

asphalt

applications

10



Airfield uses of asphalt



Asphalt
Information
Service

Introduction

Most of the world's paved roads are surfaced with asphalt*, which gives good performance and durability under the most heavily trafficked conditions. These materials are also widely used in the construction of hard standing and parking areas for both light and heavy vehicles. They are therefore eminently suitable for use in the construction and surfacing of access roads, perimeter roads and vehicle parking areas on airfields.

** 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.*

N.B. The terminology used in this guide for the structural elements of the pavement is that adopted for use in European Standards. Surface course was previously known as wearing course, binder course was known as basecourse and base was known as roadbase.

The principle document for reference and guidance on the application and specification of asphalt when used in the UK is Published Document PD 6691¹. This document interprets the requirements of the European Standards for Asphalt^{2,3,4} which cover the three main mixture types used in the UK. Under the methodology of European Standard mixture specification it is the asphalt suppliers responsibility, utilising the guidance from PD 6691¹ to determine and declare the specification against which the asphalt mixture will be produced.

In addition to these uses, asphalt mixes are widely employed in the surfacing of runways and aircraft handling areas on a wide range of airfields, from international airports regularly used by the heaviest airliners, through military airfields carrying high performance jet aircraft and the smaller domestic airfields regularly used by light or medium aircraft to the smallest private airfield used by light single-seat aircraft.

In the United Kingdom, the construction and surfacing of military airfields is the responsibility of the Ministry of Defence, whilst responsibility for the civil airports rests with the British Airports Authority or municipal authorities. These organisations have their own standard specifications for this type of work^{5,6,7}.

This information sheet does not set out to deal with these major airfield situations but to give guidance to those responsible for the maintenance of the many smaller airfields in the UK, ranging from those managed by local authorities and carrying domestic air traffic, to the smaller air-strip of the local flying club or private business.



General considerations

Without hard paving, access may be difficult to the airfield, flying may be restricted in inclement weather or the facilities may not come up to the minimum standards required by the regulatory authorities for passenger carrying aircraft. The following areas on a typical airfield are likely to require hard paving:-

- runways
- taxi-ways providing access to runways
- aircraft parking, re-fuelling or servicing aprons
- hanger floors
- car, bus or commercial vehicle parking areas
- access roads
- edge drainage (French Drains) for runways and taxiways

In each of these areas different considerations apply. For example, runways require good skid resistance and surface water drainage for good braking, an even surface regularity to ensure passenger comfort and minimum risk of damage to delicate electronic components and adequate strength to support the high wheel-loadings of modern aircraft. Where jet-engined aircraft operate, freedom from loose particles is an additional, essential requirement to avoid the expensive damage that can be caused to jet-engines from ingestion of foreign objects (known as Foreign Object Damage or FOD). This term may also be used for "Foreign Object Debris" when referring to any detritus or loose particles on or near to runways or taxiways.

For aircraft parking areas the main requirement is adequate stability under high wheel-loadings; for paved areas where aircraft will undergo re-fuelling and servicing, the principal considerations are adequate stability



Vehicle parking areas

under wheel-loads and heavy point loads from maintenance machinery as well as good resistance to oil and fuel spillage.

European Standard asphalt mixtures are very suitable for some of these applications but less suitable for others. Proprietary surfacings have been developed for situations where traditional asphalts are likely to be unsuitable. Apart from cement/polymer-grouted open graded Asphalt Concrete mixtures a number of proprietary thin asphalt surfacing treatments as well as Stone Mastic Asphalt (SMA) have been developed which may well be suitable alternatives.

The various situations are dealt with in more detail in the following notes:

The thickness and types of material normally used in the various layers of the construction of vehicle parking areas are described in Information Sheets No.1 "The construction and surfacing of car parking areas and hardstandings" and No.2 "The construction and surfacing of parking areas for medium and heavyweight vehicles". Copies of these are available from Mineral Products Association at the address given on this information sheet.

Access roads

The type of construction to be adopted for access roads on airfields will depend on the severity of their use. For roads carrying heavy traffic, the designs specified by the Highways Agency in their "Pavement Design Manual"⁸ will be appropriate. Where relatively light use is to be encountered, the design guidelines used by the local highway authority for their housing estate roads might well be appropriate.

(N.B. Any footways on airfields can also be constructed according to these local design guidelines).

Hanger floors

Hanger floors can be subjected to extreme severity of use in the form of heavy point loadings and regular spillages of grease and oil. This can give rise to serious damage to normal asphalt surfacings and these are therefore not recommended for this type of flooring. Special proprietary materials, eg, epoxy asphalt or sand/cement/polymer grouted asphalts, or alternative forms of construction such as concrete, will be more appropriate.

