



STADIA 3G CONSTRUCTION & INSTALLATION - SCOTTISH FA GUIDELINES

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Introduction

This document sets out guidance on the installation of a 3G-football turf surface in a stadium environment. It outlines the key elements that must be considered in terms of:

- i) **Procurement;**
- ii) **Installation;**
- iii) **Post-installation – including maintenance and sustainability.**

The document also outlines the key surface characteristics, requirements and testing parameters, which will help to ensure that the **quality** of surface becomes as fundamental a consideration in the procurement process as cost.

This document outlines suggested minimum standards for the quality and performance of a synthetic pitch to be installed at a professional club stadium but where community football activity equates to a significant proportion of the overall use. It is designed to assist clubs embarking on such a project and to ensure as far as possible that player safety and quality of the resultant playing surface remains a priority prior to, during, and beyond installation.

It should be noted that every project is unique with local factors such as land characteristics, site conditions and time constraints requiring to be considered on a project by project basis. **Ultimately, the field must comply with the requirements outlined in the version of the FIFA Quality Concept for Football Turf that is valid at the date of commencement of the project.**

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Frequently Asked Questions

3G installation in stadia

Construction Timescales & Optimum Installation Period

- Conversion of a grass pitch to 3G typically takes from 6 to 8 weeks in a stadium environment. This is entirely dependant on the nature of the conversion and is a baseline guide only.
- The variation in timescale is due to a number of critical factors including base construction, i.e. whether there is full base construction required or if there is an existing base under the grass pitch that will reduce work required and in turn cost.
- Favourable weather is also an important factor at certain stages of the 3G-installation process, which is best carried out during dry conditions and ideally above 5 degrees centigrade.
- In that respect, the Scottish football close season offers the optimum window both in terms of time, albeit tight at the higher end of the time-scale noted above, and weather.

Indicative Costs

- Conversion from natural grass to a FIFA Quality Pro compliant 3G football turf within a stadium environment is likely to be in the region of £500,000 (correct as at January 2016). This is dependent upon elements including overall pitch dimensions, existing sub base, the extent of immediate pitch surround works required (usually for a combination of health & safety and aesthetic reasons) and new equipment.
- Where there is a sub-base in place beneath the existing grass pitch and which could be utilised as part of the 3G install, this can result in a significant saving.
- Professional services engaged in delivering the project will typically cost approximately 5-10% of the overall project cost, depending on the individual circumstances of each project as mentioned above.

Maintenance Training Programme & Equipment

- **Under no circumstances should a 3G turf pitch be regarded as maintenance free.** This was the case with the previous sand-filled second generation (2G) artificial surfaces and has resulted in a legacy of poorly maintained and, in some cases, redundant pitches.
- A thorough and robust maintenance programme to keep the pitch at optimum standard and quality is **absolutely essential**.
- This should be the responsibility of the club's ground staff on a day-to-day, week-to-week basis, but **must be complimented by regular programmed visits by an identified specialist pitch maintenance contractor**.
- These specialist visits should be **at least quarterly** with specific works carried out at this interval. The nature of the work undertaken during these visits will require specialist equipment. Given this equipment would receive relatively infrequent use it is unlikely to be cost effective for a club to purchase it itself.
- It should be remembered that the levels of use and overall footfall on the surface has a direct correlation to the maintenance programme required. In layman's terms, the heavier the use, the more intense, and indeed crucial, the maintenance programme requires to be. Current guidelines suggest that for every 10 hours of playing use the surface should be groomed for 1 hour. See Table 1.
- **It cannot be emphasised enough that the quality and effectiveness of the maintenance programme has a direct impact on the overall lifespan and quality of that surface.**
- 3G-specific maintenance equipment such as drag brushes, grooming mats and infill distribution equipment are essential and should be most cost-effectively purchased as part of the overall pitch installation contract. Without such, the level and quality of maintenance required will not be achieved.

- In most instances, the 3G-specific equipment can be used on plant apparatus already utilised to maintain a natural grass pitch (e.g. small tractor), providing it is well cleaned and fitted with appropriate couplings. However, where such plant apparatus does not exist this will require to be purchased. As stated above, savings may be made by including purchase of such items in the pitch installation contract.
- The necessary equipment should normally be procured for around 2-3% of the total pitch installation cost (i.e. £10,000 - £15,000 when based on a £500,000 installation).

Testing Equipment and Schedule

- All SPFL clubs will require to monitor their 3G pitch on an on-going basis throughout the season in order that said pitch maintains FIFA Quality Pro standard at all times. This is especially important at clubs with high levels of community use, in order that this activity doesn't negatively affect surface quality for professional use.
- The equipment for basic ball roll and ball bounce/rebound tests should be procured for around £500 and is invaluable in assisting ground staff to maintain a high quality playing surface.
- Official pitch testing should be carried out on a quarterly basis by an approved FIFA testing house in order to ensure that FIFA Quality Pro compliance is maintained throughout the season. This is recommended as it will maximise surface quality beyond the testing window itself.

Establishment of a Surface Replacement Fund

- A surface replacement fund, also commonly referred to as a 'sinking' fund, should be established in order that the 3G surface, together with any remedial works to the immediate shock pad and base, can be replaced within a specified timescale.

- **As a guide, high quality 3G pitches can be expected to last from 7 to 10 years.** However this is directly aligned to a robust and well-managed maintenance programme that takes into consideration the level of footfall on the pitch. For example, a heavily used, well-maintained pitch can last longer than a poorly maintained pitch with significantly less footfall.
- With surface replacement likely to be in the region of £200,000, at the lower end of the pitch lifespan of 7 years, contributions to the surface replacement fund should equate to circa £30,000 per annum. Revenues from community pitch hire are usually directed toward the establishment of this fund. However, community use requires to be carefully balanced to maintain surface quality for professional activity, whether matches or training.
- Should the pitch lifespan last beyond 7 years then the additional years' contributions can be directed elsewhere, e.g. toward further replacement or into reserves for any unforeseen issues.

Sustainability in Construction and End of Life Recycling

- **Sustainable Procurement** - The Scottish FA, funding bodies and the Scottish Government all promote sustainable procurement policies in public procurement where funding from the public purse is part of the overall funding package for the project. Sports pitches can incorporate recycled materials and products and sustainable practices.



Context in relation to the professional game

The document has been designed to consider and address the following current rules of the Scottish Professional Football League that relate directly to the use of synthetic turf in the professional game.

Synthetic and Artificial Pitches and Surfaces

H4 - No League Match or Play-Off Match shall be played on a pitch utilising synthetic or artificial playing surface unless: -

H4.1 - such synthetic or artificial surface and the underlying structure of the pitch has been constructed using synthetic fibres and other materials and in accordance with a design and specification which have been approved after laboratory and field testing in accordance with the FIFA Quality Concept Handbooks as complying with the then FIFA Recommended 2 Star* Standard or, as the case may be, such higher standard as may from time to time be adopted by FIFA as the highest recommended standard and design for such pitches;

H4.2 - it is demonstrated to the Board that the pitch performs or will perform to the FIFA Recommended 2 Star* Standard or, as the case may be, such higher standard as may from time to time be adopted by FIFA as the highest recommended standard and design for such pitches and that it complies and continues to comply with any conditions imposed by the Board in terms of Rule H7, and

H4.3 - subject to Rules H5, H6 and H7, the Board, following a written application made by the Club concerned or the Candidate Club to the Secretary not later than 31st March in any year, in respect of what is intended to be the Registered Ground of that Club for the immediately succeeding Season, has approved the use of the specified pitch concerned for t*f League Matches and Play-Off Matches at that ground during that Season.

H5 - Where an approval is given in terms of Rule H4.3 and the Board is satisfied that such pitch, at the Registered Ground to which such approval relates, continues to comply with Rule H4.1 and Rule H4.2 then such approval shall apply to and be effective for, such number of complete Seasons immediately following such approval as the Board shall specify. If the Board does not so specify then any approval given by the Board in terms of Rule H4.3 shall be deemed to apply to and be effective for only the one Season immediately succeeding such approval being given.

H6 - An application for approval in terms of Rule H4.3 must specify or include specification of the pitch for which approval is sought sufficient to identify that the pitch concerned is the same pitch in relation to which the surface, construction and design has been approved or will before the application for approval by the Board is granted, be approved after laboratory and field testing under and in accordance with the FIFA Quality Concept Handbook as complying with the FIFA Recommended 2 Star* Standard.

H7 - Where an approval is given in terms of Rule H4.3 the Board may attach such conditions to such approval as the Board may consider appropriate.

H8 - The Board may in its absolute discretion waive, relax or grant a period of grace in respect of any Club's or Candidate Club's requirement to comply with the time limit for an application for approval to be made in terms of Rule H4.3.

