

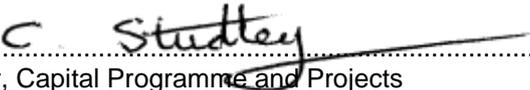


**PROCEDURE NO. 1**

**SKIDDING PREVENTION  
POLICY  
SECTION NUMBER 8  
DETERMINING THE NEED FOR HIGH SKID RESISTANT  
SURFACE TREATMENTS**

**POLICIES AND PROCEDURES  
TRANSPORTATION SERVICES AND STREET CARE**

**August 2011**

Signed .....  .....  
Group Manager, Capital Programme and Projects

Date: August 2011

Steve Evans  
Director of Community Services and  
Acting Director of Planning, Transportation & Strategic Environment  
PO Box 2081  
The Council Offices, Castle Street, Thornbury  
South Gloucestershire BS35 9BP

## **1 Policy**

The provision of High Skid Resistant Surfacing carried out by, or on behalf of, the Council should be carried out in accordance with this policy and procedure. Any queries regarding High Resistant Surfacing should be referred to the Head of Transportation Services and the Head of Streetcare.

## **2 Introduction**

Experience over the last 30 years has shown that high skid resistant surfacing, including High Friction Surfacing (HFS) can be highly effective in reducing traffic accidents where traffic density is high and there is a high skidding risk. Surveys of completed schemes have shown a reduction in accidents in excess of 50% and a First Year Rate of Return of 350%+ (Accident remedial measures data courtesy of TMS Consultancy, Coventry and the RoSPA Road Safety Engineering Manual 1995.) The application of high skid resistant surfacing, including High Friction Surfacing (HFS) at suitable sites should therefore be considered as an important accident reduction and prevention measure that will assist South Gloucestershire Council in working towards its casualty reduction targets for 2010.

Typical sites for the application of high skid resistant surfacing, including High Friction Surfacing are the approaches to traffic signals, roundabouts and pedestrian crossings and at sites recommended for such treatment under Procedure 5, "Procedure for the Investigation of wet skidding & wet Road Accident Concentration sites in South Gloucestershire". Specific site definitions are given in table 3.1 HD 36/06 (DMRB 7.5.1).

These policies and procedures have been prepared jointly by Transportation Services and Streetcare. This policy draws heavily on the Design Manual for Roads and Bridges (DMRB) and the guidelines therein. There will also be strong links within the South Gloucestershire Maintenance policy document being developed within the guidelines and recommendations of the Code of Practice for Highway Management (CSS publication). This policy may be updated in line with revisions of the DMRB and associated documents or experience of applying the policy. Officers should therefore ensure that they are consulting the most current version.

## **3 Objectives of the High Skid Resistant Surfacing Policy**

The purpose of this document is to enable officers in South Gloucestershire Council to identify sites that require high skid resistant surfacing, including High Friction Surfacing (HFS) and to correctly specify it within their works.

The policy takes into account of the need to achieve best value from Council resources and to maximise the sustainability of construction materials.

The decision whether to apply high skid resistant surfacing, including High Friction Surfacing, should therefore be agreed between Highway Maintenance (Streetcare) and Transportation Services.

## **4 Determining the need for surface treatment at new layouts/features on existing carriageways**

The requirement to install high skid resistant surfacing, including High Friction Surfacing at new layouts on existing carriageways shall depend on the skidding resistance performance achieved by the existing surface, taking into account the existing skid resistance, the skidding accident rate, road class, road geometry, the proposed road feature traffic flows and speed using Table A, Determining Skid Resistance Requirements, included in Policy No. 4. The existing skid resistance should be assessed from available SCRIM data (from Policy No. 2) or by the taking

of site skid resistance tests (from Policy No. 3). If resources or conditions do not permit the taking of tests, in lower risk sites an assessment, based on the surface condition, traffic speeds, accident records etc, can be taken to estimate the skid resistance properties of the materials.

The condition of the existing carriageway should also be assessed, consulting with Highway Maintenance (Streetcare), using Figure A, Determining Surfacing Requirements, included in Appendix 2.

