12	10
Over 500 to 600	14	12
Over 600 to 700	17	14
Over 700 to 800	19	16
Over 800 to 900	22	18
Over 900	25	20

Not this column

This column only

Diagram to describe combined defect for surface crowning and edge depression



What it means

Where you find both edge depression and surface crowning defects within the same reinstatement, (whether they meet intervention or not) this means they are combined and you then simply refer to the third column in Table S2.2 for the relevant measurement of surface crowning. (Again remember, a defect is something that's not laid flush and level)

Why?

This shows the reinstatement is not flush and level.
Again, this allows for the inspection to recognise there are two types of defect in existence within the same reinstatement.
Therefore, once it is recognised that there is a combined defect in place the combined defect intervention limits for surface crowning shown in Table S2.2 above will apply (outlined in red).

Explanation

You will see in the above diagram that there is both edge depression and surface crowning. As it is found that there are two types of defect, the surface crowning intervention measurement will change on any reinstatement with a width greater than 400mm as can be seen from Table S2.2.
Any reinstatement width less than 400mm will still maintain an intervention limit of 10mm regardless of whether there is a combination defect or not.
Remember, the defect has to be over 100mm in length in any plan direction

Condition at end of guarantee

What it says in the SROH

At the end of the guarantee period the condition of a reinstatement is not required to be superior in any respect to the condition of the adjacent surfaces.

What it means

Simply, at the end of guarantee it is not required that the new reinstatement is any way better than the existing surface around it However, it still must comply with the SROH.

The reinstatements shown above are obviously defective at end of guarantee

Explanation

In 2022, the current law as it stands, does not impose a duty on undertakers to improve an existing footway or carriageway to make it better than the existing adjacent surfaces. It is only required to ensure that the specification (SROH) is correctly applied in terms of construction and performance requirements.
However, there may be instances where the local authority and undertaker come to an agreement where improvement may be made as part of an understanding between them.

Remember, if the reinstatement was never completed in accordance with the SROH in the first place, the guarantee period cannot have started and further works would then be required to make it compliant.

PLEASE NOTE

S2.3 Fixed Features (as laid profile)

What it says in the SROH

All fixed features, such as edgings, channel blocks, drainage fixtures, surface boxes and ironware etc., should be as level and flush as possible with the adjacent surfaces and must be installed to the following level criteria:
1) Fixed features must be laid to coincide with the mean level of immediately adjacent surfaces.
2) The construction tolerance between the level of the fixed feature (excluding drainage features) and immediately adjacent surfaces is ± 6 mm.
3) Drainage features must be installed flush with or up to 6 mm below the level of the adjacent surface.
4) At pedestrian crossing points where the kerb is flush with the carriageway, the kerb must be re-laid flush with, or not more than 6 mm above, the carriageway.

When you think about it, you can see that the as laid profile for street furniture such as chamber covers, channel blocks and gully's are also to be laid flush. This is to ensure a smooth and even surface which reduces risk of trips, noise, discomfort and stress on new and existing reinstatements.

