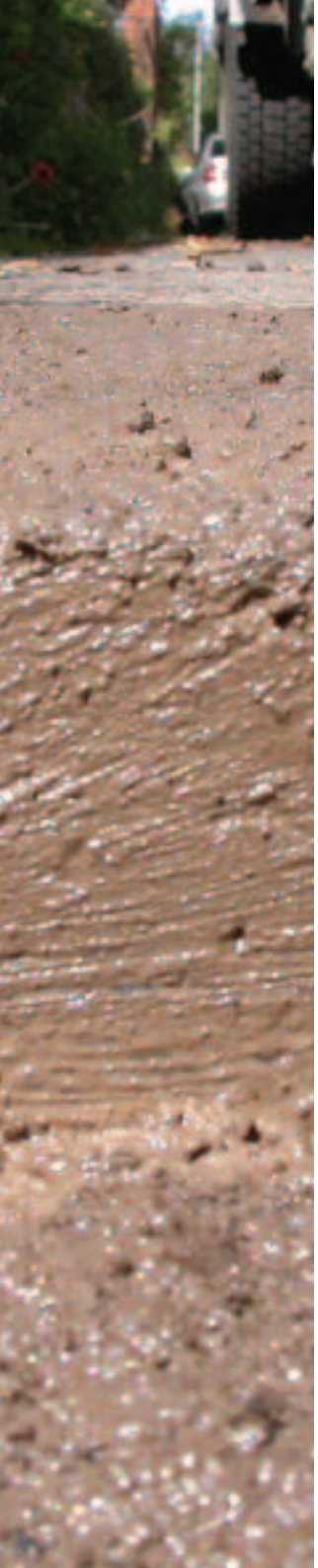
A guide to best practice

The selection, transportation, care and laying of materials for reinstatement works

SW HAUC



This Best Practice has been written by a SWHAUC sub group in consultation with:

- **Atkins (Somerset CC)**
- **Wessex Water**
- **Devon CC Labs**
- **Cornwall CC**
- **Openreach (a BT group business)**
- **Wales and West Utilities**
- **South West Water**
  and its partners
- **Balfour Beatty** and **May Gurney.**

Contents

Scope

WHAT THE GUIDE IS

This guide covers the reinstatement of flexible roads with bituminous surfaces.

It is a simple best practice guide for reinstatement teams working on the road.

Its primary objective is to give guidance on how to carry out work, so that reinstatements have the best chance of performing well.

It does have information from the *Specification for the Reinstatement of Openings in Highways* (SROH) on what work has to be done, but often in a shortened form.

WHAT THE GUIDE IS NOT

It is not a specification that covers all options but these can be found in the 'Specification for the Reinstatement of Openings in Highways (SROH).

It is not designed to be left on a shelf, it is designed as a working guide to be used on site.

It is not a replacement for trained, accredited and competent operatives, but is a useful guide for them and for those learning the skills.

Materials selection

ROAD CATEGORIES

Prior to the reinstatement of any excavation it is necessary to know what type of materials and construction depths should be used in carrying out the reinstatement.

Highway authorities place details of all roads, for which they have responsibility, on to the Streetworks gazetteer and classify them into one of the following categories. This is based on the number of vehicles in excess of 1.5 tonnes that are expected to travel along the road.

Road Category	Traffic Capacity
Type 0	High use by vehicles over 1.5 tonnes
Type 1	
Type 2	
Type 3	
Type 4	Low use by vehicles over 1.5 tonnes

The thickness of the structural layers of the reinstatement will depend on the category of the road, eg, a Type 1 road will require a greater construction thickness than a Type 4 road. Footways, footpaths and cycle tracks have their own structural layer thickness requirements. Details of the layer thickness requirements can be found on pages 28 and 29

BACKFILL AND SUB-BASE MATERIALS

In the lower section of an excavation a layer of fine material may be placed around the pipe, cable or duct, this is referred to as the surround to apparatus.

Immediately above the surround to apparatus are placed the backfill layers. Material excavated on site may be used as backfill, if considered suitable, alternatively imported material should be used.

Granular sub-base material is placed above the backfill. This material will generally be imported from a quarry and should be classed as Type 1 granular sub-base (SHW Clause 803). Type 1 GSB may also be used as an alternative backfill material. Details of sub-base layer thickness requirements can be found on pages 28 and 29. It is essential that the sub-base is transported, handled and laid in order to prevent segregation and drying.

TIP
A damp sub-base does not segregate as easily and is generally easier to compact.

In certain circumstances alternative methods of construction may be used instead of the above methods. These may include such materials as foamed concrete, cement bound materials, recycled materials mixed with soil stabilising additives. These alternative reinstatement materials may only be used if prior agreement has been obtained from the Highway authority.

BINDER COURSE MATERIALS

The first layer of bituminous material to be placed in the reinstatement is the binder course. This is placed directly on top of the backfill / sub-base course.

The preferred binder course material for carriageway reinstatements is 20mm dense binder course 125 pen (BS4987).

For footways, footpaths and cycle tracks the preferred binder course material is 20mm dense binder course 125 pen or 190 pen (BS4987).

(Pen refers to the softness of the binder. The higher the pen the easier it is to work the material).

SURFACE COURSE MATERIALS

The final layer of bituminous material to be placed in a reinstatement is the surface course. Before selecting which type of surface course material to use a number of factors need to be taken into consideration.

- Type of carriageway or footway.
- Existing surface.
- Speed of traffic and site location.
- Skid resistance requirements.

Carriageway reinstatements:

Normally carriageway reinstatements should be of the same type of surface course material as the existing road surface. This is not always the case as some highway authorities may permit or request variations. If in doubt advice should be obtained from your supervisor (or highway authority).

Careful consideration should be given to the type of stone used in the surface course. Different types of stone have varying skid resistance properties. Stone used in the surface course must comply with the polished stone value (PSV) requirement. The PSV requirement for each individual reinstatement may vary depending on the location of the reinstatement.

