ARTIFICIAL GRASS

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

Contents

Introduction

The demand for better facilities that can be used throughout the year has led to the development of a range of synthetic sports surfaces of which synthetic grass has become one of the most widely used and well accepted. Whilst it is recognised that synthetic grass tennis surfaces have limitations in use for coaching and for high-level play, the dramatic rise in the number of courts installed during the 1990s is evidence of the surface's popularity with many players.

Long Pile

Until the early 1990's the large majority of synthetic grass tennis surfaces installed for outdoor use in the UK were sand-filled tufted carpets with pile heights traditionally in the range of 18 to 23mm and with densities of between 20,000 and 30,000 tufts per square metre. These early forms of synthetic grass relied upon a particulate or granular fill to be introduced into the carpet to support the pile and to form a major part of the playing surface. The fill material, usually sand, had a number of advantages; it allowed the ball bounce characteristics to be varied; it helped to support the pile of the carpet, therefore enabling the quality of the playing surface to be more consistent over a longer period of time; it assisted the drainage of the surface; and it reduced the overall costs of an installation.

Medium Pile

It was the sand, however, that was identified as the cause of some of the surface's playing deficiencies - particularly an inconsistent and low bounce. This encouraged manufacturers during the early 1990s to develop shorter, denser carpets; initially 15mm in height with approximately 40,000 tufts per square metre – commonly referred to as medium pile today. These surfaces proved to be popular at many places to play for two main reasons; a slightly higher, more consistent ball bounce.

Short Pile

The success of the medium pile carpets led some manufacturers to continue the trend towards even shorter carpets. An increasing number of short pile carpets are now on the market. These typically have 10mm pile heights and pile densities of between 45,000 and 65,000 or more tufts per square metre. The carpets are still sand-filled, but inevitably require less sand than other products. The shorter pile height generally also allows the pile to be stiffer, offering more resistance to a ball as it strikes the surface, resulting in a slower surface pace.

Synthetic grass carpets are generally of a higher standard now than they were during the early 1990s. Better polymers have been developed to produce harder-wearing and longer-

lasting fibres, and more attention has been paid to the choice of sand used, following the early problems of compaction and drainage. Being a permeable surface, synthetic grass can be played on in most weather conditions, and can be used for twelve months of the year.

Short pile carpets should only be installed above 6mm diameter open grade surface.

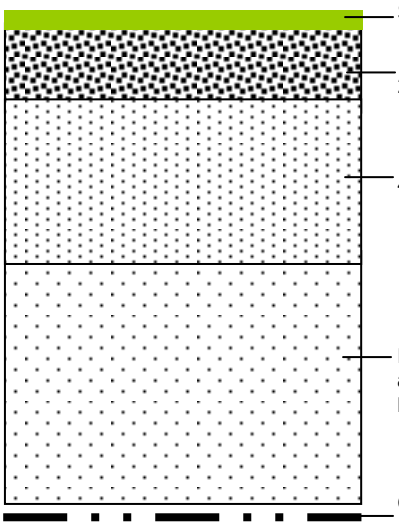
Monofibulant Yarns.

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. A small number of carpets are now available which 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.

What is it made of?

A synthetic grass court is basically a tufted synthetic carpet laid on a base usually constructed from porous macadam. Installation of the base is critical if the court is to perform satisfactorily for the duration of its life, and the specification used should be tailored to the individual site. The carpet is loose laid in pieces, and seamed, either by sticking or gluing to a backing tape.

Minimum Design Requirements



Sand filled grass carpet

25mm open textured aggregate porous macadam

40mm compacted depth binder course porous macadam

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

Geotextile membrane and draining system if required

Excavate to remove topsoil
Establish 1: 200 fall to formation in a single plain cross fall or lengthways compact formation

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

Carpets are produced in a range of widths, usually between 4.0m or 5.0m. The greater the carpet width, the lower the number of seams required in the court, which reduces the risk of premature failure of the surface.

