



The FA Guide to Artificial Grass Pitches

(Third Edition)

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There are many ways of constructing an artificial grass football pitch. These guidelines do not constitute any form of approval from The FA on a particular form of surfacing or construction but are intended to provide information to potential consumers to allow them to make informed choices when designing and selecting surfaces, contractors, etc.



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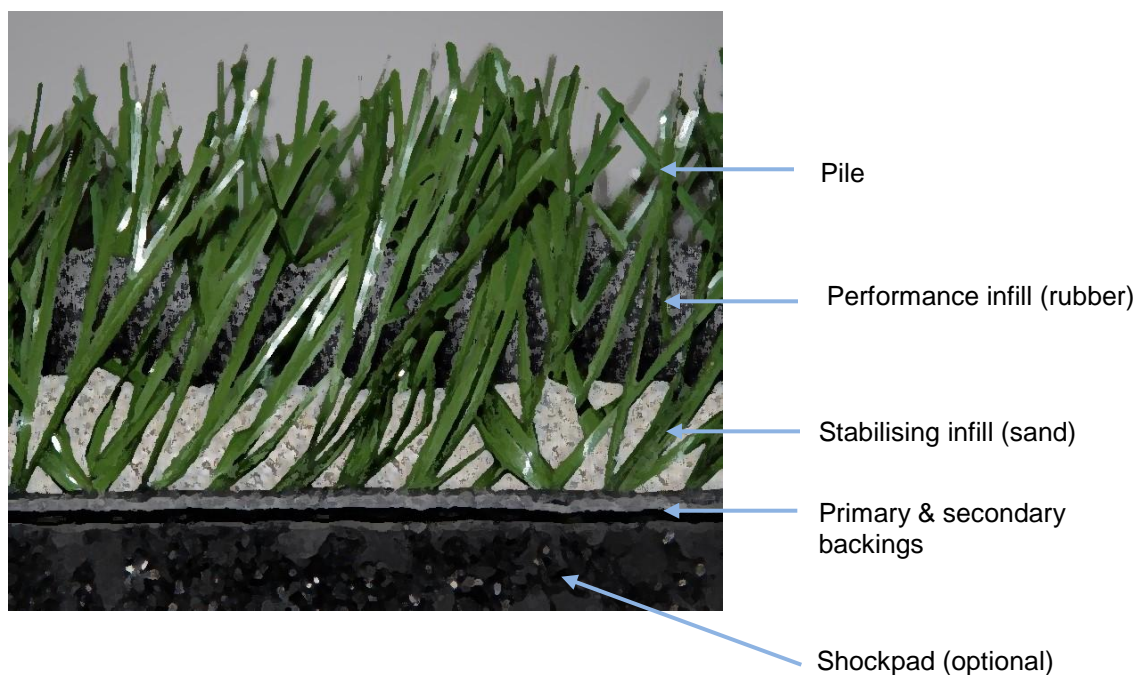
Appendix A

Requirements for artificial grass pitches used in all FA competitions with the exception of The FA Challenge Cup and FA Youth Cup (rounds proper only)

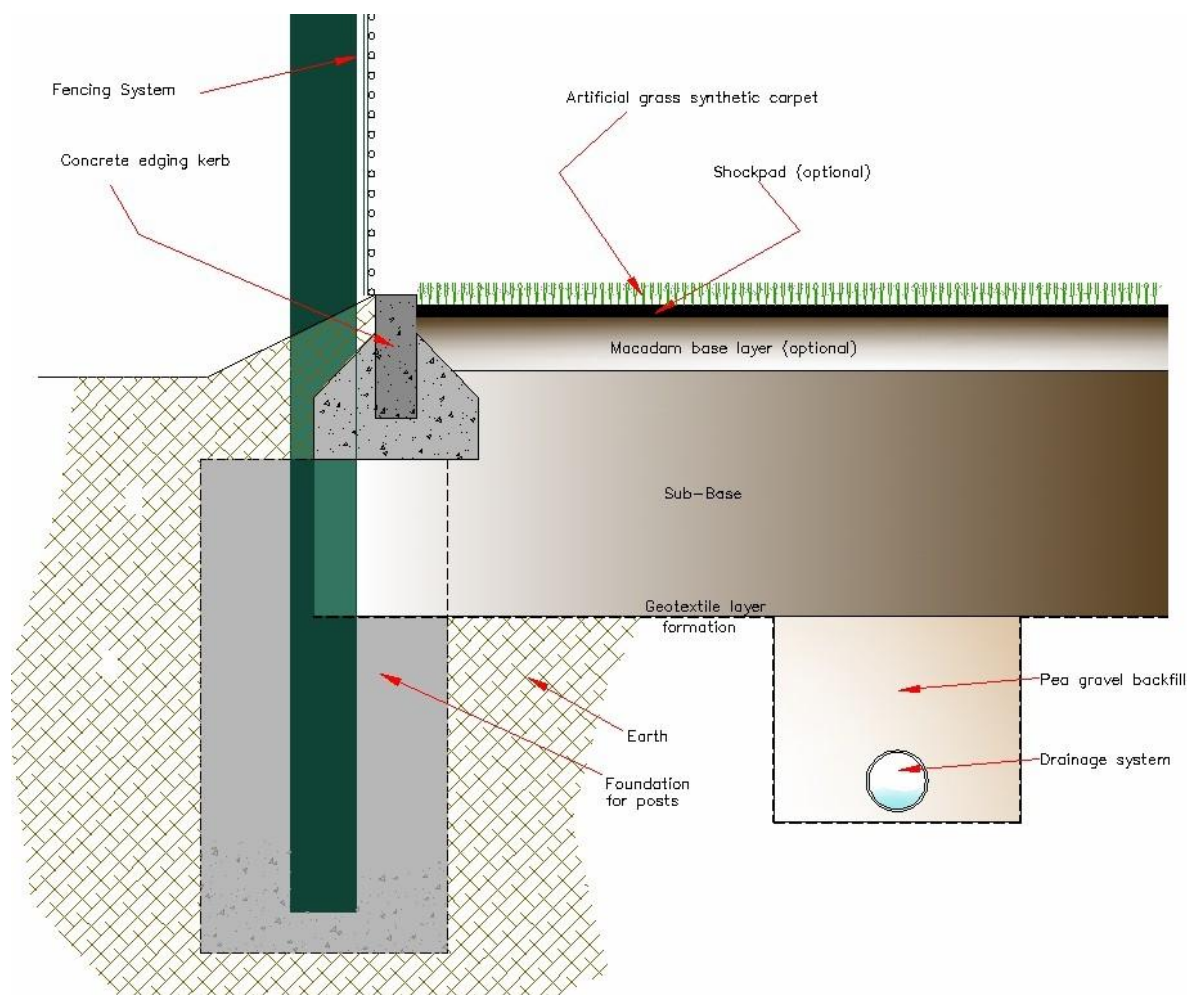
1 Introduction

The last 10 years has seen major innovations in the development of artificial grass surfaces designed for football. The development of longer pile surfaces now allows the game to be played on artificial grass that replicate the playing qualities of the best quality natural turf pitches whilst increasing the levels of use. The success of these surfaces is such that they are now being used in major competitions including FIFA World Cup qualification matches and the UEFA Champions League.

Although too many an artificial grass pitch is just the carpet, it is in fact a complex piece of engineering that needs to provide the correct playing and safety characteristics whilst ensuring adequate durability to withstand the effects of use and the ravages of the climate. Drawing 1 shows a typical cross section of the artificial grass surfacing system whilst Drawing 2 shows a typical pitch construction including sub-base, drainage, fencing etc.



Drawing 1 – principal elements of an artificial grass surface



Drawing 2 - cross section showing typical construction of an artificial grass pitch

These guidance notes are intended to provide impartial advice to organisations considering the installation of artificial grass pitches. They describes the many factors that need to be considered during the design, specification and construction of an artificial grass pitch and describes some of the various surfacing and construction options being offered by contractors. They also include advice on maintenance, life cycle costs, sinking funds and post installation monitoring and testing.



2 Use of artificial grass pitches in FA competitions

In England until fairly recently artificial grass pitches have primarily been installed for community use at training or coaching venues. Over the last few years they have, however, started to be used for competitive matches, originally in youth and junior leagues but more recently in the Non-League system within the following FA competitions:

- FA Trophy
- FA Vase
- FA Youth Cup (qualifying rounds only)
- FA Women's Premier League and Cup
- FA Sunday Cup
- FA County Youth Cup

The use of such pitches is however dependent on compliance with FA conditions of use, which have been approved by each Competition Committee; a copy of these forms Appendix A of this guide and should be read in association with these notes.

In summary matches may be played on artificial grass pitches that conform to the FIFA Quality Concept 1 Star standard, or the equivalent International Artificial Turf Standard (IATS) in all FA Competitions, **except** the FA Challenge Cup (all rounds) and FA Youth Cup (Rounds proper). To qualify for use, the pitch must be **certified annually** as meeting the FIFA 1 Star standard or the equivalent International Artificial Turf Standard. The relevant certificate must be supplied to the FA and relevant competition before play is allowed.

3 Is an artificial grass pitch right for you?

When considering the installation of an artificial grass pitch the first step is to undertake a feasibility study to identify what you really want to achieve from your pitch; this decision process is a fundamental element in the success of the future pitch. You should challenge yourself to think about the future of your organisation and ensure that you, and your colleagues, share a common vision.

Ask yourself:

- What are the priorities from your football development plan? Will training be the main use or will you be looking to stage matches on the pitch too?