PSV requirements for roads are classified into two site categories as detailed below:

- **potentially high risk sites (high PSV required)**

  These include:

  - traffic signals, pedestrian crossings, railway level crossings – and include the 50m approach to each
  - roundabouts, and their exits – including 50m approaches
  - bends with a radius of less than 100m where the speed limit is greater than 40mph – including 50m approaches
  - downhill gradients of greater than 10% for more than 50m (single or dual carriageway)
  - uphill gradients greater than 10% for more than 50m (single carriageway only)
- **average or low risk sites (lower PSV maybe allowed)**

  All other situations on single and dual carriageways.

Once the location of the reinstatement has been determined it can be put into one of the above categories and the PSV requirement for the surface course material can then be assessed from the following table.

Bituminous roads – mininimum PSV requirement		
Road type	Potentially high risks	Average or low risk sites
0	68	68
1	68	65
2	65	60
3	65	55
4	65	55

Preferred surface course mixtures for use in carriageway reinstatements:

10mm close graded surface course, 125 pen (BS4987 C.7.4), is the most commonly used material particularly in Type 3 and 4 roads.

TIP 2 This material can be prone to segregation when over raked and allowed to cool, this will make it more difficult to compact and lead to air voids.

10mm stone mastic asphalt (SMA) the Devon user guide recommends using 10mm SMA to reinstate 14mm and 6mm in 10mm SMA.

The coating of bitumen on the aggregate in an SMA material can lead to some early life skid resistance problems. The material does not achieve its full skid resistance performance until the coating of bitumen has been worn off the surface of the road by passing traffic. In order to get over this problem it is recommended that SMA surface courses laid on roads with a speed limit greater than 40mph should be treated with suitable 3mm grit, (eg, clean angular crushed quartzite or steel slag) at a rate of 1kg per m^2.

The grit should be spread after the first roll. Rolling should continue to the required specification and before opening to traffic must be swept to remove any loose grit.

TIP 3 6mm SMA is easy to compact and tends not to segregate.

Hot rolled asphalt (HRA) surface course mixtures:

Type 0 and 1 roads	30/14 HRA Design Type F, 50 pen, 6kN to 10kN
Type 2, 3 and 4 roads	30/14 HRA Design Type F, 50 pen, 3kN to 8kN *or*
	30/14 HRA Recipe Type F, 50 pen

Other types of surface course may be allowed subject to prior agreement with the Highway Authority.

Before carrying out the reinstatement always check the delivery ticket for correct materials for the job. Each ticket should show details of the type of material, binder grade (pen) and the PSV of the stone.

See page 12 for an example copy of a delivery ticket.

Footway and cycle track reinstatements:

The preferred surface course for use in footways and cycle track reinstatements is:

6mm close graded surface course, 125 pen or 190 pen (BS4987 C.7.5)

The preferred mixture may be replaced by other agreed alternative materials where the stone size of the existing surface is significantly less than 6mm nominal size.

PERMANENT COLD-LAY SURFACING MATERIALS (PCSMS)

In certain circumstances PCSMs may be used as an alternative to hot-laid materials. When used properly, in accordance with the manufacturers' recommendations, PCSMs will perform as well as hot-laid materials. The most common use of PCSMs is in small footway reinstatements.

It should be noted that only HAPAS approved PCSMs should be used, unless prior approval has been given by the highway authority to use another material.

(HAPAS – Highway Authority Product Approval Scheme)

TIP 4 PCSMs need to be stored and handled in line with the manufacturers' instructions and must be compacted mechanically to meet required specification.

SPECIALIST SURFACING MATERIALS

There may be instances where a reinstatement needs to be carried out on a section of carriageway, footway or cycle track that has been surfaced using a specialist material. The most common examples of these are given on page 30.

Permanent reinstatement of specialist surfaced areas shall be carried out using like materials of equivalent type and colour.

ROAD MARKINGS

Prior to the opening of any works to traffic all road markings shall be reinstated to a permanent or temporary standard.

Temporary road markings may be made using quick drying, durable paint, adhesive strips or like materials of a similar colour and dimensions to the original markings. These must comply to the EN standards for skid resistance value (SRV) and reflective value (RV). Appendix B refers.

The permanent reinstatement of road markings shall be carried out within 10 days of the completion of the permanent reinstatement using like materials of equivalent colour and dimensions.

For small reinstatements affecting up to 2.5m overall length of road markings, tape or pre-formed thermoplastic markings may be used as an alternative to the existing type of road marking.

WORK SHEET / JOB CARD INFORMATION

Work sheets or job cards issued for each job should include details of the materials to be used for the reinstatement:

- the type of materials to be used and layer thickness.
- binder grades (pen) for the bituminous materials
- surface course PSV requirement.

These details should be checked against the materials delivery tickets to ensure that the correct materials have been delivered.

A section on how to understand quarry delivery notes (tickets) is included in this guide, page 12.

SELECTION PROCESS

Make sure you get the right materials for the job. This includes getting the right binder grade (pen) and polished stone value (PSV) for the surface course.

Material collection, handling and transportation.

- The PSV required in the surface course depends on the category of road and whether it is to be used in a potentially high risk area. See page 7

The minimum PSV required can be worked out from the table below.

