SAPCA

SPORTS AND PLAY CONSTRUCTION ASSOCIATION

SAPCA Code of Practice

For the selection and use of Sports Performance Infills in 3G artificial turf

www.sapca.org.uk

The Sports and Play Construction Association

February 2021 (1st Edition)

ISBN: 978-1-907391-09-5

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Foreword

As a Code of Practice, this standard takes the form of guidance and recommendations for the use of Sports Performance Infills in 3G artificial turf. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading. Any user claiming compliance with this document is expected to be able to justify any course of action that deviates from its recommendations. Cross references are included within this Code of Practice to various other standards and reference documents, to link to existing information sources available. However, it remains the responsibility of the project designer to assess whether any specific reference is relevant to the specific project and to ensure the latest versions are used.

The criteria detailed in the Code of Practice are based on current best practice and whilst accurate at the time of publication, the author cannot accept any liability for the design or construction of any facilities, or the actions of any contractors employed, because of, or in connection with, any information provided in this document.

Whilst the information contained in the Code of Practice is considered accurate at the time of publication it may be subject to change at a future date due to changing technology and developments in construction methods or changing requirements of the sports' governing bodies and relevant British Standards. Only the most recent edition of the Code of Practice should be used. Revisions will be made as and when considered appropriate.

Parties not experienced in sports surfacing design, specification and construction are strongly advised to consult qualified sports facility construction specialists.

Definition of Terms

3G Artificial Turf	A carpet manufactured from polyethylene or polypropylene yarn, normally of tufted construction, partially filled with a combination of stabilising infill (sand) and polymeric or organic sports performance infill, to replicate a natural turf surface used primarily for football and rugby.
Sports Performance Infill	Granular material introduced into the sports surface, to provide ballast and stability to the sports carpet to contribute to the playing characteristics of the surface.
Stabilising Infill	Granular material introduced into the pile of sports carpet, to provide ballast and stability to the sports surface.
Polymeric infill	Granular material comprising polymers, either as manufactured virgin material such as EPDM or TPV or more commonly recycled end-of-life vehicle tyres.
Organic infill	Granular material comprising organic material such as cork, olive stones, coconut husks or in some cases tree-based materials.
Bio-degradable infill	Granular material which bio-degrades in accordance with levels defined by the European Chemicals Agency.
Bound base	A layer or layers of bound asphalt laid above the sub-base to allow the artificial turf sports surfacing system to be directly on it.
Unbound base	A layer of unbound aggregate graded to the necessary tolerances to allow the artificial turf sports surfacing system to be laid directly on it.
Shockpad	A polymer-based layer used in conjunction with the artificial turf product to provide the suitable sports performance required for that sport. The layer comprises either a resin bound in-situ laid material or prefabricated, often with interlocking layers.
ECHA	The European Chemicals Agency - an agency of the European Union which manages the technical and administrative aspects of the implementation of the EU regulation called Registration, Evaluation, Authorisation and Restriction of Chemicals, more commonly known as REACH Restrictions.
REACH restrictions	EU regulations covering the use of chemicals in the marketplace in Europe.
UK REACH	The UK regulator covering the use of chemicals in the marketplace in United Kingdom.

The Sports and Play Construction Association (SAPCA)

As the recognised UK trade association, SAPCA fosters excellence, professionalism and continuous improvement throughout the sports and play construction industry, ensuring the provision of high-quality facilities necessary for the success of British sport.

SAPCA's Aims and Objectives

- To promote high standards of design, construction, and workmanship for sports facilities in the UK.
- To regulate the industry through the vetting and monitoring of SAPCA members.
- To participate fully in the development of British, European and other standards for the construction and performance of sports facilities, for all levels of play.
- To liaise closely with the governing bodies of sport, both nationally and internationally.
- To encourage the use of new technology in the design and construction of sports facilities.
- To provide and support training and education for the industry's workforce.
- To provide a strong voice for the sports construction industry in the UK.

www.sapca.org.uk

The SAPCA website (www.sapca.org.uk) provides a wealth of valuable information for anyone involved in the development of sports facilities.

Further information

SAPCA operates through its own full-time administration. For further information, including a list of members, please contact SAPCA at the headquarters address below.