*FIFA 2 Star will be replaced by FIFA Quality Pro from circa late 2016.

Technical Element

1. Overview

1.1 General

The purpose of this document is to outline best practice for the construction of a 3G pitch for use for football in a professional stadium environment. However, many of the principles and practices as detailed herein can be applied to 3G pitch projects at lower levels as appropriate. The requirements aim for a high quality surface for use by professional level football. The facilities may also be accessed by the local community groups for football development and for the purposes of recreational football. The primary target remains to be Stadium Facilities for professional play. The key objectives which underpin this document being player safety and the need to provide a pitch that performs to as high a standard as possible. For this reason the pitch must play at FIFA Quality Pro level at all times.

1.2 Specification v Guidance

This document is NOT a specification for the construction of a 3G pitch and should not be used as such. It is for guidance only. It identifies minimum standards, which should be applied in the design, specifications and construction of 3G turf pitches for football, primarily in a stadium environment but which can be applied across all levels of the game to ensure as high quality a playing surface as possible.

1.3 Impact of related research

The guidance covers the construction of new facilities and the refurbishment of existing facilities. The guidance reflects the findings of the 2013 survey conducted by the Scottish FA and PFA Scotland, which examined perceptions of current professional players on the use of 3G surfaces at the top level of the game in Scotland. One fundamental consideration highlighted in the survey was the player's preference to play on surfaces that incorporated a shock pad in the 3G turf system installed. Shock pads have been proven to improve overall safety, long-term performance, and can prolong the life of the surface in both general terms and in relation to the continued compliance with Governing Body requirements.

A further benefit to this approach, dependent on selection of an appropriate shock pad, is that it should allow the pitch to comply with the requirement of World Rugby's Regulation 22. The pitch should then be appropriate for use for rugby. This opens up a further potential market/customer base and additional income stream. However, this may only be viable in locations where rugby use is sufficiently significant to offset any related additional installation costs.

1.4 Establishment of the Project Team

Construction and installation of a 3G pitch is a costly and specialist exercise. Therefore, the club should consider the establishment of a project team to oversee the design, specification and overall project management. This team should consist of proven professionals with expertise in delivery of 3G projects, particularly those in a stadium environment. Such a team will go far to ensuring the success of the project and should include the following individuals;

- Pitch Consultant (please see 1.5 below for further detail on this particularly specialist role).
- Project Manager (if not covered through the services provided by the Pitch Consultant).
- Contract Administrator.
- FIFA-accredited test house for football turf.
- CDM Co-coordinator (if not already covered by another member of the project team).

1.5 Employment of an expert Pitch Consultant

The design, specification and project management of 3G pitches is a specialist discipline. As such clubs wishing to convert, construct or refurbish a pitch to meet the requirements of the FIFA Quality Concept (FQC) should employ the services of a suitably qualified, specialist pitch consultant with extensive experience in the design, specification, procurement and project management of 3G pitches.

It must be noted that the Pitch Consultant appointed cannot be involved in the initial field test and certification process. This should be carried out by an independent FIFA-accredited test house for football turf as mentioned in 1.4 above.

The Scottish FA and **sportscotland** can provide contact details for a number of experienced and reputable pitch consultants whom both organisations have worked with on similar projects in the past. If any club is intending to apply to **sportscotland** for funding to support the pitch installation project, it should be noted that the appointment of a specialist pitch consultant is a condition to securing financial support from **sportscotland**.

1.6 Formal Inspections/Testing at Key Stages

The construction or refurbishment of a 3G pitch involves complex processes to meet stringent construction tolerances. For this reason it is essential that a specialist Test Institute monitors the works being undertaken. The Test Institute will be engaged to inspect, sample and test aspects of the works at milestone points in the construction process, ensuring that the specification is met and that the resultant construction will meet the requirements of the FQC. It may be that the FIFA-accredited test house for football turf testing (noted in 1.4) may also be able to conduct the key stage tests/inspections. Further detail is given in Appendix 1.

1.7 Pitch Utilisation

In general, the expectation is that stadium pitches will be subject to low use. FIFA define "low use" in a stadium environment as approximately 12 hours use per week. This would typically be a football pitch used in a full-length format. However some stadia may also set up the pitch to accommodate small-sided formats of the game, such as 4s and 7s and/or training activity. The Scottish FA's Facility Strategy, which can be viewed at:

www.scottishfa.co.uk/scottish_football.cfm?page=3805

This outlines various pitch layouts (pages 24 & 25).

1.8 Balancing Professional and Community Use

This guidance is aimed primarily at stadia pitches which in the past have not been subject to significant community use, if at all. However, the currently challenging financial climate means many clubs already with a 3G surface

within their stadium have turned to community use to create a new income stream, with other clubs recognising the economic benefits of this approach. It is recognised, that in some instances the pitch will be subjected to higher levels of use than defined in this document. In addition, and as outlined previously, some pitches are now being used for other sports, such as rugby.

If the pitch is to be used intensively even in a stadium environment, the amount of use will have a direct effect on the performance and safety of the playing surface. Intensively used pitches require a robust maintenance regime to be in place. This should include brushing, decompaction and top dressing on a frequency in line with the 3G manufacturer's recommendations and commensurate with the levels of use. The pattern of use, or pitch management, also has a critical impact on the frequency of maintenance required.

1.9 Balancing Cost and Quality in the procurement process

It should also be noted that making the right choices regarding the selection of 3G is very important as the cost differential involved in selecting high quality turf over lower quality turf can amount to a fraction of the overall cost of the project.

Selection of high quality, proven 3G systems, which will provide a durable, high performance-playing surface, safe for players is a primary objective of this guidance. Given this backdrop and the discussions regarding the use and maintenance of the pitch, installations will be constructed or refurbished in such a way that they conform to the requirements of the FQC at 2 Star (or Quality Pro) level. The facility will then be maintained at that level for the duration of its life and tested formally to that standard on an annual basis. This is in addition to the 'in season' pitch testing outlined previously.

Table 1- Hours of Use v Estimated Playing Surface Lifespan

Average of hours per week	12 hours	35 hours	60 hours
Life expectancy of a pitch when maintained to the manufacturers recommendations at FIFA Quality Pro Level	10 years	7 to 8 years	Less than 7 years

2. Summary of Pitch Construction Requirements

A pitch needs to be built to minimum construction standards. Table 2 below provides guidance on the minimum standards expected for the various aspects of the make-up of any pitch. It makes specific reference to new build construction but applies equally to refurbished pitches where relevant.

Table 2 –Typical Construction for the Make-up of the Pitch Base

Element of works	Description of aspect of construction of base related to specific technical requirements
Formation, ground, soil base	Formation: to be trimmed to a tolerance of plus or minus 10mm and be within 10mm of design level. The surface modulus of the soil platform should be measured by using in-situ CBR tests recording moisture conditions to allow for proper sub-base design to be carried out.
Sub-base layer	Sub-base: to be adequately compacted to achieve a surface modulus of an absolute minimum of 40Mpa and an average of 60Mpa when measured using a LWD device. The normal convention for the thickness of the stone layer is for 300mm (compacted thickness). It should be laid to exacting tolerances and should be trimmed so that no gap under a 3m straight edge of greater than 10mm is found.
Macadam base	Macadam Base: to be measured as a compacted thickness the normal convention for a macadam layer depth of 50mm and should be trimmed so that no gap under a 3m straight edge of greater than 10mm is found. The surface modulus of the macadam platform should be no less than 100Mpa with no deformation when tested using a LWD device

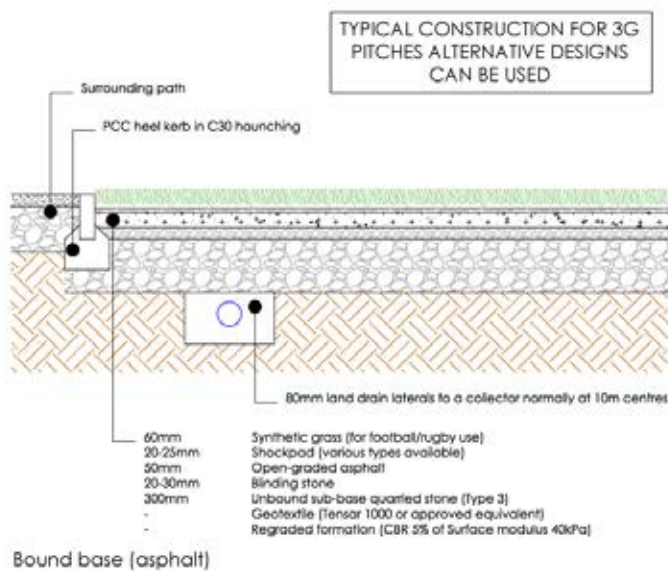
Note - whilst the design detailed in this table is typical, alternative designs may be used.