What it means

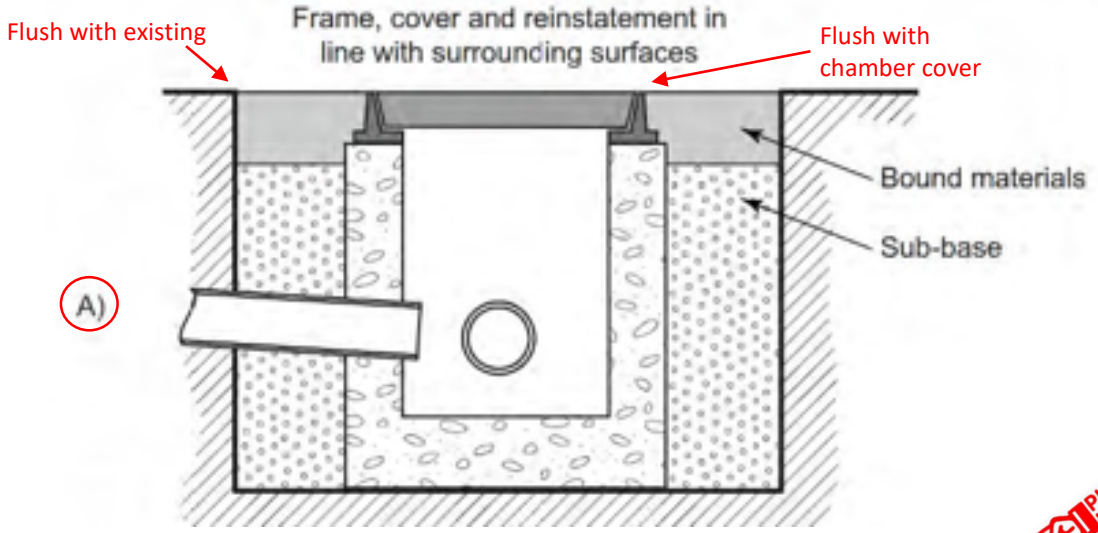
Any items such as chamber lids, channel blocks or gully's that can be found within or beside the reinstatement, has to be laid flush and level. There is a tolerance of + or - 6mm at the time of laying (the same as reinstatement) but there is no plus 6mm on drainage items.
This makes sense when you think that water cannot drain over anything higher than level and flush, but drainage items are allowed to be 6mm below level and flush at time of laying.

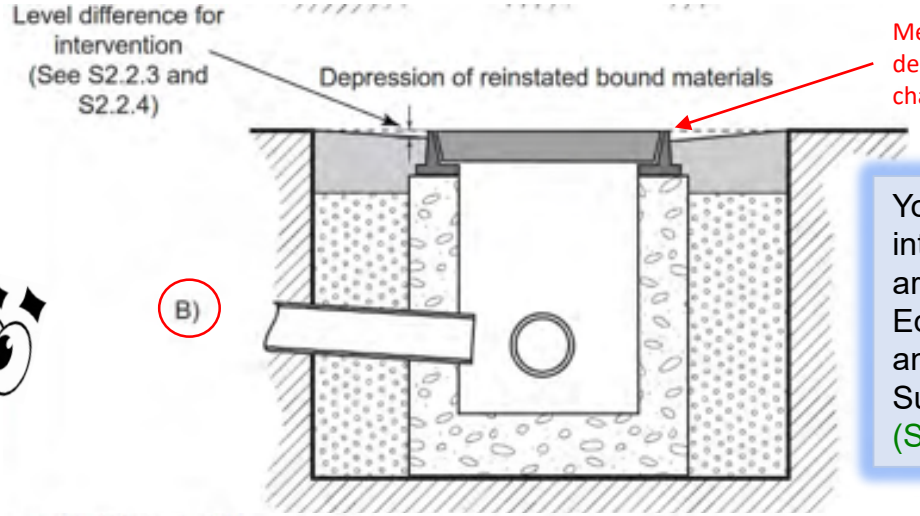
Once the reinstatement is open to traffic, the requirement for intervention limits will apply. The following slide will demonstrate how to verify intervention limits on a chamber cover.

Fixed Features (Intervention)