- What are the demands for the artificial grass pitch in your area?
- What will your hiring fee structure be across the various times the facility will be open?
- Can the proposed hiring fees be afforded by the local community and will this provide sufficiently towards your sinking fund?
- How will your development affect the key policies of The FA's National Game Strategy, e.g. have you taken advice from The FA and/or your local County FA?
- Dependent on the type of use, you must make your own informed judgement on the quality of the surface. This judgement can often be reached by visiting similar facilities in your area to seek information on best practice and to learn from their mistakes. This guide also aims to provide you with independent information on the many aspects of an artificial grass pitch that you will need to consider.
- Are you able to commit to the maintenance requirements of the surface? The maintenance of the artificial grass surface is of vital importance if the pitch is to retain acceptable performance and be long lasting. It is therefore essential that this vital aspect of the pitch's management is not over looked.

Where an artificial grass pitch is to be used in FA competitions a club should make their own risk assessment of whether long term compliance with the FA competition rules is realistic given their individual circumstances. In particular they need to consider the need to retain a level of performance that meets the exacting standards of FIFA One Star certification verses the risk of deterioration in performance through the high levels of use and or inadequate maintenance often associated with community use.

It is suggested that clubs negotiate suitable longevity and performance warranties from the artificial grass surfacing system's supplier to ensure that the pitch will last in line with the Club's business plan and intended usage levels. A sinking fund should also be established to ensure sufficient funds are available when the surface needs replacing. Clubs are also encouraged to understand the full levels of maintenance required by the surface, which will be necessary to validate any warranty.



4 The project team

Having decided an artificial grass pitch is right for your organisation you are committing to a large capital investment that should be supported by thorough design and planning if it is to be successfully built and operated. Experience shows the design, specification and project/construction management of the pitch is best undertaken by people with specialist expertise. A typical project team is likely to include:

- Design consultant
- Geo-technical engineer
- Project manager / quantity surveyor
- Floodlighting engineer
- Sports surface test laboratory
- CDM Coordinator (as required by the Construction Design and Management Regulations)

Project team members should be appropriately qualified in their respective disciplines, be independent of suppliers and manufactures and have adequate professional indemnity insurance cover. Each specialist should be carefully selected and should provide references from previous relevant engagements.

The appointment of a project team is likely to incur professional fees, some of which may have to be paid early in a project and possibly before any external funding awards have been secured. Adequate budget allowance for professional services should therefore be made at an early stage of a project. Most external funding agencies, however, consider the fees incurred by the use of professional advisors as a justifiable part of a project's cost and will allow them to be included in funding applications; indeed many see the use of specialists as a way of ensuring a pitch is built to the required standards and within budget. The complexity and size of a project will ultimately dictate the level of external professional advice and services that will be required. As a budget guide professional services may be expected to typically cost between 5% and 10% of the actual cost of constructing the pitch depending on the complexity of the scheme. As a number of the services required will be the same, irrespective of the size of the project, the allowance for professional services on smaller projects (small sided pitches, etc) will be proportionally high than on larger projects.

5 Where is the best location for a pitch?

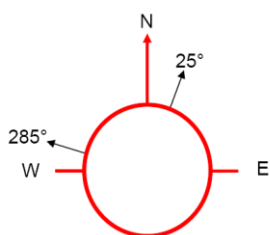
The design and cost of a new artificial grass pitch will be greatly influenced by the site on which it is to be built and it should be recognised that some sites are probably not cost effective to develop. Factors that will influence the

construction costs include topography, access, drainage, availability of an adequate power supply (for lighting) and most importantly ground conditions.

Before commencing the design of the pitch the design team will require as much information as possible about the site and its surroundings. It is therefore essential that adequate resources are budgeted at an early stage of a project as this greatly reduces the risk of unforeseen problems (and increased costs), during, construction or even later. Of greatest importance is an understanding of the ground conditions, as the largest risk of unforeseen problems and additional cost normally occurs here. A specialist geo-technical survey should be undertaken where boreholes or trial pits are excavated to allow a detailed examination of the substrata across the proposed site.

Ideally a pitch should be located:

- close to changing accommodation and other support facilities;
- on relatively flat ground - to reduce construction complexity and costs and to prevent contamination of the playing surface from run-off from adjacent banking, etc;



- the main playing direction is approximately north (between 285° and 20°) / south, to minimise the effect of a setting sun on the players, although the inability to achieve this orientation need not preclude the construction of a pitch;
- in a sheltered location away from exposed terrain;
- where the installation of services (electricity and drainage) will not be prohibitively expensive;
- where easy access for maintenance and emergency vehicles is available;
- where players, spectators and maintenance equipment do not have to cross natural turf areas, as mud, debris and other contaminants will all contribute to the deterioration of the playing surface;
- away from trees as roots and leaf litter can cause on-going structural and maintenance issues.

