

# Artificial Surfaces for Outdoor Sport

Updated guidance for 2013

### Foreword

Sport England believes that good facilities are fundamental to developing sporting opportunities for everyone, from the youngest beginner to the international class athlete. Outdoor sports facilities, whether large or small, can encourage civic pride and assist the process of revitalising deprived neighbourhoods. Facilities that are well designed, built to last and well maintained are a pleasure to use and give an ample return on the time and money invested in their construction and day to day operation.

Good design needs to be based on a sound understanding of issues such as the current trends and practices within individual sports, the wider leisure industry and the lessons learnt from previously built schemes.

Good design needs to be embraced within the earliest vision statement for a particular project and enshrined in the initial briefing stage through to the final detailed specifications and operational arrangements.



Sport England Design Guidance Notes aim to promote a greater general understanding of overall design concepts, an appreciation of technical issues and the critical factors that need to be considered in reaching the appropriate solution for a particular project. They also advise where further information, advice and expertise may be found and point to benchmark examples.

### ***Sport England's Design Guidance Notes aim to:***

- ***Increase awareness of good design in sports facilities***
- ***Help key building professions, clients, user representatives and other stakeholders to follow best practice***
- ***Encourage well designed sports facilities that meet the needs of sports and are a pleasure to use.***

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### 1.0 Introduction

#### General

This Design Guidance Note considers design issues for a wide range of outdoor sport spaces including pitches, single sports use courts and multi use games areas (MUGAs) with artificial surfaces constructed from various combinations of man-made materials<sup>1</sup>. It is concerned with optimising the provision of all such facilities whether they are located in new or existing schools, local parks, sports clubs or as part of larger regeneration projects.

The guidance covers:

- The benefits of various surface materials
- Design concepts
- Common technical expressions
- Technical classifications of various playing surfaces
- Suitability of surfaces for various levels of sports at training or performance levels
- Other sources of information and more detailed advice.

***Artificial pitches can provide an array of cost effective and efficient facilities to suit a wide range of sports and physical activities.***

#### Advantages of artificial surfaces

The general advantages of artificial pitches over natural grass can be summarised as allowing:

- Greater durability
- More efficient use of space
- Increased usage<sup>2</sup>
- Flexibility
- Better overall value for money
- Defined performance characteristics.

A further advantage is that less maintenance is required for a given level of use when compared to natural grass. However it is a myth that artificial playing surfaces are maintenance-free. For example, an artificial grass pitch is likely to have the same annual maintenance cost as a turf pitch, but be able to take ten times as much use<sup>3</sup>.

Specification and construction techniques can be tailored to a spectrum of uses and budgets, and include casual kick about or recreation areas, more serious training pitches and various levels of competition venues.

However, there are important safety and management implications that are explained later in this document (see Section 2.0).



A polymeric hard court used as an informal play and amenity area within a school site

<sup>1</sup> This new guidance supersedes the previous Sport England / SAPCA document 'A Guide to the Design, Specification and Construction of Multi Use Games Areas (MUGAs) including Multi-Sport Synthetic Turf Pitches (STPs) - Part 1 (of 3) – General Guidance and Design Considerations; Dimensions and Layouts

<sup>2</sup> Subject to weather conditions, a well-maintained grass pitch would allow some seven hours of use per week.

<sup>3</sup> 'Maintaining Synthetic Turf: Sand Filled Systems, The Cranfield - IOG Guidelines'

'The SAPCA Code of Practice for the Maintenance of Synthetic Sports Surfaces'





Mini tennis court included in a multi sports hard court area

### Common forms of external artificial sports areas

The most usual forms of external artificial sports areas include:

- Small informal play areas with mini sports features
- Small multi use games areas (often referred to as MUGAs)
- Specialist courts for tennis or netball
- Larger format pitches that can be used for training for hockey, football and/or rugby
- Competition pitches for hockey, football or rugby
- Cricket wickets (match and practice)
- Athletics training facilities
- Flat green bowls facilities.

However, every situation should be considered from first principles and the briefing and design process should be tailored to the needs of each locality. Flexibility should be built in to help maximise use and promote long-term sustainability. For example, a full-sized artificial grass pitch (AGP) for hockey or football can be designed for a number of smaller 5-a-side pitches across the width or as a flexible physical education area - see Appendix 1 for typical layouts.

### School provision

For school sites, artificial sports surfaces offer advantages and are promoted in standard briefing guides for schools<sup>4</sup>:

- **Sports pitches**

All-weather pitches, including artificial grass pitches or polymeric surfaces, allow more intensive use than grass and, particularly with floodlighting, can also offer a popular community resource.

- **Games courts**

Laying out a variety of courts within a single multi use games area makes supervision easier and extends the range of games. It must be recognised however, that whenever a facility is designed for use by two or more sports, it is likely that the different sports will have different 'ideal' playing characteristics and some compromise in performance is likely.

- **Athletics training facilities**

Not many schools have the necessary space to accommodate full-sized athletics tracks. Schools and their design teams should look first at the space available and then consider if other sports can also be included with athletics. Polymeric surfaces are the preferred option for athletics but an artificial grass surface is an acceptable option.

- **Other school areas**

Artificial sports areas offer great potential for other 'hard', 'informal' and 'social areas' on a school site. See Sport England document *'Thinking Differently'* for how imaginative design concepts can provide stimulating physical education facilities in a school context.



Colour used to enliven a multi use artificial grass pitch on a school site

<sup>4</sup> BB 98 Briefing Framework for Secondary School Projects. DfES  
BB 99 Briefing Framework for Primary Schools Projects. DfES

### Technical language

#### Common technical expressions and abbreviations.

All weather surface	Playing surface unaffected by rain (but effected by frost and snow).
Astroturf <sup>1</sup>	Trade name of original artificial grass product often mis-used as a generic term for artificial grass.
AGP	Artificial Grass Pitch: Preferred term used to describe a playing surface made from strands of polymeric material such as nylon or polypropylene.
ATP	Artificial Turf Pitch: As AGP above, refers to a playing surface made from strands of polymeric material such as nylon or polypropylene.
AP	Active Places - database of facilities which provides the baseline information for all the 'Active' planning tools.
APE	Active People / Active England – the survey results from the December 2006 report, relating to current participation rates for adults i.e. 3 x 30 minutes of participation in sport and physical activity per week.
BB 98	The minimum level of provision, across all spaces, recommended for secondary schools.
BB99	The minimum level of provision, across all spaces, recommended for primary schools.
BSF	Building Schools for the Future.
BREEAM	Building Research Establishment Environmental Assessment Method, for various sustainability factors.
CSN	Community Sports Network.
CSP	County Sports Partnership.
Community Use	Describes facilities, which are 100% accessible for use on a turn up and play basis; no membership fee required.
Community use agreements	Legal agreement that defines the extent of community use of educational facilities.
DDA	Disability Discrimination Act.
Dynamic Base	Description of the sub-surface layers of a sports surfacing system where the layers, supporting the surfacing system, are of an unbound construction. This contrasts with an 'engineered base' system where the sub-surface layers are bituminous-bound macadam.
Extended Schools	The initiative which seeks to increase access to a number of activities for the community on school sites, outside curriculum time; activities could include sport, ICT, etc

See Sports and Play Constructors Association (SAPCA) web site for a full list of technical terms.

[http://www.sapca.org.uk/page.asp?node=39&sec=Glossary\\_of\\_Terms](http://www.sapca.org.uk/page.asp?node=39&sec=Glossary_of_Terms)

Engineered base	Description of the sub-surface layers of a sports surfacing system where the structural layers supporting the surfacing system are of a bituminous-bound macadam construction. This contrasts with a 'dynamic base' system where the sub-surface layers are unbound. Engineered bases can also be of in-situ formed concrete with respect to artificial surfaced bowls greens or cricket wickets.
Football turf	FIFA reference to '3G' pitches.
FTP	Football turf pitch - The FA's abbreviation for a 3G surfaced football pitch.
Hard court	A sport surface based on road building technology with little or no cushioning / resilience within the playing surface.
LA	Local Authority.
LAA	Local Area Agreement.
LDF	Local Development Framework.
MUGA	Multi Use Games Area.
NGB	National Governing Body.
Participation	Where participation is referred to, this means 5 x 30 minutes per week, which is the basis on which the current levels have been assessed for adults (16+), and on which any increases will be measured by Sport England (Active People Survey) hours per week of quality PE for every student, plus 2 hours per week of quality PE / physical activity out of school hours.
Polymeric	A term covering plastics, rubbers and synthetic resins.
PCT	Primary Care Trust.
PESSCL	The Physical Education and School Sport Club Links Strategy.
PSA	Public Service Agreement.
S106	Section 106 (S106) of the Town and Country Planning Act 1990 allows a Local Planning Authority (LPA) to enter into a legally-binding agreement or planning obligation with a landowner in association with the granting of planning permission. The obligation is termed a <i>Section 106 Agreement</i> .  These agreements are a way of delivering or addressing matters that are necessary to make a development acceptable in planning terms. They are increasingly used to support the provision of services and infrastructure, such as highways, recreational facilities, education, health and affordable housing.

Sand filled pitch	A type of artificial grass pitch (normally of tufted carpet) where the carpet is fully sand-filled to within 2 – 3 mm of the top of the pile.
Sand dressed pitch	A type of artificial grass pitch (normally of tufted carpet) where the carpet is only partially filled with sand. The sand is to help stabilise the carpet and retain some moisture in the system. The infill is not normally necessary for the playing performance of the surface.
Shock pad	A resilient layer below the playing surface to give a degree of cushioning / resilience to an impact of a player or ball.
SSP	School Sports Partnership.
STP	Synthetic turf pitch. As AGP above, refers to a playing surface made from strands of polymeric material such as nylon or polypropylene.
The 5 Hour Offer	The Government PSA target which seeks to provide all 5 - 16 year olds with access to 5 hours of sport per week by 2011, which includes 2 curriculum hours of quality PE, and 3 hours of sport and physical activity out of curriculum time; for 16-19 year olds the aim is to encourage them to take part in 3 hours of sport and physical activity per week. The activity in extra curriculum time will be delivered in partnership with e.g. clubs.
Water based pitch	A type of artificial grass pitch (normally of woven carpet) where the carpet is not filled with sand. The carpet is usually shorter piled than the sand filled type having a much higher pile density and requiring a regular application of water during matches to reduce player friction and slow the speed of the ball down across the surface. Combined with some form of underlay / shock-pad, sometimes integral. The carpets and / or the pad are typically designed to retain the applied water whilst maintaining a free draining characteristic.
3G pitch	An abbreviation of the so called 'third generation' of artificial grass pitch construction using longer pile artificial grass with a rubber crumb infill / dressing within the pile to influence friction and impact characteristics.

Needle punch	A type of carpet commonly used for all types of sports facilities, primarily bowls, cricket and tennis. It is formed by layers of polymer fibres which are needled together. The carpet can be sand filled or non-sand filled to suit the intended sport.
Woven	Can be either a woven polypropylene carpet (cloth-like in appearance) which is non sand filled primarily used for indoor and outdoor bowls greens or a non-filled artificial grass cricket carpet.

***Outdoor sports surfaces can be split into two categories - natural and artificial.***

***A natural surface is one formed by the suitable preparation of natural areas of land (such as grass).***

***An artificial surface is one constructed with a variety of man-made materials (such as timber boards, synthetic products or bituminous products).***

***Within each of these groupings, there are many sub-categories of surfaces which are used for a multitude of different sports.***

See the Sport England Design Guidance Note 'Athletics' for examples of athletics tracks integrated with an all weather pitch.

