



Porous Macadam Court Guidance



Porous Macadam remains a very popular surface throughout Britain's clubs, local authorities and schools, representing approximately 80% of courts in the UK. This is mainly attributed to its porous properties, designed to allow rapid drainage through the entire surface, which means a speedier return to play.

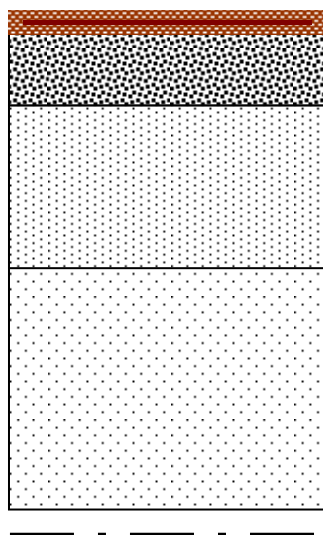
Porous macadam can be played on in most weather conditions for twelve months of the year and the life expectancy is typically ten to twelve years depending on method of construction, quality of drainage, extent of use and the care and maintenance given to the court.

As well as being well suited to the UK's climate, porous macadam is chosen because:

- of the comparatively low level of initial capital cost for court construction
- porous macadam surface course provides a hard and durable playing surface
- maintenance requirements are considered to be minimal over the initial 10 year life of the court. See life cycle cost for details.
- the surface provides a high level of court utilisation during the year
- porous macadam courts may be colour coated to improve aesthetics and playing environment

Most porous macadam 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 macadam. This forms the surface course or playing surface and binder course which improves the strength of the court. The surface course is 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.

The resulting tennis surface is fully permeable, hard-wearing, frost resistant and requires relatively little maintenance, but however modest this maintenance requirement, it is, nevertheless of vital importance if the surface is to remain free draining, aesthetically pleasing, good to play on and long-lasting. The installer's guarantee is likely to be conditional upon recommended maintenance requirements being carried out with reasonably efficiency.



Acrylic or polyurethane Colour Coat (see Colour Coating section)

25mm open grade porous macadam **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 macadam

Minimum 150mm compacted depth of 28mm diameter non-frost-susceptible, free draining **aggregate**

Geotextile membrane

Excavate to remove topsoil

Establish 1:120 fall to formation in a single plane long or cross fall.

Compact formation

A colour coated macadam court can take between 7-10 weeks to total completion. This is allowing 4-6 weeks for construction; 3 weeks for the macadam to cure, one day to colour coat and a further week for the paint to fully cure.

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. This will take approximately three weeks during the summer months and could take up to three months in winter. It is usual for the surface coating to be allowed to harden for approximately one week before play commences with four days as an absolute minimum unless otherwise specified by the installer.

Coating the surface enhances the appearance of the court and has been shown to increase participation. It also helps to prolong the life of the surface by preventing harmful UVs from penetrating and degrading the bitumen.

How does it perform for the player?

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
Shock Absorption (Player comfort)	Non-shock absorbing (hard)

How do I look after it?

- Maintenance requirements are playing surface is kept clean to preserve its playing characteristics
- free drainage of surface water is maintained throughout the life of the court
- court looks attractive and well cared for at all times and achieves a reasonable life span

These objectives are achieved by:

- sweeping or vacuuming leaves and other detritus from the surface
- periodic power washing of the surface
- applying both moss and weed killer when required
- re-coating periodically.

No intensive upkeep is necessary. However, failure to keep the upper surface free of moss, algae and debris by moss/weed killing and power washing will cause surface water drainage problems and reduce the total service life of the court. The maintenance procedures are designed to ensure the:

NOTE (1) Under current pesticide directives the use of pesticides as a preventative treatment is not recommended. Applications are only effective on residual infestation and should only be made if infestation is evident. (2) Oil based moss-killer should not be used.