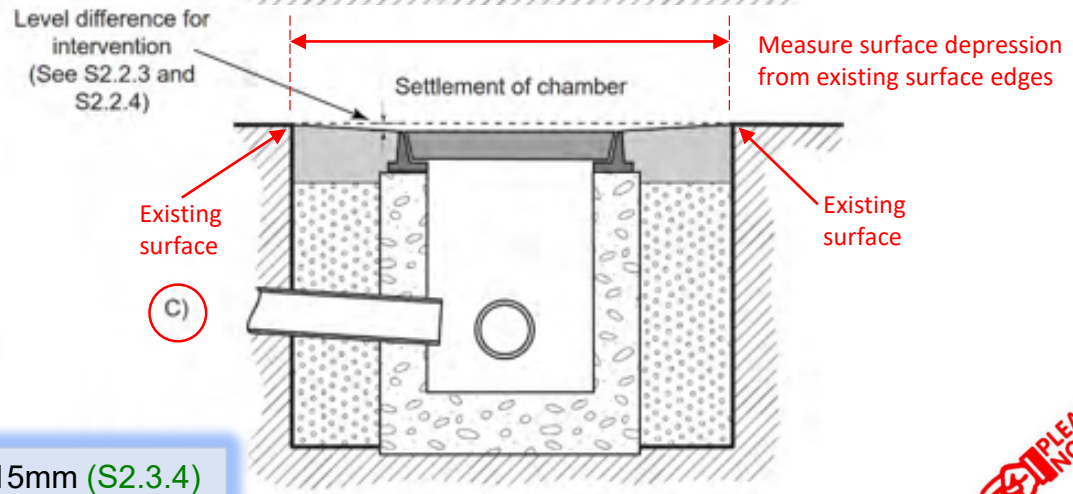
Figure S2.5 Fixed features relative to adjacent surfaces

The three images taken from the SROH will show:
A) When a chamber cover is laid correctly flush and level
B) When edge depression of reinstated material occurs
C) When surface depression occurs through settlement
These images show how and where the measurement is to be taken from (existing adjacent existing surface) and the usual intervention limits can then be applied as seen from previous slides





You will notice that intervention limit values are taken from:
Edge Depression (S2.2.3)
and
Surface Depression (S2.2.4)



PLEASE NOTE

Intervention limits for drainage features are different and are plus 0mm and minus 15mm (S2.3.4)

PLEASE NOTE

At pedestrian crossing points intervention is required where the paving (including tactile) exceeds 6mm in a continuous length of over 100mm in any direction (S2.3.5)

Surface regularity

S2.4 Surface regularity

Please be aware that surface regularity measurement will only apply to road surfaces and not footways. This is done using a rolling straightedge under controlled conditions and is usually undertaken by a specialist company or laboratory.
Do not mistake an uneven footway for a surface regularity performance requirement as it is not allowed for within the SROH.
Table S2.3 of the SROH will provide the values that a road surface is has to meet for surface regularity conformance and where the tests should be carried out.

PLEASE NOTE

Why?

It is important when driving a vehicle that there is a consistent road surface that the front wheels can follow without undulations. If one wheel track differs from the other, the steering can be affected and made difficult for the driver as the vehicle moves across the surface.

How is the test done?

The test is a simple comparison between the two wheel tracks in a single lane of traffic. The straightedge is comprised of wheels that roll across the surface and if they meet a dip or hump, the wheels follow it and record the location. Some devices are fitted with a bell that rings at each dip or hump and this assists with recording the location. When you pass the rolling straightedge along one wheel-track in the direction of traffic flow you record the where each is located (or when the bell sounds).
You then you pass the rolling straightedge on the adjacent wheel-track and also record the undulations. If the these occur at the same locations as the first wheel-track you will have a regular surface as the vehicle wheels run over the undulations at the same time. However, if the undulations are different you now have an irregular running surface which will affect the steering of the car and will need continuous correction in the steering.
There are more modern versions of the rolling straight edge that may have less wheels or are now digital, but they essentially measure exactly the same values.

Structural Integrity
Cumulative settlement

What it says in the SROH

S2.5.1 = The cumulative settlement of a reinstatement is the level difference, Q*, between the adjacent surfaces and the original surface of the reinstatement – see Figure 2.6 This measurement will include the thickness of any materials during any preceding remedial work