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SAPCA
SPORTS AND PLAY CONSTRUCTION ASSOCIATION

Introduction

For fifty years synthetic sports surfaces have been providing safe and hard-wearing playing areas that retain their appearance and condition and allow high levels of usage for play in comparison to natural turf facilities. The hard-wearing properties of these synthetic surfaces along with their consistent nature has allowed sports to be played at a much more intensive level with pitches being operated throughout the year. The impact on sport has been that more people can use the playing surface, more often throughout the year, allowing communities to enjoy more access to sport. The advent of 3G artificial turf surfaces designed primarily for football and rugby to imitate natural turf and has led to a significant increase in the number of pitches in the UK.

Most 3G synthetic surfaces contain a combination of stabilising infill (sand) and sports performance infill comprising polymeric (rubber and plastic) materials to achieve the required sports performance and therefore provide a suitable playing surface. The stabilising infill forms a base for the performance infill, which is designed to be semi-mobile to retain the required playing characteristics for sports like football and rugby, which is achieved through regular maintenance and dressing.

Since 2015 public concerns initially around the potential chemical content of polymeric infill and more recently the definition of the infill material as a microplastic, has involved the European Commission undertaking a series of studies and public consultations. The EC have commissioned this work to be undertaken by the European Chemicals Agency (ECHA). The European Chemicals Agency is an agency of the European Union which manages the technical and administrative aspects of the implementation of the European Union regulation called Registration, Evaluation, Authorisation and Restriction of Chemicals, more commonly known as REACH Restrictions.

The initial ECHA consultation considered the chemical content of infill materials used in the product design for 3G pitches. Primarily this was as a reaction to health concerns that the end-of-life car tyres being used as polymeric infill had the presence of certain polycyclic aromatic hydrocarbon chemicals. In response to this consultation there have been a series of developments at a European level (CEN) to ensure that standards are available to assess the materials used and to ensure compliance with the standards set through REACH. At the same time SAPCA have developed their Quality Control Protocol for Sports Performance Infills and in 2019 this was launched.

SAPCA's Quality Control Protocol for Sports Performance Infill has been developed to provide a robust framework of obligations which suppliers and installers need to follow to demonstrate compliance with current legislation and regulatory requirements. The Protocol applies to the use of Sports Performance Infills (SPIs) and has been prepared in conjunction with SAPCA's member companies and key sports bodies, including Sport England. The requirements outlined within the Protocol are taken from existing standards and match the requirements set out by the European Commission.

In 2019 ECHA launched a second public consultation investigating methods to reduce microplastic materials being released into the environment. Due to the particle size and non-biodegradable nature of polymeric infill for synthetic sports surfaces, this was one of the specific materials identified in their research. The main concern is the migration of the infill from the playing surface to the wider environment during the construction, use and maintenance of the pitch. To alleviate this concern, the synthetic surface industry devised a series of alterative designs and enhanced working methods (installation, operation, maintenance, and disposal) to prevent the migration of infill into the environment. SAPCA has been working with the European Standards Committee (CEN) in the publication of CEN

Technical Report 17519: *Guidance on how to minimise infill dispersion into the environment*, which highlights these best practice ideas into a single document (available from BSI).

Since the United Kingdom left the European Union in January 2021, at the time of writing, details of the impact of this change on the UK sports construction market from a legislative perspective are not fully known. Currently the SAPCA Quality Control Protocol for Sports Performance Infill is considered the industry standard for the use of infills in the UK with full details of the Protocol included in this Code of Practice. The principals of the CEN Technical Report 17519 are also adopted into this Code of Practice.

This Code of Practice sets out the UK industry standard for both the use of design mitigation to prevent infill loss to the environment and the assessment of chemical content within infill materials. This document also outlines the current findings of these potential restrictions and offers guidance and clarity to the UK sports construction industry by highlighting designs and standards which can be adopted in sports pitch construction and address the issues raised by ECHA regarding the use of sports performance infills on 3G pitches.

