

asphalt

applications

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Uses of asphalt in the
construction of games and
sports areas



Asphalt
Information
Service

Introduction

Asphalt* mixes, the outstanding performance and durability of which have been proven over many decades on the majority of UK roads, are very versatile materials and can be used in a variety of non-highway situations. This is one of several information sheets covering these other uses. This sheet deals with uses in the construction of sports and games areas, such as playgrounds, tennis courts, netball and five-a-side pitches and kick-about areas. The information given is intended as general guidance, not as detailed specifications. It is recommended that detailed advice be obtained from specialist organisations and contractors experienced in this type of construction and familiar with local conditions and materials. Some useful addresses are given on the penultimate page.

**The term 'asphalt' is used in this publication and unless accompanied by a descriptor for example "Asphalt Concrete" (AC), 'Hot Rolled Asphalt' (HRA) or 'Stone Mastic Asphalt' (SMA), is applied in its generic sense to refer to the range of mixtures used in the UK.*

Main applications

Asphalts are used in games and sport areas in two ways:

- i as the final surfacing layers over an appropriate base, which may also be an asphalt mix, or
- ii as a firm base beneath one of the wide range of proprietary synthetic surfacings promoted for use in these areas.

This information sheet concentrates on the first of these two situations. In the case of synthetic surfacings, each proprietor has his own specific requirements for the substrate; it is therefore strongly recommended that before preparing detailed specifications involving these surfacings, specifiers obtain advice from the proprietors. A few useful points are however given in this information sheet.

Areas to be surfaced with asphalts

By choosing appropriate asphalt surfacings, a pleasing and durable finish requiring little maintenance over long periods can be obtained. The materials are generally black/dark grey when laid and thus provide a good contrasting background for line paints. If a coloured surfacing is required, this can be obtained either by using pigmented asphalt as the surface course or by over-painting the normal black surface course with special proprietary coloured paint finishes.

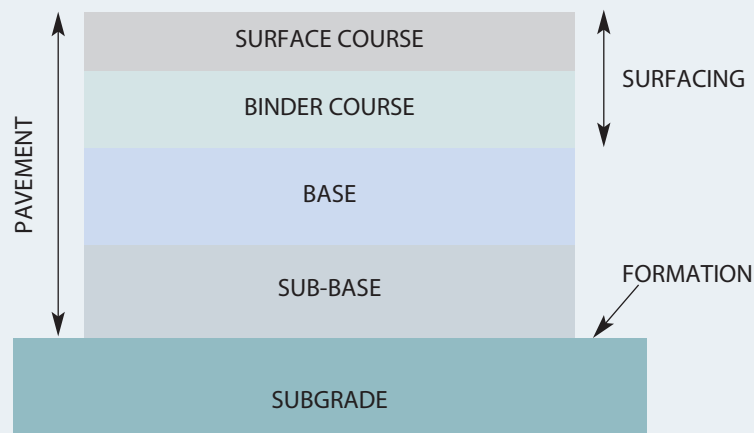
The following general guidance relates to the construction and surfacing, with asphalt of games areas such as school playgrounds, general play areas, tennis courts, netball and volley ball courts, five-a-side and basketball pitches and hard surfaced kick-about areas. Information on the recommended layout and other requirements of these areas should be obtained from the governing authority of the individual sport or from Fields in Trust¹ (FIT), formerly the National Playing Fields Association. Specific guidance on the construction and maintenance of tennis courts is available in a publication of the Sports and Play Construction Association² (SAPCA).

a General considerations

Where reference is being made to European Standards it is considered essential that initial reference should be made to the UK National Guidance Document PD 6691³.

The terminology used in this guide for the structural elements of the pavement, as illustrated on the next page, is that adopted for use in the European Standards for asphalt mixtures^{4, 5}. Surface course was previously known as wearing course, binder course was known as basecourse and base was known as roadbase.

A wide variety of asphalt materials for surfacing is available and several points need to be considered in selecting appropriate materials.



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i Is the surfacing to be porous or non-porous?