What it means

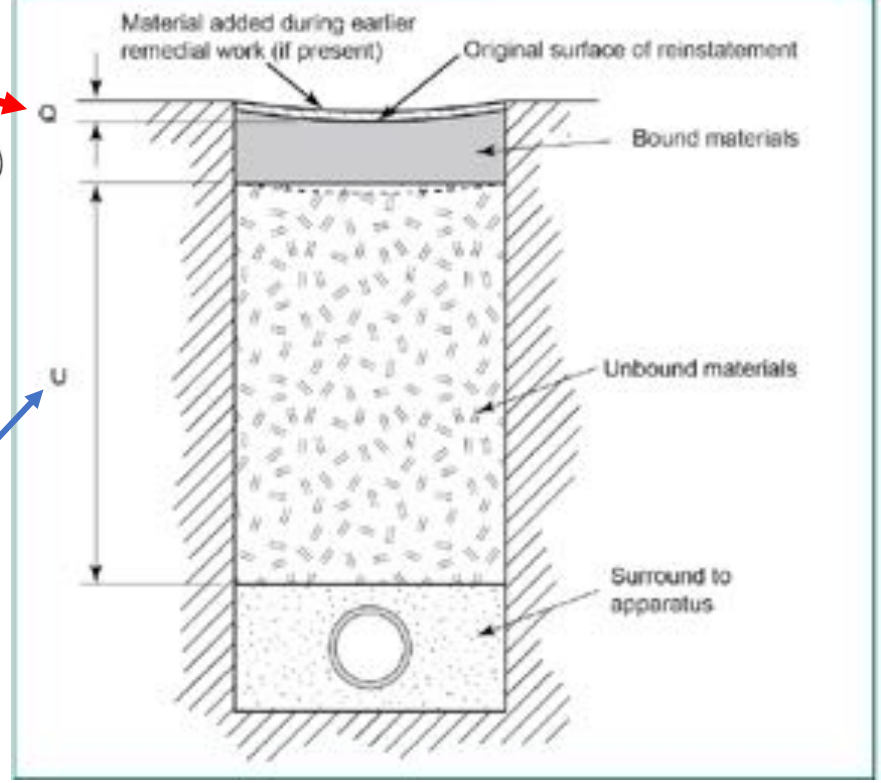
Where a reinstatement has been defected for a depression and the remedial has been carried out to make flush again. Should it sink further, the Inspector measures the new depression and adds it to original measurement. In practical terms, if this combination of measurements exceeds values outlined in red below in Table S2.4 an agreed engineering investigation must be carried out.

Table S2.4 Structural integrity

Reinstatement width (mm)	Intervention limit Q	
	Normal ground conditions	Bad ground conditions
Up to 1000	1.5% U or 30 mm whichever is greater	2.5% U or 30 mm whichever is greater
Over 1000	1.5% U or 35 mm whichever is greater	2.5% U or 35 mm whichever is greater

U = the combination of Base, Sub-Base and Backfill materials (unbound only)

Figure S2.6 Cumulative settlement



*This applies where a trench has sunk and was topped up but continues to sink. The measurement is taken from the surface of original layer of the reinstatement and not from the remedial layer(s). This is what is known as cumulative settlement (i.e. it is continuing to sink). The guarantee only re-starts after an investigation has taken place, not when a defect has been completed

PLEASE NOTE

Skid resistance

What it says in the SROH

S2.6.1 The texture depth, Polished Stone Value (PSV) and Aggregate Abrasion Value (AAV) at the running surface of all interim and permanent reinstatements in all roads must comply with the following:
1) There is no requirement to provide a texture depth, PSV or AAV that is superior to that of existing running surfaces adjacent to the reinstatement.
2) For rigid roads, where the surface of the concrete is the running surface and it has been randomly grooved, a brushed surface finish to the requirements of Table S2.5 and Table S2.6 is permitted for small openings, narrow trenches and other openings less than 1 m wide.

What it means

The three elements mentioned to the left are simply:

1. Texture depth = the open texture or roughness of the running surface (compare sandpaper to glass)
2. PSV = measure of how rapidly aggregate becomes polished under the action of vehicle tyres (a limestone chipping will polish much easier than a hard granite one)
3. AAV = the value that determines aggregate toughness and abrasion resistance (how hard and rough it is)

S2.6.1.1) above will show you are not required to exceed the skid resistance of the existing adjacent road surfaces

PLEASE NOTE

The pendulum test mimics the skidding of tyres in wet conditions and determines the resistance of the road surface measured in PTV (same test as PSV). The higher the value, the better the resistance

The Macro-texture depth test (tiny glass beads) measures how rough or open-textured the road surface is. SROH Table S2.7 shows three test locations are required. The smaller the circle the better texture depth.

