

## POROUS COURT SURFACES GUIDANCE NOTE

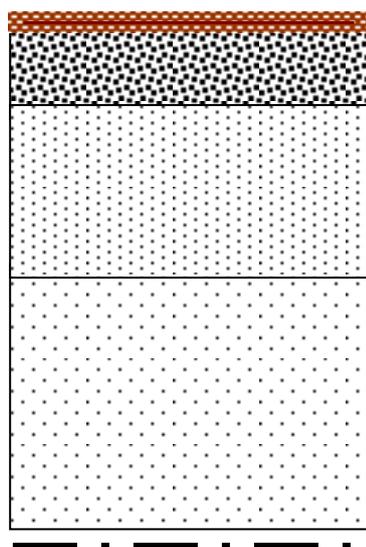
The LTA promote the use of all year round court surfaces for competition, recreational and community tennis. There are 3 main types of surfaces for all year round play these being macadam, artificial grass and artificial clay. There are many variants for each of these surfaces and this guidance note provides general advice on specification and construction details. It is recommended that before a venue selects a surface that they player test a range of options so that they can select the relevant surface for their venue. This guidance note provides general guidance on each of the surfaces. If more detailed construction information is required then please refer to the Sports and Play Contractors Association (SAPCA) tennis code of practice.

### POROUS ASPHALT (MACADAM)

Porous Asphalt is a porous surface that remains a very popular surface representing approximately 80% of courts in the UK. Porous Asphalt can be played on in most weather conditions for twelve months of the year and the life expectancy is typically ten to twelve years depending on method of construction, quality of drainage, extent of use and the care and maintenance given to the court.

Most porous Asphalt tennis courts consist of a frost resistant, permeable foundation of broken graded carboniferous limestone or granite aggregate on which is laid a two-layer system (65mm recommended depth) of open grade modified bitumen Asphalt. This forms the surface course or playing surface and binder course which improves the strength of the court. The surface course shall be coated with a coloured polyurethane or acrylic based paint. Playing lines are painted onto the coloured surface using a paint with the same specifications as that used for the entire playing area.

#### Minimum Design Requirements



Acrylic or polyurethane Colour Coat (see Surface Coating section)

25mm open grade porous asphalt **surface course** consisting 6mm diameter aggregate. Tolerance of surface course 8mm under a 3 metre straight edge.

40mm compacted **binder course** of 10mm, 14mm or 20mm open graded asphalt

Minimum 150mm compacted depth of 28mm diameter non-frost-susceptible, free draining **aggregate**  
Depth may need to be increased to suit local ground conditions

Geotextile membrane

Excavate to remove topsoil

Establish 1:200 fall to formation in a single plane long or cross fall.

Compact formation

#### Surface Coatings

These are usually acrylic, but can be polyurethane based, and contain carefully balanced quantities of slip-reducing agents to optimise foothold and ball bounce. Surface coatings are usually spray-applied and for best results should not normally be applied until the bitumen has hardened.

## Playing Characteristics

Playing Characteristics	
Ball-surface:	
Speed of court:	Slow
Height of ball bounce:	High
Trueness of bounce:	Almost uniform, however this will decrease with age of surface course
Ball spin:	
Topspin	Yes
Slice	Little
Player-surface:	
Footing:	Firm footing. (Foothold will inevitably be affected when the surface is damp or wet, especially in certain, usually transitory, conditions, such as heavy morning dew or light drizzle. A degree of care needs to be exercised by the players in these conditions).
Traction:	Non-slip
Player Comfort:	Non-shock absorbing (hard)

### How to look after the surface

Porous macadam requires little maintenance and no intensive upkeep is necessary. However, the surface needs to be kept clean and free from moss/algae. This can be achieved by sweeping or vacuuming the surface regularly, periodically power washing the surface and applying both moss and weed killer when required. The surface should be repainted every 5 years and should be resurfaced every 8 – 10 years. If the court requires resurfacing then the existing surface should be pierced at 450mm centres before a new layer of macadam is installed. Post construction the surface will still be slightly soft as the bitumen and surface coating achieve their final hardness. Caution should be applied when playing in hot weather as the courts may be susceptible to softening, especially in the first season after construction.

If a venue is looking to resurface its courts, then it is recommended that the venue seeks the advice of a professional court consultant to provide a specification for the works especially if the existing courts have suffered from subsidence, poor drainage or cracking. If the existing surface is in poor condition then the court might require a full rebuild which will consist of installing a new of stone foundation and two layers of macadam.