Where required, defects in the road surface should be addressed, prior to the application of surface dressing or High Friction Surfacing.

## **5 Determining the Need for High Friction Surfacing**

The requirement to install HFS shall depend on the required skid resistance performance, taking into account the road class, road geometry and traffic flows using Table 3.1, Minimum PSV of Chippings, or Coarse Aggregate in unchipped surfaces for new wearing courses (HD36/06), included in Appendix 3.

High friction surfacing will be required where the required PSV of the aggregate exceeds 70.

The condition of the existing carriageway should also be assessed, consulting with Highway Maintenance (Streetcare), using Figure A, Determining Surfacing Requirements, included in Appendix 2.

Where required, defects in the road surface should be addressed, prior to the application of surface dressing or HFS.

## **6 Requirements for texture depth/surface macrotexture**

Texture depth or surface macrotexture is required on roads where the 85 percentile speed of traffic exceeds 65km/h. The required average depth is generally 1.5mm (HD36/06, paragraph 3.29), but on areas subject to high turning stresses (but not braking stresses), i.e. circulating areas of roundabouts, the required average texture depth may be reduced to 1.0mm to reduce chipping loss and fretting of joints.

Since materials such as high friction surfacing provide minimal texture depth, an assessment should be made of whether the loss of texture depth/surface macrotexture if using high friction surfacing on high speeds roads is negated by the higher microtexture high friction surfacing provides. The need for surface macrotexture will also depend on the topography and drainage of the particular site, and other features which affect the amount of or frequency with which water may stand on the surface of the road.

## **7 HFS Systems Specification**

### **Classifications**

There are a variety of HFS treatments currently available using a number of binder materials to 'broadcast' the aggregates upon. Alternatively the binder and aggregates may be pre-blended prior to application either by spraying or 'screed'.

Any HFS treatment specified for use under this policy shall be specified to Clause 924 (MCHW1) and must have a current British Board of Agrément (BBA HPAS) certificate and shall only be installed by a contractor approved by both the BBA and the certificate holder.

HFS treatments certificated by the BBA HPAS are currently classified into types 1-3 in accordance with site category and commercial vehicle usage (CV/Lane/day) with a Type 1 system being suitable for a heavily trafficked site and type 3 for a very lightly trafficked site. Each level of classification has an expected service life of 5 to 10

years at the **Maximum** traffic levels. It follows, therefore, that a Type 1 system used on a moderately or lightly trafficked site can offer a much extended life (twenty years not being unknown).

Only HFS systems to Type 1 BBA HPAS should be installed in South Gloucestershire. If traffic volumes are sufficiently low to allow the use of Type 2 or 3 systems then the use of a high PSV wearing course (68+) should be considered. The minimum Polished Stone Value of the aggregate to be used shall not be less than that specified in accordance with table 3.1 HD 36/06 (DMRB 7.5.1), included in Appendix 3.

### **Aggregate**

The maximum Aggregate Abrasion Value of the aggregate to be used shall not be more than that specified in accordance with table 3.1 HD 36/06 (DMRB 7.5.1), included in Appendix 3.

HFS on approaches to junctions, traffic signals, etc should be grey (Guyanan Bauxite), in order for the road markings to remain visible.

If a particular colour is required, i.e. for a bus lane, the colour can be provided either by pigmenting or dyeing aggregate or by using naturally coloured materials. The pigmented or dyed aggregate's colour will fade, but its skidding resistance properties are likely to be higher and its costs lower than naturally coloured aggregates. Therefore if colour is important to highlight the area, the method of how the colour is produced will need to be assessed, balancing the colour fastness against the skid resistance and cost.