Both porous and non-porous surfacings can be provided, the porous materials usually being selected for situations where good surface water drainage falls (gradients) cannot be provided, e.g. where these would seriously affect play. Where good falls can be adopted, the non-porous materials can be used. Whichever surfacing is used, drainage considerations are important (see para c).

ii Severity of use

The non-porous Hot Rolled Asphalt mixes will prove generally more durable in heavy-duty situations, such as school playgrounds, where running, jumping and sliding can cause high shear stresses in the top of the surface course, or where occasional aggressive use is anticipated, e.g. by roller skates or skateboards. (Special surfacings, such as Mastic Asphalt which is outside the scope of this information sheet, may be necessary for areas designed specifically for the latter uses).

iii Is the surfacing to be laid by hand or machine?

Many small areas of surfacing, such as single tennis courts, are hand-laid but wherever possible machine-laying should be employed as a paving machine produces a more uniform and even surface finish and can cope more adequately with the stiffer, stronger surfacing materials that are less prone to softening in hot weather. However, it should be borne in mind that machine-laying requires an adequate depth and strength of base capable of supporting the paver and associated delivery vehicles.

iv Softening in hot weather

Open, medium and fine graded Asphalt Concretes complying with PD 6691³ particularly when intended for hand-laying, may contain a volatile oil to ensure good workability during laying. This can give rise to a degree of softening of the material in hot weather in its early life with consequent risk of damage under use. The problem can be exacerbated by under-compaction of the materials. Proprietary 'reduced-softening' asphalts, designed to lessen this problem, some incorporating latex or wax, are available.

The stiffer surface courses which utilise the harder grades of bitumen in their manufacture, i.e. dense and close-graded Asphalt Concrete and Hot Rolled Asphalt complying with PD 6691³, are less likely to be affected by softening.

v Special mixes

Asphalt Concretes and Hot Rolled Asphalts designed for lightly trafficked carriageways or footpaths, are usually satisfactory for sport/games areas, but special mixtures have been developed which may be more suitable for some situations. It is thus essential that the contractor should be given the fullest possible information regarding the purpose for which the area is required. This will include whether lorries can deliver materials within the site, the method of laying to be used (e.g. machine or hand) and the period likely to elapse between laying and use of the area, to enable him to consider the most appropriate materials for the circumstances.

N.B. Impact absorbent surfaces should be used in the vicinity of children's playground equipment, as recommended in BS 5696, Part 3⁶.

b Preparation

There should be adequate site access for materials to be delivered by lorry and to permit the use of a heavy roller and mechanical paver where the type of construction warrants their use. This is particularly important when the area being constructed is indoors or is a 'sunken' play area below normal ground level.

The formation should be prepared by removing top soil and vegetation down to the required depth and replacing obvious 'soft spots' with more satisfactory material. The formation should be graded to the required falls and then well compacted. A total weed killer should be applied to the formation if weeds have been growing on the site or there is the possibility of seed falling onto the exposed formation.

c Drainage

Adequate formation and subsoil drainage is important. Unless there is very efficient natural drainage away from the site, artificial drainage should always be provided.

To avoid ground water problems, particularly in very wet seasons, consideration should be given to installing some form of under-drainage. This might take the form simply of 'soakaways' connected to perimeter drainage. However, under porous constructions an adequate system of formation drainage should be provided, laid to falls of about 1.66% (1 in 60), to take away water which passes through the construction.

A cut-off ditch or drain to intercept surface water from any ground higher than the area being surfaced will also be necessary.

