

FACILITIES GUIDANCE NOTE 7

ARTIFICIAL RUGBY TURF

April 2013
© Rugby Football Union

Whilst every effort has been made to ensure the accuracy of the information contained in this publication any party who makes use of any part of this document in the development of an Artificial turf pitch shall indemnify The Rugby Football Union (RFU), its servants, consultants or agents against all claims, proceedings, actions, damages, costs, expenses and any other liabilities for loss or damage to any property, or injury or death to any person that may be made against or incurred by the Rugby Football Union arising out of or in connection with such use.

There are many ways of constructing a Artificial turf pitch. These guidelines do not constitute any form of approval from the Rugby Football Union 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.

Prepared with the RFU

by



www.labosport.co.uk

CONTENTS

1. Introduction
2. What is Artificial Rugby Turf?
3. IRB Regulation 22 and the IRB Artificial Rugby Turf Standard
4. Multi-Sports use
5. Surfacing options
6. Base constructions
7. Fencing
8. Floodlighting
9. Design team
10. Procurement
11. Contractors
12. Quality monitoring during construction
13. Maintenance of Artificial Rugby Surfaces
14. Replacement funds
15. Other sources of useful information

Appendix A – Guideline Design Brief for Artificial Rugby Turf Pitches

1 INTRODUCTION

The last 15 years has seen major innovations in the development of Artificial turf surfaces; the development of longer pile surfaces now providing Artificial surfaces that replicate the playing qualities of the best quality natural turf pitches whilst allowing significantly higher levels of usage. The success of these surfaces is such that they are now being used in major competitions for a number of sports including Rugby Union and Football.

To assist potential developers of Artificial turf rugby pitches the RFU have produced these guidance notes; they come in two parts. Guidance Note 6 is a general introduction to Artificial turf pitches and has been written to assist organisations considering such a facility. This Guidance Note describes in more detail many of the factors that need to be considered during the design, specification and construction of a Artificial turf pitch. It is aimed at the project team responsible for the design, specification and construction of such facilities.

2 WHAT IS ARTIFICIAL RUGBY TURF?

Artificial Rugby Turf is the term chosen the International Rugby Board (IRB) to describe Artificial turf surfaces designed for the game of Rugby Union. Diagram 1 shows the typical cross section of a Artificial Rugby Turf surface.

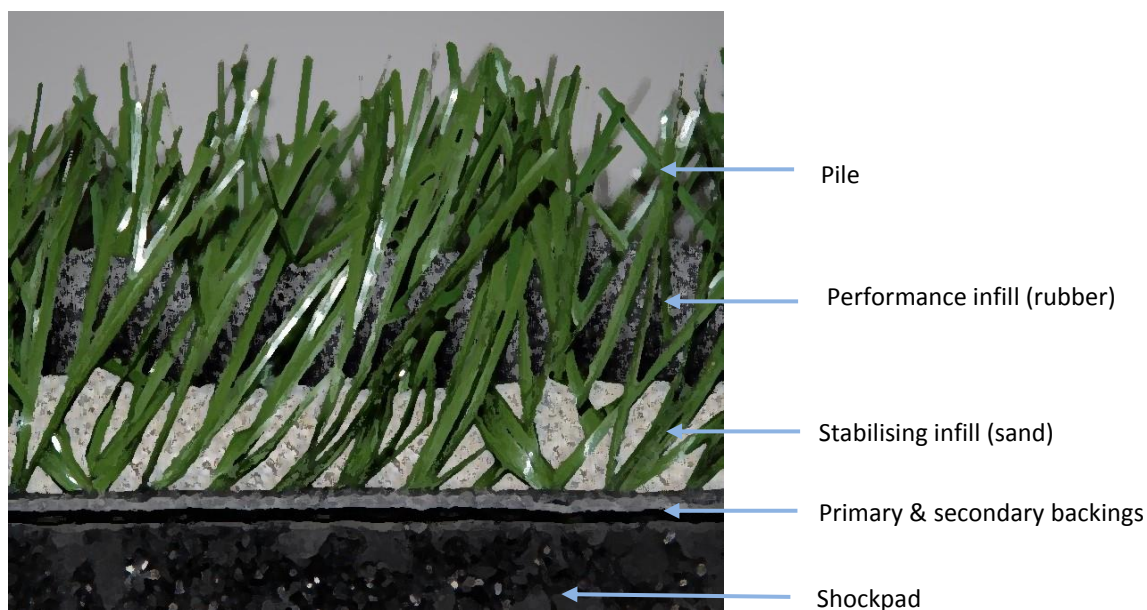


Diagram 1 – principal elements of an Artificial Rugby Turf surface

The surface comprises a long pile tufted carpet that is normally laid on a shock-absorbing pad that is laid on a free draining stone or macadam base. The pile of the carpet is partly filled with rubber granules to provide a cushioned surface, that in conjunction with the shockpad underneath the carpet, provides the comfort and protection players require. Beneath the rubber granules is a layer of sand that provides weight to hold the carpet in place.

3 IRB REGULATION 22 AND THE IRB ARTIFICIAL RUGBY TURF SPECIFICATION

The International Rugby Board (IRB) believe Artificial Rugby Turf pitches have a major role to play in developing the game in regions of the world where natural grass is not a viable alternative; either due to an unsuitable climate, inadequate maintenance resources or where the intensity of use are too great to maintain good quality natural grass - which is often the case in England.

The IRB wants to ensure that only Artificial turf pitches of acceptable quality are used for rugby to prevent players being exposed to any greater risk of injury than when playing on natural grass. To achieve this they have developed their *Artificial Rugby Turf Performance Specification* and incorporated this into the Laws of the Game through IRB Regulation 22. This Regulation states that rugby matches (at any level of competition) may only be played on a Artificial turf pitch that meets the IRB *Artificial Rugby Turf Performance Specification* and Law 1.

Whilst technically IRB Regulation 22 only covers pitches on which competitive rugby is played, advice received from insurance companies is that any pitch on which contact activities will take place should be certified in accordance with IRB Regulation 22 to minimise the risk of player injury and the field owners liabilities. Therefore the RFU require any pitch on which full contact activities (including line-outs, tackling, scrums or rucking) are to take place to be designed, constructed and certified in accordance with IRB Regulation 22.

The IRB *Artificial Rugby Turf Performance Specification* may be downloaded from <http://www.irbplayerwelfare.com>. It has been written to ensure Artificial turf pitches are constructed with surfaces of proven quality; that the surfaces are installed correctly and that they continue to provide satisfactory playing environments throughout their service lives. This is achieved by three stages of testing and inspection:

Stage 1 - product type approval - the Artificial turf surface is subjected to a comprehensive series of laboratory tests that assess its performance, durability and material qualities. Only Artificial turf surfaces that have been tested by an IRB Accredited Test Institute and shown to comply with the IRB standard should be considered when designing a Artificial turf pitch on which rugby union activities are going to take place. Confirmation that a particular Artificial turf surface has been shown to comply with this first stage may be obtained from the IRB Technical Services Department.