Keeping the surface clean

- Leaves, tree flowers, pine needles, fluff from tennis balls and other detritus should not be allowed to remain on the surface for any length of time. If this happens they rapidly rot down and settle into the pores of the surface impairing drainage and providing a growing medium for algae and moss.
- A wide soft broom can be used to sweep the surface but this has a tendency to push smaller material into the surface. A rubber-tined rake is usually better, although slow and arduous. Best of all is a mechanical garden vacuum cleaner which will greatly speed up the operation and do it more efficiently. Mechanical leaf sweepers can also be good. The equipment should be well maintained and carefully operated to avoid contamination of or physical damage to the surface.
- At least once a year the court surface will benefit from a vigorous wash. This not only has the effect of keeping the surface pores clean and free-draining but is also essential to maintaining good foothold. Courts near busy roads are particularly susceptible to becoming coated with "traffic film", whilst those near trees may become coated with sap. The resulting black film from either cause can make the courts very slippery after rain.
- Cold water pressure washers are recommended and are available from most equipment hire outlets. These, however, must be used with care and preferably by an experienced court cleaner or professional. During cleaning great attention must be paid to ensuring that the process does not damage the surface by removing the coloured coating or dislodging stone chippings. A mild, non-foaming detergent increases the efficiency of the operation. **STEAM CLEANERS SHOULD NOT BE USED.** If the court has become very badly sealed and does not respond satisfactorily to this treatment, consult the installer or a firm that specialises in cleaning tennis courts.

The post construction period

The installer will have indicated when play can commence on the new surface, and operation and maintenance instructions must be followed. Thereafter, for the first few months the surface will still be slightly soft as the bitumen and surface coating achieve their final hardness. Whilst the surface can be kept in full and normal use, as with a new motor car, a little extra care and vigilance will pay dividends. In particular, unsuitable footwear and other bad habits like racket abuse should be prohibited.

On a very new court water will sometimes stand on the surface after heavy rain. This is a very temporary phenomenon resulting from excess oils within the macadam and can be removed by using mild detergent, and should not cause concern unless it persists.

Play in hot weather

Caution should be applied when playing in hot weather as the courts may be susceptible to softening, especially in the first season after construction. Thereafter the tendency to soften should rapidly diminish. **IF THE SURFACE SOFTENS STOP PLAY IMMEDIATELY** because serious damage can result from continuing play. The first sign of the problem is usually when black marks begin to appear as a result of the paint being rubbed or scuffed off. It is sometimes possible to cool a hot surface by hosing it down with cold water to allow evening play to take place.

Softening is a phenomenon usually confined to the first season, but, even thereafter for a year or two, the surface should be checked if very hot weather is experienced. Latex or other modified macadam's have been formulated to lift the temperature threshold at which the surface softens in hot weather, making it less susceptible to damage from play in hot weather. (see also **Polyurethane Binders** in 'Renovation' section).

Bird damage

An unusual nuisance that may sometimes be experienced is damage caused by bird droppings. This is usually only a significant problem

- during the first year or two of the court's life
- in summer and
- where branches overhang the court

The droppings adhere to the surface, dry out in warm weather and shrink. In the process the paint coating and even stone chippings may be pulled off. The remedy is to cut back overhanging branches. If the droppings are

already in-situ they should be hosed away. Damaged spots should be carefully firmed with the foot and touched up with surfacing paint.

Worms

Another rare cause of surface damage is that caused by worms. In mild, wet weather, worms sometimes appear on the court surface, usually in ones or twos but very occasionally in larger numbers. How they get there is something of a mystery, but once on the surface they usually die. In warm weather, they then adhere to the surface and shrink causing very similar damage to bird droppings.

Worms on the playing surface should be removed as soon as possible. Damaged spots should be carefully firmed with the foot and touched up with surfacing paint.

If the problem persists consideration should be given to applying an appropriate worm-killer (see F1 Court Care Guidance Notes for appropriate treatment). Repeat applications may have to be made, copiously watered in, to ensure that the subsoil beneath the courts is impregnated.

Snow and Ice

Snow and ice should not prove harmful and can be allowed to melt through in due course. Powdery snow can be swept away using a wide soft broom or wooden scraper. Metal shovels or scrapers should not be used because they may damage the surface, as will mechanical snow removing equipment i.e. mini tractors, etc.

DO NOT USE SALT OR OTHER CHEMICAL DE-ICING AGENTS. Their effect is unpredictable and they can cause severe damage.