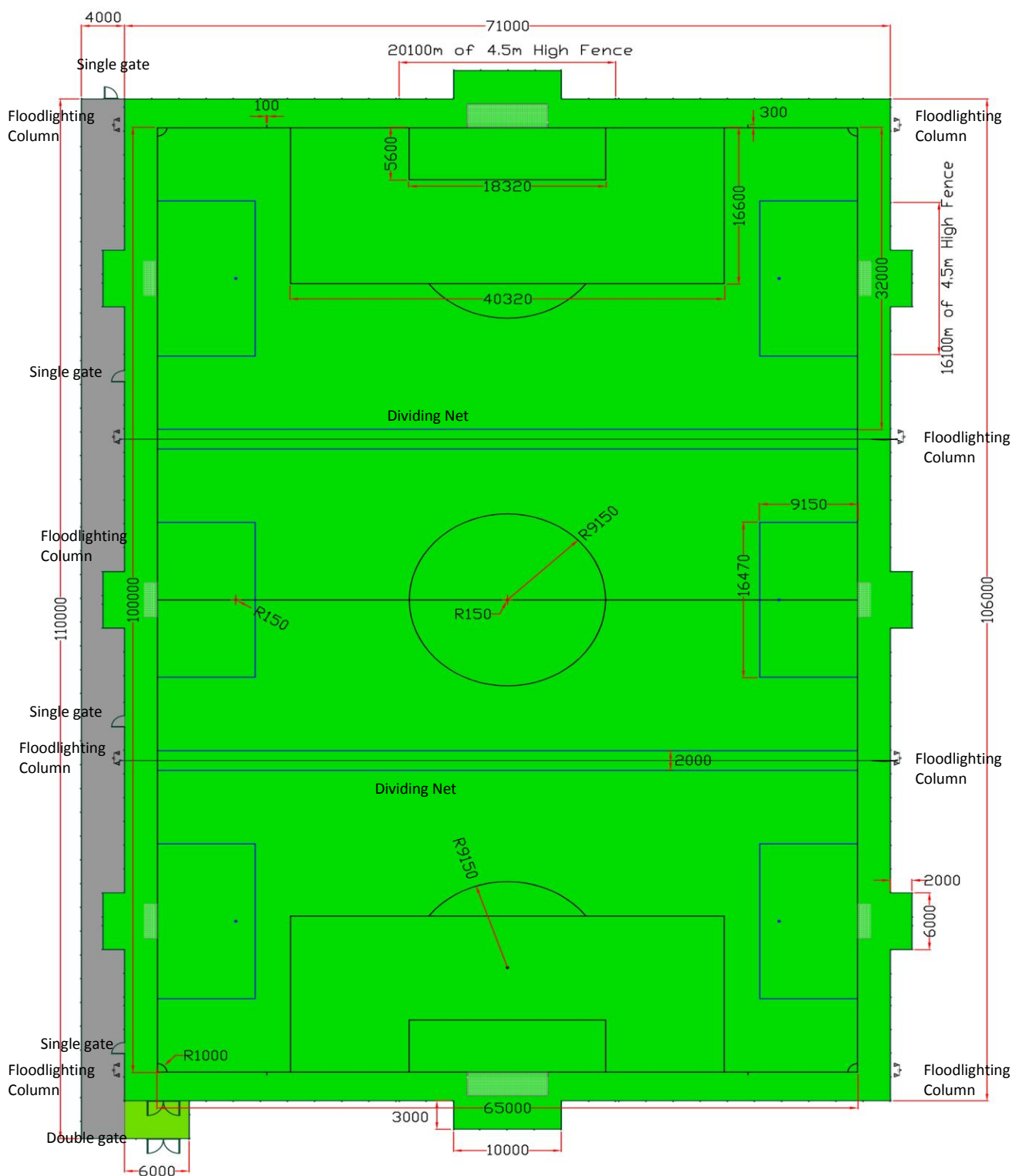


6 Pitch dimensions

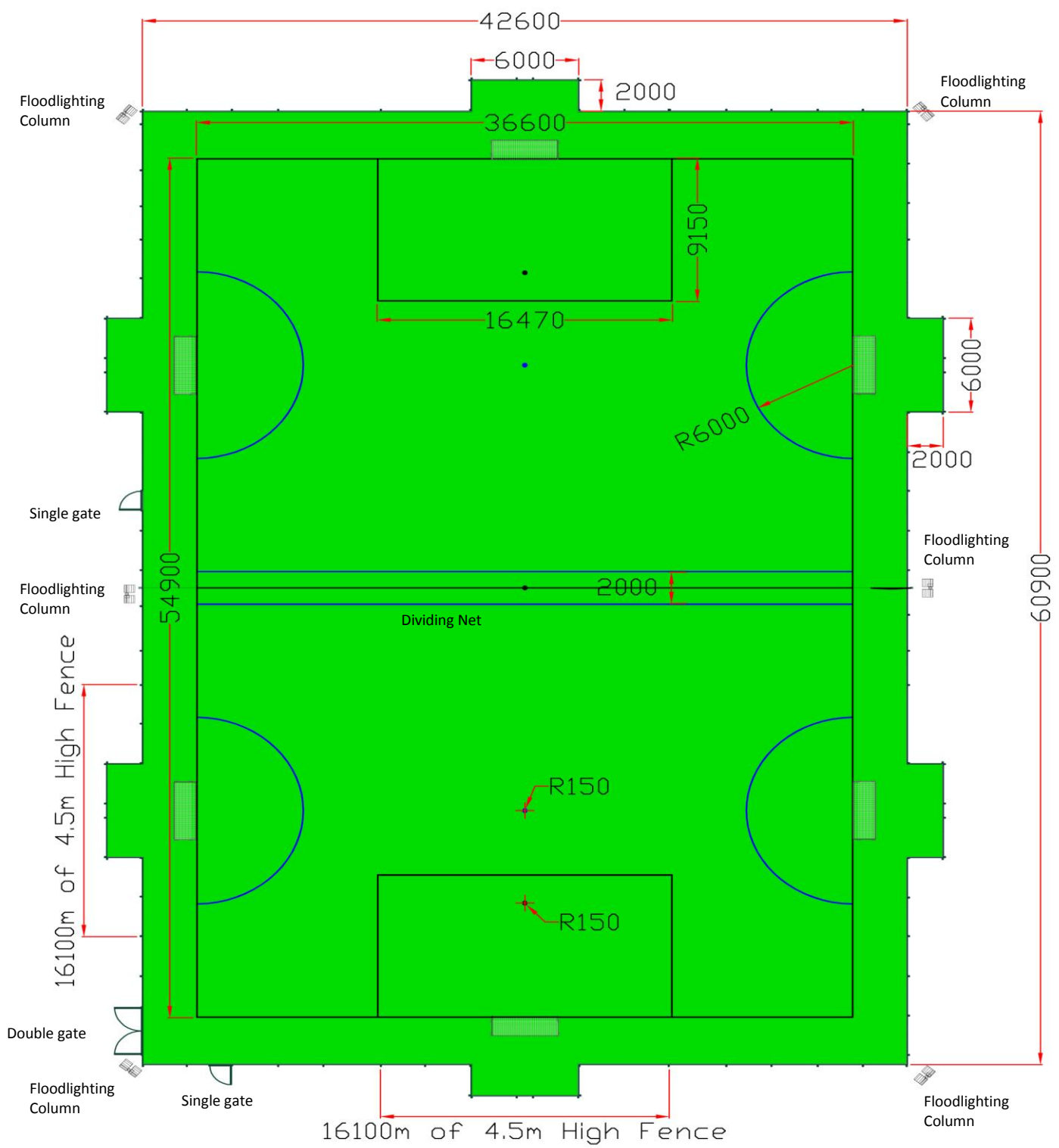
A pitch comprises the area within the field markings and run-offs (the areas beyond the markings which are provided to ensure players do not injure themselves by running into fencing, hoardings and other obstacles). The FA has established recommended pitch sizes to ensure facilities are suitable for all potential levels of use, categories of competition, etc. These, along with the recommended run-offs, are detailed in Table 1. The run-offs should be surfaced with exactly the same artificial grass surface as the playing area.

Table 1 – recommended pitch sizes						
Game	Age group	Length	Width	Run-off at ends	Run-off at sides	Total area
Eleven – a – side	Senior & Youth (U17 – U18)	100.0m	65.0m	3.0m	3.0m	106m x 71m
	Youth (U15 -U16)	82.0m	55.0m	3.0m	3.0m	88m x 61m
	Youth (U13 -U14)	73.0m	55.0m	3.0m	3.0m	79m x 61m
	Youth (U11 -U12)	64.0m	46.0m	3.0m	3.0m	70m x 52m
Mini soccer	U9 – U10	54.9m	36.6m	3.0m	3.0m	60.9m x 42.6m
	U7 – U8	45.75m	27.45m	3.0m	3.0m	51.75m x 33.45m
Small sided football	Senior	Between 25.0m & 50.0m	Between 16.5m & 35.0m	No run-offs required when rebound boards / fences form boundaries. 3.0m on each boundary when playing to goal and touchlines		
	Junior					
	Mini	The ratio of the length to width should be approximately 2:1.				
Futsal		Between 25.0m & 42.0m	Between 15.0m & 25.0m	3.0m	3.0m	
Note: When folding goals are used run-offs should be extended (typically by 200mm) to ensure the stored goals do not encroach onto the run-offs.						

Drawings 3 and 4 show the dimensions and typical layouts of a senior 11 a-side pitch and a under 9 /10 mini-soccer pitch.



**Drawing 3 – dimensions of typical full size community pitch
(minimum size 106m x 71m – playing area 100 x 65m)**



**Drawing 4 – dimensions of typical training pitch
(minimum size 60.9m x 42.6m – playing area 54.9m x 36.6m)**

7 Pitch layouts/designs

To help obtain the maximum benefit from the pitch it is important it is designed to be as player friendly as possible. The following features have been identified as good practice:

- run-offs in accordance with Table 1
- permanent line markings for the principal sports. If the pitch is to be used for FA Competitions all markings other than those specified in the Laws of the Game should be applied in removable paint to allow their removal prior to competition matches.
- provision of recessed areas for goal storage (folding goals can be used when site restrictions apply).



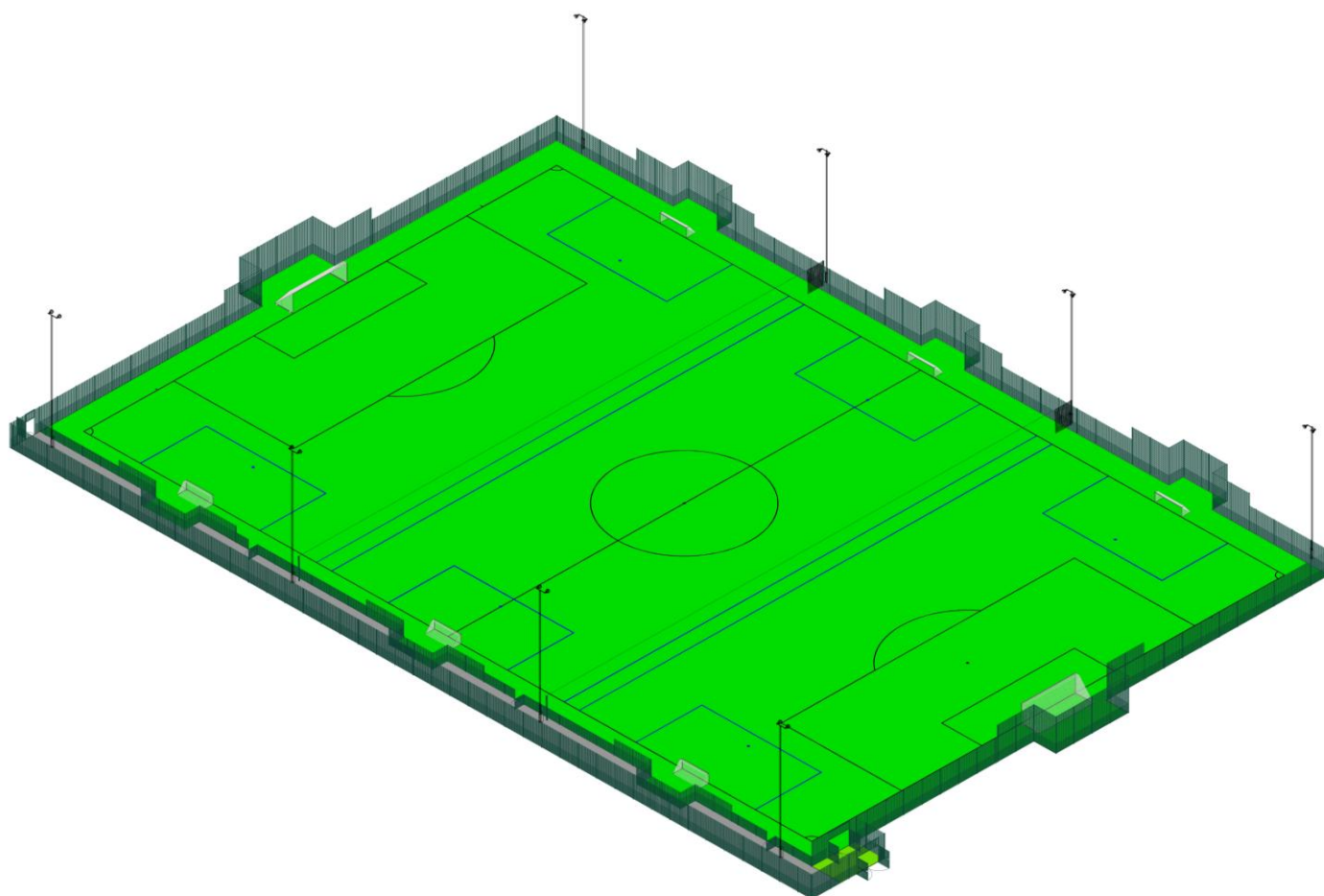
Recesses for goal storage, high fencing behind the goal, paved access – all examples of good design

- eight floodlight columns to allow uniform lighting of individual segments of a pitch when split for cross-pitch community use