Stage 2 – initial facility testing and certification - Following construction a pitch is tested to verify the Artificial turf surface has been installed correctly and is providing the required 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 once every two years throughout its life to verify it is still providing a satisfactory and safe playing environment.

The testing of pitches requires specialist test equipment and expertise and the IRB has accredited laboratories that have been independently assessed and shown to achieve the levels of competence and professionalism required. Only accredited laboratories can undertake IRB testing of products and pitches. Details of suitable laboratories may be obtained from the IRB website

<http://www.irbplayerwelfare.com>. At present there are two accredited laboratories located in the UK:

Labosport Ltd Unit 3 Heanor Gate Road Heanor Derbyshire England DE75 7RJ Tel 01773 765007 Email info@labosport.co.uk	Sports Labs Ltd 12b Nasmyth Court Houston Industrial Estate Livingston Scotland EH54 5EG Tel 0845 602 6354 Email infor@sportslabs.co.uk
---	--

As required by the IRB the RFU maintains a register of certified pitches. This is available to anyone wanting to verify if a pitch is IRB Regulation 22 compliant prior to playing or training on it.

4 Multi-sports use

Many Artificial turf pitches are 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. Football and Rugby League Football can both be successfully be played on certain forms of Artificial turf that can also be used for Rugby Union without a major impact on the playing characteristics of any of the three sports.

FIFA has published its *FIFA Quality Concept for Football Turf* that defines the playing qualities they consider necessary for high quality and community football. The Concept 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 turf pitches whilst the FIFA One Star category is primarily aimed at organisations wishing to provide facilities for training and community use football. Under the FIFA scheme fields that have permanent markings for sports other than football can only be certified as a FIFA One Star category pitches, irrespective of the pitch's performance (unless the non-football markings are painted out). The Football Association have adopted the FIFA standards and guidance on the use of Artificial turf pitches in FA competitions may be obtained from them (www.thefa.com).

The Rugby Football League has also developed a standard for Artificial turf Rugby League pitches. Similar in concept to the IRB and FIFA standards the RFL *Performance and Construction Standards for Artificial Turf Rugby League Competition and Training Pitches* defines two levels of performance (designated Stadium and Community). Guidance on the use of Artificial turf pitches in RFL competitions may be obtained from the RFL.

Whilst hockey is also played on Artificial turf pitches the requirements of the game, and especially their desire for a surface on which a hockey ball rolls in a fast and true manner means that Artificial turf surfaces suitable for rugby will not be suitable for anything other than very basic hockey training and certainly not comply with the recommendations and competition regulations of England Hockey.

5 SURFACING OPTIONS

Artificial turf carpets

The range and design of Artificial turf 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 a Artificial turf carpet and some of the parameters often detailed by manufacturers in their trade literature.

Pile height 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 IRB specify a minimum pile height (above the backing) to help ensure surfaces meet their requirements. Historically the IRB has specified a minimum pile height of 65mm but a recent amendment to increase the potential for dual use rugby and football surfaces has seen this reduced to a minimum of pile height of 60mm.

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 turf 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 Artificial 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 increasing the risk of poor foot grip, infill compaction and skin burns.

Monofilament yarns have become the standard for long pile Artificial turf 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.

Pile weight or face weight is the weight of yarn forming the pile; typically ranging from 900g/m² to 2,000 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 Artificial turf 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 Premier League or Championship competitions should have all markings other than those specified for Rugby Union applied in paint to allow their removal prior to competition matches.

Infill materials

The majority of Artificial turf 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.

As the development of Artificial turf 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 for enhanced performance. In addition 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.

Several manufacturers are also now offering organic infills, based on coconut fibre and cork these infills are designed to provide a more natural playing surface. They do, however, require moisture to keep them at in their optimum condition and are likely to require replacement periodically through the Artificial turf carpet's life. In practice such infills are probably more suited for stadium pitches.

Shockpads

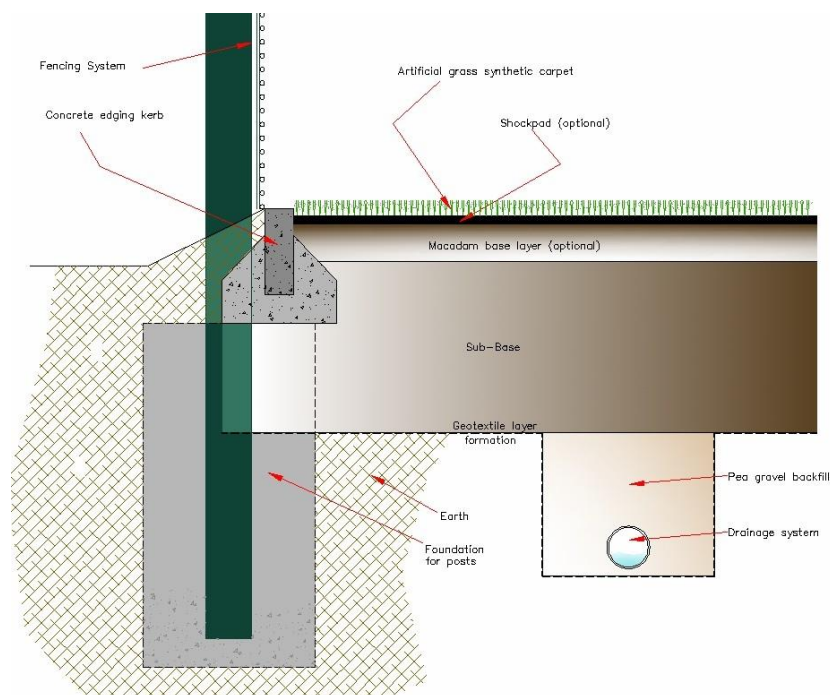
To ensure a Artificial turf pitch is able to provide the levels of player impact protection considered necessary for the game, it is likely to include a shockpad or elastic layer. Laid beneath the Artificial turf carpet they take many forms including polyurethane bound rubber mixes that are laid with 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 an increasing number of sand filled Artificial turf pitches are being converted to long pile 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 turf 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 quotations being sought (which will require the existing Artificial turf surface to be cut to allow access to the shockpad) so that contractors bidding for the resurfacing work will know what the performance of the shockpad is and design accordingly.

6 BASE CONSTRUCTIONS

The base on which the Artificial turf surface is laid is required to provide a stable and free draining platform on which the Artificial turf 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 drawing below shows a typical pitch construction including sub-base, drainage, fencing etc.



Drawing - cross section showing typical construction of a Artificial turf pitch

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.

Most commonly bases for long pile Artificial turf pitches are now constructed from unbound graded free draining aggregates (coarser gradings in the lower sections, finer gradings at the top) typically installed to a depth of 300mm – 450mm depending on ground conditions.

If an 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. This has resulted in some contractors promoting the use of bound or engineered bases of porous (open textured) bituminous macadam, as commonly used for hockey pitches.