Maintenance Schedule

Daily – at the end of the day's play

- Make sure the gate is shut to prevent unauthorised use
- Inspect firmness of surface prior to play in hot weather

Weekly

- Clear leaves and rubbish from the court

Monthly

- Deal with any moss or algae

Annually

- Apply moss and weed killer
- Power washing
- Call in the installer if any aspect is causing significant concern

Note: These are minimum recommendations. 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.

What about Renovation?

Resurfacing

As a macadam court ages the bitumen binder incorporated in the macadam will become weaker and at some point, typically after eight or more years, will no longer provide adequate adhesion resulting in the aggregate in the macadam starting to break away – a characteristic known as fretting. This will eventually lead to a potentially hazardous surface with unacceptable playing characteristics. The rate of deterioration will be dependent on a number of factors including, amount of use, maintenance and severity of winters.

Re-colour coating

As a guideline a new colour coating should be carried out every five years using either a polyurethane or the more traditional water based acrylic paint. Polyurethane paints are slightly more expensive than acrylic but less prone to softening in moist conditions as they retain the texturing agents incorporated in the paint for longer. This helps to retain acceptable slip resistance. There are two types of polyurethane paint: moist curing is solvent based and

does not soften in wet/damp conditions. Water based polyurethane paint is slightly cheaper (and more environmentally friendly) but offers slightly less protection against wear.

Frequently Asked Questions

Having decided our court needs repainting, what is the procedure?

- Application of proprietary moss-killer and allow approximately 2 weeks for the treatment to take effect. Repeat treatment if the infestation is particularly severe.
- Removal of debris – a wide soft broom should be used but this has a tendency to push smaller material into the surface. A mechanical garden vacuum cleaner is the most effective.
- Power Washing
- Application of colour coat with textured tennis court paint. The grade of paint used to colour coat the courts and form line markings should ensure that the slip resistance will be greater than 60, when measured in accordance with ITF CS 02/01 (*a test method specified in the Initial ITF Study on Performance Standard for Tennis Courts Surfaces* published by the international Tennis Federation in June 1997)

Will repainting extend the life of the existing surface?

The paint only covers the upper face of the aggregate forming the top of the surface. Whilst it can improve the **slip resistance** of the court it will do little if anything to improve the bond strength and extend the life of the surface. Once a court starts to fret the economics of repainting are often questionable, as the court is likely to require resurfacing before the full life of the new paint coating has expired.

Having decided our court needs resurfacing, what is the procedure?

In the majority of cases resurfacing merely involves undertaking preparatory works before laying a new macadam layer (normally 25mm thick) and painting. Some courts, however, will have suffered damage to their foundations, which will have resulted in an undulating playing surface. Common causes are inadequate foundation, depths and materials, settlement and root damage. In such cases the cause of the damage should be identified, normally requiring trial holes to be opened, and appropriate remedial works undertaken – in the worst case this may involve reconstruction

Assuming the existing court surface does not have excessive undulations the resurfacing process normally includes:

- Treatment of moss, algae and other weeds – normally carried out a couple of weeks in advance of the resurfacing
- Piercing at 450mm centres to help ensure the new surface has adequate drainage throughout its life
- Power washing to remove dirt and debris on and within the exiting surface
- An application of bitumen tack coat – to allow the new and old layers of macadam to key together
- The laying of the new macadam layer – if the surface has undulations that cannot be masked by a single layer of macadam but do not justify reconstruction a macadam binder layer (typically 40mm thick) between the old and new playing surfaces can be used to improve the surface regularity
- Colour coating or painting

When should the works be undertaken and how long will they take?

The installation and painting of macadam surfaces should ideally be undertaken at times of the year when the ambient temperature is not too cold and the weather will ensure the court surface is dry during the painting process. This is normally considered to be April through Mid October (for completion works, not commencement).

The resurfacing of a single court will normally take about four weeks. The preparation and laying of the new macadam will take about a week; the new surface then has to be left for three weeks to cure and age before it can be painted. Painting will take one day but the court should be left for at least a further five days to allow the paint to fully cure before play commences. Installing floodlighting ducts, reconstruction etc. will increase the construction period.