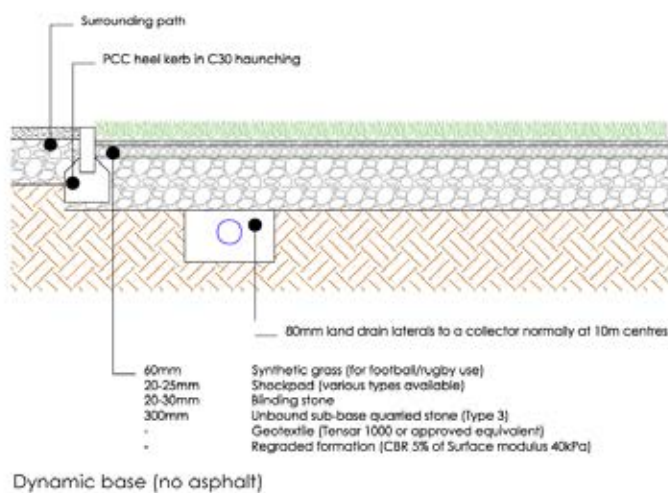
It is recommended that the pitch be designed with a thick stone sub-base foundation overlaid with a bound macadam surface, which would be defined as the 'base' of the pitch. This construction would, in general, be designed to be free draining. Further guidance on the various elements of the foundation, base and synthetic system, which together form the pitch, is given in the sections highlighted herein:

1. Formation preparation should be in accordance with the Specification for Highway Works;

2. Drainage typically would be set out in accordance with Clause 5 of this guidance document;
3. A geotextile membrane to separate layers would normally be required in accordance with the Specification for Highway Works.
4. Sub-base would be set out in accordance with Clause 6 of this guidance document.
5. Kerbs would be set out in accordance with Clause 7 of this guidance document.
6. Macadam would be set out in accordance with Clause 8 of this guidance document.



2.2 Sketch of 'Typical' 'make-up' of a 3G Artificial Turf Pitch



Note- whilst this make-up is typical other base designs may be acceptable.

3. Dimensions

The dimensions of the pitch must i) conform to the rules of football, and ii) consider the criteria outlined within the Scottish FA's Club Licensing System, whichever level currently applies to that club/stadia. Any implications of moving up or down the Club Licensing levels should also be considered at this point as resurfacing only occurs every 7-10 years.

The minimum dimensions applicable at the various levels within the Scottish FA Club Licensing System (see Section 5.4) are:

Club Licensing system	Playing Area	Run-off (Recommended)	Total Area of Synthetic Turf
Minimum – Entry Level	90m x 56m	3m	96m x 62m
Minimum – Bronze Level	95m x 60m	3m	101m x 66m
Minimum – Silver Level	100m x 64m	3m	106m x 70m
Best Practice and Gold Level	105m x 68m	3m	111m x 74m
International Matches	100m x 64m to 110m x 75m	3m	106m x 70m to 116m x 81m

4. Earthworks

Earth working – scraping away the topsoil, organic materials and other non re-usable soils – is designed to produce a flat, stable footprint onto which to build the pitch. The overall design of the drainage and sub-base platform will be based on the properties of the ground and soils, which the pitch is founded on. The properties of the soils must therefore be defined by a site investigation, which will assist the pitch specialist to design the pitch taking account of any issues highlighted by the investigation. It should be emphasised that this is where the services of an experienced pitch specialist are particularly valuable when providing interpretation of the information provided in the site investigation report.

There are a number of processes and materials which can be used to improve the formation of a pitch, such as soil stabilization, and geotextile membranes and grids. These treatments and supplementary measures can render what would have been unacceptable soils to be acceptable, thus creating a suitable surface onto which the pitch can be founded. Geotextiles or grids can be used to cover the soils acting as a separator membrane and/or a reinforcing structure to the interface between soils and stone. Powders, such as lime or cement, can be ameliorated with the soils to enhance the bearing capacity of the formation after treatment.

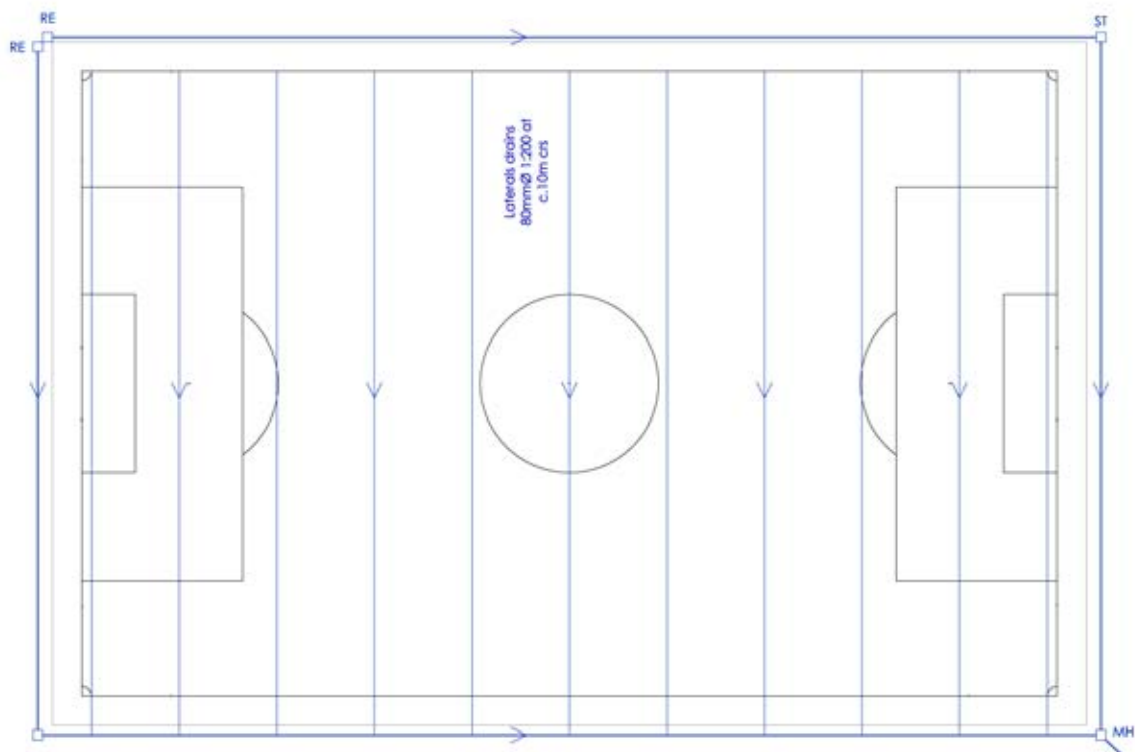
5. Drainage

5.1 Drainage Requirements

The drainage to an artificial pitch must provide sufficient capacity to transport the rainfall levels sustained by the pitch surface to a suitable outfall. In terms of discharge rates many drainage calculations are based on 100 year or even 200 year rainfall event levels. The run-off may reach 100mm per hour in storm situations. The drainage in these situations reach levels at 50 litres per second discharge rates. The design therefore must be designed to meet local planning requirements.

5.2 Typical layout for Drainage

Stadium pitches have particular requirements for efficient drainage. This depends on how the pitch is laid out, the levels and falls constructed into the pitch and the soil conditions where the drainage is situated. It is not unusual for a stadium pitch to have a crown in the middle. This is not necessarily the preferred design for a 3G pitch where a fall to a low corner or side is normal. These factors influence the design of the drainage and its subsequent layout. Lateral drainage is normally installed at 8 to 12m centres, all connected to a land drain, which circumnavigates the perimeter. The drainage will connect to an outfall, which takes the run-off away from the site.



*Note - whilst the design detailed in this drawing is typical, alternative designs may be used.

5.3 Performance of Drainage

3G pitches need to discharge run-off quickly due to the requirements for play in all conditions. The design makes an allowance for rainfall events which occur infrequently but which would be classified as a storm under normal circumstances. Rainfall which results in heavy run-off is measured in mm/hr or l/s and it is important to understand this terminology. FIFA do not regulate drainage. However a normal convention applied to 3G pitches is a rate of discharge greater than 150mm/hr. This value is considered very low and designs should consider a rate of 600mm/hr as the minimum requirements.

5.4 Attenuation of Run-Off

In new pitch construction it is normal to make allowance for the attenuation of run-off. This is due to Local Authority (LA) planning restrictions, which can be placed, on developers when connecting to outfalls, which are typically operated by Water Companies. This involves either using the pitch base to temporarily store run-off during storms or building capacity within or near to the pitch. There are many methods of attenuation and an expert in drainage design should be sought to design attenuation capacity into the pitch should it be required.