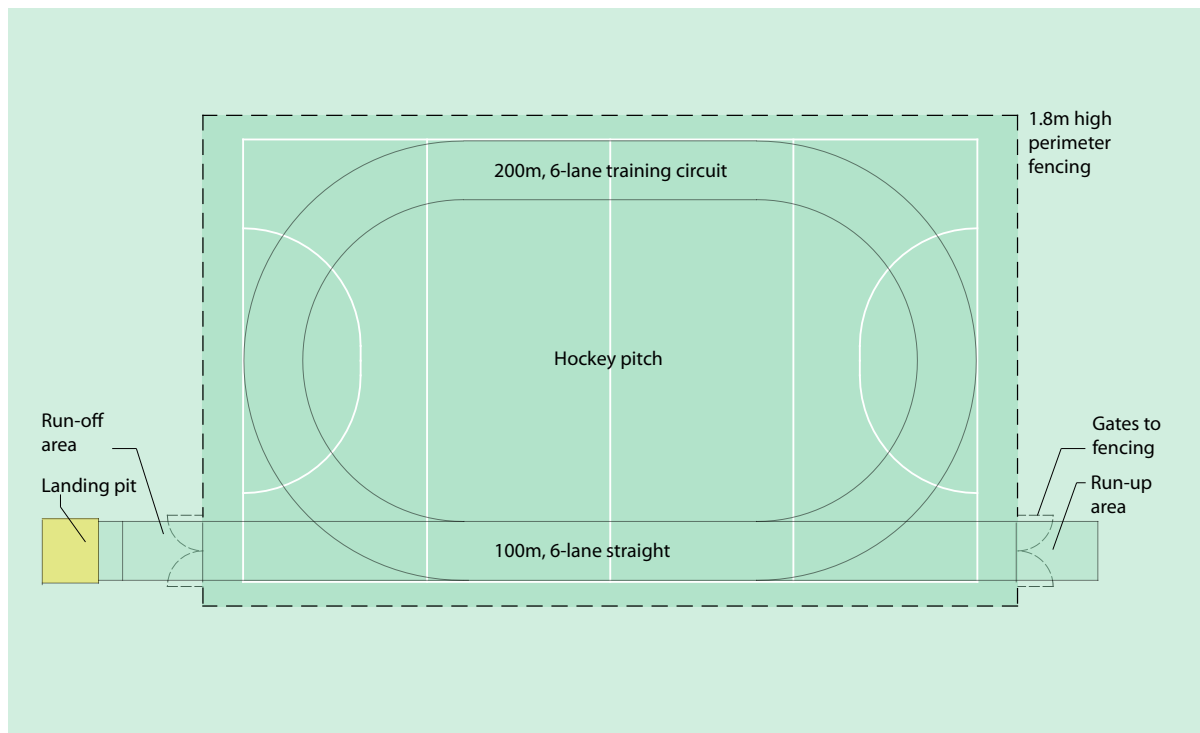


Artificial surface with a simple weather protective structure

Figure 3 below demonstrates the potential for greater use of artificial turf pitches for athletics training:

- Hockey pitch enclosure (63.0 x 101.4 m)
- 200 m, six-lane marked training circuit
- 100 m, six-lane straight and gates to the perimeter fence to access run off and landing pit areas

The principle could be equally well applied to a multi use games area development.



Artificial grass can be used both as an indoor and outdoor sports surface

See '*Floors for Indoor Sports*' Design Guidance Note available from the Sport England web site.



### Background and trends

The majority of outdoor sports have evolved in environments using natural turf. However, in recent times, the desirability of using natural turf in some situations has been brought into question. Restrictions on available land, increasing participation in sport, the need to lessen external environmental influences and the desire to reduce operating and maintenance costs have led to alternatives becoming more widely used.

See separate Sport England Design Guidance Note '*Natural Turf for Sport*' for further details of the maintenance requirements, limitations in use due to wet weather and recovery time after use.

In the late 1970's, there was a large demand for sports facilities which fuelled the growth in artificial alternatives. Difficulties maintaining natural turf and a shortage of available space (especially for inner cities) further amplified the demand. Many approaches were made in the search for an appropriate substitute for grass which could sustain a high level of use, required little maintenance, and yet still provided a suitable surface that offered desirable playing characteristics. The one technical development that has had the greatest impact was the use of plastics and rubber surfacing systems.

The first installation of an artificial grass pitch (AGP) is accredited to the Monsanto Company in the USA; it was designed and constructed with sponsorship from the Ford Foundation at Moses Brown School, Providence, Rhode Island in 1964. The first mainstream installation was at the 'Astrodome' in Houston, Texas, in 1966. Artificial grass was considered because natural grass would not grow indoors under artificial lighting and survive heavy usage. With the success and versatility of this system, it soon became prevalent in the USA for both indoor and outdoor use. The first AGP in Britain was installed in 1971 as a non-commercial football facility for Islington Borough Council, London. An AGP was considered because of the durability/cost ratio and the limited availability of land. After this installation, the introduction of AGP's became widespread in the UK.

During the 1980's, a more scientific approach led to definitions of the mechanical properties for individual sports that could be verified by laboratory and on-site testing. Today there are a wide range of 'standards' that can be used to design and test the actual playing qualities of sports surfaces through their life span. Such standards are being increasingly integrated into the 'rules of play' and the safety issues for the majority of outdoor sports. See later Section 3.

The technological advances in artificial grass in recent years has led to a general acceptance of the surface for training and increasingly for competition. Hockey was the first sport to adopt the surface for competition play and the FIH was the first International Sports Governing Body to publish performance standards for artificial grass pitches which has now become the accepted standard. Football initially viewed the surface as mainly suitable for training due to disparity in the playing characteristic when compared to natural turf. However, the situation has changed with the introduction of the latest 'third generation' (3G) artificial grass surface and recent work on performance standards. The use of '3G' pitches is allowed in all FA competitions (FA & FA Youth Cup to the first round proper) and some league matches. The FA have published guidance documents entitled '*The FA Guide to Artificial Grass Pitches*' (Third Edition) in 2010, the '*Third Generation Football Turf Guidance - Information for Players, Referees, Clubs, Leagues and Groundstaff*' and '*The FA Guide to 3g Football Turf Pitch Design Principles and Layouts*' in 2012 all of which are available on line.

There has been significant growth in interest in mini soccer, 9 v 9 and small-sided football and a high demand for five-a-side pitches in both school and community recreation sites. Similarly, the growth in female football participation has a major implication for new pitch provision.

A similar situation can be seen in rugby with a performance specification now being agreed by the sports governing body subject to a selection procedure that ensures that key safety characteristics are verified<sup>5</sup>.

It should be noted that separate and different performance specifications have now been agreed for hockey, football and rugby. For high level specialist facilities, there are testing and licensing requirements set out by the sports governing bodies to ensure safety, but there are potential issues in a multi sports context that need to be considered to ensure that the correct surface is selected. See later Section 3.

Artificial surfaces are widely used for cricket practice and match wickets and the *England and Wales Cricket Board* (ECB) have published a performance standard and associated documents for non-turf cricket pitches covering construction and performance requirements<sup>6</sup>. The ECB publish a list of approved 'non-turf pitch' systems and suppliers.

<sup>5</sup> [http://www.irb.com/mm/document/lawsregs/0/regulation22080611\\_6080.pdf](http://www.irb.com/mm/document/lawsregs/0/regulation22080611_6080.pdf)

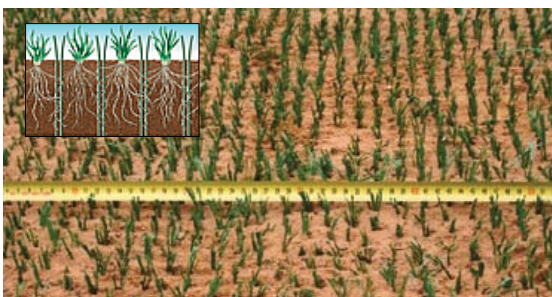
<sup>6</sup> <http://www.ecb.co.uk/development/facilities-funding/facilities-guidance-and-project-development/ts6-performance-standards-for-non-turf-cricket-pitches,1574,BP.html>



Similarly, artificial surfaces are widely used for flat green bowls and *World Bowls* have published a performance standard describing the construction and performance requirements for flat green bowls surfaces <sup>7</sup>.



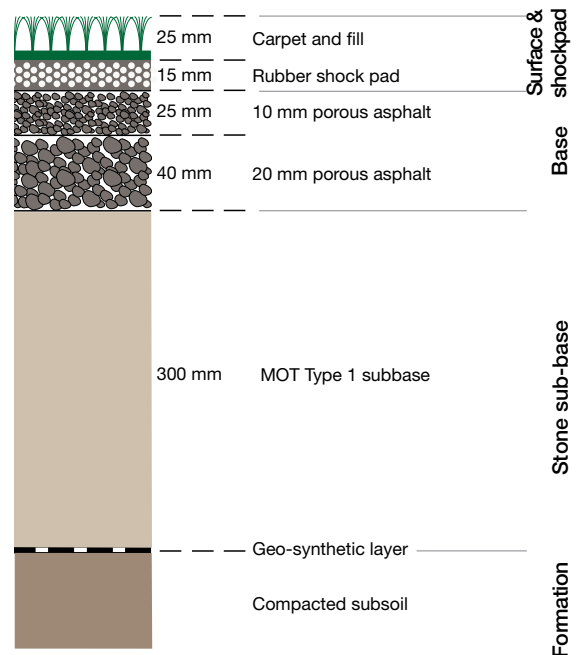
The distinction between ‘*natural*’ and ‘*artificial*’ grass pitch construction has become blurred due to the development of artificial grass ‘*reinforcing*’ systems. These consist of polymeric fibres or ribbons that are ‘*planted*’ at regular spacings into a natural grass pitch or blended into the soil forming the rootzone to give improved durability and withstand more intensive use. Polymeric fibres are also blended with sand to form artificial equestrian surfaces.



### Typical construction

An artificial surfacing system is generally made up from a number of layers (top down):

- Surface layer e.g. carpet, polymeric material
- Shock absorbing layer often termed shockpad
- A stable and carefully regulated base layer on which the synthetic surfacing is supported e.g.
  - Porous macadam - a hot-rolled blend of aggregate and stiff bitumen binder
  - Compacted sand
  - Specialised mineral particulate materials
  - In-situ formed concrete (occasionally used for bowling green and cricket wicket bases)
- Crushed broken stone sub-base layer - normally a compacted graded aggregate
- Geo-synthetic layer (to prevent the migration of particles between layers)
- Consolidated subsoil (or compacted fill), often the natural soil found on site or a ‘*stabilised*’ formation. Drainage is normally installed within the subsoil.



Typical build-up for an artificial surfacing system

<sup>7</sup> <http://www.worldbowlsstd.co.uk/artificialsurfaces.html>

Variations on these designs are not uncommon and they will differ between sports. For example, a shockpad may not always be used or needed and in some instances the porous macadam will be the surfacing layer or a stiffened in-situ formed shockpad may serve as a combined macadam / shockpad system (known as an e/layer).



Separate artificial grass performance specifications are now available for hockey, football and rugby

See Section 3.0 for more details.

### Active Design principles

*Active Design*<sup>8</sup> provides easy-to-use guidance and information to town planners, architects and urban designers on how to put sport and opportunities to get active at the heart of new housing and community developments, both public and private.



For many sports, artificial grass is increasingly seen as the standard surface for training



Polymeric surfaces can be found both in high level competition venues and in local school sites

The key principles are:

- **Accessibility**

Improving accessibility refers to the provision of easy, safe and convenient access to a choice of opportunities for participating in sport, active travel and physical activity for the whole community.

- **Amenity**

Enhancing amenity involves the promotion of environmental quality in the design and layout of new sports and recreational facilities, the links to them and their relationship to other development and the wider public realm.

- **Awareness**

Increasing awareness highlights the need for increased prominence and legibility of sports and recreation facilities and opportunities for exercise through the layout of the development.



Shared community use of a school facility that is conveniently located in a prominent part of a school development

<sup>8</sup> See '*Active Design*' download available from the Sport England web site.