7 FENCING

Perimeter fencing is normally erected around community pitches 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 balls 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.

8 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 on full size pitches.

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. Guidance on floodlighting and lighting levels is provided in the RFU's Facilities Guidance Note 4 – Floodlighting.

When designing a floodlighting system 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 a full size pitch is likely to be in the order of 35 to 40 kilowatts.

9 Design Team

Having decided an Artificial Rugby Turf 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.

10 PROCUREMENT

There are various forms of specification that can be used when inviting contractors to bid for the construction of a Artificial grass pitch. Most Artificial turf 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 use of a specialist architect or consultant to prepare such a document is strongly recommended. The RFU's *Guideline Template - Design Brief for*

Artificial Rugby Turf which forms Appendix A of these guidance notes has been prepared to form the basis of such a document.

11 CONTRACTORS

As a result of the expansion in the market for Artificial turf 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.

To reduce the risk of poor quality installations the RFU have joined the FA in entering a framework agreement with six specialist manufacturers of Artificial turf pitches. The agreement places enhanced responsibilities onto the partner companies to project manage the design, construction and on-going maintenance of the new facilities, with particular focus on quality, performance and longevity. Details of the Framework Agreement may be obtained from the RFU Club Facilities Technical Manager.

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>.

12 Quality monitoring during construction

To ensure the objectives of having a Artificial turf 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	• profile and gradients • adequate compaction
Drainage system	• channel spacing and falls • permeability of infill
Edgings	• design levels • haunching and line
Base	• construction depth • grade • compaction • permeability • surface regularity
Shockpad	• construction depth • permeability

	• surface regularity • tensile strength – laboratory test • shock absorption
Artificial turf surface	• joints • joint strength – laboratory test • infill application • carpet characteristics – laboratory tests • infill characteristics – laboratory tests

13 MAINTENANCE OF ARTIFICIAL RUGBY TURF SURFACES

The maintenance of the Artificial Rugby Turf 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 may result in a field not being certified to IRB Regulation 22.

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 undertake 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:

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 more fibrillation and matting of the carpet's pile with a deterioration in performance
- The localised topping up of infill 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.

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. 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.

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.

Maintenance costs

The maintenance of Artificial turf 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 2013 Institute of Groundsman recommended salary rates and an estimate of the likely levels of maintenance required for a floodlit community / school pitch it is suggested that a budget of £11,000 to £13,000 per annum be allowed for regular and routine periodic maintenance. For pitches subjected to lower levels of use costs reduce to around £4,000 per annum. As a guide 10 hours match play (30 players over an area of approximately 6,500m²) will typically result in one hour's maintenance activity on the pitch.

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.

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.

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.

14 REPLACE FUNDS – ARTIFICIAL TURF 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.

15 OTHER SOURCES OF USEFUL INFORMATION

IRB Regulation 22 – standard relating to the use of Artificial Rugby (Union) Turf

<http://www.irbplayerwelfare.com>

FIFA Quality Concept for Football Turf

www.fifa.com

RFL Performance and Construction Standards for Artificial Turf Rugby League Competition and Training Pitches

www.therfl.co.uk

Selecting the Right Artificial Surface

www.sportengland.org.uk

Artificial pitch construction

Guide to the Construction and Maintenance of Artificial 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

Floodlighting

www.sportengland.org.uk

www.sapca.org.uk

Maintenance of Artificial grass surfaces

www.sapca.or.uk

Trade associations

European Artificial Turf Organisation (ESTO) (www.theesto.com)

Institute of Groundsmanship www.iog.org

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

Appendix A

Guideline template

Design Brief for Artificial Rugby Turf Pitches

Foreword

To help organisations wishing to install Artificial grass pitches for community use the RFU have produced guideline documents to provide assistance during the design, procurement, construction and operation of Artificial Rugby Turf pitches. This document has been prepared to assist in the preparation of a design brief for an Artificial Rugby Turf pitch where the pitch is to be procured using a design and build form of contract. This is where the body commissioning the pitch describes what they require in a design brief (also known as the Employer's Requirements) and the appointed contractor has responsibility for the detailed design and construction of the pitch to satisfy the brief.

Where a site proves particularly difficult, or a number of different facilities form a larger development being undertaken at the same time, the procurement of the pitch may be best handled on the basis of a detailed specification, with full working drawings. If this method of procurement is selected, the outline design brief can be used as the basis of the design from which the drawings and bills of quantities can be derived.

Every project and site is different meaning that it is not possible to take an "off the shelf" specification and issue it to contractors to price. Every scheme will require project specific information that needs to be incorporated into the project specification. **Sections where project specific information is required are highlighted. These should be fully completed prior to tenders / quotes been sought from contractors.**

Design brief for the construction of an Artificial Rugby Turf pitch and ancillary works

1 Project Details – Site, Employer and Project Manager, etc

1.1	Site	
	Address	
1.2	Employer	
	Address	
	Tel	
	Fax	
	E-mail	
1.3	Project manager	
	Address	
	Tel	
	Fax	
	E-mail	
1.4	CDM Coordinator	
	Address	
	Tel	
	Fax	
	E-mail	

2 Description of works

Guidance note
A detailed description of the required facility shall be included here. The description should include: • A full description of the facility required including a summary of the proposed sports to be played on the pitch. • Details of any works to be undertaken by others in advance of the main construction works • Details of what is to happen to spoil resulting from the works (taken off site, creation of mounds, etc.) • Details of the proposed drainage outlet • The type of fencing (height, mesh type and colour), gates (numbers, type and height), rebound boards/mesh (type and colour), etc • The required levels of floodlighting performance including details of any secondary level lighting to be provided for training and other sectional pitch use • The location of the control and switchgear for the floodlighting system • The location of an available power supply for the floodlighting system or details of who is to provide an adequate supply • Details of all small power, egress and amenity lighting and all control features to be provided as part of the floodlighting scheme • Details of any landscaping works to be undertaken as part of the contract • Details of any external maintenance access ways and footpaths etc to be constructed by the contractor. • Details of any site specific restrictions

Anticipated use

The pitch is to be used for the following activities. The anticipated maximum weekly usage for each activity will be as detailed:

Guidance note
List each activity to take place on the pitch together with an estimate of weekly usage. Distinguish between full pitch play and cross pitch play

3 Drawings

Guidance note
The drawings that form part of the Design Brief should be listed here. There will normally be drawings showing:

- The location of the site, site access, working area and contractor's compound
- The topography of the existing site
- The required pitch layout including line markings, fencing heights, equipment storage areas, drainage outlet, access ways, location of floodlight power supply, etc
- Any other site of project specific requirements

4 General Conditions, Preliminaries, Form of Contract and Form of Tender

The Employer's specific conditions, preliminaries, form of contract and conditions of tendering are detailed in Appendix A.

4.01 Contract

The Contractor shall agree to undertake to enter into a formal contract of the form detailed in Appendix A. The Contractor shall further agree that until their tender is incorporated in such a formal contract, executed under deed by the Employer, their tender together with the Employer's written acceptance thereof will constitute a binding contract between the parties.