The playing lines are nearly always permanently inlaid, and can either be incorporated into the carpet during manufacture, or cut and glued into the surface once it has been laid. The overall layout of the carpet sections should be carefully designed, especially when lines are to be introduced during manufacture, to ensure that the finished surface is acceptable both aesthetically, and in terms of its performance. Surfaces are increasingly being laid in kits, rather like jigsaw puzzles, which reduces the installation time required.

Sand infill

Once the carpet has been installed, dry weather conditions are required to fill the surface with sand. The choice of sand itself is vital if the court is to perform well. Many of the earlier surfaces experienced over-compaction and pollution of the sand, which led to drainage problems, and so these days larger rounded sand particles are usually preferred.

Typically, installers will recommend filling the carpet with sand to within 2 or 3mm of the top of the pile, but in practice this can be seen to vary considerably. Different players may also have their own preferences for the level of sand maintained, according to the playing characteristics and the visual appearance required.

During the first few months of a courts life, the sand will compact to some degree, and should be topped up as necessary. It is important that not too much of the pile should be exposed, as otherwise it will flatten and can then be very difficult, if not impossible, to raise. This can cause excessive wear and tear of the fibre, and reduce the life of the carpet. Correct on-going maintenance is also vital to keep the surface in optimum condition (see How do I look after it?)

Important considerations when choosing and installing synthetic grass.

As there are many different designs of carpet and an even greater number of manufacturers of synthetic grass it is important that when considering which grass 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 or investigation into the type of surface can be undertaken before tendering. The 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. These requirements should be written into the scope of works for the works.
Given the range and different types of surface within the market place the above information is essential together with play testing in order to allow's places to play to make an objective comparison of surfaces available.

Due to the globalisation of carpet manufacture it is likely that some surfaces will be manufactured outside of the EU area. It is important for the place to play to request the above information from the proposed carpet manufacturer together with their formal warranty documentation and history of trading.

How does it perform for the player?

Since the mid-1980s there has been significant growth in both the range and installation of synthetic grass surfaces in clubs, with approximately 10% of all club courts now being synthetic grass. The surface has proved to be popular with many club players, mainly due to its shock-absorbing qualities, ability to allow play in "all weathers" and the surface's aesthetic appeal. However, the variation in speed and playing performance of, particularly long and medium pile, synthetic grasses (such as ball bounce), means that the surfaces are less well-suited for higher standards of play or coaching. It is, therefore, increasingly difficult to generalise about the characteristics of synthetic grass as a single type of surface, and it is very important that anyone choosing a synthetic grass court play tests all products under consideration.

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

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

Player Testing

It can be a difficult task to compare the quality and performance of the many different products currently available on the market. Prospective purchasers must rely largely on their own inspection and play testing of different courts, although this can also be difficult when comparing examples of surfaces of varying age and condition. Buyers should be particularly careful when play-testing older, well-worn installations of artificial surfaces, as the performance of courts can change significantly from when they were new.

Most court contractors act as agents for different manufacturers' products, and it is important to ensure that surfaces inspected are the same as those offered, as products may vary whilst still having the same trade name. An increasing number of manufacturers are now having their products assessed using test procedures adopted by the International Tennis Federation. Whilst not attempting to replace player evaluations this data does allow potential purchasers to make desktop comparisons of products to shortlist for further consideration.

How do I look after it?

The maintenance procedures are designed to ensure:

- The playing surface is kept scrupulously clean, to preserve its playing characteristics
- That the pile remains supported to prevent flattening leading to inconsistency in ball rebound, foot friction and poor drainage.
- That the free drainage of surface water is maintained throughout the life of the court.
- That 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 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.

Keeping the Surface Clean

Leaves, tree flowers, pine needles, and other detritus should not be allowed to remain on the surface for any length of time. If this happens they rapidly decay forming a drainage-inhibiting skin within the surface, and providing a growing medium for algae and moss.