**See the Football Association's publication 'Football Facilities in Schools' for technical advice and sample designs.**

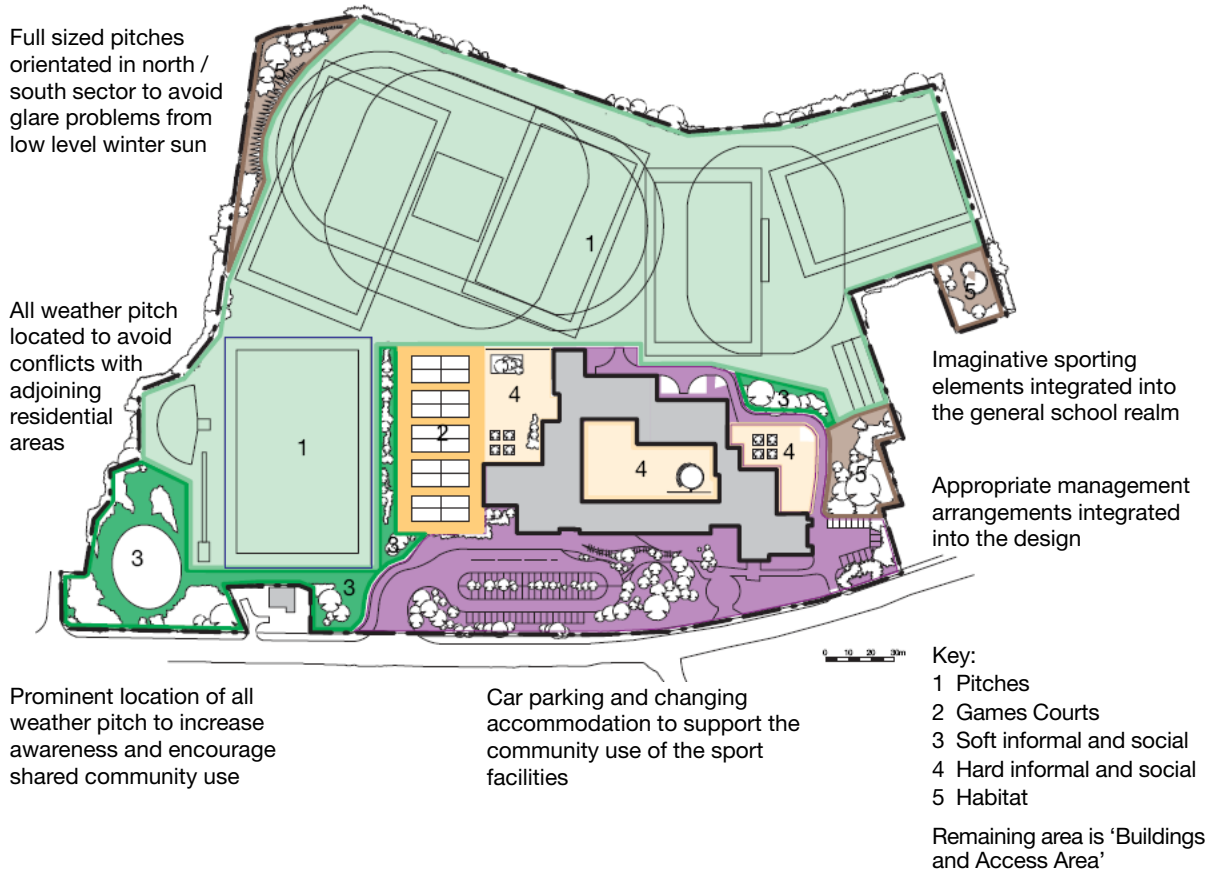
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Artificial play facility as an integrated part of a general amenity space



Imaginative design adding to the awareness of physical activity spaces



The principles of *Active Design* applied to a typical school site

<http://www.activeplaces.com/>



### 2.0 Key issues

#### Preparing the brief

Critical to the success of any sports facility is an assessment of the likely use of the facility and the ability of a particular location to meet the strategic and local sports needs. It must be determined which sports the facility will provide for, the standards of playing performance needed, and the priorities for usage between them. The choice of sports and the feasible balance between them may also depend on the different levels of income generation that are possible. The initial planning stage should also include a thorough assessment of the proposed management and operation of the new facility. It is vitally important that all stakeholders are made aware of the proposed design and layout of the facility before the planning application is submitted, to avoid costly errors.

No one surface or court configuration will be ideal for every combination of use and it is important to

understand all the safety implications and where compromise might or might not be acceptable. See Section 3.0.

#### Sports performance standards

*BS EN 15330 'Surfaces for Sports Areas'* lays down the basic requirements for artificial grass and needle punched surfaces for a variety of sports and many sports governing bodies have identified key performance criteria for their sport which are designed to ensure that the surface does not inadvertently affect the way the game is played and ensures safety criteria are met. These requirements are based on the behaviour of 'good quality' natural or equivalent surfaces and relate to the way the ball and player interact with the surface. In particular the height the ball bounces, the distance it rolls and the hardness of the surfaces are evaluated.

If the surface is to be used for top-level competition, some governing bodies will need it to be tested on a regular basis to ensure it continues to meet their performance requirements. The FA require annual testing for competition facilities and some football leagues also insist on annual testing. Surfaces that are not used at the highest level of competition do not require the same frequency of testing but should be checked on a regular basis to ensure they are still acceptable for the sport.

If the surface is used for multi-sport then reference can be made to the European standards (which incorporate the British Standards). These standards are referred to in Table 1 on page 19.

Reference should be made, as appropriate, to other relevant sources of information, including:

- Other technical standards such as Construction Codes of Practice<sup>9</sup>
- Technical requirements of funding bodies
- Technical requirements of the individual National Governing Bodies (NGBs).

#### Consultation

Early consultation is essential with the sports sector (e.g. sports clubs, stakeholder groups) and the surrounding catchment to understand the demand for community use and local views. The current provision on the proposed site should be compared with what is being planned for the future. This should include the likely usage in terms of days / hours and how this could be managed in the light of the community consultation. The potential sports

### **Critical consideration should be given to:**

- **The priority sports / activities**
- **Levels of play**
- **The size and pitch / court marking**
- **The site and surrounding areas**
- **The intensity of use**
- **The sports performance and playability characteristics required**
- **The potential income and expenditure**
- **The management and maintenance regime**
- **Establishing a sinking fund for future replacement of the surface**
- **Funding body requirements**
- **Business plan**
- **The FA require annual testing for all FA competitions.**

<sup>9</sup> See Sports and Play Constructors' Association <http://www.sapca.org.uk/>

### ***Consultation with the potential users to ensure an attractive design that:***

- ***Meets needs***
- ***Encourages ‘ownership’***
- ***Is fun to use.***

### ***Avoid the perception that the facility is unsafe or dominated by a single group or sport.***

activities for the site should be considered against the proposed specifications to ensure they are fit for purpose and truly multi use.

Identify where uncertainty might exist about precise needs for the facility and how flexibility might be increased by selecting a surface that can accommodate a range of sports/activities.

Consider also if the design ensures accessibility to all users and whether the changing/storage facilities are appropriate.

### ***Sporting outcomes should be integral to the initial design brief and reviewed throughout the:***

- ***Design***
- ***Construction***
- ***Operational phases of the scheme.***

#### **Planning risk**

The potential difficulties of obtaining planning consent should also be considered such as the conformity with local planning policy for ‘open spaces’ and the sensitivity of the site to the inclusion of floodlighting, particularly where income from use of the facility in the evening is fundamental to the success of the business plan.

See later Section 4.0 and separate ‘*Artificial Sports Lighting*’ Design Guidance Note available from the Sport England web site.

#### **Site investigations**

The cost of a new facility can be greatly influenced by site conditions and might be significantly higher for engineering on a difficult site. In some cases, site conditions can render an otherwise attractive project to be financially unviable.

A designer has to consider the following factors:

- Topography
- Access
- Site drainage
- Electrical supply
- Water supply
- Trees
- Underlying soil conditions
- Biodiversity issues.

Before starting detailed design, the designer will require as much information as possible about the site and its surroundings. Allowing sufficient resources for a thorough initial information gathering exercise greatly reduces the risk of unforeseen problems (and increased costs) during construction and after completion. It is strongly recommended that this information be obtained at an early stage of the design process and be made available to all contractors tendering for the construction of the facilities.

### ***Undertake early detailed site surveys and ground investigations to reduce project risks.***

Understanding the ground conditions is vital, as the greatest risk of unforeseen problems and additional cost usually lies in the ground. Gathering information is only the first step and may need to be followed by fieldwork and laboratory testing. The most important element in ground investigation is to confirm the type of underlying soil or rock. This is done using either boreholes or trial pits to allow close examination of each layer to provide a detailed engineering description in accordance with *BS 5930: Code of Practice for Site Investigations*. This is required across the entire development site to establish any variations.

If the proposed site is a sloping one, it may be necessary to level it, in which case the investigation should include an assessment of the soils that will be nearer the surface at the new, reduced level.

The excavated plateau on which the pitch, track or court is to be constructed is termed the 'formation'. On a level site, this might be created by simply scraping away the topsoil. On a sloping site, a level formation is most economically created by a process of 'cut-and-fill' in which soil from the higher part of the site is re-distributed to the lower part. For this operation to be successful, it must be confirmed that the soils that will be encountered can be compacted firmly.

The formation is then compacted, usually by rolling, to provide a firm stable platform on which to build up the layers of the new construction. The stability of the formation is measured in terms of its bearing capacity (its ability to withstand loading without deforming) often expressed as CBR (California Bearing Ratio). It is essential that the employer gets a firm pre-contract undertaking from the contractor that the design of the sports facility (based on existing ground conditions) will ensure long term stability.

Creating a level plateau within a sloping site in this way will create changes between the pitch and its surrounds. If space permits, these differences are most economically dealt with by creating slopes, which can partly be used as spectator vantage areas.

If the space is constrained, expensive retaining structures may be the only way of dealing with the level differences. Abrupt changes of level bring other complications, such as the need for barriers, steps and special disabled access provision, all of which can also add considerably to the cost of the scheme.

If poor ground conditions are encountered on a site, the formation can be 'stabilised' by treating the soils with cement and lime which is rotivated into the site soils. This is a specialist process and can only be attempted following detailed chemical analysis of the site soils which indicates the quantity and ratio of additives required.



Installation of ground stabilisation treatment

The load bearing capacity of a formation can also be increased by overlaying it with purpose made plastic mesh products and/or installing the plastic mesh within the foundation stone layer.



Plastic mesh within stone layer

If floodlighting is to be installed it will be necessary to determine the amount of power required and to establish the capacity of the existing electrical supply on the proposed site. Provision of a new electrical supply onto the site will generate a significant cost and time implication.

Whilst a MUGA, small pitch or a netball or tennis court may appear to only be a simple macadam construction with a synthetic or painted surface, the exacting demands and tolerances of sport mean that they should be built by companies with the relevant and proven construction expertise. Likewise, consultants with specialist expertise should be used for the design, specification and project/construction management of all artificial pitch projects. Appropriate checks should be made on the contractors and designers before selection to ensure they have the necessary experience, financial standing and proven quality of workmanship to undertake the work.



Artificial grass pitch associated with an inner city sports centre

### **Sizes and layouts should take account of:**

- **NGB dimensions**
- **Levels of play**
- **Margins and safety run offs including placement of goal recesses**
- **Performance standards**
- **Location of lighting columns**
- **Access routes to point of entry to court (including wheelchair access).**

### **Quality assurance**

Proper quality assurance procedures should be applied throughout construction; certain components of a synthetic surfacing system will be factory-prefabricated, whilst others may be manufactured in-situ from complex chemical mixtures, the properties of which can be influenced by faulty workmanship, defective materials or adverse weather conditions. It is therefore essential that an experienced and qualified professional is employed to inspect the works during construction to ensure that pitch is being constructed to the correct specification and standards.

### **Risk of physical injury**

Impacts with sports surfaces can lead to a range of potential physical injuries if they are not used or designed correctly. These injuries can be split into acute and chronic; acute injuries occur suddenly during activity and include injuries such as sprains, friction burns and fractures; chronic injuries usually occur as a result of overusing one part of the body over a prolonged period of time. Whilst acute injuries are often more severe than chronic injuries, the causes of both need to be considered when designing a sports surface.

Obviously accidents can happen and no surface will remove all the risks but certain factors should be considered when designing and procuring a sports surface to ensure these risks are reduced. There are many materials used in the construction of sports surfaces and these can be engineered to

reduce risk but also balance them against the playing requirements of the particular sports and standards of the sporting activities. If a surface is designed and specified correctly, it can greatly reduce the potential risks through appropriate levels of friction (between the shoe and surface), surface deflection (how much the surface moves during impact) and force reduction (how hard the surface is) to the activities taking place. Additionally, the manufacturer's recommendations for usage should be closely followed, in particular, the use of appropriate footwear.

*The Construction (Design and Management) Regulations 2007* places additional duties on designers to eliminate or reduce hazards and risk during design, and to advise on those risks that remain. The term 'designer' is used broadly and may include a client, contractor and anyone involved in the preparation and modification of a design or giving instructions to others. The composition, construction requirements and the lifecycle implications of sports surfaces needs to be understood. In addition, analysis and discussion of the 'in use' health and safety implications of a product will be required with end users, operators and the client.

Manufacturer's recommendations should be closely followed.

### **Testing against performance standards**

Sports governing bodies set standards that define the playing and safety criteria they consider appropriate for their sports. In addition, there are EN (European) Standards for sports surfaces. Compliance with these standards can be mandatory when competitive matches are to be played. It is therefore important that the level of competition and the relative importance of different uses of a sports area are established during the design of the facility to ensure the playing surface will provide the performance required. Even when no competition regulations apply, compliance with relevant standards is often required in order to ensure the facility is 'fit for purpose' and to show that the site operator is complying with their legal obligations and the requirements of their insurers.