Check the PSV of your surface course material and if it is less than that required above,

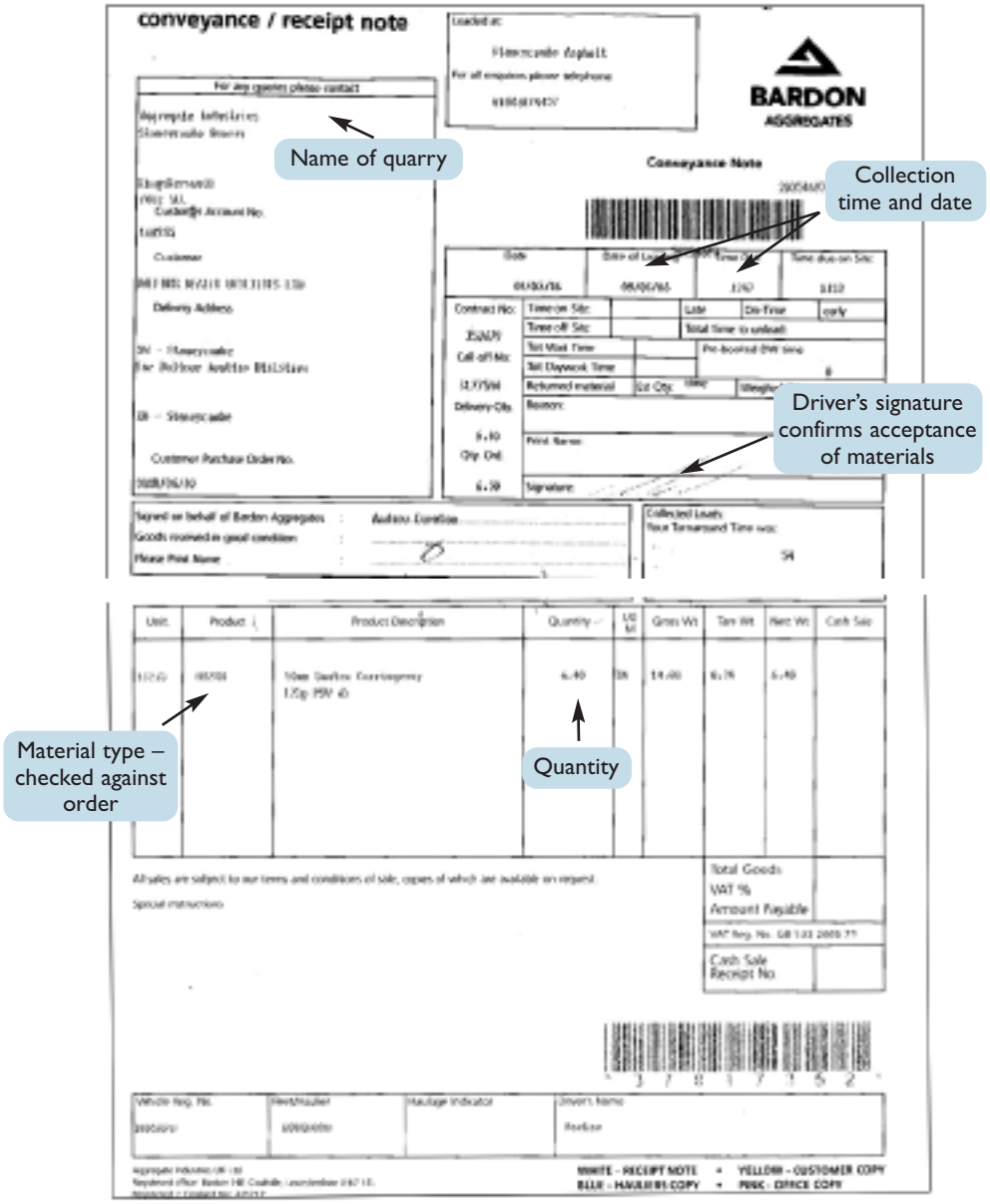
REJECT IT

Bituminous roads – mininimum PSV requirement		
Road type	Potentially high risks	Average or low risk sites
0	68	68
1	68	65
2	65	60
3	65	55
4	65	55

Your signature on the collection receipt confirms that the material has been inspected and accepted for use. Materials must only be ordered and collected from an approved source/supplier, ie, sector scheme 14 certified.

It is essential that you check the temperature of the material, by using a suitable thermometer, before leaving the supplier. If the material is found to be too hot or too cold, the load **must not** be accepted as it is likely to fail at a later date.

Example of a quarry ticket.



NB : Not all quarries make specific reference to the PSV, this must be confirmed to ensure that you are getting the correct material.

Collection

Before collection:

- Check that the vehicle insulation is in good condition as temperature is critical to the performance of bituminous materials.
- Check that the vehicle is clean. Always remove any waste/leftover material before collecting a new batch.
- To get the best performance always treat the vehicle with a suitable release agent.

NEVER USE DIESEL

The use of approved release agents will enable you to remove waste/leftover material. Only use approved release agents. The most common approved agents are:

- stone dust
- coated dust
- water
- vegetable oil emulsion.

Storage

When carrying more than one type of material always use separating boards to prevent the possibility of cross contamination. Remember - always separately double sheet different materials. Each type of load carried on the vehicle is to be separately sheeted. Hot boxes: always use the same side for the same material type.

Transportation

When moving between reinstatements always replace the sheeting to maintain separation and temperature. Sheeting must be re-secured between jobs and immediately replaced after any material is removed.

It is necessary to continuously monitor the material temperature before reinstating. Do not use material that is too cold for compaction as it will fail, see table on page 24.

Do not delay, get the materials to the excavation sites as quickly as possible and ensure that after placement and prior to compaction it is at a temperature of not less than 100º (best practice requirement).

TIP 5 Reduce the risk of cooling and segregation by direct placement.

From lorry to excavation

- Where a barrow is used, consider the condition and type, this should always be treated with a release agent.

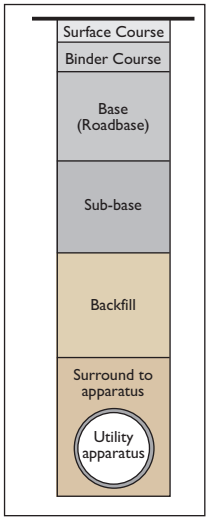
NEVER USE DIESEL

- When practical fill the barrow as quickly as possible but do not throw the material through the air as this causes rapid cooling. Use quilts on barrows to minimise heat loss.
- **DO NOT** leave the load un-sheeted.
- **DO NOT** cross contaminate materials.
- **DO NOT** leave unused material in barrow.
- **DO NOT** cause or use segregated material, eg, by improper handling.
- **DO NOT** use material that is too cold for compaction, ie, less than 100°c.