A wide soft broom or a rubber-tined rake is ideal for removing vegetable matter and other rubbish. Better still a mechanical leaf sweeper or garden vacuum cleaner will greatly speed-

up the operation. The equipment should be well maintained and carefully operated to avoid contamination of or physical damage to the surface. Both sweepers and vacuum cleaners may tend to remove rather too much sand during the first few months of the life of the surface, but thereafter should cease to be a problem. Some disturbance of the surface of the sand may be a positive benefit (see Brushing below).

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 Machinery

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 machines vary in the vigour with which they treat the surface – some methods, namely rotary brushing, are rather fierce and only recommended for use by experienced operatives and where heavy remedial brushing is indicated. Combined brush and vacuum machines must be used with even greater care because sand brushed and sucked from the surface may be very difficult to replace especially when the court is wet.

The use of a small **mechanical tractor** with weighted drag brush is strongly recommended for the best long-term performance. Places to play should budget in the region of £3,500 plus VAT.

The installer's advice should always be sought when considering the use of any but the lightest machines.

Synthetic grass court maintenance tractor & brushes

The recommended frequency of brushing must depend on the amount of use the court receives and whether its location is open and clean. Once a week is a recommended norm

but it may be advisable to brush more often if the court is heavily used, shaded or subject to 'pollutions'. Similarly a little used court, in a domestic garden for instance, will come to no harm if the intervals between brushings are longer, provided the location is open and clean.

It cannot be overemphasised that to neglect the brushing of this kind of court may have serious long-term consequences even if, in the shorter term, the court does not appear to suffer. Brushing need be neither time-consuming nor onerous but its benefits are profound. To omit the process may result in a court ceasing to drain at half-life or sooner. An un-brushed court will look scruffy and be susceptible to moss infestation.

Moss and Algae

In certain situations and in some seasons algae or moss can become established on the court surface. Since prevention is very much more effective than cure, it is important to treat the court with a good proprietary moss killer and algaecide at least once a year.

Moss is not usually found on that part of the surface that is heavily used, and it may not be essential to treat these areas although it is still a wise precaution to do so. Particular attention should however be paid to those perimeter and other areas that are not heavily used, especially if they are shaded by walls or buildings or overhung by trees. Any good proprietary product is satisfactory provided it is not oil-based. The manufacturers instructions should be closely followed. Some installers can supply specially formulated moss killers.

Where moss has become established, repeated applications of moss killer may be needed until the moss can be brushed and cleared away. In the case of very severe infestation, the installer should be consulted. High pressure cleaning equipment is now available but its use is a skilled process.

It should be emphasised that moss is only a serious problem if it is allowed to become established. An annual prophylactic application of moss-killer is an easy way of preventing this. Regular brushing and use of the court renders moss an even less likely problem.

The First Month or Two

Immediately after construction there is an initial working-in period during which the final playing surface is created.

Initially the court surface will be left rather sandy but full penetration of the sand infill into the pile and its subsequent compaction into a uniform playing surface occurs naturally with normal processes, especially rainfall and initial play. This usually takes 1 to 2 months.

During construction every effort is made to ensure even distribution of sand over the whole court. Experience, however, shows that increasing the frequency of brushing in the early weeks of use is beneficial in creating the final playing surface.

If areas are found which are short of sand it should be possible to brush surplus sand into them from adjacent areas, provided this is done within the first few weeks. If the under-

sanded areas are extensive or do not respond to this treatment, the installer should be called in immediately.

Play Lines

Your court will normally be supplied with permanently in-laid playing lines. However, if additional lines are required for special events, these can be painted onto the surface using water based paints. Chalk lines can be applied but these tend to leave a lasting powder spread in the area of the line. Permanent lines require no special attention.

Stain Removal

Most stains can easily be removed with a solution of hot (NOT BOILING) water and a household detergent e.g. washing up liquid. The removal of chewing gum can be simplified by using ice cubes to harden the gum.

Weeds

No matter how much care is taken, weeds may occasionally appear on the surface usually as a result of wind blown seeds. Small numbers of weeds can be removed by hand without damaging the surface. Localised areas of weed seedling infestation can be treated with domestic weed-killers without causing damage to the surface of your court. Oil based weed-killers should not be used.