4.02 Design and Construct Responsibilities

The Contractor shall assume full responsibility for the preparation of the design, and for the construction of the whole of the project as described in the Design Brief. Any preliminary or preferred scheme detailed in the Design Brief represents a discharged portion of the design service previously commissioned by the Employer. The Contractor shall use any such scheme indicated as a basis for the development of the undischarged portion of the design.

The Contractor shall conform to the mandatory data and dimensions indicated in the Design Brief. Any materials, fixings, foundations or drainage detail indicated in the Design Brief are typical only and shall not relieve the Contractor in any way of any of his design or other responsibilities.

4.03 Conditions of Tendering

The Contractor shall take into account and comply with any conditions of tendering or procurement stipulated by the Employer or funding agencies and notified to the contractor in these Design Brief.

The Employer does not bind itself to accept any design or tender. Contractors tendering do so at their own cost and their tender shall remain open for acceptance for a period of TWELVE weeks after the due date for submission. The Contractor shall note that after the submission of his tender he may be required to attend an interview at the Employer's office to explain his tender proposals including the methods of construction, the construction programme and management structure to be used to control and progress the works.

The Contract Sum is a fixed price and will not be subject to any adjustment saves only in respect of any provisional or prime cost items or where the Employer shall have issued a written change in design instruction.

4.04 Site Access and Temporary Roads, Hard Standings etc.

The contractor shall allow for forming a suitable site access to allow the works to be undertaken during the agreed contract period. This shall include all temporary roads, hard standings, crossings and the like, necessary for carrying out the whole of the works. On completion of the works the contractor shall remove all temporary roads and fully reinstate the disturbed areas.

4.05 Limitations of Working Space

The Contractor shall confine everything pertaining to the Contract within the area of the proposed works and surrounding areas, as agreed with/defined by the Employer.

The Contractors operations are to be confined to the minimum area required to carry out the works, which shall be executed carefully so as to cause minimum nuisance and inconvenience to the users of adjoining facilities.

4.06 Trespass and Nuisance

All reasonable means shall be used to avoid inconveniencing adjoining owners and occupiers. No persons employed on the works shall be allowed to trespass on adjoining properties. The Contractor shall indemnify the Employer against any claims or action for damage on account of any trespass or other misconduct of the Contractors' employees.

4.07 Inspection of the Site

The Contractor is recommended to visit the site before submitting their tender, as no claim due to lack of knowledge that could have been obtained by such a visit will be entertained. Permission to visit the site may be obtained from the Employer.

4.08 Programme

The Contractor shall before being given possession of the site prepare and submit his proposed programme for the execution of the works for comment by the Employer. Thereafter the Contractor shall amend and revise the programme as required by the Conditions of Contract or as requested by the Employer. The programme shall be represented on a bar chart showing each primary stage of construction. When updated this shall show the percentage of works completed up to the date of reporting.

4.09 Method Statement

The Contractor shall provide, prior to contract, a statement describing their proposed general and detailed arrangements and methods for carrying out the works. The document should also indicate areas of work that will be sub-contracted and detail the company that will be employed.

The Method Statement should include details of how all stages of the works will be executed. It should detail procedures to ensure the specified parameters are obtained, the appropriate climatic conditions in which the surfacing can be laid, the appropriate Health and Safety requirements and training that personnel will undergo prior to working on site.

4.10 Plant, Tools and Vehicles

The Contractor shall allow for providing all plant, tools and vehicles necessary for the completion of the Works.

4.11 Site Administration

The Contractor shall allow for all necessary site administration for the proper execution of the works. Prior to commencing the works on site the Contractor shall confirm to the Employer the name of the person in charge of the site together with brief details of their experience. This person is not to be changed without the prior agreement of the Employer, which shall not be unreasonably withheld.

4.12 Site Security and Temporary Fencing

The Contractor shall ensure that the works and the site are properly protected and secured at all times, including any works outside the site boundary, and that the Employer is indemnified against any claim for loss, damage, theft or the like.

The Contractor shall provide for situating his temporary buildings and offices and the storing of materials etc. within the site boundaries.

On completion of the works all temporary fencing, building materials and equipment shall be removed and the site reinstated.

4.13 Temporary Accommodation for use by the Contractor

The Contractor shall allow for providing and maintaining all necessary temporary services, offices, containers and compounds for storage of materials.

No offices, stores or temporary buildings shall be erected on site without first obtaining the consent of the Employer as to the position in which they are to be erected.

Sanitary accommodation for workmen and staff shall be provided, connected to existing drainage where practicable, and maintained in a thoroughly clean, deodorised and orderly condition.

All huts and other temporary facilities shall be removed, and contaminated soil disinfected and all damage made good on completion of the Contract.

4.14 Safety, Health and Welfare

The Contractor shall allow for providing and maintaining all welfare and safety measures to a standard not inferior to that laid down in statutory instruments, rules and orders and subsequent amendments thereto for all workmen employed on the site including the employees of subcontractors.

4.15 Maintenance of Roads Etc.

The Contractor shall maintain all public and private roads, footpaths, paved areas, boundary walls and fences on or adjacent to the site in their present condition, and on completion, make good any damage arising from the works and reinstate to the satisfaction of the Employer.

The Contractor shall keep any public, private and existing roads, drains, footpaths and paving on or adjacent to the site or used by traffic entering or leaving the site in a clean and unobstructed and safe condition state to the satisfaction of the Employer, the Police and the Local Authority.

The Contractor shall use all means to prevent mud or rubbish of any kind being carried on to such roads, footpaths and paving, by vehicles belonging to himself or any other subcontractor to the reasonable satisfaction of the Employer.

Where, however, in spite of such precautions, mud or rubbish is carried on to the roads, footpaths or paving, the Contractor shall immediately clean up such mud or rubbish at his own expense by scraping, brushing, shovelling and removing to tip. Special attention must be given to prevent mud becoming embedded in the road and footpath surfaces.

4.16 Removing Rubbish etc. and Cleaning Works

The Contractor shall allow for removing all rubbish, protective casings, coverings and debris from the site.

4.17 Statutory Regulations

Statutory regulations shall be ascertained and the Contractor shall allow for complying with any such regulations or requirements concerning pedestrian or vehicular traffic control, the loading and unloading of or waiting by vehicles on the public highway, site ingress and egress, safety precautions and other matters affecting the works.

4.18 Planning Consent & Building Regulations Approval

Appendix B contains details of the planning application and consent for the facilities. The Contractor is to allow for any necessary liaisons with the relevant planning authority, and for complying with any requirements of the planning authority, as advised by the Employer. The Contractor shall obtain any necessary statutory formal approvals for the works, as advised by the Employer.

4.19 Ground Conditions & Site Investigation

A ground investigation report forms Appendix C of the Design Brief. It is the responsibility of the Contractor to satisfy himself as to the completeness of the Report to ensure he has adequate knowledge of the existing ground, and its bearing capacity to allow the required design for the project. On the award of the contract the successful Contractor will have been deemed to have undertaken any additional site investigations they consider necessary and no increase in the tender price or subsequent Contract Sum will be allowed for any costs of resulting from unknown conditions.