Backfill and compaction

Backfill and sub base layers are critical to the overall performance of the reinstatement.

GET IT RIGHT FROM THE BOTTOM UP!

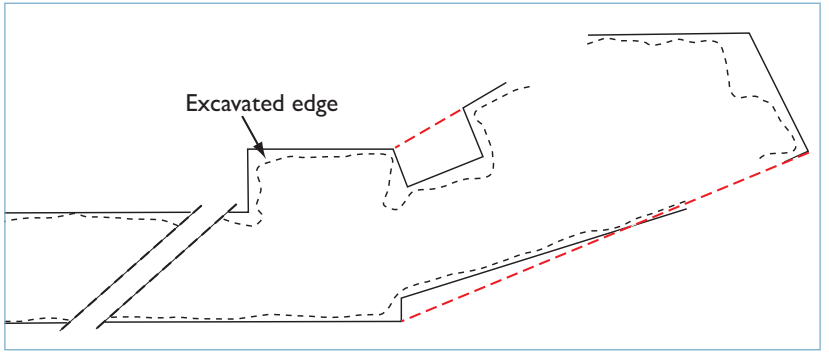


The trench width should be big enough so that access can be made for the compaction of the backfill/sub base materials.

The trench walls must be even and vertical with no significant undercutting of the running surface. Undercut areas cannot be correctly compacted

All trenches must be squared off/cut back to leave no irregular shapes, so that a Vibrotamper (Wacker) can compact all the material in the trench.

Edge outline prepared for permanent reinstatement.



TIP 6 It maybe easier to follow red lines, shown, for fewer corners to cut.

- Excavations should be protected from water getting into the trench.
- The suitability of excavated materials for backfill must be assessed before use. If in doubt ask your supervisor.
- All excavated materials for re-use should be covered to avoid drying out or getting wet during storage. It should be stored within the site barriers but at a safe distance from the trench edge.

Recommended backfill/sub base materials for use in carriageway and footway reinstatements

1. Type 1 / GSB
2. Foamed Concrete
3. Soil stabilised material
4. Recycled material from accredited recycling plants.

Note:

- the use of these preferred options will reduce the risk of failure
- options 3 and 4 need the approval of the highway authority.

Backfill/sub base material classifications

Class A = graded granular material (Type 1 / GSB). In general should be 50mm size or smaller.

Class B = granular materials. Similar to Type 1 but will usually be less well graded.

Class C = cohesive/granular material. Usually contains a much larger proportion of fine material.

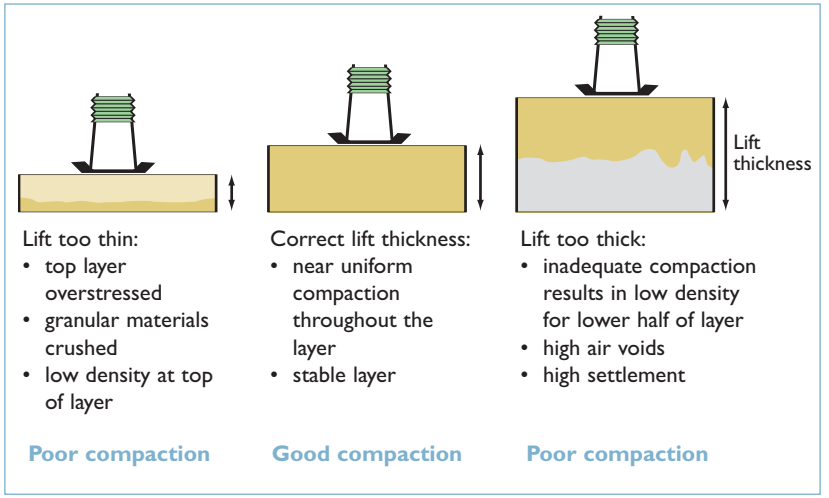
Location	Material classification
Carriageways	A and B
Footways	A, B and C

When using selected backfill the required sub base thickness are shown below

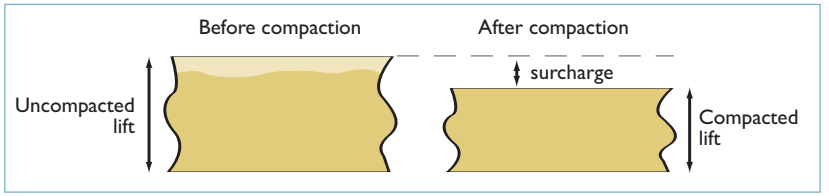
Road types	Minimum depth required
1	Full depth
2	Full depth
3	320mm
4	180mm
Footway	100mm

Compaction

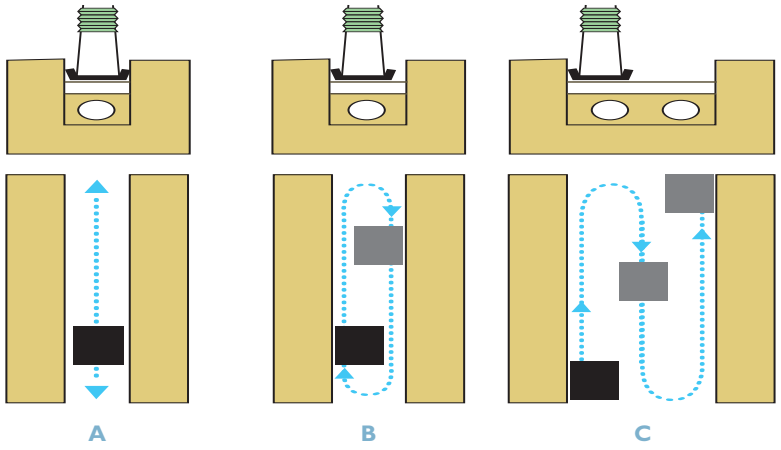
- To ensure the backfill/sub base materials are compacted correctly they should be laid in stages (lift by lift) approximately every 150mm (6 inches) uncompacted; giving 100mm (4 inches) compacted. Each lift should then be compacted with a Vibrotamper (Wacker).