Specific sports standards can be obtained directly from the relevant sports governing body (check their websites) and European Standards can be purchased and downloaded from:

<http://www.bsi-global.com/>.

*BS EN 15330 'Surfaces for Sports Areas'* is the most relevant for outdoor sports. As the performance of a playing surface will change throughout its life, periodic re-testing should be



undertaken to ensure the facility is still performing to the required standards. Some sports governing bodies give guidance on the frequency of re-testing. Where this is not provided, a frequency of 2-3 years, depending on levels of use, is often recommended.

### Management, programming and flexibility

The management of the artificial surface and the way that it will be used on a day-to-day level needs to be considered at an early briefing stage. For example, the arrangement for teams/individuals to make bookings, the degree of security and supervision that will be appropriate, the arrangement for regular cleaning and for periodic maintenance need to be factored in to a business plan for the facility. See the table below for a model to calculate the level of use and maintenance.

Usage	Example hours / year
School use: lessons / games	800
Community use (practice)	200
Community use (full matches)	600
Community use (recreational)	100
Maintenance hours	150

See Section 6.0 - *Operation and Maintenance* <sup>10</sup>.

<sup>10</sup> See also 'Maintaining Synthetic Turf: Sand Filled Systems, The Cranfield - IOG Guidelines'

Major Project Stages
<b>Preparation</b> (RIBA Stages 0 & 1)
Review of project brief Establish the relevant Performance Quality Standards (PQS)
Business justification Site investigations Review of site constraints Approximate estimate of costs
<b>Design</b> (RIBA Stages 2 & 3)
Establish a procurement strategy Additional information Concept design Concept and detailed design approvals
<b>Pre-Construction</b> (RIBA Stages 4)
Detailed design information Tender documentation TENDER process Investment decision
<b>Construction</b> (RIBA Stages 5 & 6)
Construction Process  Project Completion Testing against Performance Quality Standards (PQS) Establish if pitch is ready to use
<b>Use</b> (RIBA Stage 7)
Aftercare and ongoing maintenance programme Periodic testing against PQSs

Major stages of project development

### 3.0 The choice of playing surface

Among the most commonly played sports on multi-sports games areas are:

- Tennis
- Mini tennis
- Netball / basketball
- Five-a-side football
- Hockey.

Other sports that might also be played include:

- Uni-hockey
- Rugby union and rugby league
- Lawn bowls
- Cricket
- Tag rugby
- Rounders
- Athletics practice
- Tri-golf
- Roller hockey
- Volleyball
- Lacrosse.

Whilst some sports facilities are built for the sole use of a single sport, many have to cater for a number of activities on the same surface. This will inevitably lead to design compromises as certain types of surface are more suitable to some sports than others. In recognition of this, manufacturers are making great efforts and technological advances to design surfaces that provide a good playing experience for more than one sport.

Table 2 on page 20 identifies the general suitability of main types of playing surface for a range of sports. The standard of competition to be accommodated may also influence the choice of surfacing <sup>11</sup>.



One of the important issues relating to the choice of surface is the need for some form of shock absorbency (or cushioning), but again, there can be conflicting requirements between the sports. On the one hand, there are clear benefits for participants in protection from injury, but on the other hand too much cushioning of the surface may be detrimental to the performance of certain sports, such as tennis, basketball and netball. Rugby Union and Rugby League are examples of sports where the synthetic surfacing system requires a high degree of shock absorbency to prevent head injury during full contact training sessions and competitive matches.

It is increasingly possible to quantify the playing performance of sports surfaces using a series of standard test methods to measure the different characteristics and a number of NGBs can provide guidance on the individual recommendations for their own sports.



High fencing is commonly installed adjacent to car parks and roads

<sup>11</sup> These descriptions are provided as a general guide and are not necessarily the views of individual NGBs.

### Classification of surfaces

In the past, multi use games areas (MUGAs) have been classified in a numerical system that can be summarised as:

- **Type 1**

Open textured porous macadam areas used for ball rebound sports where tennis is the priority and sports such as mini-tennis, netball, and basketball are secondary users. These areas are suitable for wheelchair sports although care is needed in warm weather during the first year of use.

- **Type 2**

Open textured porous macadam areas used for ball rebound sports where netball is the priority and sports such as tennis, mini-tennis, and basketball are secondary users. These areas are suitable for wheelchair sports although care is needed in warm weather during the first year of use.

- **Type 3**

Polymeric surface over macadam base areas used for ball rebound sports where netball is the priority and sports such as tennis, mini-tennis, and basketball are secondary users. These areas are suitable for wheelchair sports.

- **Type 4**

Polymeric surface over macadam base areas used for recreational football, basketball and general sports and recreational training and play. Due to their greater shock absorbency and lower surface friction, these areas are not recommended for tennis or netball.

- **Type 5**

Artificial grass areas (MUGAs or AGPs) with a shockpad and either heavily doused with water before play or filled or dressed with sand or rubber crumb. These areas are used for sports such as hockey, five-a-side football, football, lacrosse, American football and training for activities such as athletics, rugby union and rugby league. '3G' artificial grass with long pile and rubber particulate pile filling is less suitable for hockey. Competitive (i.e. full contact) rugby union and rugby league must be played on pitches which have a high degree of shock absorbency as specified by the NGBs of those sports.

Recent rapid development of various combinations of artificial grass surfaces (i.e. type 5) make it more useful to group products under other characteristics such as the pile height of the grass and types of fill. Current terms used within the industry are used in Table 1 on page 19.



Sport	Surface type	Relevant Standards
Recreational football	Macadam	SAPCA Code of Practice for the Construction and Maintenance of Tennis Courts (macadam courts)
	Polymeric	BS EN 14877: Surfaces for Sports Areas – Specification for Synthetic Surfaces (multi-use)
	Needle punch surfacing	BS EN 15330-2: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 2 Specification for needle punched surfaces (multi-use)
Small sided football	Sand-filled artificial grass	BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (football)
	Long pile artificial grass	BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (football)
Rugby	Long pile artificial grass	BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (Rugby Union), or IRB Regulation 22 for Rugby
Football (mini, 9v9, small sided and full size pitches)	Long pile artificial grass	BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (football), or <b>FIFA Quality Concept for Football Turf – FIFA One Star Category or International Artificial Turf Standard (IATS)</b>
Hockey and hockey training	Macadam	SAPCA Code of Practice for the Construction and Maintenance of Tennis Courts (macadam courts)
	Polymeric	BS EN 14877: Surfaces for Sports Areas – Specification for Synthetic Surfaces (multi-use)
	Non-filled artificial grass	<b>FIH Handbook of Performance Requirements for Synthetic Turf Pitches</b> BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (football)
	Sand-filled artificial grass	<b>FIH Handbook of Performance Requirements for Synthetic Turf Pitches</b> BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (hockey)
	Needle punch surfacing	BS EN 15330-2: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 2 Specification for needle punched surfaces (multi-use)
	Long pile artificial grass	BS EN 15330-1: Surfaces for Sports Areas – Specification for synthetic turf and needle punched surfaces: Part 1 Specification for synthetic turf surfaces (hockey) <sup>12</sup>

Table 1: Types of sports surface and applicable standards – text in red identifies compliance with the standard is also a competition rule of a sports governing body. Also see ‘The SAPCA Code of Practice for the Construction and Maintenance of Synthetic Turf Sports Pitches’

<sup>12</sup> See England Hockey web site for up-to-date advice on the certification of long pile / 3G pitches.  
[www.englishockey.co.uk/page.asp?section=75&sectionTitle=Facilities](http://www.englishockey.co.uk/page.asp?section=75&sectionTitle=Facilities)



Pitch type	Porous Macadam	Polymeric	Water based pitch	Sand filled pitch		Sand dressed	Needle punch surfacing		Short Pile 3G	Long Pile 3G	
Shockpad	N/A	N/A	N/A	Yes	No	Yes	Yes	No	N/A	N/A	
<b>Sport</b>											
Athletics	○○○○○○○	●●●●○○○	●○○○○○○○	●●○○○○○	●●○○○○○	●●○○○○○	●●○○○○○	●●○○○○○	●●○○○○○	●●○○○○○	
Basketball	●●○○○○○	●●○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●●○○○○○	●●○○○○○	○○○○○○○	○○○○○○○	
Netball	●●●●○○○ <sup>1</sup>	●●○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●●○○○○○	●●○○○○○	○○○○○○○	○○○○○○○	
Mini-tennis	●●●○○○○	●●○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●○○○○○○○	●●○○○○○	●●○○○○○	○○○○○○○	○○○○○○○	
Tennis	●●●○○○○	●●○○○○○	○○○○○○○	●○○○○○○○	●●○○○○○	●○○○○○○○	●○○○○○○○	●●○○○○○	○○○○○○○	○○○○○○○	
Use as school playground	Not suitable to be used as playground as this use will probably invalidate manufacturers warranty and increase maintenance requirements.										
Football, Rugby Union, Rugby League and Hockey	○○○○○○○	○○○○○○○	← See Table 3 →								
<b>Key</b>	○○○○○○○	Not suitable for use									
	●○○○○○○○	Surface for modified games / training on but not suitable for serious training / competition									
	●●○○○○○	Surface for training/recreational use									
	●●●○○○○	Surface for training and for some competition									
	●●●●○○○	Surface for competition and training									
	●●●●○○○	Surface for competition and training (regional / national)									
	●●●●●●●	Surface for high level competition / training (national / international)									
<b>Note:</b>	<sup>1</sup> For netball it is preferred that the macadam is not colour coated										

**Table 2: General suitability of sports surfaces for various sports**

### The range of construction techniques

The range of construction techniques that can be used for artificial pitches are briefly described below. See SAPCA - Codes of Practice for more details.

#### Macadam

Macadam surfaces may take the form of dense or porous macadam. Whilst the former may provide a more durable surface and is typically laid on school playgrounds it usually provides limited benefits for sports use.

Porous macadam is used on around 80% of all tennis courts in the UK and can be played on in most weather conditions all year round. Most netball courts are also of porous macadam.

Porous macadam courts may be colour coated to improve aesthetics and the playing environment. This is achieved by either using pigmented materials to form the macadam or by painting the un-pigmented surface after installation. Although the use of pigmented macadam may be initially higher, the increased durability of the colour may make it more suitable for areas of high use.

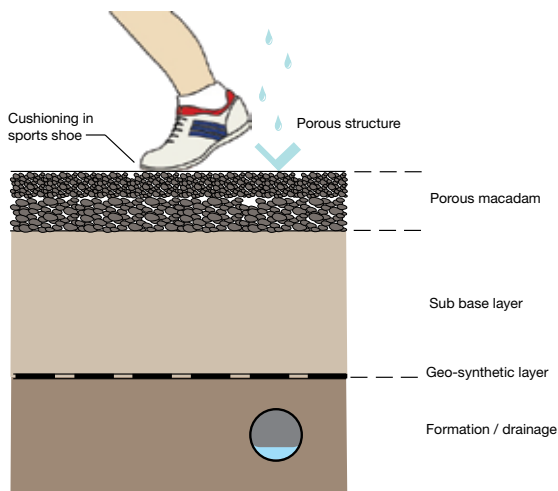
The slip resistance of the colour coating is important and requirements for this will vary for tennis and netball<sup>13</sup>.



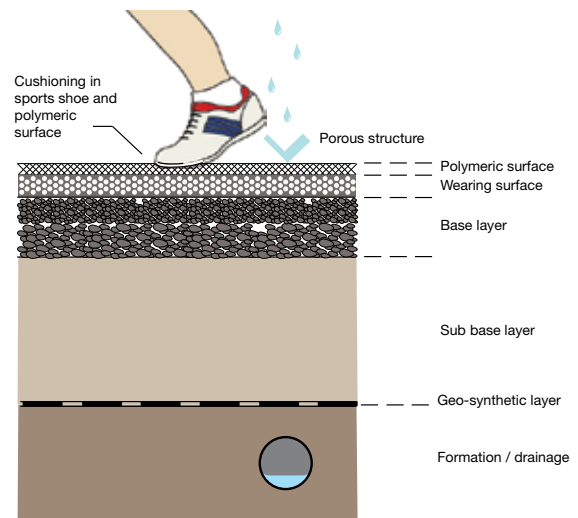
Resurfaced porous macadam track

#### Polymeric Surface

Polymeric surfaces have a degree of inherent shock absorption, which may be varied by increasing the thickness of the surfacing layer or altering the composition of the polymeric materials. To provide the high degree of slip resistance required by sports such as netball, a specially modified final coating can be applied although the use of this surface for ball contact sports will cause a rapid reduction in its slip resistance. It is for this reason that combining sports such as five-a-side football and netball is not recommended.