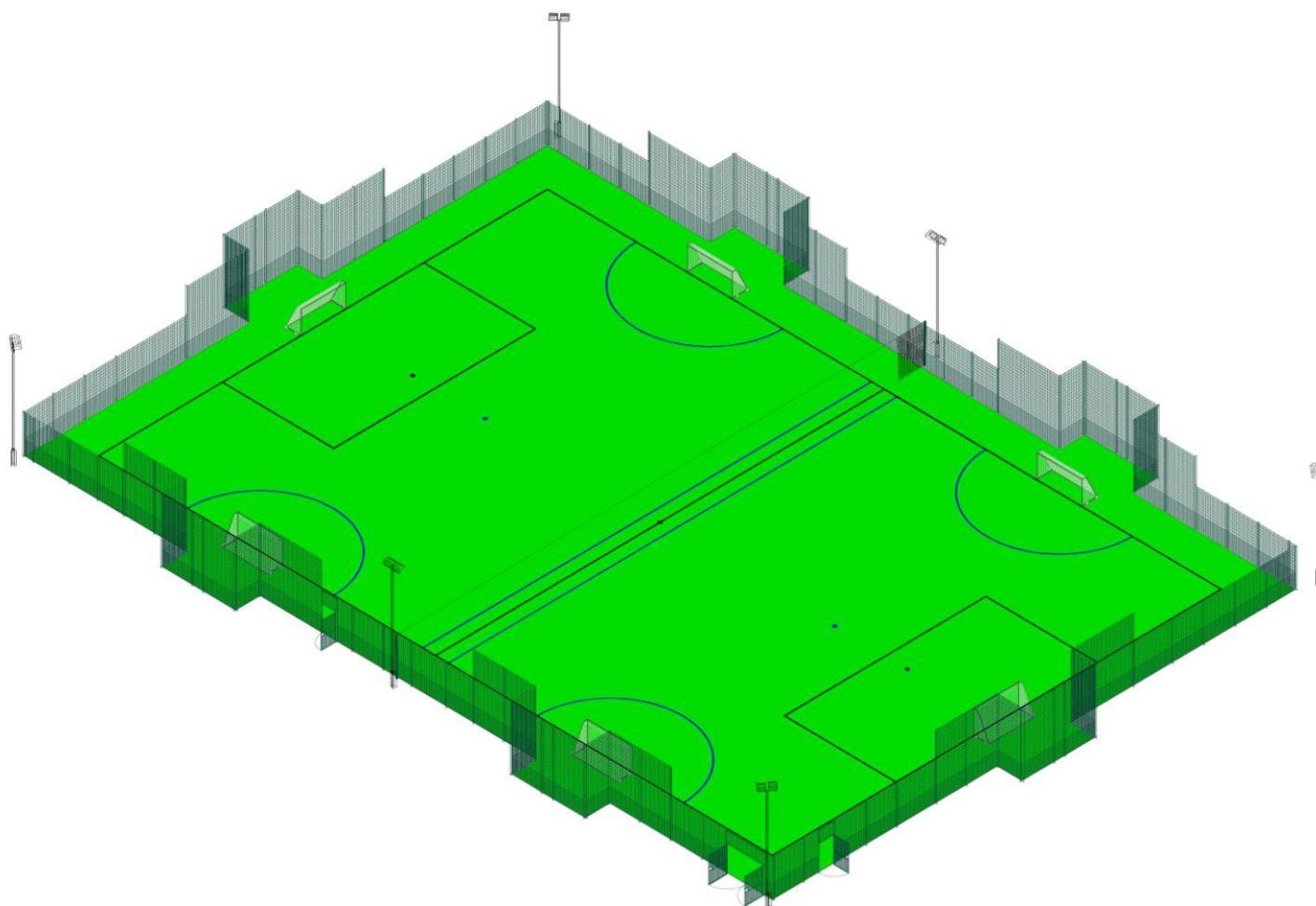
- use of portable division nets to allow the segregation of the pitch to allow cross pitch play. When considering division netting the disadvantage of having wire cables strung across the width of the full size pitch and the potential trip hazard billowing netting can form in windy conditions need to be seriously considered.
- paved access ways for players, spectators and maintenance
- higher fencing (typically 5m) behind goals

For specialist training and competition sites consideration should be given to providing a small warm up area for teams waiting to play; as should provision of a covered spectator facility, separated from the pitch by a low fenced area.

Drawings 5 and 6 show how many of these features may be integrated into a pitch's design.



Drawing 5 – layout of typical full size community pitch



Drawing 6 – layout of typical community training pitch

The design of the pitch and supporting infrastructure (clubhouse, car parks, footpaths etc) should be Disability Discrimination Act (DDA) compliant as well as satisfying Sport England's Access for Disabled Technical Guidance Notes, BS 8300 and Part M of the Building Regulations. Footpaths should be wide enough to permit wheelchair users access to spectator areas and dropped kerbs should be provided at crossing points. Car parking should include at least one disabled person's hard-standing parking bay, allowing direct pathway access to any support facilities and the pitch.



8 Standards for artificial grass pitches

8.1 Full size football pitches

In 2001 FIFA recognised that if artificial grass surfaces were to be accepted at the highest levels of the game it was necessary for them to replicate the playing qualities of good quality natural turf whilst also ensuring the risk of player injury were not increased. To ensure these objectives were achieved FIFA established its *Quality Concept for Football Turf* (see www.fifa.com). Under constant review as the technology to manufacture and test surfaces evolves the *FIFA Quality Concept for Football Turf* is a comprehensive set of test criteria designed to ensure only the highest quality pitches can achieve and retain the prestigious FIFA Recommended designations.

The *FIFA Quality Concept for Football Turf* has two categories; the **FIFA Two Star category** is the higher grade and is intended for professional clubs wishing to compete or train on artificial grass surfaces. The playing qualities of a FIFA Two Star category are extremely demanding and can normally only be sustained on pitches subjected to low or moderate use. To ensure FIFA Two Star pitches retains the highest levels of performance they are re-tested every twelve months.

The 2009 edition of the **FIFA One Star category** has been developed to include a more severe assessment of a surfaces ability to withstand the effects of simulated wear. The category is designed for pitches that will experience the higher levels of use associated with community use. The FIFA One Star category is primarily aimed at organisations wishing to provide facilities for training and community use although fields meeting this category of performance may also be used for competitive play up to and including FIFA World Cup qualification matches.

From the 1st January 2010 The FA require all full size community and competition pitches to be constructed and certified to the FIFA Quality Concept for Football Turf - One Star category or the technically equivalent IATS.

It is important to note that the *FIFA Quality Concept for Football Turf* is not a product approval scheme but the certification of individual pitches that have been built and tested to show they have the required playing characteristics and have been constructed from materials of known quality. Even the best quality product poorly installed or badly maintained will not provide a satisfactory and safe playing facility.



The objectives of the FIFA and IATS standards are to ensure pitches are constructed with artificial grass surfaces of the required quality; that the artificial grass surfaces are installed correctly and that they provide satisfactory playing environments throughout their service lives. This is achieved by a three stage process:

Stage 1 - product type approval - The artificial grass surface is subjected to a comprehensive series of laboratory tests that assesses its performance, durability and material qualities of the surfacing system. Only artificial grass surfaces that have been tested and shown to comply with the relevant standard should be considered for possible selection when designing an artificial grass pitch.

Stage 2 – initial facility testing and certification - Following installation the pitch is tested to verify the artificial grass surface has been installed correctly and is providing the anticipated levels of performance – even the best quality surfaces will not perform acceptably if they are poorly or incorrectly installed.

Stage 3 – pitch recertification - The pitch is re-tested throughout its life to demonstrate it is still providing a satisfactory and safe playing environment. FIFA Two Star certified pitches are re-tested every twelve months, FIFA One Star certified pitches are re-tested every four years.

The FA recommend, however, that pitches are re-tested more frequently as deteriorations in performance may not be identified soon enough to allow a reasonable chance of rectification resulting in a pitch being prematurely condemned as unsafe or unsuitable for play ; a frequency testing once every three years is recommended. In addition pitches to be used in FA competitions are required to be re-tested every twelve months.

The testing of pitches requires specialist test equipment and expertise and as part of their FIFA *Quality Concept for Football Turf* FIFA has accredited a number of laboratories that have been independently assessed and shown to achieve the levels of competence and professionalism that are required. Only accredited laboratories can undertake FIFA testing of products and pitches. Details of suitable laboratories may be obtained on the TheFA.com.

As the FIFA Quality Concept for Football Turf is linked to a commercial licensing fee FIFA have also published the International Artificial Turf Standard (IATS) for companies not wishing to join the Quality Concept; the IATS is technically equivalent to the FIFA One Star category and compliance with either is permitted by the Laws of the Game.



Whilst community use pitches may not be subjected to competition rules, pitch operators have legal responsibilities to ensure the facilities they provide are fit for purpose and are not a hazard to users. Assuming your pitch is satisfying the requirements of the *FIFA Quality Concept for Football Turf* is unlikely to be an adequate defence in the event of a personal injury compensation claim as it is well known that the performance of an artificial grass surface will change over its life. With the high levels of use community pitches are subjected to experience shows they should ideally be re-tested every twelve months and certainly no less frequently than once every three years.

8.2 Small sides football pitches, football training areas and junior pitches

As the *FIFA Quality Concept for Football Turf* currently only applies to full size pitches (as defined in the Laws of the Game) The FA recommend small sided football pitches, football training areas and junior pitches should be surfaced with artificial grass products that satisfy the laboratory test requirements of the *FIFA Recommended One Star* quality level and that installed pitches should be field tested in accordance with British Standard BS EN 15330-1: *Surfaces for Sports Areas: Synthetic Turf and Needlepunched surfaces primarily intended for outdoor use – Part 1 Specification for synthetic turf (intended for football)*.

8.3 Multi-use pitches

Many artificial grass pitches have to be used for more than one sport and this inevitably results in compromises in performance. In making such compromises it is important that the playing characteristics of the sports or the protection provided to players is not reduced to a point at which the surface fails to provide a satisfactory playing environment.

8.3.1 Football – rugby pitches

Rugby can be successfully played on certain forms of long pile artificial turf that can also be used for football without a major impact on the playing characteristics of either sport. The International Rugby Board has developed its own standard for artificial grass rugby surfaces used for competitive play (*IRB Regulation 22 – Artificial Playing Surfaces*) used for competitive play. The Rugby Football Union (RFU) have adopted this standard but added their own additional aspects for certain properties. Details may be obtained from the RFU.