- Section one outlines the design principals for the construction of a 3G pitch, the different types of infill used in their construction and considers the sports performance requirements that should be adopted for these types of facility. It considers the reasons and causes of migration of infill from the pitch. Finally, it looks at the different stages in the life of a pitch where consideration needs to be given to both the handling of the infill and the impact on the environment.

- Section two gives guidance on the design mitigation which can be adopted when designing a 3G pitch to prevent the loss of infill to the environment.

- Section three gives details of the SAPCA Quality Control Protocol for Sports Performance Infills and outlines the testing required on all infill materials used in the construction and maintenance of a 3G pitch.

1 Guidance on the use of Sports Performance Infills

1.1 General Design Guidance

The performance of a synthetic turf sports surface is provided by the interactions of the artificial turf carpet, the infill materials and, depending on the system, the shockpad. In the case of 3G pitches, the sports performance standards are often set by governing bodies such as FIFA, World Rugby or GAA, at both an elite level and in the case of the UK market, down to facilities designed for community use. Consideration should also be given at a community level for EN 15330-1 – 'Surfaces for sports areas' which specifies the properties required of synthetic turf surfaces used for football, rugby, hockey, and multi–sports applications.

Consideration should be given to the specific sports that the pitch is being designed for, to ensure that the combination of artificial turf carpet, infill material and if required shockpad meets the specific requirement for that sport. The use of both bound (engineered) and unbound subbases should be considered in the overall design of the playing surface.

Consideration should also be given to the following in relation to the use of sports performance infills in 3G pitch construction, maintenance, and renovation.

- Combination of artificial turf product, infill and potential use of shockpad.
- Use of polymeric versus organic infill.
- Consideration for use of biodegradable infill.
- Incorporation of designs to minimise infill loss to the environment.
- Use of infill material that both complies with and are registered on SAPCA's Quality Control Protocol for Sports Performance Infills.
- Working practices to prevent the loss of infill to the environment during the construction, maintenance, and renovation of 3G facilities.
- Working practices considering removal, recycling or disposal of end-of-life 3G pitch surfaces.

1.2 Types of Infill

The following infill product types are available to use as both stabilising infill and sports performance infill in 3G pitch products. To achieve the required sports performance, different combinations of artificial turf carpet and infill will be required, along with the use of shockpads.

1.2.1 Stabilising Infill (sand)

Graded silica sand used to infill the lower portion of the synthetic turf surface to provide support to the carpet pile and ballast to hold the carpet in place and help prevent dimensional movement.

1.2.2 SBR granulate

Currently, the most commonly used infill material, due to its low cost and good elastic properties. SBR (Styrol Butadiene Rubber) rubber infill is made from recycled end-of-life tyres, ground into a particulate specifically for use as pitch infill.

1.2.3 Coated SBR granulate

Recycled car tyre infill with durable polyurethane coating produced from SBR granules that are with a layer of green or brown coloured polyurethane resin. The product is an aesthetically improved infill.

1.2.4 EPDM

A manufactured virgin synthetic rubber granulate (ethylene propylene diene monomer rubber) and is a type of synthetic rubber that can be used as a sports performance infill.

1.2.5 TPE

TPE (Thermo Plastic Elastomer) is a virgin material infill available offering an impact absorbing infill that offers safe and comfortable performance.

1.2.6 TPV

TPV, also known by its full name of Thermoplastic Vulcanisate, is a form of rubber offered in a number of colours, which has been vulcanised during the compounding process. This means that the polymers are converted into more durable material.

1.2.7 Cork

A natural cork infill which is a recyclable and sustainable product that is harvested from the cork oak tree. It provides a natural soil aesthetic to your pitch and also reduces heat on the surface.

1.2.8 Other composite organic infill

Organic material such as olive oil stones, coconut husks or graded tree bark material, providing aesthetic to your pitch and significatively reduces heat on the surface.

1.2.9 Bio-degradable infill

There is a bio-degradable infill currently in development, which is being tested and marketed in the Netherlands which will potentially be available to the UK market. It is a bio-degradable polymer which can be used as a pitch infill material but which bio-degrades in soil so would potentially not be classified as a microplastic polluter.

1.3 Causes of infill migration from constructed pitches

There are a number of situations during the usage of a 3G pitch which can cause the infill to migrate from the pitch into the surrounding environment. These situations need to be considered and addressed by pitch designers, installers, maintenance companies and users.