### Costs and Sinking Funds.

The cost of a Porous Macadam court is £35k - £45k dependent upon the specification and the number of courts being constructed. The sinking fund for a Porous Macadam court is £1200 per annum and this should cover the repainting of the court after 5 years and the resurfacing of the court after 8 years. The cost to install a single layer of macadam or paint is approximately £12.5k per court and a total reconstruction will cost approximately £35k per court.

## ARTIFICIAL GRASS

Artificial Grass is a carpet laid on top of a porous asphalt surface. There are 2 main types of artificial grass for tennis and these are tufted carpets or needle punch textile carpets. Tufted carpets are the most popular for tennis and are manufactured by looping the tufts into a woven mesh (primary backing) and then anchoring them in place by applying a backing compound (normally a latex screed). Drainage is provided by punching holes through the backing, normally every 100mm. The pile of a sand-filled artificial grass is quite flexible and is unable to stay vertical unless it is supported by a sand infill. The sand, of a

specifically selected size and shape, is brushed into the pile to the top of the surface of the carpet. The carpet is laid directly onto an asphalt base (as described in the porous macadam section).

Sand filled needlepunch is a wholly fibre based product, where layers of fibre are needled together to create a pile which can be tailored to alter the speed and playability of the surface. The unique benefits of the needlepunch surface are maximum porosity within a sports surface product, durable and hardwearing with a minimum sand content. The enhanced stability of the sand within the pile of the carpet means the surface requires less maintenance than sand filled artificial turfs and is less likely to be considered slippery in dry weather, when loose sand can move to the surface of all types of sand filled surfaces. The enhanced stability does, however, allow moss to become established more readily in the surface and this can be a problem on sites surrounded by trees etc.

There are three generic types of artificial grass: long, medium, and short pile. Typically for tennis medium or short pile yarn is used, which varies in height from 15mm to 10mm. The density/length of yarn and amount of sand fill will determine the speed or play and bounce characteristics.

Play-lines are most commonly permanently marked onto courts. This is most commonly done by using either inlaid lines, tufted lines or a combination of both. Inlaid lines are where a section of the parent roll of carpet is cut out and a line inserted. The line is manufactured from the same carpet as the main court, just in a different colour. Tufted lines are incorporated into the main carpet during manufacturing.

### Monofilament Yarns

Most synthetic grass carpet are produced with the carpet fibres being produced using what is known as a fibrillated yarn, this is a strip of yarn, typically 10mm in width which is split along its length to produce the individual fibres seen on its surface, these fibres have a tendency to fibrillate further during their life and can eventually begin to break up and mat down giving rise to changes in playing characteristics. Monofilament yarns use a different technology whereby individual fibres are extruded at around 1mm in width commonly known as monofilament fibres, these are grouped together to form the tufts which are then woven or tufted into the carpet backing. These 'monofilament' type carpet fibres generally do not begin to fibrillate until much further into the carpets life.

Playing Characteristics	
<b>Ball-surface</b>	
<b>Speed of court:</b>	Medium slow to very fast, according to type of product, age & condition
<b>Height of ball bounce:</b>	Medium to low
<b>Trueness of bounce:</b>	Variable depending on carpet design
Ball Spin	
<b>Topspin:</b>	Little
<b>Slice:</b>	Yes
<b>Player-surface</b>	
<b>Footing:</b>	Generally firm footing, but can have partial slide depending on type of product and condition.
<b>Traction:</b>	Mainly non-slip but can be variable and slippery when dry or badly maintained.
<b>Shock Absorption:</b>	Most sand-filled products have reasonable shock absorption qualities.

## How to look after the surface

Artificial Grass is considered a low maintenance surface however it is critical that:-

- the playing surface is kept scrupulously clean, to preserve its playing characteristics.
- the pile remains supported to prevent flattening leading to inconsistency in ball rebound, foot friction and poor drainage.
- the free drainage of surface water is maintained throughout the life of the court.
- the tennis court should look attractive and well kept at all times.

These objectives are achieved by:

- Regularly sweeping leaves and other detritus from the surface.
- Regularly weekly brushing to freshen the fibre surface, counteracting any slight sand drift or compaction and tendency to form an impervious skin on the sand surface that might impair drainage.
- Applying prophylactic treatments of moss killer and/or algaecide.
- Checking sand levels on a monthly basis.