4.20 Inspections & sampling

Where the Contractor has given notice that a particular operation or stage of the works will be ready for inspection by the Employer or his Agent on a specified date and they then find that the works are not complete on that date so that the inspection cannot be carried out or completed necessitating a further visit, any additional cost incurred, including all expenses, will be borne by the Contractor.

The Employer shall be at liberty to take samples of all materials and to have them tested for compliance with the Contractor's tender submission and the Design Brief. The Contractor shall allow for the taking of such samples and the proper recording of the location to which the samples relate, as directed by the Employer and detailed in the Design Brief. Samples for test shall be delivered within 48 hours of being instructed by the Employer. Any delay to a scheduled inspection or preparation of a report by the Test House arising from late delivery of the samples for test or from failure to keep proper records as required, shall not relieve the Contractor from his responsibility with regard to completion within the Contract Period.

4.21 Failure of tests

Should any samples or intermediate stages of construction tested be found, in the opinion of the Employer or his Agent, to be unsatisfactory or likely to produce unsound work, the defective material or the consignment which the sample represents shall be removed from the site or suitable corrective action taken, as approved by the Employer, to achieve the specified performance outcome. Notwithstanding that, any sample or intermediate work stage, which has been accepted by the Employer or his Agent, may subsequently be rejected if they shall decide that the quality has in any way deteriorated.

The Contractor shall, at his own expense, remove and replace all rejected materials, or correct any intermediate work stage shown to be outside specification. Any delays consequential upon the rejection of any sample or work stage shall not in any way relieve the

Contractor from his responsibility with regard to completion within the Contract Period.

Work corrected or materials replaced for these reasons will be re-checked or re-tested by the Employer or his Agent. The additional costs of testing any material replaced for this reason or re-inspecting any work stage subjected to remedial works shall be recovered from the Contractor by an appropriate deduction from the contract sum.

4.22 The Construction (Design and Management) Regulations

The Contract will be executed strictly in accordance with the Regulations. The Contractor named in the Articles of Agreement of the Contract will be deemed the Principal Contractor.

The Contractor shall allow the CDM Coordinator access to the works and afford him every reasonable facility for the performance of his duties.

The Contractor shall co-ordinate with the CDM Coordinator to execute the Health and Safety Plan and contribute as required to the Health and Safety File.

5. **Design & performance requirements**

The pitch shall be designed and built to satisfy the construction tolerances and performance requirements of the *IRB Artificial Rugby Turf Performance Specification*.

6. **Pitch construction requirements**

6.1 Quality of materials and workmanship

Where and to the extent that materials, products and workmanship are not fully specified they are to be:

- (i) suitable for the purposes of the Works stated in or reasonably to be inferred from the contract documents;
- (ii) in accordance with good building and/or engineering practice, including the relevant provisions of current British Standards;
- (iii) in accordance with the *IRB Artificial Rugby Turf Performance Specification*;
- (iv) in accordance with the *Code of Practice for the Construction and Maintenance of Artificial Grass Sports Pitches* published by the Sports and Play Construction Association.;
- (v) in accordance with the current edition of the *Institute of Electrical Engineers Wiring Regulations*.

6.1 Formation

6.1.1 Design criteria

In the absence of any site specific geotechnical requirements the prepared formation shall be trimmed to a tolerance of $\pm 25\text{mm}$ relative to the design levels and when checked with a Light Weight Deflectometer (Prima or equivalent) on 10m x 10m grid the minimum stiffness shall be 25 MPa. If required, this requirement should be achieved by the use of geotextiles, or stabilisation methods as considered appropriate by the designer.

6.1.2 Construction criteria

The area of the works shall be stripped of all vegetation and topsoil and the ground trimmed and levelled using cut and fill techniques as required. Any filling should be carried out in layers not exceeding 150mm thickness, and each layer should be compacted before the next is spread.

The formation shall be free from mud or slurry and will have no areas of freestanding water. Any loose, fragmented or soft materials or any soft spots shall be excavated and replaced with imported crushed rock, free from detritus material, in accordance with the relevant clauses of the Department of Transport Specification for Highway Works.

The prepared formation shall be treated with a weed-killer selected to minimise the risk of future weed growth within the construction and applied strictly in accordance with the manufacturer's specified application rate

A geotextile membrane shall be laid over the formation. Joints shall overlap by at least 300mm. The membrane shall be a non-woven type and have a minimum tensile strength of 20kN/m when tested in accordance with BS EN ISO 10319 and a static puncture strength of at least 2.0kN when tested in accordance with BS EN ISO 12236.

6.2 Drainage

6.2.1 Design criteria

The drainage system shall be designed and install to:

- (i) Ensure that all surface water is removed from the pitch at a rate greater than 100mm/h and to ensure that no surface flooding will occur during heavy storms, or the facility will not be lost either through rain at the highest intensity which may be expected to occur once every five years or through continuous rainfall of 50mm over a 24 hour period.
- (ii) Protect the installation from the effects of ground or surface water from the areas surrounding the pitch.

- (iii) Ensure no water remains present in the construction so that it may result in a reduction of the load bearing capacity of the formation or damage to the constructions from the actions of frost.

6.2.2 Construction criteria

The drainage system shall comprise a perimeter drain (minimum 160mm diameter) tied to lateral drains installed at (minimum 80mm diameter), which shall be fully connected via 'T' piece connectors.

Drainage trenches shall be a minimum of 450mm deep by 300mm wide and be back filled with clean graded round/sub-rounded gravel. Perforated drainage pipe shall comply with BS 4962 and be laid to a minimum fall of 0.5%. Pipe bedding materials shall be clean, durable 10mm to 20mm single size stone.

Flexible pipes shall be laid on a bed of 75mm (minimum depth) of compacted granular materials and the trench filled with similar granular materials above the barrel of the pipe. Pipe jointing shall be carried out strictly in accordance with the manufacturer's instructions. All pipes shall be tested for effectiveness before haunchings or backfilling.

Rodding eyes or catch-pits, with covers, shall be installed at each corner of the pitch. Pre-cast concrete manholes and soak-away type structures shall be circular and comply with BS 5911-3. Units that bed onto bases shall be manufactured so that the full wall thickness is in contact with the base.

Pre-cast soak-aways shall be perforated with rows of 50mm diameter holes at nominal 450mm horizontal and 300mm vertical centres. The lowest row shall not be less than 150mm above the base of the soak-away.

Existing drains cut through during the construction of the pitch shall be re-connected into the new drainage system.

6.3 Perimeter Edgings

Edgings shall be precast concrete kerbs or other approved edgings, well haunched in concrete with movement joints at appropriate spacing. The maximum gap between the outer kerb face and any adjacent perimeter fencing shall be 10mm. Kerbs shall be laid to a true line and level with adequate up-stand for the subsequent fitting of the Artificial grass surfacing system.