### **Binder/Adhesive**

Irrespective of the BBA HPAS type specified, the binder used for each individual HFS systems will be one of three categories; Thermoplastic, Polyurethane or Epoxy. BBA HPAS certificates specify a road temperature for the ranges of 0° to 35° for Thermoplastic or Polyurethane with a higher **minimum** temperature of 5° for Epoxy binders. The South Gloucestershire tender for HFS is divided into Thermoplastic, Polyurethane or Epoxy binders and expected minimum road surface temperatures for installation should be borne in mind when specifying materials. Anecdotal evidence would appear to indicate that epoxy binders offer longer-term adhesion and less risk of de-lamination and officers should actively consider this where conditions/availability permit and costs are similar.

### **Laying on New Surface Courses**

HFS treatments should not generally be laid upon newly constructed or surfaced carriageway because of the problems of adhesion materials. Where possible newly laid surfacing should be used by traffic prior to the application of HFS, (6-8 weeks). This is especially important when dealing with SMA, whose modified binder takes longer to wear off.

### **Aftercare**

Because of the loose nature of the HFS material the site should be swept at the completion of the works (a responsibility of the HFS contractor). Officers should, however, monitor the site and if necessary require the re-sweeping of the site by the contractor.

### **Specification**

The specification requirements for the high friction surfacing should be shown either in the Project specification document as Appendix 7/1 or by reference to the current Annual Tender for High Friction Surfacing.

## 8 Geometric requirements

Guidance on the lengths of carriageway over which HFS should be applied are given in table 3.1 HD 36/06 (DMRB 7.5.1). In addition TD 50/99 Para 2.57 recommends a minimum length of 50m ahead of a stop line on ALL lanes on an approach to traffic signals. However site specific conditions (approach speed, accident record, average queue length) should **all** be considered in determining the length of HFS to be laid and this may result in an increase beyond any specified minimum lengths of HFS. At Traffic Signal sites the minimum distance of HFS should be 50m ahead of a stop line on ALL lanes on an approach to traffic signals.

If traffic signals incorporate pedestrian facilities then HFS should be continued past the stop line to the second line of studs demarking the crossing point.

To avoid the potential for differential braking, as a minimum, HFS should be laid across the approach lane width of a carriageway and should be of the same PSV as adjacent lanes (maximum difference 5 PSV points). This should also include adjacent areas of carriageway 'marked' for other uses (bus/cycle lane, 'hatched out' sections of carriageways).

## 9 Programming Considerations

Surface dressing and high friction surfacing are weather dependent materials, which are best laid in warm, dry conditions. Orders to Contractors therefore need to be made in good time to enable this to occur.

If works can not be undertaken during the current financial year then a suitable allocation 'ring fenced' to an individual scheme budget should be made in the programme of works immediately following installation of a scheme.

## 10 Interim Safety Measures

If the carriageway has been resurfaced as part of the particular project for structural reasons prior to the application of a high skid resistance surface such as high friction surfacing then warning signs to diagram number 557 "Slippery Road Ahead" and a supplementary plate "New Surface Wearing In" will be erected until the high friction surfacing has been applied. The new bituminous surfacing has insufficient skid resistance for the location, due to the quality of aggregate used and particularly because excess binder remains on the surface.

If there is to be a delay in applying high friction surfacing to an existing surface after traffic signals etc are operational then consideration should be given to erecting the above signs if there is a concern regarding the skid resistance properties of the existing surface.

## 11 Road Markings at HFS treated sites

The correct carriageway markings should always be in place **PRIOR** to the application of HFS. Only in exceptional circumstances should it be acceptable to apply HFS and then install road markings on top of the HFS.

All road markings should be 'masked off' by contractors prior to application of HFS and the road markings re-applied to a sufficient depth to bring them (and any applied reflective material) above the surface of the HFS.

## 12 Coloured Road Surface treatments

In some instances coloured road surfacing may be appropriate to highlight areas of the road, either for their use by particular road users (buses, cyclists), to deter their

use (hatched areas, road edges) or to highlight traffic calming features, speed limits, approaches to villages etc. Such coloured road surfacing materials should only be specified in accordance with Design Advice Document TA 81/99 "Coloured Surfacing in Road Layout (Excluding Traffic Calming)" and following consultation with Principal Engineer -Traffic Management.