- A single pass is considered complete when all the surface area of the lift has been compacted (Vibrotamper / Wacker).



	Compacted lift thickness/minimum passes	Compacted lift thickness/minimum passes
50 kg Vibrotamper (Wacker)	100mm and 4 passes	150mm and 8 passes



A A single pass of any compactor is when the foot, roll or plate has covered the entire surface area of a layer.

B When the width of an excavation is 50mm greater than the width of the compactor, the layer has to be compacted with two (or more) overlapping passes of the compactor.

C Irrespective of how many overlapping passes are required to cover the entire surface area of the layer (Figure C), all the overlapping passes are counted as ONE PASS of the compactor for that layer.

- Care must be taken around other services and compaction using hand tools only may be necessary.

TIP 7 When you replace any interim reinstatements with permanent the top surface of the sub base should be fully compacted again.

Compaction compliance

It is good practice to test the standard of the compaction and a commonly used tool to do this is the Clegg hammer.

Clegg readings

Backfill teams should carry a Clegg hammer and test each lift after compaction (100-150mm lifts).

The table opposite details the measured readings that should be obtained.

Road type/ bituminous thickness	Minimum Clegg reading	Footpath	Minimum Clegg reading
Type 1/(350mm)	30	Footpaths (60mm) (with 803 – GSB) less than 2m	20
Type 2/(285mm)	30	Footpaths (80mm) (with 803 – GSB) over 2m if binder course used	20
Type 3/4/(100mm) with 803 – GSB)	30	Footpaths (60mm) (with SMR) less than 2m	18
Type 3/4/(100mm) with SMR)	21	Footpaths (80mm) (with SMR) over 2m	18

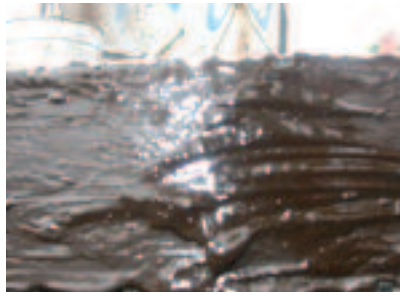
Edge preparation and sealant

As a result of trials carried out by South West HAUC it was found that dependent on weather conditions paint sealant drying times varied between 5 minutes and 2 hours, whilst spray varied between 1 and 15 minutes before reinstatement could take place.

- All edges shall be saw cut or trimmed by a saw.
- All edges shall be essentially straight, smooth and vertical. (see diagram on page 15).
- All excess water to be removed from the cut faces of the reinstatement.
- All bound vertical edges must be clean (free from slurry and dust etc with the stone in the existing layers clearly visible) and coated with a bitumen based edge sealant.
- Manufacturers' recommendations must be followed.
- Tack coat material **must not** be used as edge sealant.

The picture on the left shows the vertical edge covered in wet slurry following saw cutting. While the slurry was still wet the edge was cleaned by pouring a small amount of water over the exposed face. The picture on the right shows the edge after cleaning; all the slurry had been washed off leaving a clean face with the aggregate in the material clearly visible.

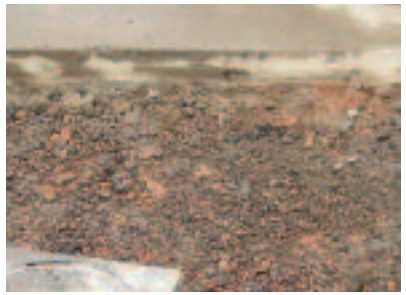
Coating of wet slurry on the edge



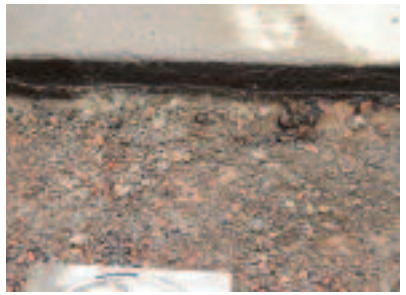
First application of sealant

COMMENTS

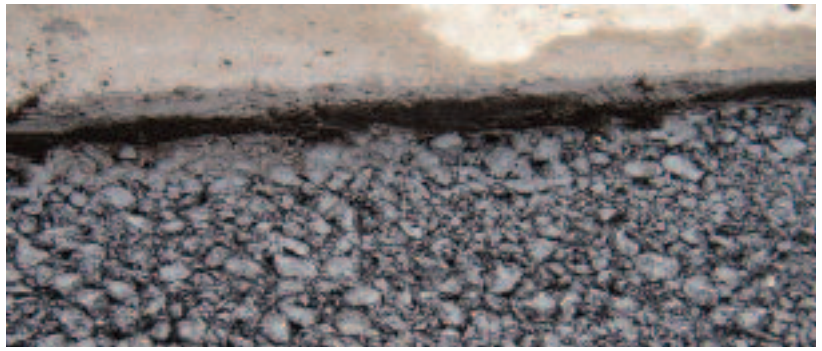
- Edge was covered with a coating of wet slurry prior to application of the edge sealant.
- Drying time for the sealant was approximately 5 minutes before reinstatement commenced.
- Core taken through the joint shows that the sealant has not adhered to the vertical edge, there was no bond between the reinstatement and the adjacent surfacing.
- Weather conditions: dry, cool, overcast



Dirty, damp edge



First application of sealant



Second application of sealant to the top of the edge following compaction of the first lift.

Weather conditions and temperature

Consideration should be given to the on site conditions when completing the backfill process.

For example, if it is raining heavily it can be very difficult to compact the backfill materials correctly.