Precast concrete kerbs shall be hydraulically pressed complying with the requirements of BS 7263 - 1. They shall be bedded in accordance with BS 7263 - concrete foundation. The minimum dimensions of the edgings shall be 150mm x 150mm/125mm

6.4 Sub-base

6.4.1 Design criteria

The sub-base shall be designed and constructed to:

- (i) Resist the effects of frost or drought that may be expected to occur in a return cycle of once every 50 years
- (ii) Provide adequate stability that it does not move outside the tolerances for surface regularity over a period of 8 years
- (iii) When checked with a Light Weight Deflectometer (Prima or equivalent) on 10m x 10m grid the minimum stiffness shall be 60 MPa.

The sub-base shall be laid to a tolerance of ± 10 mm of the design profile for this phase of construction.

6.4.2 Construction criteria

The depth of the sub-base shall be determined to satisfy the specified design criteria and taking into account the findings of the ground investigation survey. In all cases the depth shall be equal to or greater than the minimum requirements of *SAPCA Code of Practice for the Construction and Maintenance of Artificial Grass Sports Pitches*.

Sub-base aggregates shall be a reduced fines grade of crushed rock aggregates, complying with the requirements of the Department of Transport Specification for Highway Works specification for Type 3 sub-base materials. Recycled materials shall only be used with permission of the Employer. All aggregates shall be porous and frost resistant; test certificates shall be provided by the aggregate supplier.

6.4.3 Base

Where specified or offered as part of the construction for the pitch unbound bases shall be formed from interlocking but free draining blinding aggregate.

Where specified or offered as part of the construction for the pitch, storage or spectator areas, macadam binding and surfacing courses shall be produced and laid in accordance with the *Code of Practice for the Construction and Maintenance of Artificial Grass Sports Pitches*.

The base shall be laid so the maximum undulation under a 3m straightedge when tested in accordance with BS EN 13036-7: *Irregularity measurement of pavement courses – The straightedge test* is 10mm.

6.5 Artificial turf surfacing system

6.5.1 Design criteria

The Artificial turf surfacing system shall be a surface that will allow the completed pitch to be certified to the IRB *Artificial Rugby Turf Performance Specification*.

6.5.2 Shockpad

- * The surfacing system shall incorporate a shockpad.
- * The surfacing systems may incorporate a shockpad within its construction.

Guidance note
* delete as appropriate

The tensile strength of the shockpad when tested in accordance with BS EN 12330 shall be $\geq$ 0.15 MPA.

At any location on the pitch thickness of the shockpad shall be no less than 90% of the Artificial Rugby Turf manufacturer's specified thickness.

At any location on the pitch shock absorption of the shockpad shall be +/- 5% FR of the Artificial Rugby Turf manufacturer's specified shock absorption.

The combined design of the shockpad and carpet backing shall ensure that slippage and creep of the Artificial turf carpet does not occur.

The regularity of the installed shockpad shall ensure the maximum undulation under a 3m straightedge when tested in accordance with BS EN 13036-7: *Irregularity measurement of pavement courses – The straightedge test* is 10mm.

Insitu shockpads shall be laid to the contractor's specified depth. No joint should vary in level by more than 2mm.

Prefabricated shockpads shall be adequately dimensionally stable so that rucking, creasing or movement does not occur. They shall either be inter-locking, ribbon bonded to the base or seamed along side / head joints.

Throughout installation the contractor shall take samples of all materials as detailed in Schedule 1 and arrange for them to be sent to an independent IRB accredited test laboratory for testing. The test laboratory's report shall be submitted to the Employer prior to any interim application for payment for the shockpad. All samples shall be coded and the areas of installed materials from which they came recorded so any defective materials can be identified and removed - failure to do this may result in an entire section of work be replaced. All samples shall be in accordance with the Artificial Rugby Turf system's manufacturer's product declaration and IRB Regulation 22.

6.5.3 Artificial turf

The Artificial turf surface shall be laid in full widths across the pitch, other than where longitudinal rolls are laid to include tufted sideline markings. The method of jointing / seaming, including all in-laid line markings, shall be such that no ridge, groove or crease shall be wider than 3mm apparent.

No seam shall be within 300mm of any permanent inlaid line.

Bonded joints shall be formed using jointing tape of not less than 400mm wide and polyurethane glue applied evenly to either side of the tape to a minimum total of 300mm.

There shall be no loops in the tufts, random long tufts, loose tufts, tears, holes or melted areas, undulations, pile height variations or any other visual or manufacturing defects. If replacement of defect carpet is deemed necessary by the Employer or his agent, this shall involve full replacement of a length and width of a carpet roll (as designed and manufactured). No patching whatsoever will be allowed.

6.5.4 Infilling & brushing

The contractor shall carry out as many filling and brushing operations as required to fill the carpet to the required depth and to provide the specified performance. The Contractor shall carry out re-dressing of the whole pitch at six months; this should be allowed for in the tender price, it is anticipated that 15 – 20 tonnes of rubber will be required for this operation.

The Contractor shall make due allowance for providing extra rubber/sand to the Employer at the handover of the contract, these bags will be used for local topping up.

6.5.5 Line Marking

- * Line markings shall be inlaid / tufted.
- * Line markings shall be painted.
- * Straight lines shall be inlaid / tufted, curved lines shall be painted.
- * Line marking shall be formed in accordance with the supplier's recommendations.

Guidance note
* delete as appropriate – if not preference is held allow companies to offer their preferred option

Line markings shall be in accordance with the relevant rules of the game. Unless stated in the rules, all lines shall be 125mm wide and (when measured with a steel tape) within 20mm of their specified position. Markings shall not deviate by more than 10mm from a line joining their ends, nor include any sudden steps. Line edges shall be parallel and uniform.

For a period of five years following Practical Completion each straight line marking shall remain straight to within +/- 100mm of a tensioned string line joining its ends and all lines shall remain within +/- 150mm of their original position as measured at Practical Completion. Furthermore, no line shall exhibit any sudden irregularity or deviation greater than 75mm

over a distance of 1 metre.

6.06 Fencing

All fencing works shall be undertaken in accordance with the appropriate sections of BS 1722 and the *SAPCA Code of Practice for the Construction and Maintenance of Fencing Systems for Sports Facilities*.

Unless specified otherwise mesh shall be 3mm (minimum) 50mm x 50mm square weldmesh, corner posts shall be hollow section measuring a minimum of 60mm x 60mm x 3mm and intermediate posts shall measure a minimum of 60mm x 40mm x 3mm. All posts shall be set in concrete footings of minimum size 450mm x 450mm x 850mm, increased as required for local ground conditions. Heights shall be as detailed by the Employer.

All mesh and posts shall be galvanised in accordance with BS EN ISO 1461. Post caps shall be fitted to tops of all hollow section posts. Where required, powder coating shall be in accordance with BS EN 6497

There shall be no protruding fence (or other) fixings within the pitch boundaries. All fixing bolts shall be assembled with heads inside and bolts trimmed to within 6mm of the nut. The trimmed ends should be burred and treated or shear head nuts used. On low level fencing no mesh ends or straining wire shall cause hazards to players, or spectators, particularly children.