To ensure satisfactory removal of surface water, the paved area should be laid to adequate falls. For porous surfacings used on tennis courts and the like, relatively shallow falls can be adopted, but in view of the inevitable minor depressions present in any surfacing and the reduction of porosity of a porous surfacing that can occur with time, a minimum crossfall of 0.83% (1 in 120) is recommended. In the case of non-porous surfacings a crossfall of 1.25% (1 in 80) is preferred and will not seriously affect play. Where gradient is not critical from the point of view of play, an even greater crossfall of 1.66% (1 in 60) will ensure rapid and more complete removal of rainwater. Such steeper falls are generally used for school playgrounds and for Multi-Use Games Areas (MUGAS). More detailed guidance on drainage gradients is given in a Fields in Trust (formerly the National Playing Fields Association) document⁷.

d Sub-base

A sub-base is not normally necessary except over a clay subgrade when a 75mm layer of compacted material should be provided. Suitable materials are Types 1 and 2 unbound mixtures⁸ or other locally available materials of known satisfactory quality such as crusher run, hardcore and quarry scalplings. The material should be spread, shaped and well compacted to provide an even surface to the required levels and falls. Where a porous sub-base is required, an SHW Clause 805 Type 3⁸ (open graded) unbound mixture or equivalent will be required.

e Base

The base should consist of one of the following:

- i Hardcore, slag or broken stone laid to the required falls and thoroughly compacted and blinded to a thickness of 100-150mm.
- ii 32mm Asphalt Concrete (AC 32 dense base 100/150 or 160/220) complying with the requirements of PD 6691 Annex B laid to a compacted thickness of 75mm.
- iii 60% stone content Hot Rolled Asphalt (HRA 60/32 base 40/60) complying with the requirements of PD 6691 Annex C laid to a compacted thickness of 75mm.

f Binder course

The binder course should consist of either:

- i 20mm Asphalt Concrete (AC 20 open bin 160/220) complying with the requirements of PD 6691 Annex B laid to a compacted thickness of 45mm.
- ii 60% stone content Hot Rolled Asphalt (HRA 60/20 bin 40/60) complying with the requirements of PD 6691 Annex C laid to a compacted thickness of 45mm.
- iii 20mm dense Asphalt Concrete (AC 20 dense bin 100/150) complying with the requirements of PD 6691 Annex B laid to a compacted thickness of 50mm.

Note: In addition to the above, 14mm open graded (AC 14 open bin 160/220) is often used as a binder course material for tennis courts where porosity is required in the binder course layer.

Selection from the above materials should be made on the basis of type of surface course to be applied. For example binder course type ii or iii should be employed under Hot Rolled Asphalt or dense or close-graded surface course, but any of the binder courses may be used under other Asphalt Concretes. If a fully porous construction is desired, a porous surface course should be accompanied by an open graded binder course and by base i.

g Surface course

Proprietary forms of surface course, designed to remain porous, are available and these are often known as 'Tennis Court Toppings'. They are based on a 6mm Porous Asphalt complying with the requirements of BS EN 13108-7 (PA 6 surf) with the aggregate grading nominated by the supplier as there is no guidance provided in PD 6691 for Porous Asphalts.

An impervious surfacing will be provided by a 6mm Hot Rolled Asphalt surface course, complying with the general requirements of PD 6691 Annex C and BS EN 13108-4 but designated as a HRA 30/6 surf. This mixture incorporates 30% of a 6mm coarse aggregate or, where a particularly fine textured finish suitable for use by small children is required, containing no coarse aggregate and is then designated as HRA 0/2F surface course (the latter being previously known as asphalt sand carpet or sand asphalt).

A surface course which is initially pervious but will become relatively impervious under use is provided by a 4mm fine graded (AC 4 fine surf) or a 6mm medium graded surface course (AC 6 med surf).

A compacted thickness of surface course of 25mm is recommended for the AC 6 although a 15mm thickness will be adequate for the AC 4 fine graded. 30mm thickness is recommended for both the HRA 30/6 and HRA 0/2F mixtures.

A number of proprietary surface course materials of a maximum size of 3mm or 6mm have been developed for surfacing of play areas. These should be laid to a thickness and in the manner recommended by the manufacturers.

h Laying and compaction

A high degree of skill is required both in the setting out and in the laying of the materials in the various layers of the construction and it is strongly recommended that all such work be carried out by specialist laying contractors. Laying of materials should generally comply with the requirements and recommendations of BS 594987⁹ which is applicable to the transportation, site preparation, laying and compaction of hot Asphalt mixtures in the UK.