## Brushing

Brushing the surface is a crucial operation if premature loss of pile and deterioration in drainage is to be prevented. Apart from freshening the look of the surface (rather like a lawn mower making stripes on a lawn), the purpose of regular and fairly vigorous brushing is to prevent the formation of a compacted and impervious skin on the top of the sand layer which will inhibit drainage and encourage moss and algae.

Brushing by hand is basically ineffective and hard work. A selection of mechanical brushing machines is now available which will speed up and lighten the operation and these are recommended at tennis venues where there are several courts. The manufacturer or installer of the carpet should always be consulted on how to main the court and the machinery required. The use of a small **mechanical tractor** with weighted drag brush is strongly recommended for the best long-term performance.

## Costs and Sinking Funds.

The cost of an Artificial Grass Court is £50k - £60k per court dependent upon the specification and the number of courts being constructed. The recommended sinking fund for an artificial grass court is £1800 per annum which will allow for the replacement of the carpet after 8 years.

## ARTIFICIAL CLAY

The majority of Artificial Clay is a tufted polypropylene or polyethylene synthetic carpet that is laid on a porous asphalt surface which is filled with an aggregate to provide a playing surface that allows slide and, depending on the infill type used, also replicate the ball pace and spin characteristics of traditional European Clay. The benefit of most Artificial Clay products are that whilst providing similar characteristics to traditional clay courts, the surfaces allow opportunities for winter play and a reduced level of maintenance compared to traditional clay surfaces. Products using coated or heat treated sand infill do not require irrigation systems and can be used throughout the year. Products incorporating traditional red clay infill (brick dust) do require watering; to keep the surface in the best possible condition; courts with these products are commonly designed with inbuilt sprinkler systems that can be controlled automatically by computers, thus reducing the need for extensive levels of work by ground-staff. This type of surface is not as common as the sand based system. It is recommended that venues player test a range of options and speak to venues about the maintenance of the surface.

## What is it made of?

Where-as sand filled synthetic turf products are designed so the synthetic turf carpets are filled to within 1mm-3m of the top of the carpet pile, artificial clay products are overfilled with infill to allow the sliding capabilities that are experienced on a clay surface. The aggregate fillings used by these products vary, some products are actually filled with crushed brick dust (traditional European Clay) whilst others are filled with a coated or heat treated coloured rounded sands.

Playing Characteristics	
Ball Surface	
Speed of Court:	Slow – Medium (surfaces with brick dust infills being slower than those with sand infills)
Height of Ball Bounce:	Medium
Trueness of Bounce	Almost consistent – providing infill levels are maintained
Ball Spin	
Topspin	Yes
Slice	Yes

Player Surface	
Footing:	Sliding
Traction:	Non Slip
Shock Absorption:	Medium-Soft

As there are many different designs of carpet and an even greater number of manufacturers of artificial clay it is important that when considering which clay to choose that information regarding the products performance and durability is sought. This can be requested in a specification for the works, so that all the information is provided by contractors at the time the works are tendered. Two important factors are that the surface has an ITF (International Tennis Federation) court pace rating certificate and that the surface has been tested to *and* meets the requirements detailed in EN 15330 for a surface primarily used for tennis. The quality of the infill (especially when selecting heat treated and coated sands) is fundamental to the long-term performance and appearance of the surface. Poor quality coated sands can abrade quickly and the resulting dust and debris can result in hardening of the surface and a significant reduction in water permeability rates; resulting in surface flooding. It is therefore recommended that sands of proven quality are used and that they satisfy the following criteria:

Infill	Colour	Terracotta / brick red
	Particle grading (BS EN 933 - Part 1)	0.2mm – 1.0mm and within $\pm$ 20% of manufacturers specification
	Particle shape (BSEN 14955)	Sub-round or round
	Colour retention over five years	> Grey scale 3
	Resistance to friability (NF-P 18-576)	< 30
	Water permeability (BSEN 12616)	> 500mm/h

The court should incorporate an upstand of at least 50mm in height to the perimeter edging when built from new. For existing courts a wooden kick board may be incorporated to the base of the perimeter fencing in order to prevent the clay infill from spilling over the edge of the court block.