6. Sub-base stone

6.1 Materials

There are a number of ways a 3G pitch base can be constructed. This guidance document highlights the most common method currently used within the pro game for Stadia. The main criterion, which is applied to all base construction, is provision of a stable platform, which allows through drainage to an appropriate drainage scheme. The base should be stable, durable and flat.

Typically, crushed quarried stone of a particular grading is used to form the base of the pitch. This material is called 'sub-base' and is regulated by the Specification for Highway Works. The sub-base is normally a good

quality, crushed stone aggregate, which is laid approximately 300mm thick when compacted in place. The sub-base is a pre-cursor achieving the exacting tolerances imposed by the FIFA requirements and will typically be laid so that no irregularity (bump, dip) greater than 10mm is found under a 3m calibrated straight edge beam. The sub-base is normally laid to design levels and would be found to be within +5/-5mm of the datum set when measured against said requirements for the construction of the pitch. Deviations from these requirements will result in unacceptable irregularities in the playing surface. Other materials may be considered.

Table 3 – Typical Type 3 Materials for Sub-Base - Particle Size Distribution

BS Sieve Size	Percentage by Mass Passing
63mm	100
31.5mm	75-99
16mm	43-70
8mm	23-50
4mm	12-40
2m	6-25
1m	3-15
63µm	>3
This particle size distribution shall be determined the by washing and sieving methods given in EN 933 – 1:1997.	

6.2 Quality and Consistency of Sub-Base

The sub-base will need to be consistent across the supply chain to ensure that the base performs across what is a large surface area. There are a number of checks, which can be carried out to ensure the quality and consistency of the materials supplied (see Appendix 1). A UKAS-accredited (United Kingdom Accreditation Service) laboratory should be appointed to monitor the quality of materials and workmanship achieved. Testing should also be carried out on as-laid materials for surface modulus achieved within this important layer.

6.3 Levelling Layer

Sub-base can present an irregular surface profile onto which to lay the macadam layer. In these circumstances it is normal to deploy a levelling layer to provide an even platform for the macadam to be laid onto. The levelling layer can have the dual effect of stabilizing the crushed stone, dependent on the grading of the sub-base stone used, as well as providing a flat surface. A typical proven grading for the levelling layer is provided in Table 4. Other gradings have been employed successfully. Also, other methodologies have been employed to level the base prior to laying macadam layers.



Table 4 – Typical Levelling Layer Materials - Particle Size Distribution

BS Sieve Size	Percentage by Mass Passing
10mm	100
8mm	90-100
6.3mm	70-90
4mm	25-40
2mm	10-25
0.500mm	4-10
0.125mm	0-5
0.063mm	0

This particle size distribution shall be determined by washing and sieving using the methods given in EN 933 – 1:1997

7. Kerbs

In smaller stadiums where there is not a continuous perimeter wall or edge detail it may be necessary to use pre-cast concrete kerbs to form a fixed edge of which to abut the macadam surface and the sub-base. Pre-cast concrete kerbs are normally 150mm x 50mm nominal size or nearest equivalent. All kerbs should be installed to make due allowance for the subsequent fitting of the 3G turf system to be used. Subsequently, the 3G surface shall

finish slightly proud of the kerbs so there is no tripping hazard or depression between the 3Gturf and kerb. This will, in general, be selected by the contractor as appropriate and is dependent on carpet and infill combinations. There shall be no sharp kerb edge presented to the user following installation of the carpet system. All kerbs shall be located on the inside aspect of the pitch surrounds.



8. Bituminous Macadam Materials

New macadam may be required as part of the pitch construction. Macadam is used to increase the strength of the base and is recommended, if budgets allow. Macadam increases the stiffness of the base and increases the bearing capacity in overall terms. Macadam should be a homogenous platform with no noticeable irregularities greater than 10mm under a 3m straight edge. It should have minimal corrective patching in it and be free from fretting, cracking, surface blemishes, areas of segregation, excessive joints, dips, bumps and rich or lean areas of binder. It should consist of a single layer system comprising of a 14mm nominal size open graded surfacing layer overlying the sub-base stone layer.

9. Shock Pads

9.1 Shock Pad Recommendations

Shock pads are proven to improve safety, performance and lifespan of the pitch surface, and also allow compliance with World Rugby Regulation 22. The Scottish FA have also determined, from feedback offered in the previously mentioned Pro Player Perception Survey, that 3G pitches with shock pad systems are regarded as 'better' playing surfaces than those without. All shock pads being considered for a project must be assessed as part of the 3G turf/pad systems and tested together against the FIFA requirements. All shock pad systems will be supported by a comprehensive data-sheet and a method statement for installation. Shock pads can be problematic to install but form a very important part of the performance of the playing surface so should be subject to scrutiny in detail prior to use in a project.

Shock pads systems in general should be very flat and shock absorptive. They do not vary at any point in the laid pad or deviate from the nominated value (i.e. 15mm/20mm etc) by more than +2mm or -2mm. Deviations out with these tolerances may lead to variations in performance. Pads supplied with interlocking tiles or in sheet/roll form shall have joints, which abut each other, do not buckle, warp or ride up on each other. Where the manufacturer recommends taping and gluing the joints this must be done.

9.2 In-situ Shock Pads

Where shock pads are to be laid using in-situ laying techniques, the shock pad is normally required to achieve a minimum tensile strength of 0.15 MPa (this is a FIFA requirement) and an elongation at break of 30% when tested in accordance with the methods given in EN 12230:2003 where SBR rubber is used. In-situ shock pads should be checked so that the properties of tensile strength and elongation are met. It is advisable that a test report is obtained highlighting the name of the rubber used, its granulation, density, tensile strength and elongation at break.

9.3 Prefabricated/Factory Produced Shock Pads

There is a plethora of prefabricated shock pads available. These are manufactured from a variety of materials. This makes it difficult to be aware of all the benefits or demerits of a particular shock pad. Common types include closed cell foam shock pads, compressed rubber, expanded polypropylene cellular or filament-encapsulated types. In general, the expectation of these factory-produced products is that they are consistent in performance by virtue of their origin. Most, but not all, are relatively easy to install not requiring high tech equipment to lay onsite. When considering this type of shock pad it is important that its performance within the artificial grass/shock pad system is properly evaluated and certification confirming performance is provided at tender.

10. Artificial Playing Surface

10.1 Surfacing Requirements

The synthetic carpet will meet the requirements of the FIFA Quality Concept at Quality Pro level and, where deemed necessary/appropriate, the World Rugby requirements of Regulation 22 - Standard Relating to the Use of Artificial Rugby Turf. See the following web links for further information;

<http://quality.fifa.com/en/Football-Turf>
<http://www.irbplayerwelfare.com>

The artificial turf system shall have independent certification demonstrating that this is the case. All certificates should be to the current standard and in any case shall not be more than one year old.

The artificial turf shall typically have a monofilament yarn matrix. However mixed filaments or artificial turf incorporating a thatch can all meet the requirements set out by FIFA. A recommended minimum carpet specification is given below in Table 5.

Table 5 – Recommended Construction for Synthetic Turf System- Mono Filament Yarn Type

Product description	3G Artificial Turf which complies with FIFA/ World Rugby requirements
Materials/properties	Materials/properties
Ribbon Polymer	Polyethylene monofilament yarns (non fibrillating)
Colour	Green
UV Stabilized	In accordance with Din 53387; must be UV stabilised
Face Primary Backing	Polypropylene
Secondary Backing	Fiber glass or polyester scrim
Shock pad	In-situ and or prefabricated/factory produced
Backing Coating	Latex or PU
Ribbon Nominal Denier	Not restricted to be provided by manufacturer
Total Weight of product	Not less than 2800 gms/m ² [-0%, +10%]
Pile Weight	Not less than 1700 gms/m ² [-0%, +10%]
Backing weight – primary	Not less than 180 gms/m ²
Backing weight – secondary	Not less than 180 gms/m ²
Coating Weight	Not less than 800 gms/m ²
Pile Height (should comply with World Rugby Regulation 22)	Not less than 60mm*
Quality	Must be a heavy metal free product

*Where football only use is the user requirements for a pitch then alternative pile heights can be considered, however the pile height should not be less than 40mm.

10.2 Colour

The colour in general should be green and match the reference sample to be submitted within one position of the green colour to BS 5252/4800. The synthetic surface should accord with the following table.

10.3 Wear Tests

It is recommended that turf systems subjected to at least 70,200 cycles* of accelerated wear in the Lisport Test and still demonstrate compliance with FIFA Quality Pro and World Rugby requirements be procured.