What are polyurethane binders and will they extend the life of the court?

Polyurethane binders are a relatively new development in the tennis court industry and have become popular in recent years. They are clear coatings that are applied to new or old macadam surfaces to provide enhanced strength to the playing surface. They also aid the adhesion of the paint coating to the macadam surface, acting

as a form of tack coat. Binders are available in either water or solvent based acrylic or polyurethane formulations and are spray applied.

Binders are considered particularly advantageous when applied to new courts that are:

- close to trees – the binders will help resist the effects of tree sap and bird droppings on the court surface
- subjected to high levels of use or where non-tennis shoes are likely to be worn
- subjected to prolonged periods of shade leading to damp areas.
- used by wheelchair players

On older macadam surfaces, where the original bitumen binder incorporated in the macadam mix has aged and started to noticeably weaken, the application of a binder coat may prolong the life of the macadam surface in the short term. On very weak macadam, however, the quantity of binder required to hold the surface together may be such that it seals or partly seals the surface resulting in a significant loss in porosity. **As a general, if an old court starts to break-up during power washing the level of deterioration is likely to be so great that an application of binder will not be effective and resurfacing is required.**

As binders do not have any form of texturing agent in their formulation the resulting film coating will be slippery when wet or damp. If a binder coat is applied a court must also be colour coated. Applying a binder will not improve the texture of the macadam surface. Heavily pitted macadam will still be heavily pitted after a binder coat is applied.

The cost can vary greatly and normally relates to the type of binder being applied (water or solvent based) and the application rate. As contractors are generally unwilling to give guarantees on the future life of a court following coating, it is recommended that clubs thoroughly investigate the likely life and cost benefits.

For further information on paint and binders see the Guide and Code of Practice for the Painting of Porous Macadam Tennis and Netball courts (including Kids Zones) published by the Sports & Play Construction Association.

Do new kerbs have to be installed?

The new macadam surface needs to be laid against a hard edge to provide protection so the material does not break away at the edges.

Will new net posts be required?

If the existing posts and sockets are in good condition spacing plates can normally be inserted into the sockets to raise the heights of the posts.

Life Cycle Costs

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

Year	Court Construction	Moss and weed kill	Power washing	Re-colour coating including moss, weed killer & power wash	Renovating macadam surface course and re-colour coating	Replace fence/gates	Minor repairs
1	£24,000						
2		£150	£350				£150
3		£150	£350				
4		£150	£350				£150
5		£150	£350				
6				£1,800			
7		£150	£350				
8		£150	£350				£150
9		£150	£350				
10					£7,000		
11		£150	£350				
12		£150	£350			£3,500	£150
Total Construction Cost	£24,000						
Total Running Costs		£1,350	£3,150	£1,800	£7,000	£3,500	£600

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

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

The tables below show the amount of money to be invested each year to cover re-coating and renovation costs respectively. The combined rate of 5% for interest & inflation has been taken into account in these figures.

Re-colour Coating

Year	1	2	3	4	5	6
Annual Contribution	£300	£300	£300	£300	£300	£300
Balance Brought Forward		£300	£615	£946	£1,293	£1,658
Interest @ 5%		£15	£31	£47	£65	£83
Expenditure						£2,041
Accumulated Fund	£300	£615	£946	£1,293	£1,658	

Renovation

Year	1	2	3	4	5	6	7	8	9	10
Annual Contribution	£900	£900	£900	£900	£900	£900	£900	£900	£900	£900
Balance Brought Forward		£900	£1,845	£2,837	£3,879	£4,973	£6,122	£7,328	£8,594	£9,924
Interest @ 5%		£45	£92	£142	£194	£249	£306	£366	£430	£496
Expenditure										£11,320
Accumulated Fund	£900	£1,845	£2,837	£3,879	£4,973	£6,122	£7,328	£8,594	£9,924	

Budget costs are exclusive of VAT
Base date: March 2005

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.

This datasheet is deemed to be correct at the time of publishing – facility advice can also be provided by your regional facility project manager, see 'in your area' for further advice.