Gates in high fencing shall have a lintel above to the fence height. All gates shall be hung plumb, level and secure for full opening without interference. Gate lathes shall include provision for padlocks. Gate hinges shall permit gates to open outwards through 180° and have stops to prevent reverse opening. Bolts on gates shall be captive and lockable both shot and withdrawn. Bolt sockets shall be set in concrete.

6.7 Floodlighting

6.7.1 Floodlighting design criteria

The pitch's floodlighting system shall meet the specified lighting and uniformity levels as detailed below and be in full compliance with any conditions of the planning approval for the project:

Guidance note
Specify the level of lighting required as detailed in the RFU's Facilities Guidance Note 4

The works shall include the provision of all luminaries, columns, mains distribution switch gear, sub-circuit protective devices, metering and control devices and the associated cabling, trenching, ducting & draw pit installation, back filling and making good.

All works shall be carried out in accordance with the latest edition of the IEE Wiring

regulations.

6.7.2 Floodlighting column bases

The Contractor shall take full account of the ground conditions, as detailed in the ground investigation report (Appendix C), when designing the bases for the floodlighting columns.

Base plates shall be arranged to ensure all fixing bolts are concealed and cannot constitute a trip hazard.

6.7.3 Floodlighting system protection

System protection shall include Mccbs, rated for the prospective load of the proposed installation and selected to match the required fault level. The arrangement of the power distribution at the distribution point shall provide short circuit and excess current protection for all sub-circuits. Adequate discrimination between main Mccb and sub-circuit protective devices shall be included.

6.7.4 Floodlighting earthing

All necessary earthing and cross bonding shall be provided in accordance with the current edition of the IEE Wiring Regulations.

6.7.5 Floodlighting system management

Individual Mccb protection shall be provided for each control circuit.

A master time clock with battery back up shall be provided to turn off the floodlights at the programmed time. The clock shall allow for the seasonal changeover for day light saving time. A key switch for manual override shall be provided.

The management system shall include a system of visual warning to warn users the cut-off time is approaching. This shall be achieved by switching a flashing beacon mounted on the floodlight column. One beacon shall be installed for each operational section of the pitch. The beacons shall be programmed to operate five minutes before the cut-off time. They shall only operate if any element of the floodlighting is in use. The management system shall ensure one luminaire on each operational portion of the pitch remains in operation for five minutes after cut-off of the main pitch lighting. A set of manual override switches shall be provided for test and emergency control of the lights.

A Kwhr meter shall be provided to monitor the total power used by the floodlights.

An 'hours run' facility shall also be provided to identify the cumulative time each group of floodlights serving the pitch has been in operation.

6.7.6 Floodlighting cables

Cabling at the central distribution point and to columns shall be carried out in correctly sized XPLESWA cable. All necessary control cables shall be provided for the connection of controls within column gear trays to the main switchgear position.

Cables in the soft ground shall be buried in trenches to a minimum depth of 500mm. Where applicable (as detailed in the IEE Wiring Regulations) cables shall be laid on a bed and surround of sand 150mm thick.

Buried cables shall be identified along their entire length with yellow marker tape installed 150mm from ground level. The marker tape shall be labelled *DANGER – ELECTRIC CABLE BELOW*.

6.7.7 Floodlighting ducting & draw pits

Cable ducting shall be installed in all hard landscaping so, in conjunction with draw pits, they provide an underground containment system to allow the future re-cabling of the lighting system.

Unless otherwise specified ducting shall comprise 100mm diameter minimum rigid plastic ducting pipe, with flexible ducting where necessary. All ducting shall be buried to a minimum depth of 450mm and cable warning marker tape shall be laid 150mm above all ducting. Service ducting and draw pits shall include secured draw ropes.

Draw pits shall be installed at each floodlight column and at all changes of direction. They shall be pre-formed, be a minimum of 450 diameter or 450mm by 450mm square and have lockable removable lids. They shall be installed prior to the installation of the ducting. Where stacked plastic sectional draw pits are used duct entries shall be drilled to avoid weakening of the structure.

6.7.8 Small power

Single socket outlets, common key controlled and RCD protected, shall be provided to at least two floodlight columns (or more if specified by the Employer). Each shall be terminated within the base of the column. The fitting shall be of a proprietary make and weatherproof. Where columns are sited outside the perimeter fencing of the pitch, provision for passing plugs through the fence from the pitch to the columns shall be made.

6.8 Sports and maintenance equipment

The Contractor shall supply and erect the equipment detailed below as part of the contract.

Description	No. Required	Type
Rugby goals		
Corner flags		

Guidance note
List all sports equipment to be supplied as part of the construction contract. This shall include division nets if required.

6.9 Reinstatement

On completion of the works site shall be left in a clean and tidy condition. All damage caused to surrounding areas and surfaces shall be reinstated in full to the satisfaction of the Employer using similar materials to the existing.

6.10 Pitch Testing

On completion of the works the pitch shall be tested and certified in accordance with IRB Regulation 22. Unless agreed with the Employer testing of the pitch shall be undertaken prior to handover.

Where it is agreed that testing may be deferred for a period not exceeding three months of handover the Contractor shall provide written confirmation to the Employer that they retain responsibility and liability for IRB Regulation 22 compliance of the pitch at all times prior to IRB Certification of the pitch.

Floodlighting

In addition to testing of the electrical installation by the Contractor (as required under the IEE Wiring Regulations) for illumination tests to be carried out, after dark, on the pitch to establish the specified illumination levels have been achieved. These tests shall establish the initial level(s) of illuminance and uniformity and shall be related to the maintained levels specified.

Test house

- * The Employer shall appoint the test house to test the pitch. The contractor shall notify the Test House of when the pitch will be ready for testing and provide all necessary information materials and assistance required by the test house. .
- * The contractor shall have responsibility for appointing the test house to test the pitch. The contractor shall notify the Employer's of the proposed test house, for approval, prior to the tests being made.

Guidance note
* delete as appropriate

6.11 Maintenance

The contractor shall supply all necessary maintenance equipment, instructions and maintenance logs to allow the surface to maintain in accordance with the manufacturer's instructions. This shall include the type of brushes and drag mats to be used by name.

7. Warranty

7.1 Artificial Rugby Turf pitch - performance

Subject to adequate maintenance and agreed levels of use the pitch shall satisfy the performance requirements of IRB Regulation 22 throughout the Defects Liability Period and for a minimum of at least a further XX* years.

Guidance note
* to be defined and agreed with the surface supplier/manufacturer; unless the proposed use is considered to be excessive a minimum of five years is recommended.

Prior to handover the Contractor provide a written warranty for the durability of the Artificial grass surfacing (including any shockpad) and fill materials, as advised (in writing) together with any agreed limitations and conditions. The minimum durability warranty period shall be five years and the Contractor's warranty shall be supported by the manufacturer's guarantee.