8.3.2 Football – hockey pitches



Whilst experience shows high level hockey cannot be played successfully on long pile surfaces, certain forms do allow lower level and basic hockey training to take place and England Hockey's Pitch Policy allows the use of FIH certified long pile artificial grass pitches in certain categories of competition. Full details on the types of surface that may be used and the necessary certification may be obtained from England Hockey.

Table 2 summarises the various Standards for artificial grass pitches, their intended use and their suitability for the different usage patterns artificial grass pitches are subjected to.

Table 2a – appropriate standards for intended use – full size pitches		
Intended use	Frequency of use	Standard
Use by professional clubs	Low to moderate*	FIFA Quality Concept Two Star category
FA competitions**	High	FIFA Quality Concept One Star category / IATS (2009 edition)
Community football and local competitions***	High	FIFA Quality Concept One Star category / IATS (2009 edition)
FA competitions** and rugby training / match play ****	High	FIFA Quality Concept One Star category / IATS (2009 edition) and IRB Regulation 22
Community football*** and rugby training / match play****	High	FIFA Quality Concept One Star category / IATS (2009 edition) and IRB Regulation 22
FA competitions** and hockey match play*****	High	FIFA Quality Concept One Star category / IATS (2009 edition) and FIH Handbook of Performance Requirements for Synthetic Turf Pitches
Community football*** and hockey match play*****	High	FIFA Quality Concept One Star category / IATS (2009 edition) and FIH Handbook of Performance Requirements for Synthetic Turf Pitches
*	Typically no more than 30 hours per week	
**	Plus annual pitch recertification during the period May – July each year	
***	Subject to acceptance by relevant league committee	
****	Including additional HIC requirement of RFU	
*****	Competitions as allowed by England Hockey Pitch Policy 2009	



Table 2b – appropriate standards for intended use – small sided football and training pitches (not full sized)

Intended use	Frequency of use	Standard	
Small sided football / football training	High	Surfacing	FIFA Quality Concept One Star category / IATS (2009 edition)
		Installation	BS EN 15330-1 as a surface designed primarily for football
Small sided football / football training /rugby training	High	Surfacing	FIFA Quality Concept One Star category / IATS (2009 edition) and IRB Regulation 22 including RFU recommendations for HIC
		Installation	BS EN 15330-1 as a surface designed for football and rugby including RFU recommendations for HIC
Small sided football / football training /hockey training	High	Surfacing	FIFA Quality Concept One Star category / IATS (2009 edition) and FIH Handbook of Performance Requirements for Synthetic Turf Pitches
		Installation	BS EN 15330-1 as a surface designed for football and hockey

9 Surfacing options

9.1 Artificial grass carpet

Almost all forms of artificial grass surfacing are based on tufted carpets. In this method of construction the carpet pile is formed by looping the yarn through a backing material (normally a woven mesh called the primary backing) and cutting it to the required length. The back of the primary backing is coated with a secondary backing of latex or polyurethane that holds the tufts in place and aids the dimensional and structural stability to the carpet. Holes are normally pierced through the primary and secondary backings to aid drainage.

The range and design of artificial grass football surfaces is expanding rapidly and the selection of the best product for any particular scheme can be difficult without specialist knowledge. Described below are the principal aspects of an artificial grass carpet and some of the parameters often detailed by manufacturers in their trade literature:

Pile yarn is one of the most important aspects of the surfacing system as it influences the playing characteristics, durability and visual appearance of the pitch. Nowadays most artificial grass carpets are manufactured with a pile made of polyethylene. This type of yarn provides a resilient and durable surface, whilst not being too abrasive to players when they fall or slide on it. Some surfaces also include secondary yarns to help provide and retain the desired playing characteristics; these are often polypropylene or nylon. The surface pile is either manufactured from fibrillated or monofilament yarns.

Fibrillated yarns were originally developed for the earlier forms of sand filled synthetic grass and are manufactured from thin sheets of plastic that are slit and twisted to form thicker filaments that form the pile. Experience has shown that the abrasive effects of play can cause the yarns to split into increasing fine fibrils making it hard for the surface to provide the playing characteristics required for a good game of football. The yarns do provide good stabilisation of the infill, however, preventing excessive movement and dispersion, and are therefore considered by some to be more suitable for pitches in which contact sports such as rugby are also being played.

Monofilament yarns have become the standard for artificial grass football surfaces because of their enhanced durability and resilience. The yarns are manufactured as individual strands that are plied together to form the individual tufts. The number of plies can vary and is normally specified as the number of ends per tuft; the higher the number the denser each tuft.

As monofilament pile yarns are produced in their finished state manufacturers are able to engineer an increasingly complex range of profiles in an attempt to increase

the resilience of the fibre so that the tendency for the pile to flatten is reduced. Whilst most pile yarns are straight it is also possible to texturise the yarn during manufacturing so it develops a degree of curl. This can aid infill stability and enhance the playing characteristics for secondary sports such as hockey.

Pile length is the length of the pile; normally expressed as the height of the pile above the backing of the carpet it is also sometimes expressed as the total length of the yarn forming the tuft (the two sides of the tuft). The height of carpet piles range from 40mm to in excess of 60mm. Shorter pile carpets will normally be laid on some form of shockpad to ensure the playing surface provides the required dynamic response whilst longer pile surfaces will have greater depths of infill materials that are designed to provide the required levels of performance.

Pile weight or face weight is the weight of yarn forming the pile; typically ranging from 900g/m² to in-excess of 1600 g/m². When comparing carpets of similar pile heights those with higher pile weights will normally be of a high quality, providing greater infill stability (less dispersion) and have longer services lives.

The **primary backing** is the backing cloth into which the pile is tufted; it is normally manufactured from polypropylene. A good primary backing needs to resist fraying, absorb the secondary coatings, be weather resistant, and have high dimensional stability to ensure the finished carpet will not creep or stretch. Some higher quality carpets will also include a reinforcing layer or scrim that is designed to provide additional strength and integrity to the primary and secondary backings – particularly important when sports such as rugby are to be played or on very high intensity use areas (five-a-side pitches, etc).

The **secondary backing** is a coating of latex or polyurethane applied to the primary backing to hold the tufts in place and to increase the dimensional stability of the finished carpet. In some products the coatings are only applied to the individual tuft rows, leaving the areas between the tufts uncoated for drainage; in others, the entire backing is coated and the carpet is perforated for drainage. If perforated, the size, number and placement of perforations will vary from product to product. If carpet is to be used indoors and drainage is unnecessary, it may be ordered without perforations to increase its strength.

The artificial grass carpet is produced in rolls that are normally between 3.5m and 4.5m wide. These are normally laid across the pitch for its full width although a roll may be laid along the either side of the pitch when in-laid touchlines are required. The rolls of carpet are joined together by either stitching or using adhesive joints where the two adjacent rolls of carpet are stuck to a backing film. Both methods are acceptable providing the joints are well made.

Play lines can either be painted onto the playing surface or be tufted and inlaid. Tufted lines are incorporated into the carpet during production; inlaid lines are cut into

the carpet during installation; they provide permanent markings that reduce on-going maintenance costs, whereas painted lines give greater flexibility to the use of the area.

When specifying the type of line markings required remember that any pitch that is to be used in FA Competitions should have all markings other than those specified in the Laws of the Game applied in paint to allow their removal prior to competition matches.

The Laws of Association Football allow lines to be up to 125mm wide. To ensure adequate adhesion of in-laid lines it is recommended that lines on artificial grass pitches are between 100mm and 125mm wide. All lines should be of the same width. When a pitch is to be marked with more than one set of markings (for cross pitch play, other sports etc) care needs to be taken to ensure small sections of 'green carpet' are not left between adjacent lines, as the small area of contact between the carpet and adhesive may increase the risk of joints failing prematurely.

9.2 Infill materials

The majority of artificial grass football surfaces are filled with particulate materials. These are normally either granulated rubber polymers or mixes of rubber and sand. The infill materials are used to support the pile of the carpet, to help it remain vertical, to contribute to the playing and cushioning qualities of the surface and to provide weight to ensure the carpet is held in place. The grading, composition and depth of the infill materials are therefore carefully selected by the manufacturer to ensure the combination of the carpet pile and infill materials gives the type and level of performance required from the surface.

An increasing number of rubber polymers are being used. The most common is styrene-butadiene rubber (SBR as it is more commonly referred to); the granules are black in colour and produced from recycled tyres. If an alternative colour is required a polyurethane coating may be applied to encapsulate the SBR granules. The granules may be produced using ambient or cryogenic production processes; ambient granulating involves passing the rubber through a series of rotating knives till it is cut to the required size, whilst cryogenic granulate is produced by freezing and shattering the rubber to produce granules of the required size. Both forms of production have been shown to produce infills with good performance.

As the development of artificial grass surfaces progresses manufacturers are engineering infills materials and profiles to enhance performance. A range of materials including vulcanised and non-vulcanised thermoplastic polymers (TPE and TPV) and Ethylene Propylene Terpolymer (EPDM) granules are now being

used. As they are specifically manufactured from virgin stock material they may be granulated, extruded or moulded to have the required shape, size and colour. One major advantage of the new infill materials is that they can have flame retardant additives incorporated in their formulations to reduce their flammability; an important consideration for certain sites and in particular when surfaces are being laid indoors.

9.3 Shockpads

A shockpad or elastic layer will contribute and help maintain the dynamic properties (ball rebound, shock absorption and vertical deformation characteristics) of the playing surface. They take many forms including polyurethane bound rubber mixes that are mixed and laid with a paving machine (often described as insitu laid shockpads) or factory produced panels or rolls that are manufactured from a range of materials including rubber granules, polyurethane foam, expanded polyethylene beads and recycled polyethylene foam.

As the market develops, manufacturers are engineering enhanced properties into their shockpads and this is starting to allow innovative design solutions for the artificial grass playing surfaces and the bases on which the playing surfaces are built.