Accuracy of level on the finished surface is particularly important, and to ensure this, the tolerance on the binder course should not be greater than that required in BS 594987⁹. Wherever possible and where the strength of underlying layers permits, surfacing layers should always be laid by mechanical paver in preference to hand laying. Smaller versions of the normal road paving machines (mini-pavers) are available for spreading asphalt materials in these situations if the underlying construction or layout of the site cannot accommodate the normal-size machine. Where hand-laying is employed, it is advisable for the surface course to be laid to forms set to the required levels.



i Maintenance and aftercare

The formation and the subsequent layers of construction should each be compacted by the heaviest roller permitted by site conditions. In no case should a heavier roller be used on the surfacing than on any of the layers preceding it.

Asphalt surfacings laid on roads receive their final compaction from the rolling action of vehicles but on games areas this does not occur and thorough compaction at the time of laying is essential with the heaviest roller that can be supported by the construction. It is essential that all materials are rolled and compacted while in a workable condition. Rollers should have smooth-acting reversing mechanisms to prevent damage to the surfacing. Rolling should continue until the equipment leaves no marks when passing over the material. Any material not accessible to the roller should be adequately compacted by the use of a vibrating plate compactor or by hand tamping.

Asphalt surfacings, if satisfactorily specified, laid and compacted, provide very durable, all-weather sport/games area surfacings requiring little maintenance. The softer forms of surface course (generally hand-laid 4mm fine graded (AC 4 fine surf) and 6mm open and medium graded asphalts (AC 6 open and med surf) can 'liven-up' during hot weather in their early life while the volatile oils used to provide workability during laying are evaporating. If play continues on a surfacing in this condition marking can arise. Use of a cold water sprinkler may provide a temporary solution. It should also be recognised that these same materials are not resistant to heavy point loadings (e.g. chair feet or edges of roller skates) and if such use is regularly envisaged, Hot Rolled Asphalt⁵ or Stone Mastic Asphalt¹⁰ surface courses are advised as these are more resistant to such loadings.

Any accumulations of debris and detritus, such as mud, leaves or grit, should be regularly removed from the surface by gentle brushing.

Sometimes weed and grass growth may develop, particularly at perimeters of a paved area. This should be treated with a suitable weedkiller as soon as it appears. Weeds or grass should not simply be pulled up as this could disrupt the surfacing.

Asphalt bases beneath synthetic sports surfacings

Synthetic sports surfaces are frequently used for athletics tracks and other specialised applications. These are often constructed along the lines shown in the preceding sections; in many cases asphalt bases are appropriate.

As already mentioned, detailed guidance on the selection of asphalt bases to be used beneath synthetic materials cannot be given here as each proprietor has his own ideas on the specification required. The following general points are, however, worth noting:

a Synthetic surfacings that are impervious can trap vapour beneath them and any resultant vapour pressure build-up will interfere with the bond between surfacing and substrate. Volatile oils used in cutback Asphalt Concretes can lead to this problem and most synthetic surfacing manufacturers therefore stipulate that any asphalt substrates used beneath their impervious products should not contain such oils. This problem has been known to arise even in the case of pervious synthetic surfacings. As will be appreciated, asphalts that do not contain flux oils normally require to be laid by mechanical paver, which in turn dictates a strong and adequate base.

b Tolerances on the surface finish that can normally be expected to be achieved with Hot Rolled Asphalts and Asphalt Concretes are contained in BS 594987⁹. Considerably tighter tolerances are often specified by proprietors of synthetic surfacings, a common requirement being for a maximum 3mm gap under a 3 metre straight-edge. This is an extremely onerous requirement, normally only achievable by the use of a mechanical paver fitted with sophisticated level controls, and then not without some difficulty. It is not likely to be achievable with hand-laying.



References

Important: When referring to any of the documents listed it is essential to check that it is the latest/current edition of that document. This can be readily confirmed by checking the currency of the document on the appropriate website.