7.2 Repairs under warranty

The Contractor shall undertake as part of the Warranty that any remedial work or repair necessary under the terms of the Warranty in respect of failed seams or joints, or loss of adhesion will be completed within 14 days of notification in writing by the Employer that remedial work is required. The Contractor shall further undertake as part of the Warranty that any other remedial work or repair necessary under the terms of the Warranty will be completed within 28 days of notification in writing by the Employer that remedial work is required and repairs will be carried out with materials identical to the original installation and at such times as may be agreed with the Employer such that the planned programme of activities shall not be affected.

Schedule 1 - samples of Artificial Rugby Turf surfacing materials required for quality control testing

Component	Sampling	Tests / test methods	
Shockpad	Three 300mm x 300mm samples per day of installation	Thickness	BS EN 1969
		Tensile strength	BS EN 12230
		Shock absorption	AAA
Artificial turf	One 500mm x 500mm sample from every third carpet roll	Mass per unit area	BS ISO 8543
		Pile height	BS ISO 2549
		Pile weight	BS ISO 8543
		Tuft bind	BS ISO 4919
		Pile yarn polymer	DSC
Artificial turf joints	One 300mm joint sample to be taken every half day of carpet seaming and in-laid line fitting	Joint strength	BS EN 12228
Performance infill	1 kg sample per 10 Tonnes delivered to site	Particle grading	BS EN 933-1
		Particle shape	BS EN 14955
		Bulk density	BS EN 933-1
		Composition	TGA
Stabilising infill	1 kg sample per 10 Tonnes delivered to site	Particle grading	BS EN 933-1
		Particle shape	BS EN 14955
		Bulk density	BS EN 933-1
Sampling should be scheduled to ensure samples are fully representative of those installed over the whole pitch. Samples should be coded so any defective materials can be located and replaced on site. Samples should be left for at least 48 hours on site exposed to the elements so they experience the same climatic conditions as the installed materials			

Form of Tender and Contract Sum Analysis

To (Employer).....

For: construction of Artificial Rugby Turf pitch and ancillary works at

.....

From (Contractor):

Sirs,

I/We having read the Conditions of contract and Design Brief delivered to me/us and having examined all drawings referred to therein do hereby offer to execute and complete in accordance with the Conditions of Contract the whole of the Works described within weeks from the date of possession for the sum of:

£..... (VAT exclusive)

I/We undertake to enter into a formal contract in the form specified. I/We agree that until this tender is incorporated in such a formal contract, executed under deed by the Employer, this tender together with your written acceptance thereof will constitute a binding contract between us.

I/We confirm that if our tender is accepted we will require a period of weeks prior to works commencing on site.

I/We further agree that this tender remains open for consideration for twelve (12) weeks from the last day of submission of tenders.

I/We note that you do not undertake to accept the lowest or any tender and that the Contractors tendering do so free of charge.

I/We declare this tender to be a bona fide tender intended to be competitive and that I/We have not fixed or adjusted the amount of the tender by or under or in accordance with any agreement or arrangement with any other person.

I/We confirm that the Annual Renewal date of Insurance as supplied by me/us and referred to in the Conditions of Contract is

.....

We confirm that we have visited the site and made all necessary investigations before submitting this tender.

Dated this day of 20.....

For and on behalf of:

Signed:.....

Registered address:

.....

.....

Tender sum analysis

The Contractor shall enter costs against those items specifically listed below.

Item		Cost
Preliminaries & site establishment		
Site strip and preparation of formation		
Installation of sub-pitch drainage & outlet		
Pitch edgings		
Pitch sub-base (including geotextile)		
Macadam layers, if applicable		
Shockpad, if applicable		
Installation of Artificial Rugby Turf , infilling and line markings		
Fencing & gates		
Floodlight columns and local switchgear		
Floodlight fittings		
Floodlight power distribution cabling and connection		
Floodlight system management		
Power socket provision		
Reinstatement & landscaping		
Sports equipment		
Maintenance equipment		
Testing and inspections	Quality monitoring by independent laboratory during construction (if contractor required to organise)	
	Testing of pitch on completion in accordance with IRB Regulation 22 (if contractor required to organise)	
	Testing of floodlighting luminance levels on completion(if contractor required to organise)	

Any items not specifically included above (list)	
Total carried to form of tender	

Value Added Tax

The Contractor is set out below a provisional indication of the amount of Value Added Tax the Employer will be called upon to pay under the VAT Agreement.

£.....

Extra-over costs (excluding VAT)

Item	Cost
Excavation and back filling of soft spots per m ³	

Assignment of sub-contracting

The contractor is to state in the following schedule the names of **all** the sub-contractors that he will employ on the works and their stated trades.

Company	Trade

Appendix A - Employer's specific conditions, preliminaries & form of contract

Guidance note

Appendix A should contain:

- The Employer's specific conditions of contract
- The Form of Contract and Appendices to the Form of Contract to be used
- The Contract Preliminaries
- Any specific contract or site conditions
- Any conditions of tendering or procurement stipulated by the Employer or external funding partners

Appendix B - Planning Approval

Guidance note

In order that the contractor is aware and may comply with all planning conditions Appendix B should include a copy of the original planning application (including all supporting information), the notification of planning approval and any conditions attached.

Appendix C - Ground investigation report

Guidance note

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.

This report shall form Appendix C.

Appendix D - Schedule of information to be included in Contractor's Proposals

The Contractor shall supply the following information with their tender:

- A fully detailed method statement, giving the methods and sequence of construction operations.
- Specifications for all proposed materials.
- Drawings indicating the proposed construction, the anticipated finished levels of the playing surface and surrounds, the arrangements for drainage works, together with anticipated invert levels, lines and depths of all ducts and cables and any proposed modifications of any existing services.
- An independent test report detailing the performance of the precise construction being proposed and its ability to satisfy the laboratory test requirements of the IRB's Artificial Rugby Turf Performance Specification
- Details of at least three pitches of similar construction, including date of installation and reference contact
- Fencing design
- A computer plot showing the anticipated floodlight values of Horizontal Illuminance over each playing area at each level of illuminance.
- Computer plots of horizontal and vertical illuminance showing the predicted floodlight light spillage of the proposed system extending at least 50m beyond the pitch perimeters.
- Specification and details of the make and types of floodlight equipment, including details of the characteristics of the type(s) of lamp offered
- The proposed locations and height of floodlight columns
- Details of the dimensions of the floodlight column bases and the calculations on which these are based.
- The start-up and running power loadings (Kva) for the floodlight scheme and the predicted running cost per hour.
- The floodlight manufacturer's warranty
- Details of at least three pitches with similar lighting systems, including date of installation and reference contact
- An outline programme for the construction works in the form of a bar chart showing the

main sequence of the works.

- Details of warranty being offered
- Specifications of all sports equipment being offered including manufacturer and their reference number
- Specifications of all maintenance equipment being offered including manufacturer and their reference number.