The incorporation of shockpads into the surfacing system also allows the use of shorter pile carpets with less infill, which can aid the maintenance requirements of the playing surface.

Experience has shown that the increased cost of incorporating a shockpad into the artificial grass playing surface can be offset by the retention of the required playing characteristics for a longer period of time. Higher quality shockpads can also be expected to perform for the life of two artificial grass carpets making the initial capital outlay even easier to justify.

As an increasing number of sand filled artificial turf pitches are being converted to long pile football surfaces particular consideration needs to be given when an existing shockpad is to be retained and incorporated into the new artificial turf surfacing system. As the performance and durability of the artificial grass surface is significantly influenced by the shockpad it is important that only systems incorporating shockpads with similar performance characteristics to the one being retained are considered for the resurfacing. To enable this to be achieved the properties of the retained shockpad must be measured on-site prior to tenders being sought (which will require the existing synthetic turf surface to be cut to allow access to the shockpad) so that contractors bidding for the resurfacing know what the performance of the shockpad is and can select an appropriate system for the resurfacing.

10 Base constructions

10.1 Type of sub-base

The sub-base of the pitch is required to provide a stable and free draining platform on which the artificial grass surface is laid; it should be capable of supporting and transmitting the loads placed on the surface during normal use and maintenance; and provide adequate protection to the sub-grade from penetrating frosts.

The most commonly used forms of sub-base for artificial grass football pitches are constructed from unbound graded aggregates that are designed to provide an inert, stable and free draining sub-base for the artificial grass surface; occasionally the unbound base is constructed from carefully selected aggregates that are loose-laid to aid the dynamic properties of the playing surface. The correct selection and installation of the aggregates being critical if these objectives are to be achieved.

If a unbound base is poorly constructed it can suffer from localised movement resulting in undulations that, in extreme cases, can affect the playing qualities of the surface and in view of this risk contractors are increasingly promoting the use of bound or engineered bases of porous (open textured) bituminous macadam as commonly used on hockey and multi-sports pitches. Macadam bases may be formed in either one or two layers. Two-layer constructions were originally introduced to ensure that the construction complied with the required tolerance for surface regularity, particularly for hockey. Nowadays the use of laser-controlled paving machines (on full size pitches) to install the top layer of foundation and the macadam means that the tolerances can now be achieved with a single layer of macadam, although the structural benefits of two layers are still worthy of consideration for difficult sites. As the rigidity of the engineered base puts greater demands on the dynamic performance of the artificial grass surfacing it means the benefits of installing a shockpad greatly increase.

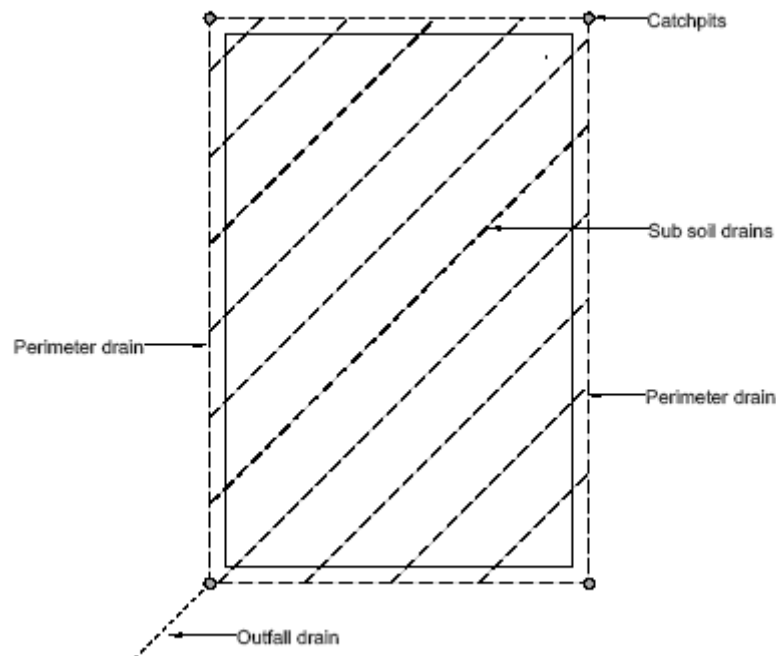
10.2 Drainage

The pitch should have a drainage system that is designed to remove surface water from the playing surface at a sufficient rate to prevent flooding and to ensure that excess water is not allowed to build-up within the sub-base causing a reduction in its structural integrity. The drainage system will typically consist of a series of lateral drains laid beneath the pitch at between 8m and 15m centres, depending on site conditions.

The lateral drains will connect into collector drains located on the outside of the perimeter edgings that will discharge into a suitable outlet. This will need to be identified (often before planning approval is granted) during the design of the pitch. Outlets can include storm water sewers, soak-aways and nearby watercourses. Whichever form is chosen permission is normally required from the relevant

statutory body.

Drawing 07 shows the layout of a typical sub-pitch drainage system.



Drawing 07 – typical sub-pitch drainage system

11 Fencing

Perimeter fencing is erected around a pitch to contain balls, to protect the playing surface from contamination and to help prevent unauthorised use and vandalism. Fencing heights vary, 3m is often used but this can increase to 5m where the site requires as many balls as possible to be retained within the pitch. Where site security and ball retention is not a serious issue or where an internal spectator compound is provided 1.2m high fencing with a top rail is often used to enable good spectator viewing.

The fencing is normally constructed from weld mesh panels or rolls that are suspended from box section posts. Weld-mesh is used, as it is better suited to the repeated impacts of footballs hitting the fence than cheaper chain-link mesh. Steelwork should be galvanised to minimise premature corrosion and may be plastic coated to improve its appearance.

Access gates should open outwards to ensure the safety of players. At least one pair of double gates should be provided to allow maintenance and emergency vehicle access.



Gates should open outwards – double gates should be provided for access by maintenance plant and emergency vehicle

Where appropriate, particularly on small-sided football pitches, rebound walls or fences can be installed. These are normally 1.2m high and constructed from a variety of materials (normally exterior grade timber panels) that are stained or painted to improve their appearance. A number of companies also offer rebound fencing formed from weld mesh panels. The use of such fencing is particularly desirable on multiple blocks of small pitches as it allows supervision and viewing of the total area.

The use of dense weld-mesh panels is also worthy of consideration behind and alongside goals etc (on pitches where rebound walls are not required) as they offer greater resistance to the repeated impacts of balls.



In order to maximise the use of full size community pitches division netting can be installed to split the main pitch into two or three separate areas of activity. The netting is normally suspended from tensioned steel cables that are hung across the pitch fence to fence and supported with portable intermediate posts.

To minimise the risk of players colliding with division nets it is recommended on pitches not being used for FA competitions that play lines be installed to define the sides of cross field pitches. .

12 Goals & sports equipment

Incorrectly used goals can kill so goal post safety should always be of paramount importance to designers, builders, operators and users of football pitches. Only goals that fully comply with BS EN 748 (full size goals) or BS 8462 (Youth Football, Futsal, Mini-soccer and Small-Sided Football) should be used. The procurement, installation, maintenance, storage and inspection of all types of goals should be undertaken in accordance with BS 8461. When selecting goals and other sports equipment consideration must be given to the precise uses of the pitch, so that changes in activity can take place with the minimum of effort and inconvenience. Goals can be freestanding, and therefore easily moved, although it is important to make proper provision for their storage when not in use; the run-offs of the pitch must not be used for this purpose.

The FA has established recommended goal sizes for the main categories of football and age groups. These are detailed in Table 3.

Table 3 – recommended goal sizes		
Game	Age range	Goal size
Eleven-a-side	Senior & Youth (U17 – U18)	7.32m × 2.44m
	Youth (U15 -U16)	7.32m × 2.44m
	Youth (U13 -U14)	6.40m × 2.13m
	Youth (U11 -U12)	6.40m × 2.13m
Mini-soccer	U9 – U10	3.66m × 1.83m
	U7 – U8	3.66m × 1.83m
Small sided football (five-a-side)	Senior	4.88m × 1.22m
	Junior	3.66m × 1.22m
	Mini	2.44m × 1.22m
Futsal	-	3.00m × 2.00m

To conform to British Standards all freestanding goals must be fitted with supports, anchors or weights to stop them toppling over, irrespective of size or type. There are a number of options for anchoring goals including:

- folding goals – recommended for full size pitches where cross field play use is also envisaged
- use of integral weighted goals – recommended for small-sided goals and full size goals that are used during training in different parts of a pitch

Corner flags, etc can either be free standing or socketed depending on the intended usage patterns of the pitch.



Small sided football and full size folding goals



Small sided goal with integral weights

13 Floodlighting

In order to maximise the use of the pitch most are floodlit. Lighting of full size pitches is normally achieved by a number of lamps mounted on columns positioned along the sides of the pitch. Typically eight columns, fifteen or sixteen metres high, are used.



As many league and cup competitions specify the minimum level of lighting they require it will be necessary to determine the competitions that the teams using the pitch will compete in and design accordingly. Where no requirements are stated the minimum levels of performance should be in accordance with FIFA's Class II for NON -TELEVISED events, which are given in Table 4.

Table 4 - Floodlighting FIFA Class II	
Property	Standard
Maintained average illuminance	> 200 Lux
Uniformity (Min/Ave)	>0.6
Glare rating	≤ 50
Lamp colour temperature	Tk > 4000 K
Lamp colour rendering	≥ 65

To minimise running costs the lighting system should allow part illumination of the pitch (for cross pitch small-sided football) and a lower level of lighting for training etc, as given in Table 5.

Table 5 – Floodlighting for training and cross pitch play		
Use	Property	Standard
Cross-field play	Maintained average illuminance	120 lux
	Uniformity (Min/Ave)	>0.6
Training	Maintained average illuminance	120 lux
	Uniformity (Min/Ave)	No requirement

Following installation or re-lamping a lighting system will normally suffer an initial deterioration in lighting performance, typically in the order of 15% to 25%. The lighting levels should then be consistent (subject to routine maintenance, including cleaning of lamp glass, realignment, etc.) until the lamps reach the end of their service life. The value of maintained average illuminance is the level of illumination provided after the initial deterioration.

