

[ Top ]

[Contents Page](#)

# The Idiots' Guide to Highway Maintenance

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## JOINT AND CRACK SEALING

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## INTRODUCTION



It is very good practice to seal any cracks and fretted joints in bituminous road surfaces, and concrete road surfaces as soon as possible to prevent the entry of water into the road fabric and thus help prevent the deterioration of the road pavement.

Over banding should not be standard practice for sealing new joints at the time of surfacing, either of extensive new surfacing or patching.

New joints should be sealed by painting the vertical face of the joint, and although in a real world there will be some bitumen squeezed to the surface (if the vertical face has been correctly coated) when the adjoining hot material is laid, this should not be sufficient to cause a hazard.

If, because of poor construction, it is decided that new joints are over banded because it is the

most appropriate course of action, the over banding shall be in accordance with the appropriate specification, e.g. **Specification for the reinstatement of openings in highways.**

## PROBLEMS ASSOCIATED WITH CRACKS AND JOINT FAILURE IN ROAD SURFACES

Water once in the road pavement can cause the early failure of the road pavement in a number of ways :-

- a) It can cause the stripping of the bituminous binder from the aggregate, decreasing the strength of the material.
- b) The water can freeze in winter and the expansion can cause the road materials to "burst" causing pot-holing, and spalling of joints in bituminous and concrete roads.
- c) If there is free water trapped in the pavement layers when the surface over the trapped water is trafficked, the force from the vehicle wheel will exert hydraulic pressure in the water which will be transmitted through the trapped water into sound areas of road and breaking them open.
- d) Water passing through the road surface whether it is bituminous or concrete will weaken the base and roadbase layers of the road pavement and eventually the subgrade ultimately causing failure and the need for re-construction.
- e) The above are the engineering problems associated with crack and joint failure, but you must not forget the very serious possibility of this type of failure resulting in a road traffic accident, but hopefully your "inspection regimes" will indicate areas for remedial treatment prior to them becoming dangerous.

## PREVENTATIVE MAINTENANCE

The process of joint and crack sealing will seal the surface layers against the entry of water and should repair the surface material against any further deterioration.

Joint and crack sealing/over banding should be regarded as a preventative measure, NOT a remedial process, it will not restore strength to a road pavement that has already been lost through water action.

It is normal practice to seal the cracks with a hot bituminous material poured into and screeded over the crack, having first prepared the area by removing loose material and dirt, usually by blasting with hot compressed air.

There are now "[infra-red](#)" procedures, i.e. reheating of the immediate area with the addition of new material, to "re-work" the surface course bituminous material to produce a "joint-less" repair.

With concrete joints the sealant must adhere to both sides of the sealing groove under all conditions, extend as the joint opens without losing adhesion to the joint edges, contract as the joint closes without protruding and exposing itself to traffic damage, and finally remain durable under all weather conditions for many years.

I regard this type of work needing to be done by gangs skilled in this type of work, or it will not be long before the joints/cracks will fail again.

You will find guidance on this type of work in various "official" documents, some of which are listed elsewhere on this page.

## COSTS

Basic crack sealing in bituminous surfacing is not expensive and is an extremely cost effective way of preserving a road surface that apart from isolated cracks or failing joints is in good condition, with remaining life, before overlaying.

Replacing joint seals in concrete roads is expensive so it is extremely important to choose a process that is capable of performing satisfactorily in the particular situation it is required, and supervising the contract to ensure the workmanship is of the standard necessary to achieve full compliance to the appropriate specification.

## **SAFETY**

It is important for safety reasons to confine the bituminous sealing material closely to the crack and not allow any spreading over the road surface generally, this is to prevent areas of low skid resistance. Also at night reflected light off smooth joint sealing and over banding can be mistaken for road markings.

It is normal to have sealing "bands" no wider than 40mm., preferably only 20mm. wide, and no thicker than 3mm., with a minimum skid resistance value (SRV) of 45 for what may be regarded as "normal" road surfaces, i.e. no areas of exceptional braking or stress. The skid resistance should be increased to a SRV of 60 in high stressed areas, or an appropriate equivalent to the adjacent surface type.

A narrow rubber slider, 31.75mm. wide, is available for use with the, **Portable Skid Resistance Tester**, for testing the skid resistance of joint sealing and over banding. In areas of known braking it may be necessary to use a sealing material with improved skid resistance.

Skid resistance requirements for particular sites are specified in the,

**DOT Design Manual : HD 31/94 : Maintenance of Bituminous Roads**

## **PUBLICATIONS ON JOINT AND CRACK SEALING / OVERBANDING**

**Specification for the reinstatement of openings in highways.**

**DfT Design Manual HD 31/94 : Maintenance of Bituminous Roads**

This manual provides good basic advice on sealing joints and cracks in bituminous materials.

**TRL Project Report R/D190/1 : The effective sealing of cracks in bituminous surfacings**

This publication has been prepared by Rendel Palmer and Tritton, in conjunction with the TRL, for the Highways Agency, and it includes a great deal of useful information relating to joint and crack sealing.

**TRL Research Report 349 : The performance of joint sealants in concrete pavements**

This is a report to study the performance of 18 different concrete joint sealants, results obtained both in the laboratory and on site are tabulated and discussed.

This is a very useful report for anybody considering work on concrete pavement joints.