Snow and Ice

Snow and ice are not harmful and can be permitted to melt through. If it is important to remove the snow to enable play to start sooner than would otherwise be the case, brushes or wooden scrapers may be used. Metal shovels or scrapers may damage the surface and should not be permitted. Rock salt and chemical de-icing agents should not be used.

Provided that the foothold is adequate the court may be played on when frozen, but heavy use is to be discouraged because the fibre is relatively brittle at low temperatures.

If heavy rain falls immediately after a very cold spell, the court may become flooded for a few hours. This is because the sand beneath is still frozen. Do not worry; the ice will soon melt and the surface will then drain normally.

Footwear and General Court Care

Make sure that suitable footwear is used i.e. tennis shoes or plimsolls.

It is strongly recommended that your court is a “NO SMOKING” area. A dropped cigarette will melt the fibres down to the surface leaving an unsightly mark. Chewing gum should be banned too.

Maintenance Schedule

Daily – at the end of the day's play

- Make sure the gate is shut

Weekly

- Brush court to re-distribute sand
- Clear leaves and rubbish etc. from the court
- Deal with any new weeds, moss or algae

Monthly

- Check sand levels

Periodically – at least every six months

- Check for moss and algae growth, food-stains, shoe-marks etc., and remedy as appropriate
- Apply grease to the winding gear

Annually

- Treat court with moss-killer/algaecide
- Call in installer if any aspect is causing significant concern

Note:
These are minimum recommendations. Cleaning, brushing and court inspection can always be done more frequently. Common sense and careful observation should prevail. If any serious doubt exists about the effectiveness of the maintenance regime or the condition of the court(s), call in the installer immediately. It is better to be safe than sorry.

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

Frequently Asked Questions.

Does it need much maintenance?

It is essential to keep the sand evenly distributed and free from dirt and debris. Effective brushing should be carried out at least once a week using a mechanical method. Brushing by hand is ineffective, hard work and does not penetrate deep enough into the pile. Contractors offer maintenance packages but these tend to encourage places to play to neglect maintaining the courts themselves.

Our courts are not draining properly, what is the cause?

Bad drainage is usually a sign that an ageing court has a build up of moss, dirt and debris contaminating the sand infill and causing it to compact. Compaction effectively blocks water from permeating through the carpet and results in ponding. If the problem is severe the contaminated infill can be replaced with new sand. There are two methods using either high power water pressure or compressed air. Vacuuming using compressed air is the most effective because the surface remains dry, allowing immediate and complete re-sanding. The water pressure method needs to be carried out in two stages. Once the sand is removed the carpet must be allowed to dry out before the new sand is installed. If the carpet is wet the sand will not flow evenly into the carpet pile. There is also the risk of some contamination being washed to the bottom of the carpet and causing a problem in the future.

Both of these methods are available through contractors but they are expensive and the choice of companies offering the dry version is limited. The only effective way of avoiding contamination is to follow the recommended maintenance guidelines.

When is the best time to brush the courts?

The courts should be brushed when they are dry.

Method of replacement

The synthetic grass carpet is removed in its entirety and replaced with a new surface and new sand infill.

In order to ensure adequate drainage for the life of the new synthetic grass carpet the macadam base of the court may need to be pierced and back filled before resurfacing. With medium and particularly short pile carpets there is a possibility of the pierced holes causing small depressions in the playing surface. This can distort the bounce of the ball after it has made contact and is therefore unacceptable. To ensure the holes do not become a problem it is strongly recommended that the pierced macadam surface is overlaid with a new macadam layer. Overlaying also has the advantage of ensuring the surface regularity of the macadam base for the carpet is to the highest possible standards – giving the best possible ball consistency. A new layer of macadam with raised kerbs will cost approximately £5000 per court excluding VAT.

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

Life cycle costs

Table 1 shows the total cumulative **budget** un-inflated, over a life cycle period of 12 years**.** It shows the initial construction cost and the subsequent maintenance, repair and renovation costs incurred during the court life cycle.