Also may be referred to as sand patch test.

Sampling and Testing

What it says in the SROH

S2.7.1 All sampling and testing must be carried out by a laboratory holding current UKAS accreditation covering the specified method of testing, unless otherwise agreed.

UKAS = United Kingdom Accreditation Service (this is the body that laboratories are accredited by)

What it means

There may be instances where a local authority or undertaker wants to ensure materials or methods have been correctly applied to the SROH requirements. This may be to verify materials are correctly used, or to ensure reinstatements have been correctly done. A vast range of UKAS accredited laboratory testing is available to assist with these requirements such as core sampling, pendulum testing, materials analysis and performance.

PLEASE NOTE

Remember

A laboratory has to be accredited for each test method, as not all laboratories take the same types of test. If you need to verify this you can visit the UKAS website which shows the current status of each laboratory and the range of tests it is accredited for. Be aware of statements or opinions that claim pass or fail where a test or accredited measurement has not been undertaken. This may also apply to material types from visual inspection such as a concrete, compared to a cement bound material or even a structural material for reinstatement where the opinion of a technician may be subjective (based on or influenced by personal feelings, tastes, or opinions)

Works in deteriorated and distressed areas

What it says in the SROH

It can be difficult and sometimes impossible to construct a compliant reinstatement where:
1) existing surfaces are close to or exceed the intervention and construction tolerances in S2; or
2) the road, footway, footpath or cycle track shows signs of deterioration or distress (either at the surface or during excavation); or
3) the existing construction is under designed (e.g. layers are thinner than specified in this Code),

What it means

Where it is obvious that the existing surface is in poor condition the undertaker is not required to extend his works to include any extra area. Essentially, all they need to do is to make sure that their reinstatement causes no edge depression beyond intervention limits.
Cracking or settlement caused by the reinstatement process has to be repaired.
In modular surfaces they may be allowed to insert different size units or cementitious infills to maintain an even surface and to comply with S2 performance requirements. If cementitious infills are applied, they are subject to a 1 year guarantee, only if the undertaker has documented and recorded the existing surface before the works started (SROH A12.2.7.4)).

Why?

The DFT has deemed it unfair if a undertaker was expected to correct an existing surface not related to the reinstatement. Sometimes both parties may come to an agreement to extend the reinstatement and the council may pay the undertaker, or make other arrangements for the additional works.

SROH

Where the undertaker has explained to the authority why the reinstatement may not comply with the specification:
1) the undertaker is under no obligation to extend the reinstatement works but must ensure that there is no edge depression (see S2.2.2) after construction;
2) the undertaker must repair cracking (see S12.3) and settlement beyond reinstatement limits (see 12.4) that occur during the reinstatement works.
3) for modular surfaces, it may be necessary to install different sized modules or cementitious infills (see A12.2.7 and A12.2.8) to minimise surface irregularities at the interfaces to meet the requirements of S2.

Where existing construction is thinner, always adhere to minimum SROH

PLEASE NOTE

SROH S2 - Summary

What is a defect?

A defect is something that is less than ideal or not meeting specification (generally all reinstatements should be laid flush).

Do all defects require remedial works?

Not always, but if is beyond intervention limits or specified test requirements of S2, it may require remedial works.

What are the performance defects shown in S2?

The common ones are edge depression, surface depression, surface crowning, surface regularity, skid resistance, texture depth, structural integrity and cumulative settlement.

Are there other types of defects besides SROH-S2?

Yes many, some may relate to incorrect materials, poor workmanship, insufficient layer thickness's and incorrect reinstatement types, to name but a few and these are covered under other sections within the SROH.
There is an assumption under SROH-S2 that reinstatements have been carried out correctly but are not performing as required and therefore, remedial action may be needed to correct.