For the purpose of this policy coloured surfacing is any material with a colour other than the Dark Grey 'Guyanan bauxite'.

### **Specification**

There is no prescribed specification or quality assurance scheme for coloured surfacing. There are a number of types and suppliers who may offer their own guarantees for their products. Enquiries will need to be made with the supplier to determine the most suitable material for a particular site.

### **Aggregate**

A limited number of coloured road surface treatments can provide sufficiently high Polished Stone Values to be treated as a High Friction Surface, however many do not.

Coloured surfacings also provide minimal texture depths, so that care needs to be taken with their use on high speed roads.

It should be noted that there is a risk of differential skidding if coloured surfacing has a significant difference in friction properties to the adjacent carriageway surface. If there is any doubt as to the friction properties at a proposed site, a wet skid test of the existing road surface should be carried out to enable specification of coloured road surfacing product with an aggregate PSV commensurate with that found on the adjacent road surface (maximum difference 5 PSV points). This will apply whether the coloured road surface is HFS or not.

Evidence of the colourfastness of a surfacing product should be ascertained, before being specified by technical staff, in order to ensure an acceptable design life.

Exactly what constitutes an acceptable design life for a scheme should be agreed with the Street Care Manager.

### **Binder**

As with High friction surfacing, there are two types of binder/adhesive available, hot applied and cold applied (epoxy).

Hot applied has a coloured binder with naturally coloured aggregates heated and mixed together before applying to the surface. It sets relatively quickly but is less durable than cold applied and therefore is more suitable for rural areas.

Cold applied consists of an epoxy binder with coloured stone applied to the binder after it has been laid on the surface. It takes longer to set, but is more durable and therefore more suitable for urban areas.

### **Colour**

Officers should be aware of the tendency for white lining to 'blend into' lightly coloured surface treatments. Lightly coloured surfacing should not be used where a driver/cyclists etc is expected to rely on white lining.

Green is the normal colour for cycle lanes and red for bus lanes and for deterrence (hatched areas, road edges) and traffic calming features.

### **Suitable Locations for Consideration**

1-At advance stop lines at traffic signals to deter vehicles from using the area intended for cyclists.

2-In mandatory or contra flow cycle and bus lanes.

3-At complicated junctions or layouts where the routes of the cycle lanes may not be obvious or direct.

4-At locations where there is a history of accidents to cyclists.

- 5-At traffic calming measures where cyclists could be directed to avoid obstructions.
- 6-In pedestrianised areas which include cycle routes, to guide cyclists and to advise pedestrians of the presence of cyclists.
- 7-To highlight hatched areas where traffic has a history of undesired use of the hatched areas.
- 8-Along the edges of roads where vehicles have a history of running over the adjacent verge.