Sectional diagram of macadam construction



Sectional diagram of polymeric construction

Thicker forms of the surface may be specified where the intended sports include five-a-side football or athletics training. This type of polymeric is also capable (in some situations) of withstanding running shoe spikes.

<sup>13</sup> A guide to the design, specification and construction of multi use games areas (MUGA's) published by Sport England in conjunction with SAPCA.

### Types of artificial grass surface

There are many different types of artificial grass construction with a range of properties, and advantages and disadvantages. Variables include the polymer used for the fibre yarn, the cross-sectional shape and area of the individual ribbons of fibre, the method of carpet manufacture, the pile height and pile density.

Two principal designs are offered for multi-sports areas, those with a vertical pile of tufted, woven or knitted construction that is supported with a sand/rubber/other filling or dressing and those with an interlocking pile of needle-punch construction that are also filled or dressed with sand or other material.

The majority of artificial grass pitches in the past have been surfaced with tufted sand filled carpets. Experience has shown this form of carpet to have good durability and performance when used in the extreme wear conditions experienced on MUGAs.

Sand-dressed carpets are a more recent innovation. They have a shorter, denser pile than the sand filled systems with a much lower quantity of sand in the base of the pile and are primarily suited for MUGAs where hockey is the primary sport.



Sand-filled pitch with 23 mm pile onto a 15 mm shock pad for hockey and for football training

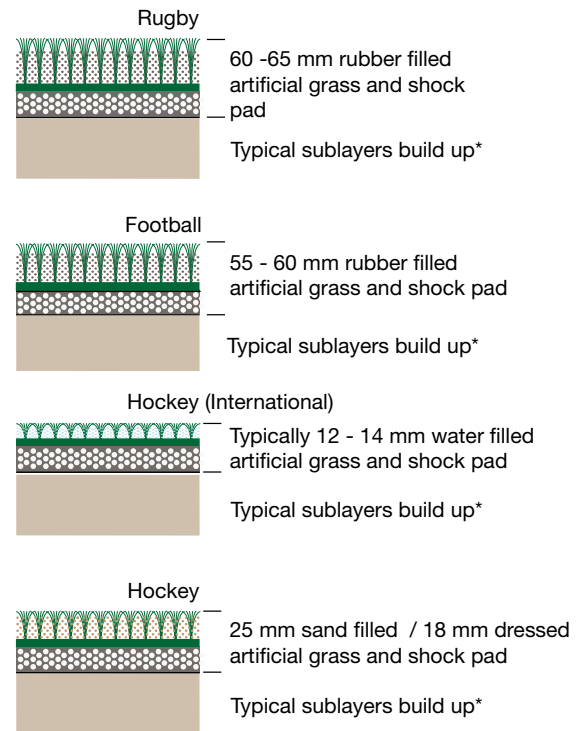
Needle-punched carpets offer benefits of increased sand stability within the pile and higher drainage characteristics.

A more recent innovation are a number of so called '3G' (third generation) or 'long pile' products with



Resurfaced pitch with 60 mm 3G long pile onto a 15 mm shock pad for football and for rugby training

generally a longer pile and various combinations of rubber crumb, or sand and rubber fillings. These are mainly suited towards football and rugby.



### Artificial grass surface construction

\* Typical sublayer build up comprising 65 mm porous macadam base / 300 mm stone subbase / geo-synthetic layer and formation as per diagram on page 9. To be read with Tables 2 and 3.

Artificial clay tennis courts that consist of artificial grass with a coloured mineral infill are becoming popular. Some systems require no watering and the maintenance is much less demanding than natural clay surfaces.

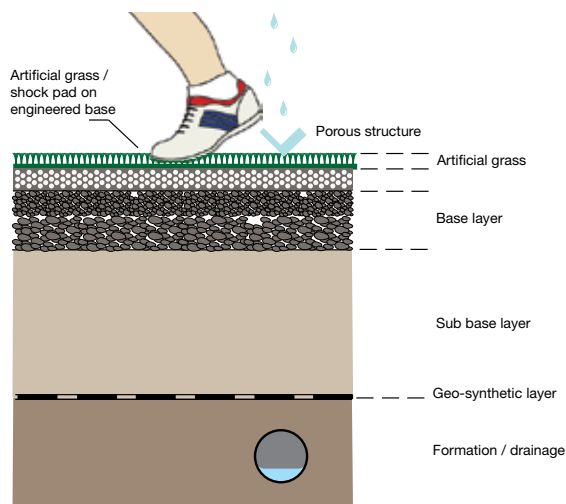


Artificial clay tennis courts

### Shockpads

A shockpad is a resilient layer introduced between the base and the playing surface. The shockpad is used to provide increased comfort to players and to create defined playing characteristics for specific sports. The shockpad also helps to retain the performance characteristics. The most common components are rubber crumb/shred mixed with a resin binder, either manufactured as prefabricated rolls or mixed and laid in-situ.

Shockpads constructed in-situ vary in thickness from 15 mm to 35 mm depending on the performance required and consist of a polyurethane binder mixed with rubber crumb / shred, installed as a cold mix through a special paving machine. The thicker pads may also contain pea gravel or other smaller aggregates and are often referred to as 'E-Layers' which are installed directly onto a stone base. The rough texture of the shockpad helps grip the back of the artificial grass carpet, minimising the risk of carpet creep or movement.



Sectional diagram of artificial grass with shockpad construction

Pre-fabricated rubber pads come in two basic types: 'flat' or 'dimpled'. The type and thickness chosen will be dictated by the priority sport, although several different options may be able to provide a surface that complies with the requirements in terms of playing characteristics. Dimple pads have a flat upper surface, with a regularly spaced pattern of undulations on the lower surface to form a rounded 'egg box' type structure. Rolls are usually 1.25 m in width. Lengths vary depending on thickness, but are normally between 25 m and 35 m.

Rolls of prefabricated shockpad may be laid perpendicular or parallel to the subsequent rolls of artificial grass carpet. Whichever arrangement is

used, it is important that all rolls should be laid straight and true with the minimum of distortion. Head joints should be staggered by at least 1.0 m. Prior to head jointing, each roll should be allowed to reach its optimum length before trimming. No joints should have a variance in height greater than 2 mm.

Several other forms of proprietary shockpad are marketed and installed by contractors in the UK. These include fibre pads, pads of closed-cell foam (flexible as rolls or rigid as panels); pads which are an integral part of the carpet system; composite pads, etc. Each has properties that the manufacturer must confirm and demonstrate (by independent test report) before a choice of synthetic surfacing system is made.

Experience has shown that the intensity of use of a MUGA can initiate carpet movement when a smooth surfaced shockpad is used. If this form of shockpad is selected the combination of carpet and shockpad needs to provide adequate protection against carpet creep, this may involve ribbon bonding (not total bonding which will impair porosity), perimeter anchoring or other means of perimeter carpet retention.

**Choose the surface that best suits the priority sport(s).**





Pitch type	Rubber crumb type			Sand type		Water type
<b>Category</b>	Long Pile 3G (60-65 mm with shock pad)	Long Pile 3G <sup>1</sup> (55-60 mm)	Short Pile 3G <sup>1</sup> (40 mm)	Sand Filled <sup>1</sup>	Sand Dressed <sup>1</sup>	Water based <sup>1</sup>
<b>Comments on sports surfaces</b>	Rugby surface	Preferred 3G football surface	Acceptable surface for football and hockey	Acceptable surface for competitive hockey and suitable for football training	Preferred surface for competitive hockey and suitable for football training	High level competitive hockey and suitable for football training if pitch irrigated
<b>Sport</b>						
Hockey	○ ○ ○ ○ ○ ○	○ ○ ○ ○ ○ ○	● ● ● ○ ○ ○ <sup>2</sup>	● ● ● ○ ○ ○ <sup>2</sup>	● ● ● ○ ○ ○ <sup>2</sup>	● ● ● ● ● ● <sup>2</sup>
Rugby League	● ● ● ● ○ ○ <sup>3</sup>	● ● ● ● ○ ○ <sup>3</sup>	● ● ● ○ ○ ○ <sup>4</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>
Rugby Union	● ● ● ● ● ○ <sup>6</sup>	● ● ● ○ ○ ○ <sup>7</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>	● ○ ○ ○ ○ ○ <sup>5</sup>
Football	● ● ● ● ● ○ <sup>8</sup>	● ● ● ● ● ○ <sup>8</sup>	● ● ● ● ● ○ <sup>8</sup>	● ○ ○ ○ ○ ○ <sup>9</sup>	● ○ ○ ○ ○ ○ <sup>9</sup>	● ○ ○ ○ ○ ○ <sup>9</sup>
<b>Key</b>	<p>○ ○ ○ ○ ○ ○ Not suitable for use</p> <p>● ○ ○ ○ ○ ○ Surface for modified games / training on but not suitable for serious training / competition</p> <p>● ● ● ○ ○ ○ Surface for training / recreational use</p> <p>● ● ● ○ ○ ○ Surface for training and for some competition</p> <p>● ● ● ● ○ ○ Surface for competition and training</p> <p>● ● ● ● ● ○ Surface for competition and training (regional / national)</p> <p>● ● ● ● ● ● Surface for high level competition / training (national / international)</p>			<p><sup>1</sup> Shockpad optional: often needed to meet appropriate performance requirements</p> <p><sup>2</sup> Surface must comply with FIH Standard (insitu tested)</p> <p><sup>3</sup> RFL currently evaluating surface standard - see their website for latest information</p> <p><sup>4</sup> No full contact</p> <p><sup>5</sup> Can only be used for Tag and Touch Rugby / Handling skills</p> <p><sup>6</sup> Surface must comply with IRB type 22 with enhanced HIC requirement</p> <p><sup>7</sup> RFU currently evaluating surface standard - see their website for latest information</p> <p><sup>8</sup> Surface must comply with FIFA 1 star or IATS equivalent approval required but pitches less than full size including small sided and training pitches can be tested to and must comply with <i>BS EN 15330-1</i> (2007 / 2008)</p> <p><sup>9</sup> Surface must comply with <i>BS EN 15330-1 &amp; 2</i> (2007 / 2008)</p>		
<b>Note:</b>	All users should refer to the individual NGB guidance, available on line, for specific information on the preferred categories					

Table 3: Categories of Artificial Grass Pitches (AGPs)

### 4.0 Site planning principles

#### Site considerations and location

The location of an artificial pitch should be sympathetic to its surroundings and any adjacent infrastructure and early guidance should be sought from the Local Planning Authority, particularly if the pitch is to be floodlit. In such cases it is essential to consider the ambient night time lighting levels and the light spillage contours for various floodlighting schemes before fixing the distances to the boundary and surrounding roadways or buildings. Landscaping and mounding can be used to obviate noise breakout and floodlight spillage. See separate Guidance Note '*Artificial Sports Lighting*' for detailed design considerations to prevent light pollution and nuisance.

The Local Authority should also be consulted on whether the drainage system needs particular features to create a 'Sustainable Urban Drainage Systems' (SUDS) that controls the flow of water to a drainage outlet. This may have a significant impact on the overall design and cost of the project. See Section 4.0.

The location of the facility must not create traffic problems and adequate access roads and car parking should be provided. Typically, one car per three players can be used to assess traffic impact. This figure can be doubled in situations where the changeover between matches is not staggered.

***Choose an accessible site location that limits noise and floodlight pollution problems for occupants of adjacent properties.***

Good locations for MUGAs and AGPs include:

- Those close to car parks and support facilities (especially where constantly supervised)
- Those where there are good sound absorbing / spectator terracing and banking possibilities e.g. the facility sits in a natural amphitheatre where it is possible to view activities (even remotely using CCTV) from a high level and where the facility will be sheltered by the surrounding terrain

- Those where there is good access to the facility for people with disabilities.