In very cold weather, consideration, and care should be taken when trying to lay and compact backfill materials. There is potential that materials could be frozen and when they thaw, it is likely the trench will sink and fail.

TIP 8 Wind can dry material very quickly.

Laying of bituminous materials

WEATHER CONDITIONS/TEMPERATURE

Reinstatement using hot lay bituminous materials is weather and temperature susceptible.

Reinstatement should not be carried out with hot lay materials if:

- in dry (light rain) conditions, ground/road temperature is less than 0°c and the Air temperature is less than -1°c Note: for Hot Rolled Asphalt materials consult the Specification for Highway Works.
- if the surface to be reinstated is frozen or iced
- there is standing water in the area to be reinstated.
- weather conditions are such (wind speed/temperature/rainfall) that the temperature of the material will be too cold for compaction (see final rolling temperature on page 25).

In these instances contact your supervisor for instruction.

TOOLS AND EQUIPMENT

Tools and equipment are to be kept clean and fit for purpose.

Mechanical equipment must be regularly serviced and inspected for damage/oil leaks etc before being used for reinstatements. Faults should be reported to your supervisor and replacement equipment sought.

Hand tools should be kept clean, using an approved release agent (NEVER USE DIESEL) and wherever possible when working with hot lay materials shovels, etc, should be kept warm.

Thermometers and probes need to be kept clean and stored safely to prevent damage and will require regular calibration to ensure they stay accurate.

Wheelbarrows and the lorry should be treated with an approved release agent (stone dust, coated dust, water, etc, ask your supervisor) to facilitate easy removal of materials.

NEVER USE DIESEL

Unloading and depositing materials on site

Before unloading ensure the area to be reinstated has been adequately prepared.

- Check that the materials have not been cross contaminated during transport.
- Check that the materials have not become segregated.

If either of these is found, do not use the material and contact your supervisor.

- Check that the sides of the excavation are sound, vertical and substantially clean. Check saw cuts have been taken into the corners properly.
- Check for 150mm (footway) 250mm (carriageway) clearance around reinstatement. No strip of existing tarmac less than 150mm (footway) 250mm (carriageway) must exist around the new reinstatement. If it does this must be cut out and incorporated in the reinstatement.
- Check minimum thickness of reinstatement materials can be achieved using a straight edge and tape at a number of locations within the area to be reinstated.
- Check that compaction of the base/sub base materials is acceptable and that the area is dry and free from contamination.

Prepare and clean the edges carefully. Use a bituminous or other approved edge sealant on the full bitmac vertical edge and any adjacent kerbs and ironwork. Edge sealants can be brush or spray applied to leave an even, complete and relatively thick coating. Always check the drying times of material used as they vary from product to product (see page 19).

TIP 9 Allow the thermometer to warm up, before taking the temperature, move to different locations.

Check that the materials in the lorry have not cooled too much to be usable. Thermometer readings should be taken at a minimum of **three** different places from within the mix. Care should be taken to avoid temperature readings from the surface of the load as this will be cooler than within the transported mix. Where the binder or surface course temperature is less than recommended in the HAUC specification table on page 24, the materials must not be used and your supervisor informed.

Material	Binder grade	Max temp	Minimum temp on Lorry °c*
Close graded surface course	125	160	120
Dense surface course	190	150	110
Dense base course	50	185	130
	125	170	120
	190	150	110
Hot Rolled Asphalt Surface Course	50	190	130
	100	175	120
Stone mastic asphalt surface course	50	200	N/A

* **Min temperature taken within 30 minutes of arrival on site.**

Note: Full details for other materials are included in the HAUC specification table A2.4

When unloading the lorry, care must be taken to avoid unnecessary cooling or segregation of the reinstatement materials. Do not throw the material through the air from the shovel to the barrow, where possible tilt the butt of the lorry and use chutes to fill the barrow. Otherwise carefully place the material into the barrow using a shovel. Fill the barrow as full and as quickly as possible to aid heat retention, use quilts on the barrow to avoid heat loss and transport the material to the reinstatement area as quickly as possible.

- DO NOT leave the load un-sheeted.
- DO NOT cross contaminate materials.
- DO NOT leave unused material in barrow.
- DO NOT cause or use segregated material, eg, by improper handling.
- DO NOT use material that is too cold for compaction.

Placement

Care must be taken to avoid unnecessary heat loss and segregation during placement. Shovel the material into the reinstatement area rather than tipping the barrow.

Particular care is needed to avoid segregation at edges and at corners. The careful use of a squeegee is recommended rather than a rake to avoid segregation of materials during placement.

As a general rule the surcharge of material should be the thickness of the required lift plus, up to, 50%. The amount of material placed should be limited, so that it can be fully compacted before the surface temperature drops. The permitted lift thickness is defined by the HAUC specification table of requirements for common materials below.

Material	Minimum at any point (mm)	Nominal Lift Thickness (mm)	Maximum at any point (mm)
6 mm DSC	15	20 to 30	40
10 mm CGSC	25	30 to 40	50
15/10 HRA SC	25	30 to 40	50
30/14 HRA SC	25	30 to 40	50
6 mm SMA	15	20 to 30	40
10 mm SMA SC	20	25 to 35	40
14 mm SMA SC	30	35 to 45	50
20 mm DBC	40	50 to 100	110

Note: full details for other materials are included in the HAUC specification table A2.2.

After placement and prior to compaction the temperature of the material should be taken again to ensure it has not dropped below the minimum rolling temperature table below. If this is the case remove the material and contact your supervisor.

Material	Binder grade	Minimum Rolling temperature °c
Close graded surface course	125	95
Dense surface course	190	85
Dense surface course	50	100
	125	90
	190	80
Hot rolled asphalt surface course	50	100
	100	85
stone mastic asphalt surface course	50	110
	85	100

Note: full details for other materials are included in the HAUC specification table A2.4.