**Locations Unlikely to be Suitable**

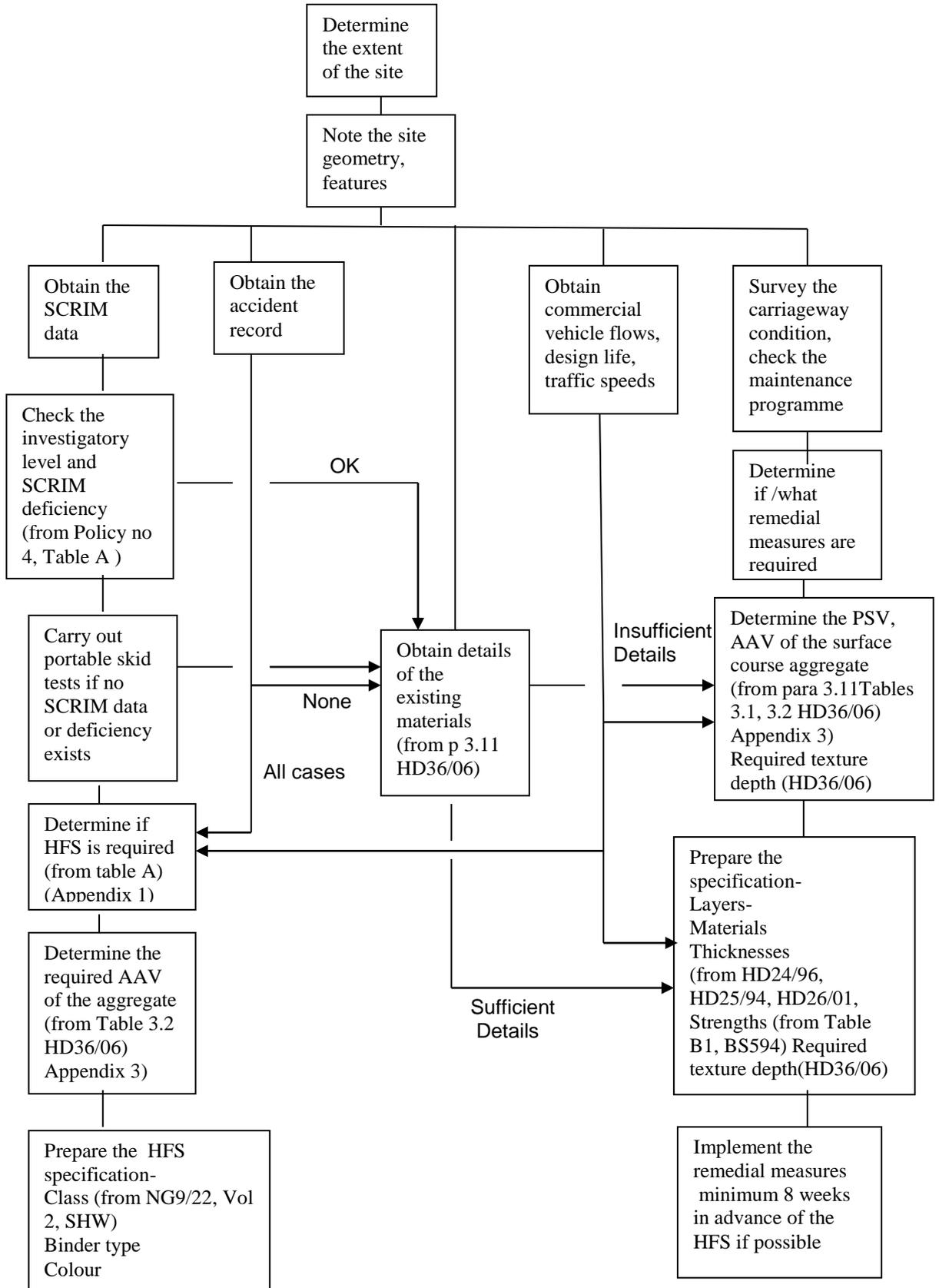
- 1-For cycle lanes in rural locations because colour would be obtrusive, (Bus lanes are unlikely exist in rural areas).
- 2-For deterrence (hatched areas, road edges) in rural areas where colour would be obtrusive.
- 3-Where its use may give a false indication of priority for particular road users.

## **APPENDIX 2**

### **Determining Surfacing Requirements Form**

Figure A, Determining Surfacing Requirements

Scheme no.....Scheme Title.....  
 Date.....Signed.....