**The DfT publication referred to above (and others) are able to be downloaded from the Highways Agency website, [www.standardsforhighways.co.uk](http://www.standardsforhighways.co.uk).**

## **JOINT AND CRACK OVERBANDING**

Joint and crack overbanding usually refers to a more structured approach to the problem where a large amount of work is to be done and a simple overbanding machine will be used to lay a uniform band of a suitable bituminous material in a correct and quick manner.

The joint/crack having first been prepared by a suitable treatment, e.g. blowing out with a "hot lance" for bituminous materials; or the "sawing" out of old joint sealants in concrete pavement, and abrasive blasting to clean the concrete joint surfaces prior to treatment.

The material used will also have enhanced skid resistance properties, usually by including a fine aggregate, (less than 2.36mm.), of a high polished stone value, (above 65 PSV), in the bituminous sealing compound.

It is also possible to increase the skid resistance of over banding by applying high PSV fine aggregate (grit) to the still molten material, almost a "mini" surface dressing.

## **MAINTAINING OVER BANDED AREAS**

Bitumen is thermoplastic, i.e. if you apply controlled heat the bitumen will become molten when it is hot. it is therefore possible to improve the skid resistance of suspect areas of over banding by applying controlled heat to the over banding until it is molten, then spreading suitable "grit" in to the molten bitumen and compacting it to produce firm bonding. Using hot grit improves the success of the process. Remember to remove the loose grit before leaving the site, or another potential hazard may be created, however it is usual to put in place temporary "slippery" road signs when performing this type of work until the area is stable.

### BRITISH STANDARDS FOR JOINT SEALING IN CONCRETE PAVEMENTS

**BS 2499 : Hot-applied joint sealant systems for concrete pavements**  
**Part 1 : Specification for joint sealants**  
**Part 2 : Code of practice for the application and use of joint sealants**  
**Part 3 : Methods of test**

**BS 5212 : Cold-applied joint sealant systems for concrete pavements**  
**Part 1 : Specification for joint sealants**  
**Part 2 : Code of practice for the application and use of joint sealants.**  
**Part 3 : Methods of test**

The above specifications cover such items as :-

- Shelf life of product
- Safe heating period for hot materials
- Flow resistance of material
- Viscosity/penetration of material
- Fuel resistance
- Various on site and laboratory tests
- Preparation of joints and cracks
- Application methods

### CUTTING A JOINT IN A NEWLY LAID SURFACE COURSE



The picture to the left shows a vertical joint being cut in a newly laid hot rolled asphalt surface course that is still warm and therefore is still plastic and able to be cut with the "cutting wheel" fixed to a "standard" three point roller. This cutting wheel is not able to be used if the bituminous mixture laid is cold, and it is not possible to cut a good stable joint if the bituminous mixture is still too hot. It is normal practice to cut back into the mat a distance equal to the depth of the surface course, but at the same time allowing some tolerance to allow for a good flowing "line" to be achieved as the centre line between mats, rather than a "wiggle". Note the pipe taking water to the cutting wheel, to keep it wet, so that the joint is not torn by a "dry" wheel that will get asphalt sticking to it and preventing a "clean" cut. The dense vertical joint achieved will then be painted with hot 50pen bitumen binder, or an approved (by the engineer) alternative. The following mat of HRA laid adjacent to this joint will melt the applied bitumen and you will obtain a positive sealed bond with no voids in the original mat.

The cutting of joints in this manner is usually only employed on dense bituminous mixtures.

Joints in open materials tend to be left, with edges being heavily "brushed" by a sweeper to remove any "loose" material.

Open materials are not usually painted as a sealed joint could prevent movement of water in the mat, across the fall of the road surface, causing "weeping", and/or water being trapped in the mat leading to hydraulic scouring by vehicle wheels.

Therefore it is especially good practice with open textured (porous) materials to always try and lay the second and

subsequent mats against a "hot edge" to in fact have a joint that is not a joint but a true merging of the two mats, and this procedure is usually followed on larger surfacing schemes. This practice is of course able to be used with dense bituminous mixtures, but more often than not, especially on local road networks, with associated traffic management, this is not possible, so a good cold joint must be constructed.

### **BASIC CRACK SEALING IN BITUMINOUS SURFACING**

This is quite a simple process providing you have good basic equipment and a gang of workmen properly trained in the procedure and who will take the care to perform the operations correctly.

The equipment comprises a temperature controlled bitumen boiler, an open bottomed shoe no more than 40mm. wide, but preferably only 20mm. wide, for screeding the hot sealant onto the crack/joint, a propane lance/torch, a compressor, brushes and shovels etc..

A straight-run 50pen. bitumen is quite suitable for most minor joint and crack sealing, although enhanced proprietary materials are on the market which claim increased "stickability" and enhanced friction properties. If you are contemplating using a proprietary material make sure you obtain all technical information about it before you make your choice.

Remove all loose material with shovel and stiff brush, blow it out with compressed air, dry out any moisture in the crack and on the crack sides, and warm the area up a little, it will help the sealant adhere better.

Take the sealant at the correct temperature from the boiler, do not overheat it, pour the sealant from the bucket into the shoe and carefully pull it centrally along the crack allowing the material to penetrate into the crack.

Provide good site supervision to ensure all items specified in the contract document relevant to width of sealant strip, thickness of sealant and skid resistance of finished surface are complied with.

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I try to refer to as few commercial sites as possible in compiling my site, but when a site offers particularly useful information about a subject I make an exception,

For excellent information on joint and crack sealing in concrete pavements, press -----> [HERE](#)

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[ [Top of Page](#) ]