Avoid locating MUGAs or AGPs:

- Where steep gradients lead to and away from the area, especially at personnel and maintenance vehicle access points.
- Where access for people with disabilities will be difficult.
- Where the facility is remote from support facilities such as changing accommodation
- In very exposed terrain - where needs dictate, it is advisable to install a shelter belt of evergreen trees especially to the NE, N and NW geographical aspects of a facility
- Where it is not possible for access roads / footpaths and maintenance routes to reach the main personnel / maintenance gates
- Where incoming services (electricity feed cables and water / drainage) will be prohibitively expensive to install
- Where too many site perimeter and internal security / access gates have to be passed, meaning gates keep having to be locked and unlocked
- Where it is not possible for a facility supervisor to monitor personnel, vehicular and cycle movements (especially on access routes and in relation to changing rooms, parked cars etc)
- Where emergency vehicles cannot readily get to the facility
- Where users have to traverse naturally turfed areas. Mud, debris and contaminants all lead to the rapid deterioration of an artificial playing surface
- Close to unstable ground (landslides) or drainage outfalls (back falling or ponding on the MUGA due to blocked drains)
- Close to deciduous (leaf drop in autumn) or leaf sap forming trees
- Close to non-sporting area where there may be a conflict with other users.

### Infrastructure

The location should ensure the MUGA is readily accessible, ideally located to the front and/or side of a management facility or site. If this is not possible, good supervision and amenity/security lighting and pedestrian, vehicular and cycle routes should be required.

The access road system needs to be wide enough to be used by visitors, maintenance and emergency vehicles (including equipment attached to a tow bar or on the back of a trailer) and have appropriate hammer heads or turning circle. The surrounding landscape should be attractive and footpaths should be well lit and wide enough to ensure wheelchair users can access the facility. See separate Sport England Design Guidance Note 'Accessible Sports Facilities' for details.

***Design for full accessibility with well lit, paved access to outward opening gates contained in the fence line.***

***See 'Accessible Sports Facilities' Design Guidance Note available from the Sport England website.***

Amenity / security lighting installations should be installed along access routes to help alleviate any severe contrast of lighting conditions when a user comes away from a floodlit facility.

To ensure safe egress from the floodlit area, arrangements should be made to retain a small part of the main lighting in operation for a limited period. This will usually be just prior to the curfew time, if one is imposed by the planning approval.

For anything greater than a one-court size of MUGA (and to a degree, needs should even be assessed for these), access to support facilities and changing provision is essential.

When sand filled or sand dressed or 3G (third generation) surfaces are used, it is advisable to install at all ingress / egress points drained catchment pits and gratings, complete with barrier matting. Certain designs of catchment pits and grilles will also double as animal deterrents, especially if pits are wide enough to prevent them being jumped over and if gates are self-closing.

Where there is a high level of team changeover throughout the day, the designation of a small court recreation / warm-up / practice area may be beneficial. This may be surfaced using a more cost effective surface if budgets are limited but matching the exact AGP surface is preferable where higher standards of competitive play are envisaged.

Experience suggests that taking the artificial grass carpet up to the fence line on an AGP is desirable as a macadam border can become dangerously slippery when sand or rubber particulates from the carpet infill migrate onto it. Carpeting the whole area in multi-sport situations, where cross pitch sub lettings and casual play lettings are envisaged, also allows the soccer goalmouths to be positioned outside the side lines of a hockey pitch. This will prevent excessive wear to the wings of the hockey pitch reducing the possibility of patch repairs that can prove hazardous.

### ***Design references:***

#### ***Sport England Guidance:***

- ***Pavilions and Clubhouses Design Guidance Note available from their website.***

#### ***FA Technical Guidance:***

- ***Ancillary Works***
- ***Changing Facilities***
- ***Artificial Grass Pitches.***

[www.footballfoundation.org.uk/external-links/](http://www.footballfoundation.org.uk/external-links/)  
[www.thefa.com/GetIntoFootball/Facilities.aspx](http://www.thefa.com/GetIntoFootball/Facilities.aspx)

### Trees

Trees adjacent to a site may have the advantage of providing privacy, shelter or screening from a low sun. Their roots, however, can be a threat to the facility itself, by penetrating the stone sub-base and distorting or cracking the surface. This is especially the case for strong-rooted varieties such as poplar, willow and sycamore. Where such a threat exists, preventative action will be necessary, such as tree surgery or the construction of a root trench to inhibit the growth of roots onto the site. This is usually done by digging a trench, cutting any roots in the process and removing them as far as possible to a depth of 1.0 m. The wall of the

trench is then lined with suitable material, such as concrete or thick polyethylene barrier grade sheet, before backfilling.

It should be noted that whilst such measures will inhibit root incursion, the only certain preventative measure is repositioning the pitch. Generally, pitches should be no closer to trees than a distance equivalent at least to the potential height of the tree and its potential canopy width. If there are no alternative sites for the pitch, construction can take place above tree roots by using special 'cellular web' sheeting which is placed onto the soil, pinned in place and filled with stone ('non-dig' construction). Tree officers recognise this technology and there are specialist companies who will prepare a design if they are provided with a tree report and geotechnical report of the site.



Example of 'cellular web' tree root protection system

In addition, branches that overhang artificial pitches are a cause of various problems, such as the continuous dripping of water and leaf sap, insect secretions and bird droppings. These can result in damage to the playing surface and impaired porosity. It is recommended that overhanging branches be pruned back or, if possible, the facility re-sited.

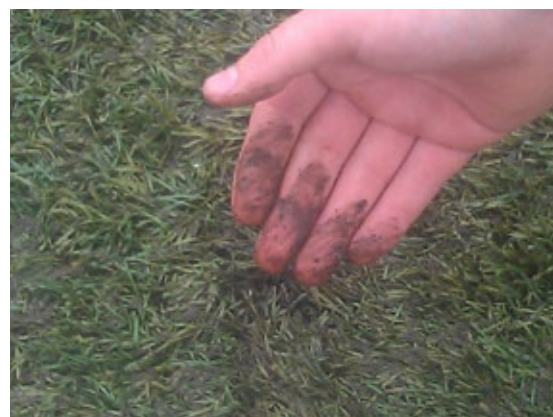
Cutting tree roots may de-stabilise a tree or kill it and it is strongly recommended that the advice of an Arboriculturist and/or Local Authority Tree Officer is sought before carrying out tree surgery. Some trees are also protected by preservation orders and significant fines will be imposed if they are cut without prior permission. The document '*BS 5837:2005 Trees in Relation to Construction Recommendations*' provides specific advice and guidance.



### Flood plains and areas at risk of flooding

Many sports facilities including pitches and athletics tracks are constructed in flood plains and areas at risk of flooding. If a sports facility is to be constructed within a flood plain or flood risk area, the local planning authority and the environment agency will almost certainly impose stringent design criteria at planning stage. The raising of ground levels in a flood plain is generally not allowed and finished levels will have to be approved before works commence. The type of fencing used can also be a planning issue as it must allow the free passage of water across the facility and planning approval may have to be sought for the type of fencing to be used. Hockey ball rebound boards may not be allowed at the base of the fence or they may be allowed provided there is a specified gap beneath them. Requirements can vary.

If a sports facility is subject to flooding, the surface will have to be cleaned and sanitised once flood waters subside. Flooding can sometimes cause artificial grass carpets to lift and carpet infill to wash away in which case total replacement may be necessary. Flooding can silt up drainage systems and CCTV surveys and jetting of drainage systems may be required.



Contamination of the infill after flooding. The pitch had to be cleaned and sanitised

During the planning process, the applicant will be asked whether the proposed site is in a flood zone and this information can be accessed on the environment agency web site or by contacting them directly. The applicant should be prepared to engage a professional to produce a flood risk assessment (FRA) in cases where the proposed site is in a flood zone.



### 5.0 Detailed design considerations

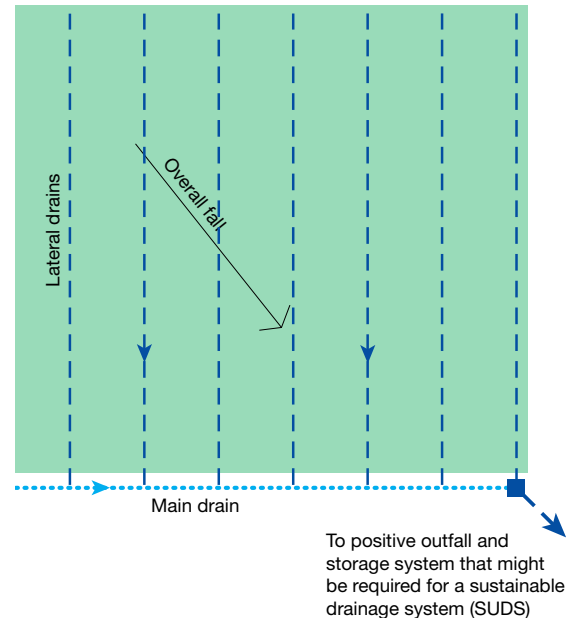
#### Drainage

The MUGA/AGP should have a suitable drainage scheme that will:

- Ensure that all surface water is removed from the pitch at a rate which will avoid surface flooding
- Avoid a reduction in the load-bearing capacity of the formation layers or frost damage to the construction
- Protect the installation from the effects of ground or surface water from the surrounding areas
- Comply with the Local Authorities requirements for compliance with Sustainable Urban Drainage (SUDS) design principles.

One area where MUGAs and AGPs differ is in the design of the drainage system. Due to the relatively small dimensions of most MUGAs, they do not have any form of sub-court drainage other than a perimeter drain that is laid around one or more sides of the facility. In contrast, most AGPs

incorporate lateral drains beneath the pitch, the centres of which are determined by the composition of the subsoil and the designed infiltration rate, but usually range from 5 m to 15 m. The ends of lateral



Typical drainage approach where the overall slope of the pitch assists the drainage system.



drains should be capped to prevent contamination and connectors should be used to join lateral drains to collector drains. Collector drains are normally located on the outside of the perimeter edging.

Interceptor drains (which may act as collector drains) should be installed at the toe of any embankments to prevent run-off from surrounding areas onto the pitch.

Silt/inspection chambers should be installed where perimeter/collection drains change direction, and the provision of rodding eyes should be included at the head of collector drain runs for ease of access for maintenance.

In most cases there will be a requirement by the Local Planning Authority or the Environment Agency for the drainage to be designed as a Sustainable Urban Drainage Systems (SUDS). This will control and limit the flow from the site and can be very expensive in terms of capital and maintenance costs. It is essential that the system is designed by properly qualified and experienced consultants.

### Base and sub-base construction

The base for a MUGA is normally a porous engineered construction consisting of two courses of open-textured bituminous macadam laid above a graded stone 'sub-base' foundation. This form of construction has gained acceptance due to its ability to offer the greatest possible level of stability to the final surface, resisting frost heave and spreading surface loading. These factors all mean that it is simpler to replace or upgrade the surface of the MUGA when the need arises.

The base to any MUGA/AGP should be designed to meet the following criteria:

- It should be capable of supporting – and transmitting to the existing ground – the loads of all vehicles, plant, machines and materials to be used in the construction, without causing deformation of the site.
- After the pitch is built, the stone sub-base should be capable of supporting and transmitting all loads on the playing surface without permanent or long-term deformation of the playing surface. Such loads arise mainly from players and maintenance equipment.
- It should ensure that water, whether rainwater or natural ground water, will drain away freely through the stone sub-base material and into the formation and/or drainage system.

The stone and macadam base should be constructed using hard, clean, free draining, crushed frost-resistant aggregates. In order to prevent contamination from the formation, it is often necessary to install a geotextile membrane on the formation prior to installation of the compacted stone sub-base.

The macadam upper layers of the base should be of a carefully graded, open textured construction and not the standard 'car-park' type mix, prevalent in school playgrounds.

### Playing lines

One of the obvious limitations of a MUGA is the possible difficulty for players in identifying the relevant play lines, where there are many overlapping sets of lines on the same surface. For this reason it is unwise to include lines just for the sake of completeness, if the sport is not likely to be played very often. The problem is usually more pronounced for sports such as tennis, where it is very important that the lines should be quickly and clearly seen by the players.



Acrylic tennis court surfaces painted on a macadam base

Playing lines can be painted on to most surfaces, but with synthetic grass they are usually either tufted in during manufacture or cut in when installing the surface. The choice of colours is also important, and advice should be taken on the most suitable combinations of colours for the sports to be included. As a rule of thumb, the most frequently used sport should be marked out in white, the second most played sport in yellow, followed by blue, and red. However, the FA have decided that blue lines will be used for 9v9 football (refer to the *FA 3g Guide 2012*).

**Take playing surface  
right up to fence lines.**



A 3G rugby pitch with carpet extending right up to the fence

### Initial settling down period for surfaces

Most playing surfaces require some degree of extra care when used during the immediate post-construction phase. It is important for purchasers to be fully informed as to when the playing surface may be first used and any precautions that may be necessary until the surface has fully settled in. This is particularly important in the case of bitumen-bound surfaces, which may be subject to some softening during hot weather and the use of wheelchairs during the first year of use need very careful monitoring.