*this requirement will be revised in January 2017

10.4 Surface Construction

Table 5 above recognizes the majority of artificial turf systems available being of a tufted construction, latex backed, with a monofilament yarn. There are however woven artificial turf systems to which this table does not apply. Where woven artificial turf systems are used then an alternate minimum specification may apply.

10.5 Performance Requirements

Table 6 details the specific performance requirements to be met.

10.6 Line Markings

Line markings should be installed for football in compliance with the Laws of the Game as laid down by FIFA. The principal lines should be in white and marked out to delineate a full size pitch marking for football. In Club Licensing terms, no permanent additional line markings should be installed on the field of play for those clubs/stadia at Bronze level and above. Lining for other sports that may be played on such pitches will be required to be temporary in nature. If line markings are to be cut, taped, or glued into the carpet, the carpet specification for line markings materials must be of the exact same carpet as the parent turf system and shall be in accordance with the main carpet specification.

10.6.1 Method of installation

All line markings which are cut into the turf

should be installed and bonded to the panels of carpet using broad woven backing tape, 400mm wide with a 3mm application of glue spread using a box screed onto the backing tape in even, regular, wide strips. Stitching of seams is acceptable where the carpet system allows. The gluing is viewed as a very important part of the works and, as such, the expectation is that the installer shall exercise a high degree of quality control on this element. Samples should be taken from all days of making seams.

The Contractor should ensure that line markings are accurately set out and installed. The line markings must be true and straight and must not deviate by more than 0.1% from straight over the length of the line. Further lines should be set so that their width does not deviate by more than +/- 5mm. The top surface of all line markings shall be within a tolerance of +/- 2mm of the adjacent carpet surface when measured under a 300mm straight edge, regardless of type, and shall be consistently laid so there are no bumpy, irregular seams presented after installation.

Nibs for goals shall be small white squares 100mm x 100mm and should be securely fixed to the backing tape and set out so as to be flush with the surrounding turf. Penalty spots should be in accordance with the rules of football and shall be round. All cut in lines should be fitted prior to adding fill materials.

Table 6 – Performance requirements for the pitch

Standard Requirements		FIFA Quality Pro	World Rugby Regulation 22
Ball Surface Interaction	Ball Rebound (m)	0.6 - 0.85	0.6 - 1.0
	Ball Roll (m)	Initial = 4.0 - 8.0 Re-test = 4.0 - 8.0	
Player Surface Interaction	Shock Absorption (%)	60 - 70	55 - 70
	Standard Vertical Deformation (mm)	4.0 - 10	5.5 – 11.0
	Energy Restitution (%)		20 - 50
	Rotational Resistance (Nm)	30 - 45	30 - 45
	Head Injury Criteria (m)		Initial ≥ 1.4 Re-test ≥ 1.3
	Straight Edge (mm)	No Deviations ≥ 10	No Deviations ≥ 10
Field of play	Dimensions (m)	<p>SFA Club Licensing Requirements Length = 90 – 105 Width = 56 – 68</p> <p>FIFA Quality Pro Requirements* Length = 100 – 110 Width = 64 – 75</p> <p>International matches Length = 100 – 110 Width = 64 – 75</p> <p>Recommended Run-offs = 3</p> <p>*Dispensation must be sought from FIFA via the SFA if the field is unable to meet these parameter.</p>	<p>World Rugby Requirements for International Rugby</p> <p>Try line to try line = 94 – 100 Try line to dead ball line = 6 – 22 Width = 68 – 70</p> <p>Recommended Run-offs = 5</p>

*Note: Current FIFA and World Rugby Board regulations supersede all other requirements.

10.6.2 The smaller sided game

Lining for smaller sided versions of the game (4 a-sides and 7 a-sides) should be denoted by the use of markers on the pitch surface. Markings maybe painted on, should they be required on the surface.

10.6.3 Governing Body Requirements

It is important to understand that both FIFA and the World Rugby certification systems place restrictions on what type of line markings can be installed on a pitch. This means rugby lines will be required to be marked as temporary lines as and when required and then removed as soon as possible and certainly in advance of the next professional football match to be staged on the pitch (this occurs on stadium pitches now in the professional game and is no different to current experience).

10.7 Infill Comprising of Sand

Typically sand infill shall consist of non-abrasive, non-staining, well-rounded and dust-free particles (sub-angular sands do not perform well in artificial sports surfaces and it would be advisable to reject these). Chemical treatments to either bleach or to coat the sand should be avoided. The preferred size range is 0.2mm to 1.0mm.

Alternative gradings may be tested within the carpet system and therefore will be offered in the FIFA Lab test report. It is therefore advisable to have the sand approved before placing an order.

10.8 Performance Infill Comprising of Rubber or Other Materials

Rubber infill shall comprise of granulated SBR rubber, or synthetic rubber such as TPU, or a non-synthetic cork or other fibrous material. The performance infill shall match the type, gradation and quality of the declared infill of that provided in the Laboratory test report for the artificial turf system tested using it.

10.9 Infill and Top Dressing

Due to the settlement of infill in the initial commissioning period for the pitch, it is good practice to build in additional maintenance measures to protect the pitch in its early life. This depends on many factors such as turf system, use, weather conditions, method of infilling and maintenance. It is common in the first 3 to 6 months of use for the Contractor to top-dress the pitch. This operation is designed to a) ensure that the pitch performs as intended very early in the life of the facility, and b) to ensure that, when tested, the pitch meets the FIFA/World Rugby requirements. This work should be called up in any works specification and/or tender offered in order to avoid any confusion as to who is responsible for the work when required. It is anticipated that a minimum of up to 10 tonnes of rubber will be set aside for this operation to top up the pitch in the first year.

10.10 Flammability Requirement

There is also a need for the Contractor to provided assurances in terms of flammability via certification in accordance with BS 5867-1:2004.

10.11 Sockets

Sockets are required for goals and flags. Sockets can be the source of a problem in a 3G pitch when goals are changed to accommodate multi-use, and flags are installed and removed during games of football or rugby. Sockets are effectively foundations and as such need to be properly designed to reflect the site's prevailing soil conditions. Sockets should be properly formed with structural concrete, have a metal tube suitably sized to accommodate the post or flag and be fitted flush with the base so a suitably designed bung can be used to seal off the socket when not in use. When not in use sockets must be covered with 3G and filled such that the area complies with the requirements of FIFA and World Rugby.

10.12 Pitch Irrigation Sprinkler Systems

The aforementioned pro player survey indicated that pro players preferred a wet surface to play on. Therefore the pitch may be furnished with a suitable means of irrigation via a pop up mounted sprinkler system. It is not mandatory to include an irrigation system with a 3G pitch. If used this should be located off the playing surface, but may be in the run-off. The sprinkler system therefore must be able to throw water to the central part of the pitch (approximately 35m). Irrigation systems require large water storage tanks and this must be factored into the specification. Water availability, water pressure, location for the tanks and power for the pumps all need to be considered.

10.13 Sprinkler Heads

It should be noted that sprinkler heads must be covered with 3G and shock pad where included in the pitch footprint. There is a requirement for the sprinkler head cover to comply with the FIFA requirements, to the same standard as the rest of the field, and it will be tested as part of assessment of the pitch if included within the playing lines.

10.14 Under-soil Heating

The rules of football require certain leagues to provide under-soil heating to the playing surface so frost protection can be provided in times of severe weather. The exact wording of the rules states that the Club shall take every available measure to ensure the game can be played on the pitch in times of severe weather. Under-soil heating is provided by either a piped water system or electrically heated flat cables or heating mats. Reference should be made to SPFL rule H5(10) (see Appendix 4).

10.15 Covers and Blankets

Covers or blankets should be designed to increase ground temperature in excess of 5.5°C.

Covers should be sufficiently strong without the need for hems and grommets. The cover should not pull apart in the middle and shall provide protection against turf damage. It also should provide for the right amount of ventilation allowing for the proper airflow required.

The covers should be made of a translucent polyethylene or equivalent material with a reinforced elemental coating woven into the plastic. The cover should be both permeable as well as protective. The covers should be UV treated, anti-rot and mildew resistant and not show any significant wear or degradation by sunlight.

An important aspect of the use of the blanket is winter protection and these should perform well against the harsh effects of the winter season.

10.16 Landscaping/Run-offs/Pitch Thresholds

It is not recommended that the immediate threshold of the pitch run-off is natural grass, pebbles, or other mineral dust etc. Where possible the run-off should all be artificial turf to minimise contamination.

11. Sustainability in Construction and End of Life Recycling

11.1 Sustainable Procurement

The Scottish FA, funding bodies and the Scottish Government all promote sustainable procurement policies in public procurement where funding from the public purse is part of the overall funding package for the project. Sports pitches can incorporate recycled materials and products and sustainable practices.