After compaction of each layer re-treat the edges, ironwork, kerbs, etc, with edge sealant to replace any edge sealant that has been removed during compaction.

Compaction (layers, lifts and passes)

Compaction must be carried out as soon as possible after placement so that the material can be fully compacted before the material temperature drops below the minimum rolling temperature.

Always check before starting reinstatement that the compaction plant is functioning correctly.

If water needs to be applied, use sparingly, but evenly to minimise cooling, eg, by using a watering can fitted with a fine rose.

After compaction of the binder course, check that a minimum surface course of 40 mm can be laid. If not, adjust the depth of the binder course accordingly.

Compaction can be achieved using a variety of equipment. The maximum lift thickness and the required number of passes is shown in the table below.

Compaction requirements for bituminous mixes				
Compaction plant & weight category	**Minimum passes per lift** For compacted lift thickness up to			
	40 mm	60 mm	80 mm	100 mm
Vibrotamper 50 kg minimum	5* *Not Permitted on surface course on trenches more than 500 mm Wide	7*	NP	NP
Single drum vibrating roller				
600 kg – 1000 kg	10	12	NP	NP
1000 kg – 2000 kg	6	NP	NP	NP
Twin drum Vibrating roller				
600 kg – 1000 kg	5	7	NP	NP
1000 kg – 2000 kg	4	5	6	8
Vibrating plate				
1400 kg – 1800 kg	6	NP	NP	NP
Over 1800 kg	3	5		

NP = not permitted

Note: full details for a range of other compaction plant is included in the HAUC specification table A8.3.

Surface tolerance

Completed reinstatements must be as flat and flush as possible with the surrounding adjacent surfaces.

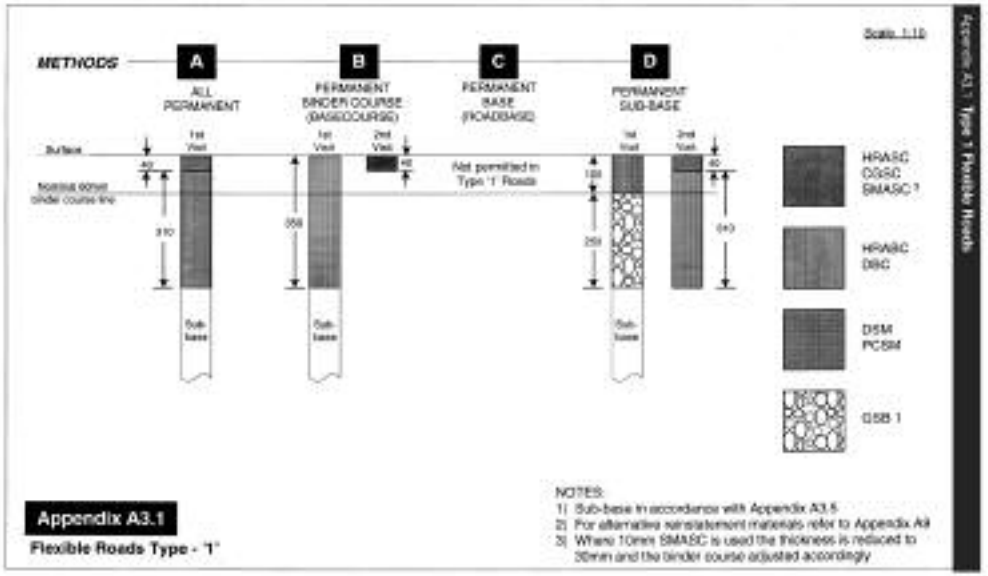
Joint between new and existing surface – any edge depression greater than 6 mm is a defect.

Level of boxes within reinstatement – any box greater than 6mm above or below the adjacent reinstatement is a defect.

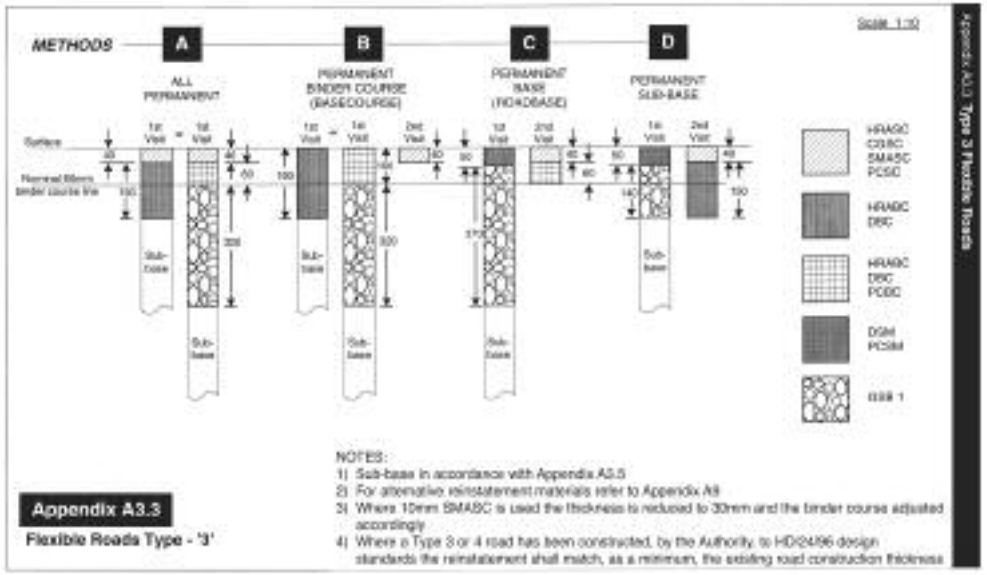
Surface depression or surface crowning – the allowable amount of crowning or depression is related to the width of the reinstatement. The limits are shown in the table below. Any crowning or depression at any stage during the guarantee period, greater than these allowances is a defect.