The principle causes are:

- Players, officials, spectators etc carrying the material from the pitch on footwear and clothing.
- Maintenance operatives and machinery carrying the material from the pitch.
- Inappropriate maintenance procedures being used.

- Poor storage containment of infill material.
- Surface water run off or pitch flooding.
- Wind dispersion.
- Snow removal.

1.4 Construction Phase Guidance

During the construction of a pitch the handling of infill in its transportation, storage on site, installation, and site clearance on completion of the project is key to prevent contamination of the surrounding environment. Pitch installers should ensure that working practices minimise infill loss from the confined working area with care taken to provide designated storage areas with close proximity to the actual artificial pitch area.

Consideration should be given to the following on-site working practices where applicable:

- Storage of palletised bags in a designated area to ensure the infill can be contained during the installation process, spillages retained within the area and removed on completion of the project.
- Handling of the infill material during loading of machines and installation to be confined to the area within the pitch boundaries where applicable.
- Care and attention given during the operation of machinery to ensure that the infill remains within the confines of the pitch area.
- Where possible, ensure that the installation of infill is carried out in optimum dry conditions.
- Regular cleaning of installation equipment to prevent infill leaving the working area.

1.5 Maintenance Guidance

During the use of the pitch the performance infill will be displaced and to ensure that the playing surface to remains in its optimum condition, regular brushing or drag matting of the surface is required. Regular brushing of the surface prevents compaction of the infill and will also maintain the appearance of the playing surface. The actual depth of performance infill within the playing surface will be specified by the manufacturer as will the type of brushing, and considerations to these methods should always be followed by those maintaining the facility. When undertaking maintenance of a pitch it is very important to ensure that the following practices are adopted:

- Ensure that the infill depths within the surface are as specified by the manufacturer in their product datasheet.
- Ensure that the infill is evenly distributed across the pitch and is it not allowed to accumulate around the perimeter.
- Ensuring that all maintenance equipment is thoroughly cleaned so any infill is removed before the equipment leaves the pitch.
- Ensure that all drainage silt traps are regularly checked and emptied to remain operational.

- When using rotary brushes, adjust the brushing patterns to ensure infill is not flicked up and off the pitch.
- Avoid the use leaf blowers near the perimeter of the pitch.
- Only open bags of infill within the confines of the pitch.
- Ensure that boot cleaning stations are cleaned frequently.
- Ensure that boot cleaning stations are located on hard paved areas to allow the infill to be collected for re-use.
- Spare infill used for the localized topping up and periodic topdressing should be stored in a secure area contain the material.
- Ensure that the pitch surface is not over filled to prevent excessive levels in infill.

1.6 End of use Guidance

During the removal of the artificial turf playing surface at the end of its usable life as part of any renovation project, it is also important that the material is correctly handled to prevent any of the component parts ending up contaminating the environment. At the end of its life ALL the component parts of the artificial turf being removed is considered waste and therefore the removal, disposal or recycling of the materials needs to be done in accordance with Waste Regulation.

It should be ensured that the contractor appointed to remove the artificial surface is licensed and able to demonstrate a full chain of custody for the materials from the point they leave the field to being recycled, reused or disposed of.

The removal and transportation of an artificial pitch and its infill should be undertaken in a way that will minimise infill migration using the principles noted within this Code of Practice with consideration given to the following:

The use of mechanised methods using purpose-built equipment to remove the infill within the confines of the existing pitch.

- Use of secure storage for the removed infill material.
- Use of containers or close sided vehicles to prevent infill migration during transport.
- Ensure that all working areas are thoroughly cleaned on completion of the process.

1.7 Snow Clearance

In certain parts of Northern Europe, the biggest source of infill migration is during the process of clearing snow from a pitch. In the case of the UK, this is not considered as significant an issue, however, in Northern England, Scotland and Northern Ireland there will be a need to remove snow from pitches, especially at elite sport venues used for football and rugby.

If time constraints allow, the snow should be cleared so that 5mm – 10mm remains on the playing and is then allowed to thaw naturally ensuring that the infill is not disturbed. If this is not possible and all the snow is removed, this will result in a proportion of the infill being removed.