## **APPENDIX 3**

# **New Materials Specification Tables**

Site category	Site description	IL	Minimum PSV required for given IL, traffic level and type of site										
			Traffic (cv/lane/day) at design life										
			0-250	251-500	501-750	751-1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-6000	Over 6000	
A1	Motorways where traffic is generally free-flowing on a relatively straight line	0.30	50	50	50	50	50	55	55	60	65	65	
		0.35	50	50	50	50	50	60	60	60	65	65	
A2	Motorways where some braking regularly occurs (eg. on 300m approach to an off-slip)	0.35	50	50	50	55	55	60	60	65	65	65	
B1	Dual carriageways where traffic is generally free-flowing on a relatively straight line	0.3	50	50	50	50	50	55	55	60	65	65	
		0.35	50	50	50	50	50	60	60	60	65	65	
		0.4	50	50	50	55	60	65	65	65	65	68+	
B2	Dual carriageways where some braking regularly occurs (eg. on 300m approach to an off-slip)	0.35	50	50	50	55	55	60	60	65	65	65	
		0.4	55	60	60	65	65	68+	68+	68+	68+	68+	
C	Single carriageways where traffic is generally free-flowing on a relatively straight line	0.35	50	50	50	55	55	60	60	65	65	65	
		0.4	55	60	60	65	65	68+	68+	68+	68+	68+	
		0.45	60	60	65	65	68+	68+	68+	68+	68+	68+	
G1/G2	Gradients >5% longer than 50m as per HD 28	0.45	55	60	60	65	65	68+	68+	68+	68+	HFS	
		0.5	60	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
		0.55	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
K	Approaches to pedestrian crossings and other high risk situations	0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS	
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
Q	Approaches to major and minor junctions on dual carriageways and single carriageways where frequent or sudden braking occurs but in a generally straight line.	0.45	60	65	65	68+	68+	68+	68+	68+	68+	HFS	
		0.5	65	65	65	68+	68+	68+	HFS	HFS	HFS	HFS	
		0.55	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
R	Roundabout circulation areas	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS	
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
S1/S2	Bends (radius <500m) on all types of road, including motorway link roads; other hazards that require combined braking and cornering	0.45	50	55	60	60	65	65	68+	68+	HFS	HFS	
		0.5	68+	68+	68+	HFS	HFS	HFS	HFS	HFS	HFS	HFS	
		0.55	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	HFS	

**Notes:**

1. Site categories are grouped according to their general character and traffic behaviour. The Investigatory Levels (IL) for specific categories of site are defined in HD 28 (DMRB 7.3.1). The IL to be used here must be that which has been allocated to the specific site on which the material is to be laid, as determined by following the procedures in HD 28.
2. Motorway or dual carriageway slip roads may fit in a number of groups depending on their layout. For example, a free-flowing section close to the main line would be in Group 1 whereas the end of an off-slip approaching a give way line or the point at which a queue develops would be in Group 3. Some slip roads with gradients may be in Group 4. Use the most appropriate Group depending upon the Site Category from HD 28 that was used to determine the IL.
3. Where '68+' material is listed in this Table, none of the three most recent results from consecutive PSV tests relating to the aggregate to be supplied must fall below 68. See paragraph 3.21.
4. Throughout this Table, HFS means specialised high friction surfacing, incorporating calcined bauxite aggregate and conforming to Clause 924 of the Specification (MCHW 1) will be required. Where HFS is required on the approaches to a hazard, the minimum treatment length must be 50m. This may be extended where queuing traffic or sightlines indicate that 50m may not be sufficiently long.
5. For site categories G1/G2, S1/S2 and R any PSV in the range given for each traffic level may be used for any IL and should be chosen on the basis of local experience of material performance. In the absence of this information, the values given for the appropriate IL and traffic level must be used.
6. Where designers are knowledgeable or have other experience of particular site conditions, an alternative psv value can be specified.

**Table 3.1: Minimum PSV of Chippings, or Coarse Aggregate in Unchipped Surfaces, for New Surface Courses**

Traffic (cv/lane/day) at design life (see 3.15)	<250	251-1000	1001-1750	1751-2500	2501-3250	>3250
Max AAV for chippings for hot rolled asphalt and surface dressing, and for aggregate in slurry and microsurfacing systems	14	12	12	10	10	10
Max AAV for aggregate in thin surface course systems, exposed aggregate concrete surfacing and coated macadam surface course	16	16	14	14	12	12

Note 1: For roads carrying less than 1750 cv/lane/day, aggregate of higher AAV may be used where experience has shown that satisfactory performance is achieved by an aggregate from a particular source.

Note 2: The maximum AAV requirement for porous asphalt is specified in Clause 938 of the Specification (MCHW 1).

**Table 3.2: Maximum AAV of Chippings, or Coarse Aggregates in Unchipped Surfaces, for New Surface Courses**