### How to look after the surface

Artificial clay surfaces require maintenance and it is critical that:-

- the playing surface is kept scrupulously clean, to preserve its playing characteristics.
- infill levels are maintained at the contractors specified depth and are uniform across the whole court area, including run-backs and side-runs.
- the carpet pile remains supported to prevent flattening leading to inconsistency in ball rebound and poor drainage.
- the free drainage of surface water is maintained throughout the life of the court.
- the tennis court should look attractive and well kept at all times.

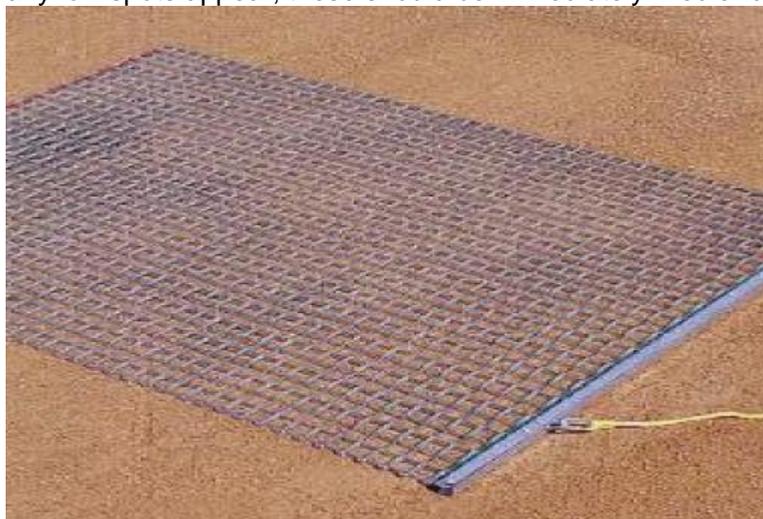
These objectives are achieved by:

- Drag matting the surface after every game, as you would on a clay or shale court
- Shovelling up the excess build up of dressing at the outer perimeter or net line and re-distributing to the main playing area
- Regularly sweeping leaves and other detritus from the surface
- Every 6 months check for moss and algae and treat as appropriate. It is recommended that all the courts have moss and algae treatment annually over the whole court surface.

### Drag matting

To ensure true and consistent playing characteristics the infill levels need to be maintained at the surface manufacturer's specified depth across the whole court. Failure to do this will result in areas that allow slide and areas that do not, which can be hazardous to players, and also result in inconsistent ball characteristics.

In order to achieve this, after each session of usage the court surface should be dragged both horizontally and laterally with a drag mat by hand. Drag mats usually comprise of a 6.5 x 5 foot PVC fabric net which is attached to either a wooden or aluminium rail. The mat allows the clay surface to be smoothed by the rail and then evenly distributed by the net. With a width of 6.5 feet, the front PVC mat smooths the unevenness and slide traces, while the back net smooths the covering of the court. Should any low spots appear, these should be immediately filled and smoothed out.



Example of a Drag Matt

More robust drag matting or brushing to prevent the compaction of the infill can be undertaken using a mat pulled behind a mini-tractor. This would be undertaken on a weekly basis.

### Rejuvenation

The majority of the artificial clay surfaces are designed so that the top of the playing surface is mobile, so that the players can slide. Regular dragging of the surface ensures that the surface remains mobile. As the court ages, the layers under the top surface / carpet will begin to compact, which will in turn lead to the base of the infill compacting. Therefore it could be beneficial for venues to look at rejuvenating the sub-base and the infill after around 5-6 years of usage in order to allow the court to achieve optimum performance.

### Costs and Sinking Funds.

The cost of an Artificial Clay Court is £50k - £65k per court dependent upon the specification and the number of courts being constructed. The recommended sinking fund for an artificial grass court is £1800 per annum which will allow for the replacement of the carpet after 8 years.

## DIMENSIONS & COURT BLOCK SIZES

The following court sizes have been taken from the rules of tennis that were issued by the International Tennis Federation.