When designing a floodlighting system it is important that an assessment of the available power supply is made to determine if adequate capacity is on hand as bringing a new supply to site can increase costs dramatically. The total installed power requirements for an eleven-a-side pitch is likely to be in the order of 35 to 40 kilowatts.

The use of programmable controllers to turn off the lights at a programmed time is desirable when the planning approval for the scheme specifies a cut-off time. Where this system of control is used at least one luminaire on each operational portion of the pitch should remain on for a five minute period following cut-off to allow safe egress from the pitch. A visual warning to alert players that the cut-off time is approaching is also desirable. Flashing beacons mounted to the floodlight columns are most commonly used to achieve this. To enable the maintenance of the lighting system to be related to 'burning hours' it is recommended that a 'hours-run' counter be included in the lighting systems control / monitoring equipment.

Provision of weatherproof power sockets mounted to one of more floodlight columns is also desirable. Sockets allow the easy use of ancillary temporary public addresses systems and cleaning equipment, etc.

When submitting a planning application for floodlights the planning authority is likely to require a lighting spillage drawing showing the levels of light pollution and their impact on the surrounding neighbourhood. Lighting engineers or specialist lighting contractors can provide such plots.

14 Procurement

There are various forms of specification that can be used when inviting contractors to bid for the construction of an artificial grass pitch. Most artificial grass pitches are, however, designed and procured using the design and build approach where a number of contractors are invited to submit their proposals for the design and construction of the facility. In this type of contract the customer needs to prepare a design brief (or Employer's Requirements document) that adequately describes what is required. The FA's *Guideline Template - Design Brief for Artificial Grass Pitches for Community Use* has been prepared to form the basis of such a document.

There are two evaluation methods commonly used, *lowest price* and *most economically advantageous tender*. Where the lowest price method is used it is essential that financial data is considered in conjunction with the technical merits of each bid. The *most economically advantageous tender* method takes a range of key parameters into account and weights each according to its importance to the project. The basis of the analysis should be detailed in the tender documentation so contractors are treated in a fair and competitive way. A *most economically advantageous tender* analysis could typically include the following areas:

- Price
- Initial performance
- Longer term performance and durability
- Warranty

15 Contractors

As a result of the expansion in the market for artificial grass pitches there has been a corresponding increase in the number of contractors offering their services as constructors of such facilities. Not surprisingly, the large number of contractors operating includes companies of a wide range of size, structure and ability, from which a choice must be made for any project. Selecting the correct company is crucial if your pitch is to meet your expectations.



The Sports and Play Construction Association (SAPCA) is the UK trade association for the sports facility construction industry. SAPCA represents most specialist constructors, professionals, manufacturers and suppliers of sports surfaces and related products. Details of SAPCA and its members may be obtained from their website <http://www.sapca.org.uk>. It should, be noted, however, that the FA does not formally approve, recommend or endorse any of its members or their products or services.

In order to raise the standards of artificial grass pitches even further FIFA have launched their FIFA Preferred Producer Concept. The high standards set by the scheme are designed to provide consumers with a guarantee that pitches built by companies that have joined the scheme are of the highest standard and meet consumer requirements. A FIFA Preferred Producer often therefore extends their services further than the traditional supplier/installer relationship. They are required to be both a manufacturer of Football Turf who is an established FIFA Quality Concept Licensee, and possess the additional expertise in civil engineering and project management necessary to support all elements of a pitch's construction from inception to completion. Further details may be found on www.FIFA.com.

16 Construction supervision

To ensure the objectives of having an artificial grass pitch that has the right playing characteristics for the game, is safe to use and at the same time is able to withstand rough treatment and remain operational for a realistic period of time are achieved it is essential that proper quality assurance procedures are applied throughout the construction process. Independent site inspections should be undertaken throughout construction with particular attention being paid to the completion of each key stage. A typical schedule of inspections would include:

Stage of construction	Inspected for:
Formation	<ul style="list-style-type: none"> • profile and gradients • adequate compaction
Drainage system	<ul style="list-style-type: none"> • channel spacings and falls • permeability of infill
Edgings	<ul style="list-style-type: none"> • design levels • haunching and line
Base	<ul style="list-style-type: none"> • construction depth • grade • compaction • permeability • surface regularity
Shockpad	<ul style="list-style-type: none"> • construction depth • permeability • surface regularity • tensile strength – laboratory test • shock absorption
Artificial grass surface	<ul style="list-style-type: none"> • joints • joint strength – laboratory test • infill application • carpet characteristics – laboratory tests • infill characteristics – laboratory tests

17 Footwear

The advice of surface manufacturers and yarn supplier is that boots with aluminium studs should NOT be used on artificial grass pitches and failure to follow this advice may invalidate a manufacturer's warranty.

Plastic screw-in and moulded studs are normally considered acceptable, although their ability to provide satisfactory traction and grip varies and research is ongoing as to what forms of studs are the most suitable for artificial grass surfaces, with the development of new profiles being envisaged.

The use of flat soled training shoes and astro trainers should be discouraged or ideally prohibited as they flatten the pile of the carpet and increase the rate of compaction of the infill.

If significant use of such footwear is envisaged the surface manufacturer should be advised before a surface is selected and appropriate provision for additional maintenance and a reduced service life made.

18 Maintenance

The maintenance of the artificial grass surface is of vital importance if the pitch is to retain acceptable performance and be long lasting. The manufacturer's guarantee will also usually be conditional on the recommended maintenance requirements being carried out with reasonable diligence and failure to make adequate allowance for the required maintenance equipment and training will result in a field not being certified to the relevant FIFA standard.

Prior to selecting a surface the manufacturer's advice must be sought on the maintenance equipment to be used and how regularly the maintenance works should be carried out given the proposed programme of use; if you cannot follow the recommendations you should not select the surface. You should also look to agree how often the manufacturer/installer should return to site to perform more major rejuvenation works to ensure the infill is evenly spread over the site to protect the fibres. This maintenance agreement will help protect your warranty provided by the surface manufacturer. Many installers offer a periodic (quarterly) inspection service as part of their after-sales. This should be welcomed and encouraged so any shortcomings in maintenance are identified before they have a detrimental effect on the playing surface.

Three types of maintenance are normally required:

18.1 Routine regular maintenance

- Drag matting / brushing to redistribute infill
- Brushing to lift the pile that will flatten through the actions of play. Failure to do so will result in a faster surface and more fibrillation and matting of the carpet's pile with a deterioration in performance
- The localised topping up (penalty spot, centre spot, corner kick areas etc) of fill materials to ensure consistent ball and foot responses from the surface and to provide support to the carpet's pile
- The removal of litter, leaves and other debris from the surface

The frequency of such maintenance will vary but is likely to be at least weekly and on regularly used pitches more frequently. Such maintenance is undertaken using specialist plant and is likely to take around two hours per session for a full size pitch.



Ride-on brushing system with oscillating brushes

The provision of litter-bins at the entrance to the pitch and other strategic positions around the pitch is advisable as this reduces the amount of litter dropped on the pitch and reduces the chances of contamination of the surface. Likewise boot cleaning brushes should always be sited at all entrances, particularly those used by players retrieving balls from adjacent grass areas / pitches.



Drag mat and triangular brush

18.2 Routine periodic maintenance

- Relieving compaction of the particulate infill to ensure consistent ball and foot response.
- Removal of any moss or weeds that germinate within the surface, particularly around the edges of the pitch where it is harder to get mechanical brushes into.

The relieving of compaction will require specialist equipment and is likely to be required between one and four times per year, depending on usage – small sided football areas with intensive use having the greatest demand. Where a pitch operator has a number of pitches they may wish to purchase the necessary equipment, whereas an operator with only one facility may find it more cost effective to enter a maintenance contract with a specialist company.

18.3 Rejuvenation

Even with good levels of maintenance dirt and fibre debris (resulting from the wearing of the carpet pile) will eventually become trapped within the fill material. At some stage during the surface's life it will probably be necessary to remove the contaminated fill and replace with new material before serious problems of compaction (leading to a harder playing surface) and a reduction in porosity (eventually causing flooding on the surface in wet periods) start to occur.



Replacement of contaminated infill

18.4 Maintenance costs

The maintenance of artificial grass pitches should only be undertaken by fully trained and competent persons; at some sites these are volunteers, at others ground-staff are employed. Based on 2009 Institute of Groundsman recommended salary rates and an estimate of the likely levels of maintenance required for a floodlit community / school eleven-a-side pitch it is suggested that a budget of £10,000 to £12,000 per annum be allowed for regular and routine periodic maintenance. Whilst small areas will take less time to maintain, the concentration of play may require maintenance at a greater frequency.

Rejuvenation processes are not cheap (up to £35,000 plus VAT for a full size pitch) and adequate allowance should be made from day one of the pitch's life.

18.5 Maintenance logs

The installation contractor or surface manufacturers should provide a maintenance register or log when the pitch is handed over following installation. The register is a working document that should be completed each time any form of maintenance is undertaken. This enables the pitch operator and the contractor/manufacturer to check that the correct levels of maintenance have been carried out if deterioration in the performance of the pitch or signs of premature or excessive wear occurs.

18.6 Floodlighting

The maintenance of the floodlighting system is also important if it is to continue to meet the performance specified at the design stage. Maintenance will include routine work on all the associated electrical services, cleaning of fittings and the correct adjustment to maintain the 'aiming angles' of the lamps. Many floodlighting

contractors now offer annual maintenance contracts and these are worthy of consideration.