11.2 End of Life Recycling

There are a limited number of manufacturers who offer pitch construction cradle-to-cradle products. These products include shock pad systems and 3G systems. It is also possible to recycle old artificial turf systems by removal of the infill. A small number of companies will recover the infill and turf, and recycle it for subsidiary use.

12. Equipment

Provision of equipment for the facility should be included in the overall tender.

12.1 Football Goals

12.1.1 Typically goals should be quick release and designed for situations where goals are assembled and disassembled on a regular basis, e.g. to allow quick changeover from football to rugby or vice versa. Normal construction incorporates quick release corner joints to allow the crossbar to detach from the uprights without the need for tools.

12.1.2

Typically the goals should be manufactured from 100mm x 107mm elliptical x 2.5mm thick reinforced aluminium, ensuring that the goals are appropriate for professional matches. All exposed surfaces should be powder coated. It is important that the equipment is checked against all relevant Club Licensing requirements.

12.1.3

Typically goalpost sockets should be mounted in a concrete foundation, designed to take into account the soil conditions encountered on the site. The foundation shall be mounted underneath a shock pad system to protect players from potential injury. A socket shall be fitted with a 3G covered bung, which mates securely with the surrounding surface.

12.1.4

The sizes for senior use shall be: 7.32m x 2.44m (24' x 8') - independently tested to BS EN 748:2004.

12.1.5

Equipment should be high quality, durable and safe. All equipment supplied must comply with the relevant codes. Goals should be in accordance with EN748 and should be erected by a specialist contractor and checked in accordance with EN356:2007 prior to handover. An experienced installer should check the equipment and a certificate of conformity shall be issued by the Contractor stating that the equipment is installed correctly.

12.1.6

Where the Client seeks equipment from the Contractor details of the guarantees provided shall be supplied with the prices submitted.

13. Maintenance

Maintenance should include in the main, the synthetic surface and infill, and, where a piped drainage system is installed, this also should be checked and cleaned periodically as outlined in the original installation documentation.

The Contractor should be asked to provide details of maintenance equipment and procedures required to properly look after the pitch and its infrastructure at the point of handover. There should also be training session(s) provided to highlight the precise details for use of equipment, brushes and localised infilling. Also details of the emergency treatments, which can be applied to the pitch for purposes of snow removal, spillage of oils, fuels etc. should be provided at this point.

The maintenance required will include a routine maintenance service and a specialist de-compaction service (which lifts the contaminated infill from the surface and then removes the ground in-debris from the infill). By following these maintenance procedures the pitch will provide:

- Consistent play quality over the life of the surface;
- A safe surface in terms of traction and drainage;
- Extended life of the synthetic playing surface.

13.1 General Guidance

The manufacturer will provide guidance for the proper maintenance of their specific 3G system. This must be followed to protect and maintain the pitch in the best possible condition. It is important to protect the warranty for the products installed by regularly maintaining the surface in an approved fashion. There are general maintenance principals, which apply in general to all 3G pitches used for football. These principals are influenced by use, management, equipment used for maintenance and environmental issues.

13.2 Drainage

The drainage system should be inspected and checked for serviceability at least every 5 years, unless a drainage issue has been noted with the pitch. Checks to be carried out will include:

- Check all manholes to ensure that the run-off is free running;
- Check the outfall to ensure that it is not blocked;
- Check all components for cracking, sinking and other damage.

The Contractor should provide all such equipment and procedures, which will allow effective maintenance of the drainage to be carried out.

13.3 Goals

Goals must be checked regularly. This could be as often as daily, depending on level use.

13.4 Maintenance Equipment

Example of minimum basic maintenance kit



Tractor



Drag Brush



Drag Mat



Ball Roll

There are a limited number of suitable brushes and drag mats for the maintenance of 3G pitches. In a recent FIFA study* it was demonstrated that certain types of equipment were particularly effective at maintaining surfaces in good condition.

The FIFA study showed that the above maintenance equipment was sufficient to keep a field maintained to a good level, however more specialised equipment such as oscillating or rotating brushes and tines were also required to be used on surfaces periodically. These had a much greater effect at reducing ball surface interaction characteristics. Advice of a specialist maintenance contractor should be sought before the use of such equipment as constant and improper use of such equipment can actually cause damage to the surface rather than improving it.

* <http://m.fifa.com/newscentre/news/newsid=2159761/index.html>

13.5 Environmental issues affecting Maintenance

The general environment around the pitch can affect the amount and type of maintenance required. The proximity of trees can be a problem due to debris, leaves and seeds falling onto the pitch. Shade and moisture can encourage moss and algae to form in the margins, while dust and other particulates can contaminate the fill materials.

13.6 Inappropriate Maintenance

Inappropriate procedures will inevitably reduce the life expectancy of the playing surface. For this reason all related maintenance information must be available at the point the pitch is commissioned, if not before.

13.7 Maintenance Reporting

All pitch maintenance activity should be recorded via a maintenance log. This must be made available by the Contractor. After every maintenance visit a report will be given to the Client detailing the nature of the maintenance activity carried out, any further work which may be required and the timescales the Contractor may place on it. The drainage report should detail the nature of the inspection carried out and any significant findings.

13.8 Maintenance Procedures

Maintenance procedures for the pitch will cover the following areas:

- Removal of litter/debris;
- Cleaning and monitoring of access, entrance and exit gates;
- Brushing of the surface as appropriate;
- Rubber dressing and monitoring of infill levels;
- Monitoring of seams and carpet rippling;
- Levelling and equalization of infill;
- Remarking of lines with specialist paint if lines are not inlaid;
- Vegetation control in terms of weed removal, moss and algae growth;
- De-compaction and deep cleaning of synthetic carpet annually.

14. Influence of Use

14.1 Hours of Use

Use is considered as the number of hours that the pitch is available for lettings and the actual number of hours that football is played on the surface. This is a broad assessment of the footfall on a particular surface and does not provide the full picture of potential wear-and-tear a pitch surface can sustain. Only the actual number of hours a pitch is used for should be factored into the wear-and-tear assessment.

14.2 Pitch size

The size of the pitch may have a bearing on the density of footfall. Not all pitches are the same size and some vary significantly from the standard size due to local factors such as available space and multi-use requirements.

14.3 Type of Use

Stadium pitches may be used on a limited basis for development of squads and competition games. However current practice encourages greater use of stadium pitches for community play. This will increase hours of use significantly and, therefore, the wear the playing surface will sustain.

14.5 Categorising Use

Where a playing surface is being used for more than 35 hours per week it can be categorised as a moderately used pitch. However many pitches can be used up to 60 hours per week. This type of use is categorised as heavy use. Heavy use affects the durability and performance of the playing surface over the long-term, and maintenance therefore needs to be tailored to match the intensity of use.

15. Management of the playing surface

Experience has shown that stadium pitches can be used to support small-sided versions of the game and wider developmental activity. This increases the amount of use on specific areas of the pitch. Goal areas, shooting areas and sides can experience much higher footfall levels than the rest of the pitch.

15.1 Rotation of high footfall areas

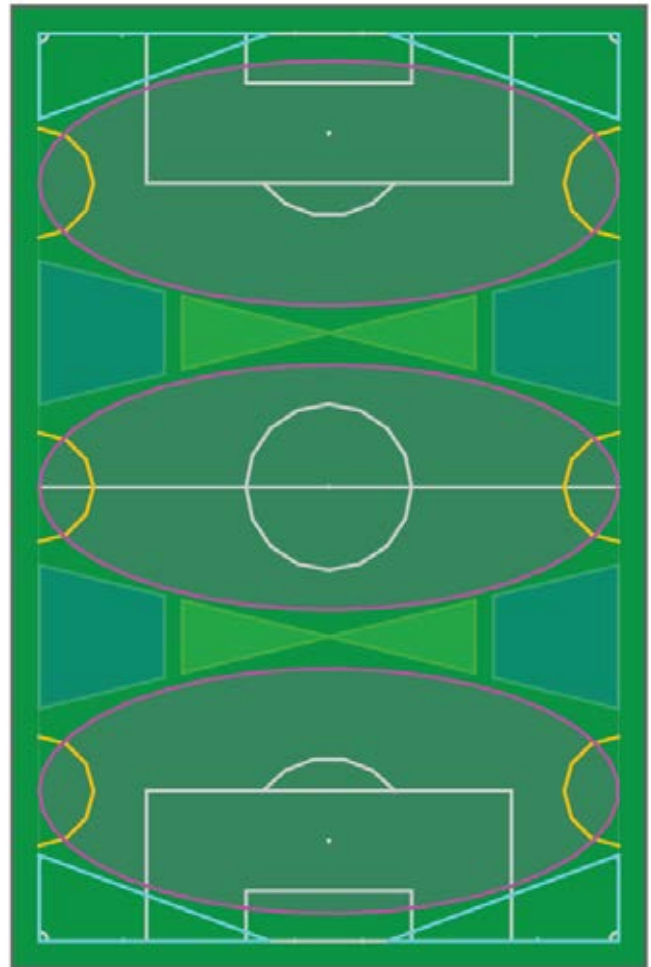
Moving the goal areas can be accommodated on a pitch when there are no dividing lines installed. This helps by distributing the high footfall areas across a wider area and so avoids specific areas of the pitch becoming damaged.