Limits on Surface Depression, Surface Crowning and Combined Defects		
Reinstatement width (mm)	Crowning/depression limit (mm)	Combined defect 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

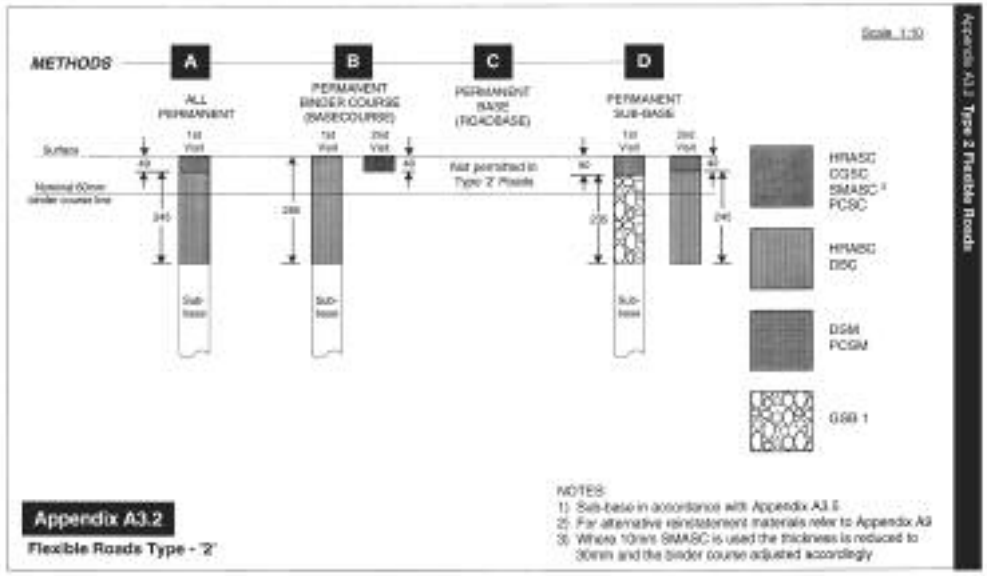
Appendices



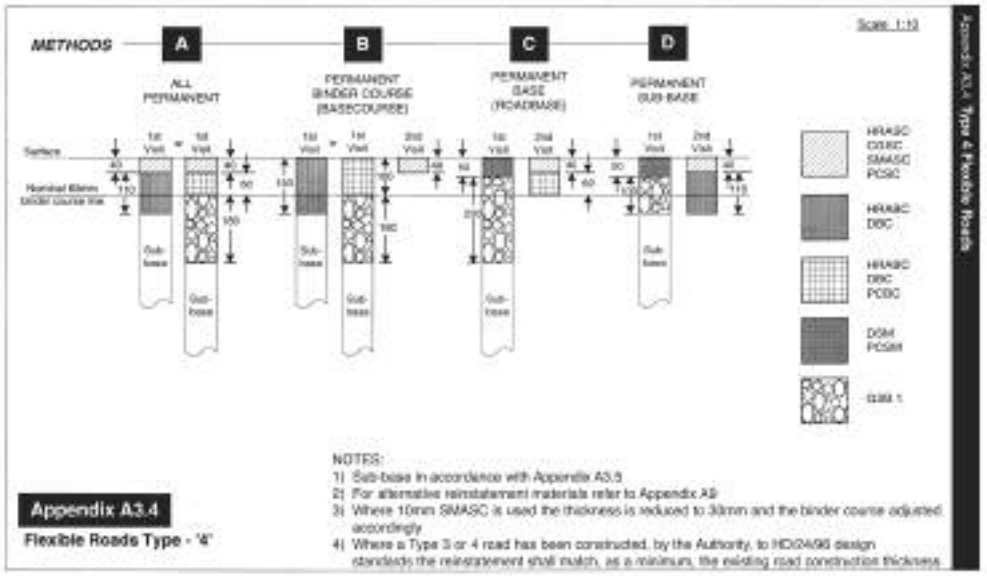
Appendix A3.1
Flexible Roads Type - '1'



Appendix A3.3
Flexible Roads Type - '3'



Appendix A3.2
Flexible Roads Type - '2'



Appendix A3.4
Flexible Roads Type - '4'

Lines and special surfaces

Before re-opening the works to traffic all road markings, studs, etc, removed during the works must be reinstated to a permanent standard or can be to an interim standard but only for up to 10 working days.

Prior to permanent reinstatement quick drying durable paint, adhesive strips or like materials of similar colour and dimensions to the original may be used.

NB All replacement lines must comply with BS EN1435. Retro-reflectivity of R2 and skid value of S3

Full details are in HAUC description, Chapter 11.1.2, 2 (b)(i) and (ii).

Road markings must be permanently reinstated within 10 working days of opening the road to traffic.

For small reinstatements affecting up to 2.5 m overall length of road marking:

- road marking tape or pavement marking paint may be used in place of thermoplastic markings or
- preformed thermoplastic markings may be used in place of hot applied thermoplastic materials.

Note: the 2.5m rule applies to the total length of all markings not individual lines (therefore length of double yellow lines is only 1.25m). No alternatives may be used in place of specialist materials such as rib markings.

All permanent road markings will need to be to the colour approved by the local highway authority and compliant with the thickness, reflectivity and skid resistance as specified by HAUC (UK). If in doubt ask your supervisor.

Special surfaces such as anti skid surfacing should be replaced at the time of permanent reinstatement prior to opening the road to traffic unless the highway authority has given permission, but certainly within 15 days.

Special surfaces should be re applied to match existing and laid in accordance with the manufacturers instructions using the tools and equipment recommended. If it is not possible to comply with this inform your supervisor who will obtain advice from the highways authority.

Approved materials can be viewed at www.bbacerts.co.uk/hapas.html

Acknowledgements

- *Specification for the Reinstatements of Openings in the Highway*, Second Edition, 2002.
- *Practical Guide to Street Works* – **HAUC UK 2006**
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