Where the pitch needs to be completely cleared of snow it is essential that the snow is stored in a location adjacent to the pitch and within the confines of the facility. The area where the snow is then stored needs to be designed to allow the water from the thawing snow to drain back onto the pitch and any drainage in the location should be fitted with silt traps to collect the infill material.

The area should be large enough to accommodate the snow and consideration should be given to the installation of 1.2m high barriers around the perimeter to prevent the snow and potentially infill from migrating from the pitch. If this is not possible then facility managers could consider using the perimeter of the pitch as storage and making the actual playing area smaller.

Under no circumstances should snow removed from a field be deposited into water courses as this can lead to aquatic pollution. Nor should snow be deposited on soft landscaping where migration and dispersion cannot be controlled.

Attention is drawn to the fact that it is likely infill levels would need to be assessed and potentially topped up to ensure that the infill levels remain in compliance with manufacturers recommendations.

2 Minimising infill dispersion into the environment

This section outlines methods to contain the infill materials used in artificial pitch constructions, within the confines of the pitch, preventing them being dispersed into the surrounding environment during use. The options described are based on examples of best practice taken from industry experts in sports facility construction. This practical guidance can be used by both designers and installation companies undertaking this kind of development.

The options outlined in this section range from changes to system designs through the use of innovation in product design, to simple barriers to prevent infill migration and the inclusion of good facility management processes and better pitch designs.

2.1 System designs

Historically 3G artificial turf surfaces consisted of 50mm or 60mm pile height carpets laid directly onto a base with a relatively low tuft density and a high proportion of polymeric infill to give the system the required performance for football and rugby. Due to the higher content of polymeric infill and the open nature of the carpet pile, it is often considered that these systems have a greater propensity for the infill to be mobile and therefore a higher chance that it could migrate into the environment. To combat this situation, and to minimise infill loss, manufacturers have designed different systems such as:

- 60mm pile height carpets which incorporate a thatch zone comprising curly tufts to stabilise the infill.
- Shorter pile carpets (40mm) with increased tuft densities which include the use of shockpads to give additional performance to the system. These systems incorporate a much lower quantity of polymeric infill which leads to a lower level of infill migration.
- Products comprising curly or texturised yarns.
- Use of organic infills, thus ensuring that the infill material is not polymeric and therefore not considered a microplastic. These systems require the use of shockpads to achieve the required sports performance requirements.

- Use of different shaped polymeric infill. Rounded granulate can assist the drainage capacity of the surface but angular infill material can lock together better to provide a more stable infill.

- Both FIFA and World Rugby have a test in their performance standards for Infill Splash, which promotes the use of products with a lower splash value and hence more stable infill and lower dispersion of infill from the carpet.

2.2 Facility design features

There are a series of potential design features that can be incorporated into pitches to minimise infill being lost from the playing surface during use. Some of these are actual physical barriers, some are improved access control for players, officials, and spectators and other have more subtle approaches which can be incorporated into the design of the pitch.

The suggested designs outlined in this section will not all be applicable to all pitch locations. For example, a 3G playing surface within the confines of a stadium layout would potentially already have a physical barrier around the perimeter of the pitch. Conversely a pitch in a community setting with no external run offs or spectator area, would require a more substantial physical barrier around the perimeter of the pitch.

2.2.1 Pitch Profile

Pitches are often designed with gradient of up to 1% to aid the removal of surface water from the playing surface. Whilst it is important that the pitch drains sufficiently, the greater the slope, the more chance that infill can be carried to the lower perimeter of the pitch. Constructing a pitch with a gradient no greater than 0.5% can prevent the movement of infill in this way.

2.2.2 Surface Drainage

Surface drains on the pitch should contain silt traps to prevent infill washed into the drain entering the storm water drainage system.

2.2.3 Perimeter detail

To minimise the loss of infill from the perimeter of the pitch during both play and maintenance, consideration should be given to the inclusion additional hard standing (asphalt or paved areas) around the external perimeter of the pitch. These areas would normally be a minimum of 0.5m wide or larger if designed as spectator areas. An additional design to minimise infill loss would be to also include 200mm high kick boards on the perimeter fencing comprising timber or recycled material.