	<b>Recommended</b>	<b>Minimum</b>
Length	23.77m (78'0")	23.77m (78'0")
Width (doubles)	10.97m (36'0")	10.97m (36'0")
Width (singles)	8.23m (27'0")	8.23m (27'0")
Length of net (doubles)	12.80m (42'0")	12.80m (42'0")
Width of white lines (included within court size)	0.05m (2.0")	0.05cm (2.0")
Width of baseline	0.1m (4.0")	0.1m (4.0")
Runback (depth clear behind baseline at each end)	6.40m (21'0")	5.49m (18'0")
Side run (width clear beside sideline each side)	3.66m (12'0")	3.05m (10'0")
Side run between courts not separately enclosed	4.27m (14'0")	3.66m (12'0")
3 court block (width)	48.77m	46.33m

### Court Block Sizes

	<b>Recommended (Indoor* &amp; Outdoor)</b>		<b>Minimum (Outdoor only)</b>	
	<b>36.58 (m)</b>	<b>120 (ft)</b>	<b>34.75 (m)</b>	<b>114 (ft)</b>
<b>Width</b>				
1 court	18.29	60	17.07	56
2 courts	33.54	110	31.70	104
3 courts	48.77	160	46.33	152
4 courts	64.01	210	60.96	200
5 courts	79.24	260	75.59	248
6 courts	94.47	310	90.22	296

## FENCING

There are three main types of fencing available to install around the perimeter court block. These being chain link, roll weald mesh and rigid panel. When choosing which type of fencing to install, venues should consider cost, security/openness of the court block, windbreak use and surrounding landscape.



Chainlink fencing on tubular posts.

### Chain Link Fencing

This fencing should comprise 2.75m high x 50mm x 3.25/2.50mm gauge, galvanised core, green plastic coated chainmesh suitably threaded or clipped with rust resistant clips to green plastic coated line wires (galvanised core) to the external perimeter of the court. The fencing is connected to either angular or tubular posts, with tubular posts now being the most common because they are stronger and more likely to be able to install windbreaks if top and bottom tubular supports are used. Chain-link fencing is considered to be the cheaper option with costs starting at £110 per metre run with tubular posts.



Roll Weld Mesh Fencing on Tubular Posts.

### Roll Weld Mesh Fencing.

This type of fencing offers a more secure option and is mostly found in park sites. The fencing is more durable than weldmesh and often utilise hollow section posts, which offer a good level of stability, tubular posts can still be used with this type of fencing. Weld mesh fencing should comprise 2.75m high by 50mm x 3.50/3.00 gauge, galvanised core, green plastic coated roll weld-mesh suitably threaded and clipped with stainless steel clips to seven high tensile steel galvanised line wires. Weld mesh fencing costs start at £130 per metre run.



Rigid panel weld mesh fencing

#### **Rigid Panel Weld Mesh Fencing.**

This type of fencing is becoming more popular at sites where durability is essential. The fencing is the strongest available and the most secure type of fencing available. It is commonly used at park sites and on multi use games areas. The fencing, usually 3metres high, is attached to hollow section postings and offers a strong level of durability. The strength of the fencing and the posts, results in the fencing being suitable for windbreak use. Rigid panel fencing costs start at £150 per metre run.

## **PLANNING CONSENT**

Resurfacing courts does not normally require planning consent however it is worth checking with the Local Authority that planning consent is not required if a venue is changing the construction, colour or level or the surface. If installing new or replacing fencing then this could require planning permission and it is worth checking with the Local Authority if planning permission will be required.

## **HOW TO APPROACH YOUR PROJECT**

If you are looking to build a new court or renovating an existing court then the following steps should help in installing a new surface:

1. It is recommended that venues player test a range of surfaces and speak to venues who have installed the surface to obtain their experiences of playability and maintenance.
2. It is recommended that venues engage a tennis court specialist to undertake a review of the site to see if the courts can be built to the required standard and to make sure that the foundation is adequate to install the surface. This should include soil samples for a new court to ascertain what foundation depth of stone will be required or foundation samples of the existing court to see if the current foundations are adequate for a new court surface.
3. After a site visit the court specialist will then be able to provide a specification in which the club can use to tender the project.
4. The LTA recommends that the project should be tendered to 3 or more SAPCA contractors for the works.
5. The venue to appoint the contractor and manage the works. If specific elements of the court construction have been specified such as slip resistance or pace then further testing by a tennis court specialist can undertake these works.

## **OPERATIONAL CONSIDERATIONS**

Adding a new porous court surface should enable the venue to attract new players to the venue and therefore the operation of the venue should be reviewed alongside the new surface to change the operation of the venue by installing a gate access system or potentially increasing revenue by offering different coaching opportunities to enable more people to access the facility. The LTA recommends that all venues become part of the LTA Rally program which enables players to be able to book courts remotely and access the facility.