15.2 Access and egress

The access point of the pitch can experience very high levels of use. If possible footwear-cleaning equipment should be positioned at this point. Good practice is to lay down appropriate lengths of 3G turf at the entrance/tunnel to the pitch to prevent excessive wear.

15.3 Footwear

There are certain types of footwear recommended for use on 3G surfaces. Detailed guidance is given in Appendix 5. It is generally agreed that normal moulded boots are the best footwear for football use. Blades can be used but some manufacturers ban their use. Where extensively used blades can lead to a general compaction of the pile, affecting performance in the long-term. BS 6366:2011 details approved studs for use in football and rugby, and is the main guidance standard which should be referred to when considering the acceptability of studs.



Principal References

1. BS 7044-1:1990 Artificial sports surfaces. Classification and general introduction.
2. BS EN 12234:2002 Surfaces for sports areas. Determination of ball roll behaviour.
3. BS EN 14808:2005 Surfaces for sports areas. Determination of shock absorption.
4. BS EN 14837:2006 Surfaces for sports areas. Determination of slip resistance.
5. BS EN 14810:2006 Surfaces for sports areas. Determination of spike resistance.
6. BS EN 14836:2005 Synthetic surfaces for outdoor sports areas. Exposure to artificial weathering.
7. BS EN 12228:2002 Surfaces for sports areas. Determination of joint strength of synthetic surfaces.
8. BS EN 12616:2003 Surfaces for sports areas. Determination of water infiltration rate.
9. MCHW Volume 1 – Specification for Highway Works (November 2006), Department of Transport, Highways Agency.
10. BS 1377-2:1990 Methods of test for soils for civil engineering purposes. Classification tests.
11. BS EN ISO 22476-2:2005 Geotechnical investigation and testing. Field testing. Dynamic probing.
12. BS EN ISO 22476-3:2005 Geotechnical investigation and testing. Field testing. Standard penetration test.
13. ISO/DIS 8771 Specification for plastics pipes and fittings for use as subsoil field drains.
14. BS EN 12620:2002 Aggregates for Concrete.
15. BS 5911-4:2002 Concrete pipes and ancillary concrete products. Specification for unreinforced and reinforced concrete inspection chambers.
16. BS EN 1917:2002 Concrete manholes and inspection chambers, unreinforced, steel fiber and reinforced.
17. BS EN 124:1994 Gully tops and manhole tops for vehicular and pedestrian areas.
18. BS EN 1008:2002 Mixing water for concrete. Specification for sampling, testing and assessing the suitability of water, including water removed from processes in the concrete industry as mixing water for concrete.
19. BS 1722:-10: 2006 Fences. Specification for anti-intruder fences in chain link and welded mesh.
20. BS 5252:1976 Framework for colour co-ordination for building purposes.
21. BS 4800:1989 Schedule of paint colours for building purposes.

- 22.** BS EN 933-1:1997 Tests for geometrical properties of aggregates. Determination of particle size distribution. Sieving method.
- 23.** BS 4987-1:2005 Coated macadam (asphalt concrete) for roads and other paved areas. Specification for constituent materials and for mixtures.
- 24.** BS EN 1339:2003 Concrete paving flags. Requirements and test methods.
- 25.** BS EN 1340:2003 Concrete kerb units. Requirements and test methods.
- 26.** BS 434: Part 1:1984 Bitumen road emulsions (anionic and cationic). Specification for bitumen road emulsions.
- 27.** BS EN 197-1:2000 Cement. Composition, specifications and conformity criteria for common cements.
- 28.** BS 4027:1996 Specification for sulphate resisting Portland cement.
- 29.** BS 4449:2005 Steel for the reinforcement of concrete. Weldable reinforcing steel. Bar, coil and decoiled product.
- 30.** BS 4482:2005 Steel wire for the reinforcement of concrete products.
- 31.** BS 4483:2005 Steel fabric for the reinforcement of concrete.
- 32.** BS EN 206-1:2000 Concrete. Specification, performance, production and conformity.
- 33.** BS 8500-1:2006 Concrete. Complementary British Standard to BS EN 206-1. Method of specifying and guidance for the specifier.
- 34.** BS 8500-2:2006 Concrete. Complementary British Standard to BS EN 206-1. Specification for constituent materials and concrete.
- 35.** BS 6366:2011 Specification for studs for rugby football boots

Appendix 1

Recommended Quality Plan for Key Stage Inspection and Testing during Refurbishment or Construction of a3GPitch

The principal of this quality plan is to provide a means of identifying by inspection and testing – or a combination of both – that a high standard is being achieved in terms of materials and workmanship.

1.1 Table of Quality Control Requirements

Item	Type of Testing or Inspection	Reason for Test or Inspection	Outcome	Number of Tests
A)	Tests on formation and sub-base.	To confirm the bearing capacity of the soils and stone base.	Ensuring the formation and sub-base provides a suitable platform for the required application.	20m grid.
B)	Level checks to be done using a 3m straight edge on stone sub-base, checks for surface irregularities to be done.	To test for porosity and regularity.	To ensure that the stone sub-base provides the level of performance required by the specification.	3 tests for porosity.
C)	Inspection of bituminous surface for surface regularity and porosity.	To ensure the surface is fit for purpose.	Ensuring the base provides a suitable platform for the required application.	6 locations for porosity testing and straight-edge survey.
D)	Inspection of shock pad, sampling of materials and laid pad, level checks to be done using a 3m straight edge, check for blemishes to be done.	To test for porosity and regularity and most importantly test for tensile strength and elongation of shock pad as well as thickness.	To ensure that the shock pad provides the level of performance required by the specification.	10 In-situ pad samples for tensile strength and elongation. 50 thickness measurements over the entire surface. Sample of prefabricated pad for inspection only.
E)	Inspection of synthetic turf installation and sampling of seams for testing.	Test seam samples for tensile strength.	To negate seam failure at a later date.	10 seam samples for tensile strength or peel strength.
F)	Initial test on completed pitch/full compliance testing.	For compliance and to ensure that the pitch receives a certification.	To ensure that the pitch gets a certificate.	2 tests: 1 no later than 3 months after hand over & 1 at the end of effects period.

1.2 Quality Control & Sampling

- 1.2.1 The Contractor should employ all means necessary in order to maintain a clear, explicit, and efficient Quality Control Scheme in tandem with the Employer's Representative.
- 1.2.2 At the request of the Employer's Representative, the Contractor will be expected to produce information and samples at any time throughout the term of the Works. A delay by the Contractor in the production of such detail may adversely affect the scheduling of the contract programme. The Contractor may not claim for an extension of time because of a delay in the programme because of poor, unsatisfactory or unsuitable Quality Control detail, as dictated by the Employer's Representative.
- 1.2.3 The Employer should have the right to select any material samples from batches delivered to site and destined for permanent works as required. Samples will be provided at the Contractor's cost. Samples which do not conform to the quality requirements will be resubmitted at the contractors cost.

Appendix 2

Recommended list of items which should be supplied by a contractor when submitting a Tender

- 2.1 Current product certificate for the synthetic turf system to be supplied (alternate certificates may be supplied by agreement with the employer's agent).
- 2.2 Technical reports for field-testing demonstrating that the synthetic system offered complies with the requirements of FIFA.
- 2.3 Certificate of conformance for shock pad must be submitted for in-situ shock pads.
- 2.4 Contractor's warranty.
- 2.5 Future maintenance requirements for installed pitch.
- 2.6 Reference samples of shock pad (A4 size).

Appendix 3

Warranty

- 3.1 The Contractor shall provide a written warranty in respect of the installation and performance of the various aspects of infrastructure supplied to the Client, in particular the synthetic turf.
- 3.2 In the case of materials selected by the Principal Contractor and placed in the permanent works he/she shall provide the warranty.
- 3.3 In the case of the shock pad and synthetic carpet the manufacturer of the shock pad/ synthetic carpet shall provide a warranty. This will be assignable to the Client. The warranty offered by the Contractor shall cover the workmanship, for example, the installation works.
- 3.4 The warranty will be such that the Contractor will indemnify the Client for all aspects of the works whether sub-contracted or not, including but not exclusive to, drainage, base works, shock pad and synthetic systems. In the case of the synthetic turf system the manufacturer will be expected to produce a collateral warranty with regard to the manufacture and performance of the synthetic turf. The warranty for the manufactured product is normally one which provides diminishing cover with time (for example, at Year 1 there would be 100% replacement but at Year 8 there would be 10% replacement). The warranty therefore diminishes with time. Other warranties for base works will be fixed for a set period of time, as will those provided to cover shock pads. The performance of the pitch can be incorporated into a warranty: here the manufacturer guarantees performance for a period of time – FIFA Quality performance for 5 consecutive years – subject to maintenance being carried out in accordance with the manufacturer's recommendations.