- c Where an adhesive is to be used to stick a synthetic surfacing down onto an open-textured asphalt, the question of adhesive loss by drainage into the asphalt should be raised with the proprietors.
- d If any shrinkage of the synthetic surfacing or its adhesive occurs after laying, this can produce undue stresses on asphalt substrates and, in the case of the softer open or medium-graded types of Asphalt Concrete, can lead to destruction of the interlock of the aggregate particles, resulting in curling of the synthetic surfacing at the edges. Use of the stiffer asphalt materials, dense or close graded Asphalt Concrete and Hot Rolled Asphalt, will reduce this risk.

- 1 **Fields in Trust**, Ground Floor South, 100 Christian Street, London E1 1RS.
- 2 **Code of practice for the Construction and Maintenance of Tennis Courts**. Sports and Play Construction Association (SAPCA), Federation House, Stoneleigh Park, Warwickshire CV8 2R. www.sapca.org.uk
- 3 PD 6691 - **Guidance on the use of BS EN 13108 Bituminous Mixtures - Material specifications**. BSI, London.
- 4 British (European) Standard BS EN 13108-1 **Bituminous mixtures - Material specifications - Part 1: Asphalt Concrete**, BSI, London
- 5 British (European) Standard BS EN 13108-4 **Bituminous mixtures - Material specifications - Part 4: Hot Rolled Asphalt**, BSI, London.
- 6 British (European) Standard BS 5696: Part 3: **Code of practice for installation and maintenance of play equipment**, BSI, London.
- 7 Fields in Trust - **Design and Maintenance for Outdoor Sports Facilities**. www.npfa.org/what_we_do/our_work_programmes/publications.php
- 8 Design Manual for Roads and Bridges, Volume 1 **Specification for Highway Works Clause 803 Type 1 and Clause 804 Type 2 unbound mixtures, and Clause 805 Type 3 (open graded) unbound mixture** HMSO, London. www.standardsforhighways.co.uk/mchw/index.htm
- 9 British Standard BS 594987 **Asphalt for roads and other paved areas - Specification for transport, laying and compaction and type testing protocols**, BSI, London
- 10 British (European) Standard BS EN 13108-5 **Bituminous mixtures - Material specifications - Part 5: Stone Mastic Asphalt**, BSI, London
- 11 **BSI website for the purchase of European and British Standards and Public Documents**. www.bsiglobal.com/upload/Standards%20&%20Publications/shop.html

Information sheets in this series

- 1 The construction and surfacing of car parking areas including private drives and permeable hardstandings
- 2 The construction and surfacing of parking areas for medium and heavyweight vehicles
- 3 Resurfacing of roads and other paved areas using asphalt
- 4 Decorative and coloured finishes for asphalt surfacings
- 5 Choosing a surfacing contractor
- 6 Asphalt surfacings for high stress areas
- 7 Use of asphalt in the construction of games and sports areas
- 8 Farming applications of asphalt
- 9 Miscellaneous uses of asphalt
- 10 Airfield uses of asphalt
- 11 Construction and surfacing of footways and cycleways using asphalt
- 12 European Asphalt Standards and their application in the UK.

Booklet

'What's in a Road?'

A general review of pavement construction and the different materials that are used for the construction and maintenance of asphalt roads.

Enquiries for orders for 'What's in a Road?' should be addressed to the Mineral Products Association, details on next page.

Topics in Asphalt

- Asphalt - Road materials with quality
- Roads are 'green' with asphalt

Publications

Apart from this and the other information sheets and booklet dealing with uses of asphalt and pavement construction, a range of other publications is available from the Mineral Products Association covering aggregate production and processing, lime, ready-mixed concrete, sand and gravel and slag. A full list of these publications may be obtained from the address shown on the next page.

Further advice

General advice on the use of asphalts may be obtained from the Mineral Products Association at the address given on this information sheet. For detailed guidance on any site-specific matter, advice should be sought from local specialist surfacing contractor members of the Mineral Products Association.



The Mineral Products Association is the trade association for the aggregates, asphalt, cement, concrete, lime, mortar and silica sand industries.

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