### Corrective / remedial action to surfaces

Some surfaces, most notably macadam, are extremely difficult to repair imperceptibly. A degree of latitude should therefore be applied when assessing minor areas of non-compliance for their effect on performance and suitability for purpose, and the appropriate extent of any remedial action.

Where remedial works are required, the repaired surface should match adjoining areas in colour, texture, levels and, except where invisible mending can be achieved (e.g. some synthetic grass surfaces), should be replaced to the nearest play lines or construction joints. Joints should be neat, straight and unobtrusive.

### Equipment

There is a wide range of nets, posts, goals, division netting and rebound boards to choose from. Consideration must be given to the precise use of each facility, so that the change of usage from one sport to another can take place with the minimum of effort and inconvenience.

Nets, posts and goals can be free-standing and therefore easily moved, although it is important to make proper provision for their storage when not required from the point of view of both safety and

security. It is vital that great care should be taken to ensure the safe anchorage of all freestanding equipment.

- Football goals (full size) should comply with *BS EN 748:2004*
- Small-sided football metal goals should comply with *PAS 36-1*
- Youth football, futsal, mini-soccer and small-sided football goals should comply with *BS 8461:2005 + A1:2009*, *BS 8462:2005 + A2:2012* and *BS 8461*
- Handball goals should comply with *BS EN 749*
- Hockey goals should comply with *BS EN 750*
- Netball goal posts should be supplied with protective post pads and comply with AENA requirements
- Tennis posts and nets should comply with *BS EN 1510*

Always insist that a Certificate of Conformity from an independent test laboratory is supplied with each item of sports equipment purchased.

Recessed sockets in the playing surface are quite usual for surfaces such as macadam and polymeric, though less practical for sand-filled synthetic grass. Also available are proprietary sports equipment systems which offer high quality bespoke solutions, such as integrated surround fencing and a variety of goal units. Especially preferable are recessed goals for five-a-side football, in order that the goals should be flush with the rebound boards or walls.



Recess for portable soccer goals

In situations where site constraints prevent goal recesses being constructed, 'folding' or 'swing out' goals are available.





'Swing out' soccer goals

**Ensure the safe anchorage of all items of equipment such as goal posts.**

### Cricket practice cages (permanent and wheelaway)

Guidance on cricket practice cages is available on the ECB web site. The wheelaway cage allows an artificial surfaced 'match pitch' to be used for practice. It is also worth noting that for reasons of safety, cricket practice facilities are sometimes enclosed within surround fencing incorporating a roof net.



'Permanent' cricket nets



'Wheelaway' cricket nets

### Equipment storage

Mainstay portable sports equipment can be stored outdoors - it is designed to be exposed to the elements.

Specialist non-personal equipment e.g. training cones, goals netting etc. are best kept in a secure facility or vandal resistant storage container close to the MUGA.

On facilities where football and its derivatives are likely to be played, it is sensible to build into the perimeter fence suitably sized recesses to accommodate and anchor portable soccer goals. The design should ensure there is sufficient height clearance in the fence goal recess to prevent cranial and thoracic injury - largely caused by someone running towards the goals or keeping goal. The design should ensure it is easy to retrieve balls from the fence recesses and goal itself (goals may not even require netting for certain standards of play). Above all, the ability to securely anchor the frame of the goals to prevent them toppling over is paramount.

If goals are required to stand inside the perimeter fence line during play, it is essential they are returned to storage recesses when the full pitch (or portions), are to be used. Beyond the play lines, run offs are provided to ensure users can stop safely, so it is important to ensure that equipment is not stored in them.

The suggested layout for the example AGP shown in Appendix 1 allows for full-size portable football and hockey goals to be relocated into fence design recesses, conveniently positioned behind the goal locations at each end zone of the facility. Such recesses should have secured posts of sufficient height (equivalent to the main perimeter fence height) with a high-level permanent tensioned wire - to allow a netting to be pulled across to containment for seven-a-side football end zone utilisation of the main pitch, when the main pitch goals are retracted into their equipment recesses.

**Provide adequate storage for equipment.**

### Fencing

The choice of surround fencing is usually dictated by the priority sport, site constraints and budget. The two basic functions of surround fencing are to retain balls within the playing area and to allow spectators to view the game safely. In some locations other important considerations may be security and the need to keep out animals. For greater durability, weldmesh cladding is strongly





Twin wire used on a school site



358 mesh used on a school site

preferred, together with rebound boards or perimeter kickboards as appropriate for the sports being played. The ability of fencing to withstand damage from impact by balls can be confirmed by asking for a Certificate of Conformity from an independent test laboratory that the product meets the requirements of *EN 15312:2007 Repeated Impact Resistance to Footballs and Kicks*.

Single gates should be 1.2 m wide. Double gates should be 3.0 m wide with removable lintel panel above for ease of access with soccer goals. All gates should be fully infilled with weldmesh / rebound boards / kick boards as appropriate, and provided with a suitable locking mechanism. All gates should open outwards for the safety of players.

At main access gates, boot cleaning facilities should be provided to prevent contamination of the playing surface with mud and material from outside the playing area.

Consideration should be given to having a bolt hole gate to allow persons backed into a corner in bullying situations to escape from the MUGA - it need only be rebound board wall height, but should have a panic spring latch release lock (operated from inside of MUGA only) with a closing mechanism (spring coil hinge restraint) to return the gate to the shut position.

All gate thresholds should be level or slightly ramped (i.e. not stepped). Gates should also be positioned so as not to create 'tight' gathering or milling points, especially where pitch / games area team changeovers are scheduled. See *SAPCA Code of Practice for the Construction and Maintenance of Fencing Systems*.

### Divider netting and screening

***Include division netting to divide the pitch into small courts and give maximum programming flexibility.***

In order to maximise the use of larger MUGAs and AGPs, good quality division netting should be installed to split the playing area into separate, smaller areas of activity, as required. This type of netting is typically referred to as 'curtain' netting which can be drawn across the pitch on support wires when in use and pulled back to the fence line when not in use. Care should be taken in the selection of the netting and intermediate free standing support posts to ensure the safety of players at all times, avoiding, as far as possible, potential trip hazards.

The greatest care should be taken if site screening or windbreak materials are to be hung on the surround fencing, to ensure that the design of the fencing is sufficiently robust. A heavy-duty surround system will normally be required for this purpose.

### Ball rebound systems

Where appropriate, particularly on MUGAs where five-a-side football is to be played, a rebound wall or board system should be installed. Rebound walls and boards can be constructed from a variety of materials and may be stained or painted in order to improve their aesthetic appearance. A number of companies now also offer rebound fencing typically of a 'twin wire' system or 358 mesh (see examples above). These are advantageous where user and site security issues are a concern as they allow viewing of the total area.

### Outdoor sports lighting

For pitches where a significant amount of community use is planned, it is essential that the pitch is properly floodlit. Most funders will insist on outdoor sports lighting.

The advantages of outdoor sports lighting are:

- **Increased use of facilities.** Outdoor sports lighting facilities enables them to be used on winter evenings, giving substantially higher usage rates than equivalent non-floodlit facilities and increasing choice and flexibility of playing times for users.
- **Programming flexibility.** Longer operating hours give facility managers and users more freedom in programming and in initiating sports development programmes.
- **Additional income.** Increased use means greater potential to generate additional income - essential with the high capital cost of providing a MUGA or AGP, although there will be increased wear and tear of the surfaces reducing its service life.
- **Usage options.** A floodlit MUGA adjoining a sports hall can accommodate activities such as football, netball and tennis, releasing more expensive indoor space for other activities.

It is essential, before deciding to install outdoor sports lighting, to be satisfied that the benefits of increased use, flexibility and additional income will justify the initial capital cost and, thereafter, help offset the ongoing energy costs, maintenance costs and the additional management costs necessary to maximise these benefits. A profile of a typical week's use during the playing seasons will help in this assessment. Such a profile should include:

- Club matches, training and coaching sessions for all adult and junior teams
- The likely casual use of the facility by other clubs, teams and individuals – the sports or leisure department of the Local Authority should be able to help in this respect.

***Most funders will insist on floodlighting of a synthetic pitch to ensure maximum use of the pitch.***

With the profile it should be possible to predict the likely levels of additional income and expenditure that providing outdoor sports lighting will generate and whether such provision is likely to be financially viable. It may also be helpful to consult the Local Authority's Sport and Recreation Strategy or the Regional Recreation Strategy and Sport England's Facility Planning Model to ascertain whether a need for floodlit sports facilities has been identified for the area.

Where outdoor sports lighting is to be installed as part of a MUGA construction, independent specialist technical advice should be taken regarding the choice and performance of the lighting system, the illumination requirements for the specific sports that will be catered for, and the management of the lighting system. Many Local Authorities have planning guidance on sports lighting and early consultation with the planning authority is advisable.

It should be noted that conflicting guidance might sometimes be given by different organisations or publications regarding the recommended standards of lighting for different sports. In such instances, reference should be made to the appropriate NGB for the sport(s) concerned <sup>14</sup>.



<sup>14</sup> See 'Artificial Sports Lighting' Design Guidance Note available from the Sport England web site.

### 6.0 Operation and maintenance

#### Playing surface

The maintenance of any synthetic sports surface is of vital importance. It is required to ensure consistent playing characteristics and compliance with the specified sports performance requirements, visual appearance and permeability (if appropriate). Regular maintenance is often referred to as ‘*planned preventative maintenance*’ and will also help to maximise the life of the carpet. The contractor should provide full maintenance instructions upon completion of the project. The contractor’s guarantee will usually be conditional on the recommended maintenance requirements being carried out with reasonable diligence.

The precise maintenance requirements will vary according to the type of surface and particular guidance should be sought from the contractor / manufacturer. Detailed maintenance guidelines are included in ‘*The SAPCA Code of Practice for the Construction and Maintenance of Synthetic Turf Sports Pitches*’ published by the Sports and Play Construction Association (SAPCA).

It is a common misconception that artificial surfaces are maintenance-free. The products are expensive to install and a proper maintenance programme should be followed to maximise the life expectancy<sup>15</sup>. In addition, regular cleaning will help to keep the pitch in an attractive condition and encourage usage.

Refurbishment techniques are available for some types of artificial grass in which some or all of the fill is removed and replaced with new materials. Typically, this would be after 5 or 6 years of use. This can help to maintain the drainage, remove dirt and pollution material and reduce compaction.

***Industry guidance is for 1 hour of maintenance for every 10 hours of use.***

Frequency	Task
Every 1-2 days	Empty bins Sweep pitch
Weekly	Drag brush Inspect for damage
Every 2-4 months	Standard power brushing
Every 3-4 years	Deep power brush
Every 5-10 years	Infill jetting and replacement

Typical maintenance regime for an artificial grass pitch used for 2000 hours / years<sup>16</sup>



Artificial grass pitch marked for hockey and football

<sup>15</sup> The Football Association estimates that £9,000 - £11,000 per year is required (at 2008 prices) for regular and periodic maintenance of a full sized pitch.

<http://www.footballfoundation.org.uk/external-links/>  
<http://www.thefa.com/GetIntoFootball/Facilities.aspx>

<sup>16</sup> ‘*Maintaining Synthetic Turf: Sand Filled Systems, The Cranfield - IOG Guidelines*’

### Outdoor sports lighting

The maintenance of the outdoor sports lighting installation is also of vital importance if it is to continue to meet the performance standards and life expectancy set at the design stage. The maintenance will include routine work on all the associated electrical services, cleaning of fittings and checking of the correct 'aiming angles' set up during final commissioning. To enable future maintenance of the lighting to be related to the 'burning hours', a suitable 'hours run' counter should be included in the control / monitoring system. When the performance of the lamps fall below the design standards, the maintenance budget should be used to replace them. This is best done on a planned basis and allowance should be made for all lamps to be replaced as a complete set, and not individually on lamp failure.



### Costs in use and replacement funds

Project co-ordinators should take into account the full life costs of the facility at an early stage. Information should be obtained on the costs of routine maintenance of the chosen playing surface, together with the cost of the total replacement at the end of its useful life. The manufacturer of the surface will be able to advise on their particular products and information may be available from other projects. Similar information should be obtained in respect of the floodlighting installation.