3.5 It is important to obtain a clear definition of the terms of what the warranty covers when assessing the Contractor's offer. The following details what is typical for 3G pitches:

- For base works a normal warranty would be for 20 years;
- For shock pad a normal warranty would be for 20 years;
- For synthetic carpet a normal warranty would be for 5 to 8 years.

3.6 Insurance backed warranties or third party warranties, which can be assigned, add extra protection for a Client and should be investigated when considering a contractor's offer.

Appendix 4

SPFL Rules for Synthetic and Artificial Pitches in the Professional Game

The following rules of the Scottish Football League relate directly to the use of synthetic turf in the professional game (Section H4-H8 are also included on Page 7, for ease of reference).

Synthetic and Artificial Pitches and Surfaces

H4 - No League Match or Play-Off Match shall be played on a pitch utilising synthetic or artificial playing surface unless: -

H4.1 - such synthetic or artificial surface and the underlying structure of the pitch has been constructed using synthetic fibres and other materials and in accordance with a design and specification which have been approved after laboratory and field testing in accordance with the FIFA Quality Concept Handbooks as complying with the then FIFA Recommended 2 Star Standard or, as the case may be, such higher standard as may from time to time be adopted by FIFA as the highest recommended standard and design for such pitches;

H4.2 - it is demonstrated to the Board that the pitch performs or will perform to the FIFA Recommended 2 Star Standard or, as the case may be, such higher standard as

may from time to time be adopted by FIFA as the highest recommended standard and design for such pitches and that it complies and continues to comply with any conditions imposed by the Board in terms of Rule H7, and

H4.3 - subject to Rules H5, H6 and H7, the Board, following a written application made by the Club concerned or the Candidate Club to the Secretary not later than 31st March in any year, in respect of what is intended to be the Registered Ground of that Club for the immediately succeeding Season, has approved the use of the specified pitch concerned for the playing of League Matches and Play-Off Matches at that ground during that Season.

H5 - Where an approval is given in terms of Rule H4.3 and the Board is satisfied that such pitch, at the Registered Ground to which such approval relates, continues to comply with Rule H4.1 and Rule H4.2 then such approval shall apply to and be effective for, such number of complete Seasons immediately following such approval as the Board shall specify. If the Board does not so specify then any approval given by the Board in terms of Rule H4.3 shall be deemed to apply to and be effective for only the one Season immediately succeeding such approval being given.

H6 - An application for approval in terms of Rule H4.3 must specify or include specification of the pitch for which approval is sought sufficient to identify that the pitch concerned is the same pitch in relation to which the surface, construction and design has been approved or will before the application for approval by the Board is granted, be approved after laboratory and field testing under and in accordance with the FIFA Quality Concept Handbook as complying with the FIFA Recommended 2 Star Standard.

H7 - Where an approval is given in terms of Rule H4.3 the Board may attach such conditions to such approval as the Board may consider appropriate.

H8 - The Board may in its absolute discretion waive, relax or grant a period of grace in respect of any Club's or Candidate Club's requirement to comply with the time limit for an application for approval to be made in terms of Rule H4.3.

Pitch Protection - SPFL rules

The SPFL rules detail the arrangements which must be put in place for the protection of the playing surface during inclement weather. For clarity and to augment the information provided in this guidance document these are reproduced here.

Pitch Protection

H9 - In order to protect the pitch and unless otherwise agreed between both participating Clubs, the following procedures shall be adopted by Players and Officials in the periods immediately before and after and at half time during a League Match or Play-Off Match:

H9.1 - the pitch shall only be used for warming up or warming down by Players named on the lists of Players provided to the Referee not less than one hour before the time of kick-off;

H9.2 - pre-match warming up by either team shall not commence until at the earliest 45 minutes before the scheduled kick-off time, shall not last for more than 30 minutes, and shall end not later than 10 minutes before the scheduled kick-off time;

H9.3 - if portable goals are provided they shall be used for all goalkeeping drills other than crossing practice;

H9.4 - the goalmouth area shall be used by goalkeepers only if portable goals are not provided or for crossing practice and then only for not more than 20 minutes;

H9.5 - for the purposes of warming up and warming down each team shall use only part of the pitch between the edge of a penalty area and the half way line or as otherwise directed by the groundsman;

H9.6 - all speed and stamina work shall be undertaken off the pitch parallel to the touchline opposite the side to be patrolled by the assistant referee or, in the absence of sufficient space at that location, in that part of the pitch described in Rule H9.5 or as otherwise directed by the groundsman;

H9.7 - Players using the pitch at half time shall give due consideration to any other activity or entertainment taking place on the pitch at the same time;

H9.8 - the Home Club may water the pitch at half time provided that it gives reasonable notice to the referee and the other Club that it intends to do so and that any such watering is carried out evenly over the entire length and width of the pitch; and

H9.9 - any warming down after the conclusion of the League Match or Play-Off Match shall last for no longer than 15 minutes and for that purpose neither penalty area shall be used.

H10 - Each Club shall provide, maintain and use in such manner as to ensure its efficient and effective operation an adequate winter pitch protection system. Such systems shall be fully utilised by the Home Club before any League Match or Play-Off Match where there is a reasonable possibility of its pitch otherwise being frozen or covered in snow or ice so as to ensure that the League Match is able to take place at the venue and on the date and time scheduled notwithstanding such possibility.

Pitch Condition

H11 - Each Club shall ensure that the field of play at its Registered Ground and at any other ground at which it is the Home Club for a League Match or Play-Off Match is:-

H11.1 - smooth and in good condition and repair; and

H11.2 - equipped with an efficient and effective drainage system so that it cannot become unplayable due to flooding.

H12 - The Board may, without prejudice to any sanction that might be imposed on a Club for failure to comply with Rule H11, require the Club concerned to take such steps within such time and on such conditions as the Board shall specify, if the Board is not satisfied that the Club concerned is complying or has complied in all respects with Rule H11.

Appendix 5

Suitable Footwear Guidance – Reference should be made to individual manufacturers recommendations

FOOTWEAR GUIDELINES FOR 3G SYNTHETIC SURFACE

To protect & maintain the high quality playing surface, approved footwear must be worn

NO BLADES OF ANY TYPES ARE ALLOWED

Under no circumstances should any type of blades, trainers or spiked running shoes be worn on the pitch. Only approved footwear may be carried onto pitch. Any player with incorrect footwear will not be allowed to participate. Failure to comply may lead to loss of future bookings. In this statement we are not endorsing any of the brands or footwear shown but are merely using them as an example of the types of footwear allowed on our 3G synthetic pitches. The amount of sports footwear available is enormous and we cannot include all, therefore these are only guidelines, and are subject to change if the manufacturer of our pitches change their policy. We reserves the right to amend their footwear policy at any time, and although will endeavour to give notice of any change we cannot guarantee it.

- Use appropriate, recommended footwear only
- Footwear should be clean and in good condition
- No smoking / naked flames
- No chewing gum
- No food
- No drinks (other than water)
- No animals allowed
- No vehicles (other than approved equipment)

A SELECTION OF SUITABLE FOOTWEAR

Only approved footwear can be taken onto the pitch



A SELECTION OF NON-SUITABLE FOOTWEAR

Please note it is your responsibility to ensure your footwear meets our footwear policy



Appendix 6

Typical Maintenance Log, which would be completed routinely by a maintenance contractor or a member of the ground staff.

Week No.	
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Week Commencing: Monday	
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MAINTENANCE LOG

MAINTENANCE								
Activity	Material Used	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
Equalizing with drag net								
Removal of debris-garbage								
Brushing (enter a number including 0)								
Decompaction - aering								
Topdressing rubber (penalty point/corner)								
Weed killing/Moss killing								
Ball Roll Test								
Checking of bonding joints/penalty point/repairs								
Checking drains								
Other activities								
Remarks								
Name/Signature (Groundsman)								
DAILY PLAYING HOURS		Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday

Weekly Total Playing Hours	
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Times Brushed	
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**STADIA 3G
CONSTRUCTION &
INSTALLATION -
SCOTTISH FA GUIDELINES**