Table 1.

Year	Court Construction	Moss and weed killer	Rotary brushing	Remove and replace turf	Replace fence/gates	Minor repairs
1	£34,000 00					
2		£150.00	£350.00			£100.00
3		£150.00	£350.00			
4		£150.00	£350.00			£100.00
5		£150.00	£350.00			
6		£150.00	£350.00			£100.00
7		£150.00	£350.00			
8		£150.00	£350.00			£100.00
9				£12,500.00		
10		£150.00	£350.00			£100.00
11		£150.00	£350.00			
12		£150.00	£350.00		£3,800.00	£100.00
Total Construction Cost	**£34,000**					
Total Running Cost		**£1500.00**	**£3500.00**	**£11,000.00**	**£2,500.00**	**£600.00**

New Artificial Grass Court- £34,000

Notes:

Figures are based on the average cost of a new court in a block of three. For more than one court costs should be calculated on a pro-rata basis.

Figures exclude VAT, inflation and overheads (e.g. fees)

Figures are subject to regional variation

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION

What is a sinking fund?

A sinking fund is created by putting aside each year an amount in cash that will cover the full cost at the time of replacement of an asset such as a tennis court.

As the cost to you of this replacement is in the future, you will need to save the amount of money that you will spend at that future date, not the cost at today's date.

This means that it is not possible to take the cost of replacement at today's prices and divide it by the number of years until replacement is due. A more complex sum, but one which is standard practice, is involved. This sum takes into account compound interest to the replacement date and can make the amount you need to save appear quite high.

The logic is that present membership fees should cover the deterioration of the courts caused by the present members so that the funds for replacement are automatically available when the courts have to be renewed.

Sinking fund requirements

Table 2. shows the amount of money to be invested each year to cover the cost of removing and replacing the turf.

Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Annual Contribution	£1,800	£1,800	£1,800	£1,800	£1,800	£1,800	£1,800	£1,800	£1,800	£1,800
Balance Brought Forward		£1,800	£3,690	£5,675	£7,758	£9,946	£12,243	£14,656	£17,188	£19,848
Interest @ 5%		£90	£185	£284	£388	£497	£612	£733	£859	£992
Expenditure										**£22,640**
Accumulated Fund	**£1,800**	**£3,690**	**£5,675**	**£7,758**	**£9,946**	**£12,243**	**£14,656**	**£17,188**	**£19,848**	**0**

The combined rate of 5% for interest & inflation has been taken into account in these figures.

Budget costs are exclusive of VAT

Terminology:

Future changes in the terminology to be included in the European Asphalt Standards:

The term "asphalt" is the internationally accepted technical name for "macadam" which has been used throughout this document as it is more commonly known within the UK.

The term 'base course' as it is most commonly known and used in this document will in future be called 'binder course'.

Contributors:

LTA Technical Services
National Tennis Centre
100 Priory Lane
Roehampton
London
SW15 5JQ
Tel: 020 8487 7158
Fax: 020 8487 7301
E-mail:
christopher.donkin@lta.org.uk
Web: www.LTA.org.uk

The Sports & Play Construction Association (SAPCA)
Federation House
Stoneleigh Park
Warwickshire
CV8 2RF
Tel: 024 7641 6316
Fax: 024 7641 4773
E-mail:
chris@sapca.org.uk
Web:
www.sapca.org.uk

Alastair Cox
Labosport
Unit 3, Heanor Gate
Rd Heanor Gate
Industrial Park,
Heanor
DerbyshireDE75 7RJ
Tel: 01773 765 007
Fax: 01773 765 009
E-mail:
alc@labosport.co.uk
Web:
www.labosport.com

SFPD Limited

39 Hemwood Road
Windsor
Berkshire
SL4 5EJ
Tel: 01753 850 123
Fax:01753 857 799
E-maoffice@sfpad.co.ukWeb
www.sfpad.co.uk

LTA BRITISH TENNIS
IN PARTNERSHIP
Tennis FOUNDATION