2.2.4 Containment barriers

The installation of physical barriers around the perimeter will provide the best form of protection to minimise infill loss through use of the pitch or during maintenance work. Where the synthetic surfacing is laid up to the perimeter fencing then barriers of 500mm high are recommended to prevent infill being lifted and deposited into the surrounding environment. Where additional hard standing run offs are incorporated or spectator areas then 200mm timber boards or raised perimeter edgings are considered suitable.

2.2.5 Field entrance points and boot cleaning stations

All entrance points should incorporate a combination of decontamination grates and scraper mats which are the full width of the entrance point to ensure that all infill is collected. The grates should be recessed to collect infill and have suitable drainage and silt traps to allow water to pass away whilst still collecting the infill.

Boot cleaning stations should also be installed at these points to ensure that all loose infill from boots and clothing can to retained within the perimeter of the pitch.

3 SAPCA Quality Control Protocol for Sports Performance Infills

SAPCA's Quality Control Protocol for Sports Performance Infill was developed to provide a robust framework of obligations which suppliers and installers need to follow to demonstrate compliance with current legislation and regulatory requirements.

The Protocol covers **ALL** polymeric and organic SPIs that are to be used in a synthetic turf system as the performance layer (normally the upper layer). It does not include uncoated sand infills that may be used as the stabilising infill in longer pile (3G) synthetic turf systems or as performance/stabilising infill within short pile (2G) synthetic turf surfaces.

3.1 General Requirements

Sports performance infills used in the construction of pitches should comply with the standards set out in the SAPCA Protocol. The SAPCA website **www.sapca.org.uk** has a list of compliant products currently available in the UK marketplace. These materials are tested regularly in accordance with the requirements of the SAPCA Protocol.

3.1.1 Definitions and Test Methods

BS EN 71-3: 2013

British European Standard entitled Safety of Toys Part 3: Migration of Certain Elements.

BS EN 17409:2020

British European Standard entitled Code of practice for the sampling of performance infills used within synthetic turf surfaces

BS EN ISO/IEC 17025:2005

British European International Standard entitled General requirements for the competence of testing and calibration laboratories.

BS EN ISO 9001:2015

British European International Standard Quality management systems.

3.1.2 Infill Protocol Requirements

PAH Content			
PAH	**Cas No.**	**Requirements**	**Test Methods**
Benzo[a]pyrene (BaP)	50-32-8	≤ 20.0 mg/kg for the sum of the eight PAHs listed	PAH - AfPS 2014:01 PAK Prior to chemical analysis, samples shall be prepared in accordance with BS EN 17409:2020: Code of Practice for the Sampling of Performance Infills used Within Synthetic Turf Surfaces.
Benzo[e]pyrene (BeP)	192-97-2		
Benzo[a]anthracene (BaA)	56-55-3		
Chrysen (CHR)	218-01-9		
Benzo[b]fluoranthene (BbFA)	205-99-2		
Benzo[j]fluoranthene (BjFA)	205-82-3		
Benzo[k]fluoranthene (BkFA)	207-08-9		
Dibenzo[a,h]anthracene (DBAhA)	53-70-3		
Frequency of sampling and testing	Sampling shall be undertaken in accordance with BS EN 17409:2020 Code of Practice for the Sampling of Performance Infills used Within Synthetic Turf Surfaces. A minimum of one lot shall be taken per week of production.		

Heavy Metal Migration			
Element	**Migration limit (mg/kg)**	**Test Method**	**Frequency of Testing**
Aluminium	70,000	As specified in Clauses 7 and 8 of BS EN 71-3	A minimum of one sample taken from production, shall be tested at least once every six months.
Antimony	560		
Arsenic	47		
Barium	18,750		
Cadmium	17		
Chromium (III)	460		
Chromium (VI)	0.2		
Cobalt	130		
Copper	7,700		
Lead	160		
Manganese	15,000		
Mercury	94		
Nickel	930		
Selenium	460		
Strontium	56,000		
Tin	180,000		
Organic tin	12		
Zinc	46,000		