Both a routine maintenance budget and a 'sinking fund' for total replacement (or major works) should be established as soon as the new facility is in use, in order to ensure that sufficient funds are available when necessary. Such costs should also be reflected in the business plan and charges for use of the facility by the wider community.

***Establish a 'sinking fund' for total replacement of the surface (or major works) at the end of its life.***



### APPENDIX 1:

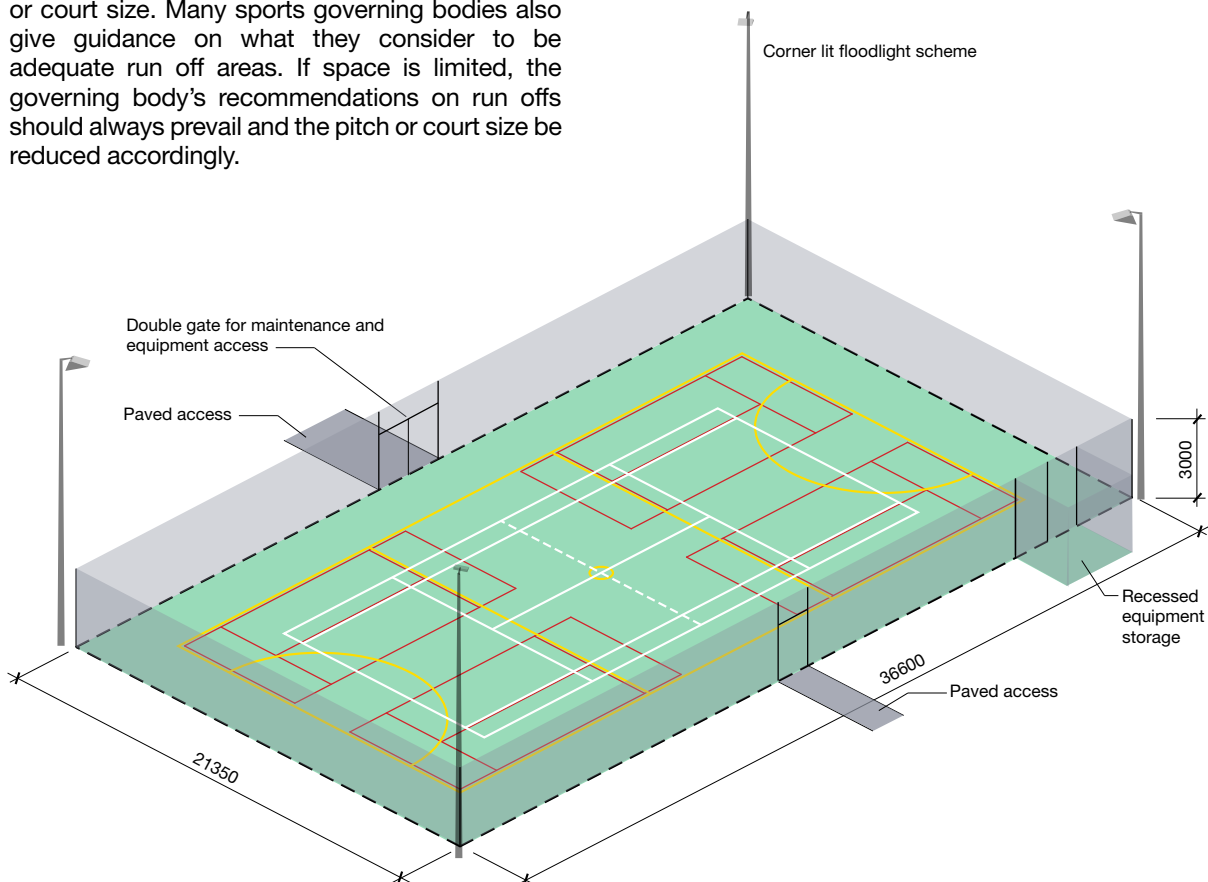
#### Typical layouts

The success of a MUGA or AGP is dependent on the layout, for the various sports to be played on the facility, being correct. The critical consideration when designing the layout of a MUGA is to maximise the available space whilst providing an acceptable playing environment. The size and layout of the pitch or MUGA should suit local and strategic sporting needs and user profiling.

Project teams should check with NGBs of all sports included for their most current recommendations on pitch dimensions, including run offs, before drafting the facility layout. The total area of the pitch or court comprises the principal play area (the area within the line markings and run offs that are provided to ensure players do not collide with fences, floodlight columns etc). For some sports e.g. tennis, a secondary total play area is prescribed for floodlighting. This is the area outside the principal playing area but less than the total fenced area. The rules of the various sports define the pitch or court size. Many sports governing bodies also give guidance on what they consider to be adequate run off areas. If space is limited, the governing body's recommendations on run offs should always prevail and the pitch or court size be reduced accordingly.

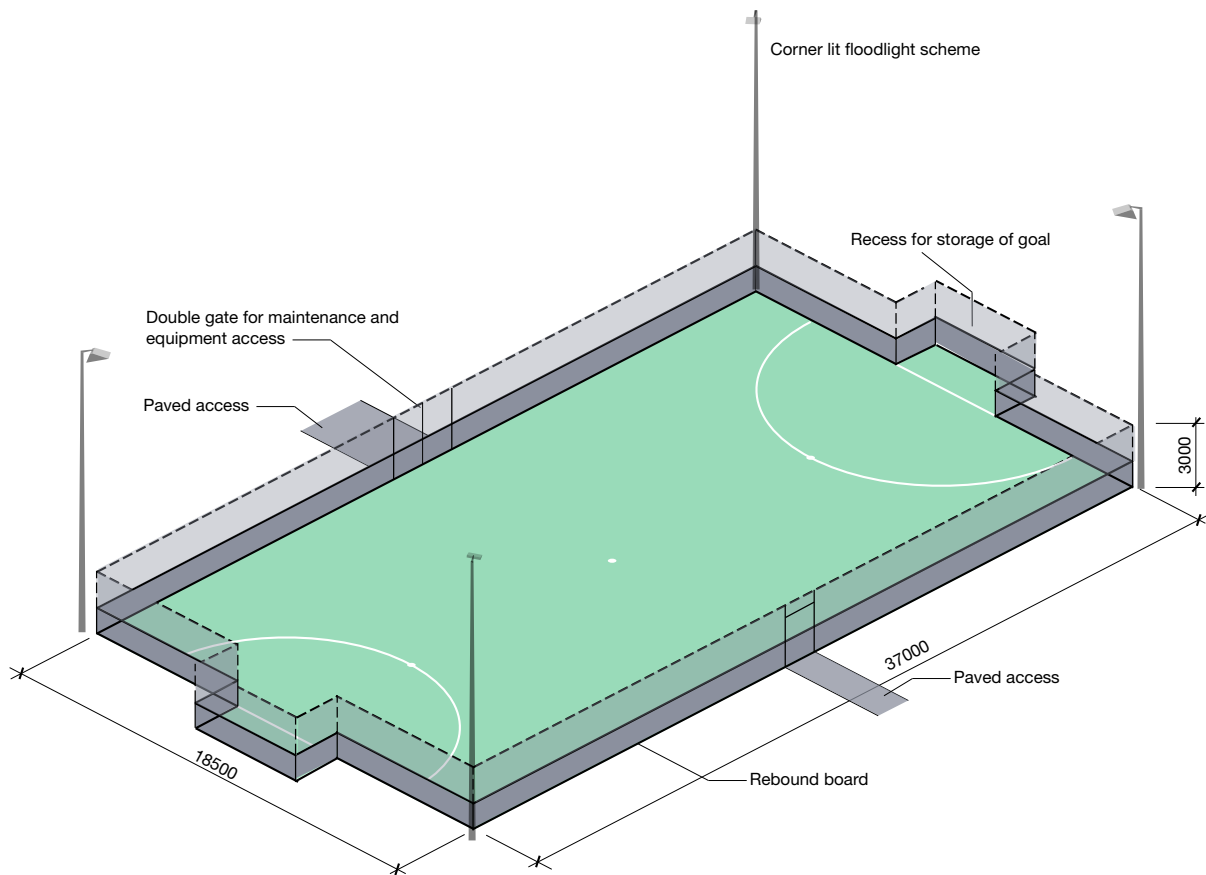
It is generally recommended that playing areas should be orientated approximately in a north-south direction. This orientation is preferred because it minimises the effect of a setting sun on the players, but in the UK climate, the inability to achieve this orientation need not preclude the construction of the facility. It is also worth noting that where a facility is built primarily with daytime play in winter in mind, a north-south orientation may be far from ideal, especially where shading from the south may need increased time for thawing of frosty areas.

The typical layouts indicated for MUGAs and AGPs follow the NGB recommendations. The MUGA layouts are based on single units. Where multiple units are required, sectional boarding or fencing may be used to separate areas, particularly where five-a-side football is to be played.

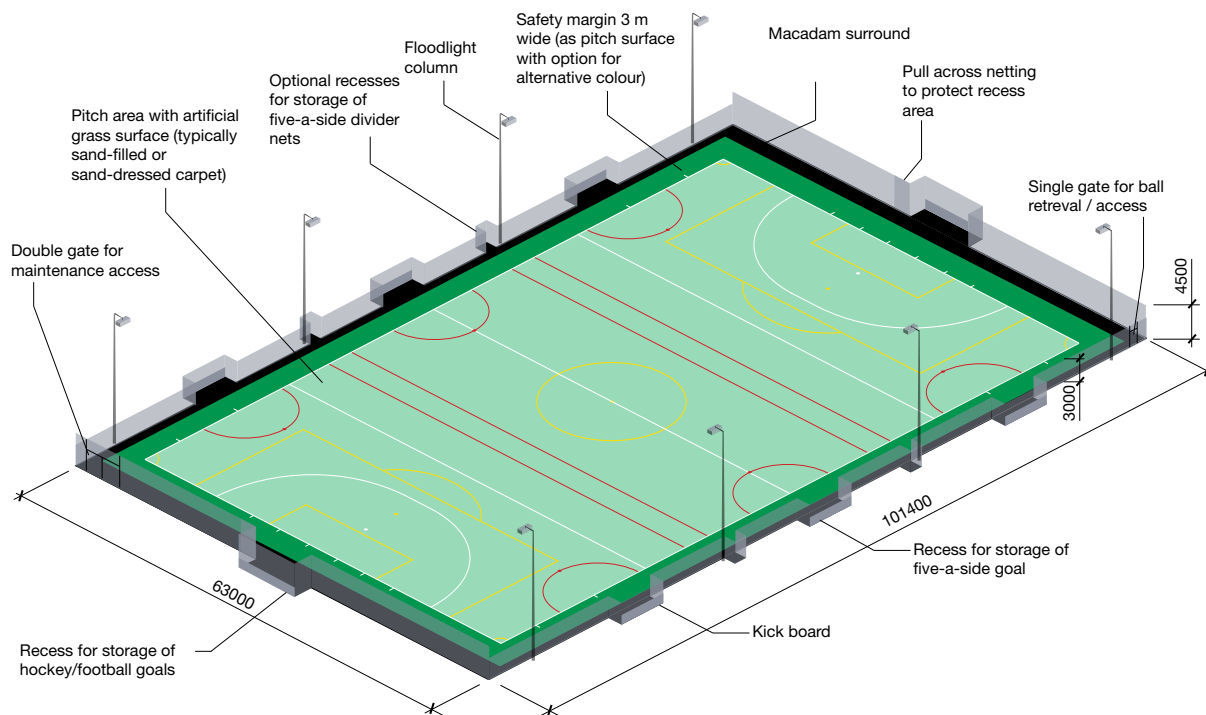


Typical Type 1, 2 or 3 MUGA layout with line markings for tennis, netball and mini tennis

See the **'Artificial Sports Surfaces'** section of the Sport England web site for downloadable drawings



Typical Type 4 or 5 MUGA layout with line markings for five-a-side football



Typical AGP layout with line markings for hockey, football and five-a-side football

See the **'Artificial Sports Surfaces'** section of the Sport England web site for downloadable drawings

See **'Comparative Sizes of Sports Pitches and Courts'** guidance note available from the Sport England web site.



## Alternative Languages and Formats:

This document can be provided in alternative languages, or alternative formats such as large print, Braille, tape and on disk upon request. Call the Sport England switchboard on 08458 508 508 for more details.

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## User Guide:

Before using this guidance for any specific projects, all users should refer to the 'User Guide' to understand when and how to use the guidance as well as understanding the limitations of use.

[Click here for 'User Guide'](#)

[Click here for current 'Design and Cost Guidance'](#)

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## Further Information:

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