19 Replacement funds – artificial grass surfaces

Project co-ordinators should be aware of and plan for the full life costs of the pitch and supporting infrastructure from an early stage. Information should be sought regarding the on-going costs of routine maintenance of the chosen playing surface, together with the life expectancy and cost of replacement at the end of the surface's useful life. The manufacturer of the surface will be able to provide guidance on the likely life of the surface - provided it is properly maintained – and its replacement cost. Similar information should also be obtained in respect of the floodlighting and fencing.

A sinking fund should be established as soon as the new pitch is brought into use to ensure that sufficient funds are available to replace the surface when it reaches the end of its life. As the cost of replacement is in the future, it will be necessary to save the amount of money required at that future date, not today's cost. This means that it is not possible to take the today's cost and divide it by the number of years until replacement is due. A more complex calculation that takes into account compound interest to the replacement date needs to be used.

Current estimates for the resurfacing of a full size pitch (including removal of the existing surface and disposal of the surface and fill) suggests a budget of between £150,000 and £180,000 plus VAT is realistic. Based on 5% inflation a sum of £180,000 will equate to £293,202 in 10 years time. To achieve this figure, and assuming a compound interest rate of 5%, a monthly contribution of £1,924 (£23,311 per annum) is required every month from the first month of the pitch's life.

To also ensure £30,000 is available for rejuvenation in year five a further sum of £577 per month (£6,929 per annum) is required to be invested in a sinking fund. Whilst the cost of resurfacing smaller sized pitches will be less, the more intensive wear patterns are likely to mean replacement of the surface is required sooner, thereby reducing the length of time available to accrue the required replacement funds.

20 Sources of useful information

Artificial grass surfaces

FIFA Quality Concept for Football Turf Handbook of Requirements www.fifa.com

FIFA guides to Football Turf developments
www.fifa.com/aboutfifa/developing/pitchequipment/footballturf/development

BS EN 15330-1: Surfaces for sports areas – synthetic turf and needle punched



surfaces primarily intended for outdoor use – Part 1 Specification for synthetic turf surfaces www.bsi-global.com

Guide to the Construction and Maintenance of Synthetic Turf Sports Pitches
www.sapca.org.uk

Pitch fencing

Guide to the Construction and Maintenance of Fencing Systems for Sports Facilities www.sapca.org.uk

Football goals

The Football Association – Football Goals – Guidance Notes
www.thefa.com/GetIntoFootball/Facilities

BS 8461: Football Goals – Code of Practice for their procurement, installation, maintenance, storage and inspection www.bsi-global.com

Floodlighting

FIFA Guide to Artificial Lighting of Football Pitches www.fifa.com

Maintenance of artificial grass surfaces

Guide to the Maintenance of Synthetic Sports Surfaces www.sapca.org.uk

Trade associations

European Synthetic Turf Organisation (ESTO) (www.eu-syntheticurf.org)

International Association of Sports Surface Sciences
www.iss-sportsurfacescience.org

Institute of Groundsmanship www.iog.org

Sport and Play Construction Association www.sapca.org.uk

Appendix A - Requirements for artificial grass pitches used in all FA competitions with the exception of the FA Challenge Cup and FA Youth Cup (rounds proper)

Where sanctioned by the competition rules artificial grass pitches may be used in the in FA competitions provided the pitch is listed on the FA's Register of Artificial Grass Pitches.

Note The register is maintained by The FA to ensure artificial grass pitches have the ball/surface and player/surface interactions that FIFA have specified as being suitable for football. The register is not a list of approved or certified pitches or products and no FA endorsement of any pitch or product appearing on the list is given or implied.

To appear on the register a pitch shall satisfy the following conditions:

Condition 1 – performance requirements

The pitch shall:

- a be surfaced with an artificial grass surface that has laboratory type approval in accordance with the FIFA Quality Concept *Handbook of Requirements for Football Turf* Two Star Category;
- or be surfaced with an artificial grass surface that has laboratory type approval in accordance with the FIFA Quality Concept *Handbook of Requirements for Football Turf* One Star Category or the *International Artificial Turf Standard* and satisfies the skin friction and skin abrasion requirements of the FIFA Quality Concept *Handbook of Requirements for Football Turf*.
- b have satisfied the performance and construction requirements of Table 1 at the time of its last annual assessment.

Table 1 – performance requirements required at annual test			
Characteristic		Test Method ¹	Requirement
i	Vertical ball rebound	FIFA 01	60cm - 100cm
ii	Angle ball rebound	FIFA 02	Dry surface 45% - 70% Wet Surface 45% - 80%
iii	Ball roll	FIFA 03	Initial test 4m – 10m Annual Re-tests 4m – 12m
iv	Shock Absorption	FIFA 04	55% - 70%
v	Vertical Deformation	FIFA 05	4mm – 9mm
vi	Rotational Resistance	FIFA 06	25Nm – 50Nm
vii	Linear Friction – Stud Deceleration Value	FIFA 07	3.0g - 6.0 g
viii	Linear Friction - Stud Slide Value	FIFA 08	120 – 220
ix	Water permeability	EN 12616	> 180mm/h
x	Surface regularity	EN 13036 3m straightedge	<10mm
xi	Rubber infill grading (This test is carried out to ensure that coarser infill material has not been installed on the pitch)	A minimum sample of 250g shall be taken from the top portion of the performance infill (20mm) on each of the six tests positions. The infill shall be graded in accordance with EN 933 Part 1 and the largest sieve retaining at least 10% by mass of the infill determined.	The largest sieve retaining at least 10% by mass of the infill shall be within the range detailed in the manufacturer's declaration forming Section 4 of the product's FIFA Laboratory Test Report.
xii	<p>During the field test programme the Test Laboratory shall make a visual inspection of the playing surface to ensure there are no obvious defects considered to be hazardous to players</p> <p>Important note:</p> <p>The visual inspection undertaken by the Test Laboratory does not constitute a formal site audit and does not remove the legal responsibility of the club or pitch operator to ensure the field is safe and fit for use.</p>		

Note 1 As described in the *FIFA Handbook of Test Methods for Football Turf*.

Note 2 Pitches carrying the *FIFA Recommended Two Star* designation will automatically satisfy these requirements, subject to compliance with Note 6.

- Note 3 Pitches carrying the *FIFA Recommended One Star* designation during the initial twelve months following the FIFA pitch test will automatically satisfy these requirements subject to compliance with Note 6.
- Note 4 Pitches certified as meeting the field test requirements of the *International Artificial Turf Standard* during the initial twelve months following the IATS pitch test will automatically satisfy these requirements subject to compliance with Note 6.
- Note 5 Tests shall be undertaken in the six positions specified in the *FIFA Handbook of Test Methods for Football Turf*.
- Note 6 Testing shall be undertaken during the period May to July immediately prior to commencement of the playing season.
- Note 7 The results of the test programme (including any FIFA or IATS) tests shall be reported on a FA test report, which shall be submitted to the FA for registration prior to commencement of the season.
- Note 8 When an application is made for a pitch to be registered for the first time the application shall include a confirmation from FIFA that the surface has satisfied the laboratory test requirements of the FIFA Quality Concept or IATS.
- Note 9 Registration of the Pitch by the FA is for twelve months or until the artificial grass surface is replaced, whichever comes first, subject to a pitch showing continued compliance with Table 1 or Note 10 during any spot checks undertaken by the FA during the twelve month period.
- Note 10 If during an FA spot check a pitch is found to fail requirements iv, v, vi, vii or viii of Table 1 it shall not be used in the competition with immediate effect and until appropriate remedial works/rejuvenation/resurfacing have been undertaken and the pitch has been fully retested and shown to have regained acceptable performance.
- Note 11 If during an FA spot check a pitch is found to fail the requirements of Table 1 but fall within the ranges detailed in Table 2 the FA may, at its discretion, allow continued use of the pitch for the remainder of the playing season. Any pitch found to have a coarser rubber infill will be reviewed on a case by case basis.

At the end of the season all necessary remedial works (including resurfacing) shall be undertaken to enable the pitch to comply with the annual test requirements.

Note 12 Pitches shall be tested by laboratories authorised by FIFA to undertake field tests under the FIFA Quality Concept. Details of authorised laboratories may be obtained from the FA or FIFA.

Note 13 Testing of a pitch and applying to the FA for registration of the pitch is the responsibility of the Club wishing to play on it. In the event of more than one Club or team playing on the same pitch each Club or team is required to apply for the pitch to be registered for their use, although the pitch need only be tested once.

Table 2 – performance requirements: permitted deviations from Table 1 occurring during the playing season			
Characteristic		Test Method ₁	Requirement
i	Vertical ball rebound	FIFA 01	60cm – 120cm
ii	Angle ball rebound	FIFA 02	40% - 80%
iii	Ball roll	FIFA 03	4m – 12m
iv	Water permeability	EN 12616	> 50 mm/h
v	Surface regularity	EN 13036 3m straightedge	< 15mm

Note 14 All costs incurred in the annual testing of a pitch (test laboratory fee, remedial works etc) are the responsibility of the Club. The FA makes no additional charge for the registration of a pitch.

Condition 2

The artificial grass pitch, including run-offs, shall be one continuous playing surface. It shall be green in colour. All line markings shall be white and in accordance with the Laws of Association Football. Any other lines shall be masked out prior to any FA competition match.

Condition 3

The home Club shall allow their opposition the opportunity to use the pitch and train on the surface two hours prior to the kick-off and there must not be another game or event on the pitch following the training period. If it is intended to water the pitch before the match the pitch shall also be watered prior to the training period.

Condition 4



The Club using the artificial grass pitch shall advise their opponents at least 10 days before the match of limitations or recommendations on the types of boot or stud that may be used on the surface.

Condition 5

The Club shall provide all necessary assistance and data relating to player assessments, injury records, maintenance etc as requested by the FA, FIFA or UEFA.