Aircraft parking, re-fuelling and maintenance areas

Where re-fuelling or maintenance operations are to be undertaken, the same considerations apply as for hanger floors. However, where areas are simply intended for aircraft parking, high-strength design mix asphalts and high-stone content Hot Rolled Asphalts have been used for the purpose and should prove satisfactory. Where a degree of oil resistance is required asphalt mixes containing proprietary oil-resistant binders should be considered. Where the larger aircraft are involved, epoxy asphalt may well prove the most suitable surfacing.

Taxi-ways and runways

Taxi-ways and runways both need to be constructed with sufficient strength to carry the moving aircraft but from the surfacing point of view the difference between the two is that runways require a higher degree of resistance to skidding and aquaplaning in view of the higher speeds involved. One means of achieving the latter, now employed on many major runways in the UK, is to use an open-graded Porous Asphalt surface course traditionally known as Porous Friction Course⁶ as the running surfacing. This acts as a drainage layer to prevent surface water adversely affecting aircraft tyre grip on the surfacing in wet weather.

Beneath the Porous Friction Course a strong impervious binder course of Hot Rolled Asphalt or a dense Asphalt Concrete known as Marshall Asphalt⁷ is required laid to adequate falls. Alternatively the new surface course may be laid directly on an impervious existing surfacing

When resurfacing work is being undertaken on runways, it is essential that the existing surfacing is of good regularity and laid to adequate falls or the levels are corrected by applying an appropriate regulating layer. This is of particular importance if a Porous Friction Course is to be applied and ensures that water is not held in the new surfacing to lead to heavy ice formation in winter.

Edge drainage

Where relatively light aircraft are involved standard road surfacing materials, namely Hot Rolled Asphalt, close-graded/dense Asphalt Concrete or Stone Mastic Asphalt specified using the guidance from PD 6691¹ and the appropriate European Asphalt Standard will provide good durability and adequate performance. If Hot Rolled Asphalt is employed, a 35% stone content mix without the application of pre-coated chippings should give good performance and durability.

A Porous Asphalt mixture described as a Pervious Macadam in the Defence Estates Specification 125, is used alongside runways and taxiways as a means of facilitating drainage of the rainwater from the surface. The material utilises a 32mm sized aggregate which after compaction leaves a larger number of interconnecting voids allowing the water to permeate into the French Drain whilst reducing the risk of FOD from loose aggregate particles at the surface.

Laying considerations

Laying asphalt on airfields generally follows the same methodologies and procedures as are recommended in British Standard BS 594987⁹ for the materials. One point to be borne in mind when laying open-graded Porous Asphalt surface courses on runways is that longitudinal joint painting will form a barrier to water draining sideways through the material and could thus reduce its effectiveness. Such painting should therefore be avoided and other methods for forming longitudinal joints should be employed, ie, joint heating or echelon paving.

Getting the job done

In view of the specialised nature of some of the materials laid on airfields and the skill needed for their satisfactory laying, it is strongly recommended that laying is entrusted only to specialist surfacing contractors with the appropriate plant and expertise. Details of such contractors in any particular area of the UK who are members of the Mineral Products Association are available from the address given on this information sheet.



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.

- 1 PD 6691 - **Guidance on the use of BS EN 13108 Bituminous Mixtures - Material specifications.** BSI, London.
- 2 British (European) Standard BS EN 13108-1 **Bituminous mixtures - Material specifications - Part 1: Asphalt Concrete,** BSI, London
- 3 British (European) Standard BS EN 13108-4 **Bituminous mixtures - Material specifications - Part 4: Hot Rolled Asphalt,** BSI, London.
- 4 British (European) Standard BS EN 13108-5 **Bituminous mixtures - Material specifications - Part 5: Stone Mastic Asphalt,** BSI, London
- 5 Defence Estates Specification 012 - **Hot Rolled Asphalt and Macadams for Airfields.**
- 6 Defence Estates Specification 040 - **Porous Friction Course for Airfields.**
- 7 Defence Estates Specification 013 - **Marshall Asphalt for Airfields.**
- 8 Design Manual for Roads and Bridges, Volume 7 - Section 2 **Pavement Design and Construction,** HMSO, London. www.standardsforhighways.co.uk/dmrb/vol7/section2.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 13108-7 **Bituminous mixtures - Material specifications - Part 7: Porous Asphalt,** BSI, London. PD 6691: Asphalt.
- 11 **Decorative and coloured finishes for asphalt surfacings,** Information Sheet 4, Mineral Products Association, London.
- 12 **BSI website for the purchase of European and British Standards and Public Documents.** www.bsiglobal.com/upload/Standards%20&%20Publications/shop.html
- 13 **Defence Estates website for the purchase of Functional Standards and Specifications.** www.defence-estates.mod.uk/publications/functional_standards/fs.php

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.

Mineral Products Association

Gillingham House
38 - 44 Gillingham Street
London SW1V 1HU
Tel +44 (0)20 7963 8000
Fax +44 (0)20 7963 8001
mpaasphalt@mineralproducts.org
www.mineralproducts.org



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