

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

BACKGROUND

This document has been prepared as result of a collaboration between the key stakeholders listed below to bring together a series of frequently asked questions (FAQs) regarding the use of infill materials in “third generation” (3G) artificial grass (aka synthetic turf) pitches.

The FAQs are provided for general information only and are based on information, research and material that is currently in the public domain.

The guidance will be kept under review continually by members of the group and updated as necessary.

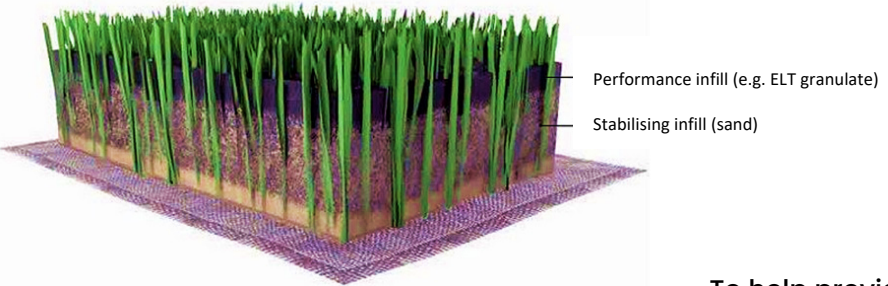
The FAQs are not intended to be a comprehensive guide replacing the need for specialist technical advice.

You should seek specialist advice from suitably qualified and experienced professionals in relation to concerns about specific sites or projects.

Care has been taken over the accuracy of the content of this guidance note, but the Stakeholders cannot guarantee that the information is up to date or reflects all relevant legal requirements at the time of reading.



Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

1.	What is the difference between an artificial grass surface and a synthetic turf sports surface?	There are no differences, various names are used to describe the same types of sport surfaces and the facilities they are laid on. These include synthetic turf, artificial grass, artificial turf, turf and artificial grass pitches (AGP). FIFA, World Rugby and International Hockey Federation also refer to the specific forms of artificial grass used for their sports as Football Turf, Rugby Turf and Hockey Turf. Increasingly, international standards, environmental regulations and the supply industry refer to synthetic turf.
2.	What is a 3G artificial grass surface?	The term “3G” refers to the third generation of artificial grass sports surfaces. The first generation are the non-filled short pile surfaces used primarily for hockey; the second generation are the sand filled surfaces that were used extensively in the 1980s and 90s and sand dressed surfaces used for hockey to this day. The third generation were developed in the early 2000s and are intended to replicate the playing characteristics of natural turf, making them particularly suitable for football and the various forms of rugby.
3.	How does a 3G surface differ from other artificial grass surfaces?	<p>A 3G surface has a carpet pile that is typically between 40 mm and 60 mm, which is much longer than other forms of artificial grass that typically have pile lengths of between 10 mm and 25 mm, depending on the sports to be played on the surface.</p>  <p>To help provide the desired playing characteristics and to aid player comfort and protection, the spacing of the stitches forming the carpet’s pile is quite open; this is to allow infill to be placed between the pile fibres.</p>

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

4.	What is infill and why is it used?	Infill is the term used to describe granular materials that are placed around the fibres forming the pile of an artificial grass carpet. In 3G turfs two layers of infill are normally used, a layer of rounded sand at the bottom, that acts as a stabilising ballast to hold the carpet in place, and an upper layer of performance infill that helps provide the playing characteristics and player welfare properties of the surface.
5.	Are there different types of performance infill used in 3G surfaces?	<p>Initially, most 3G pitches had a performance infill made from granulated end of life car and truck tyres; this is often described as ELT or SBR (after the type of rubber) granulate. ELT infill is, the most commonly used type of performance infill in the UK.</p> <p>Alternative infill materials are now available including:</p> <ul style="list-style-type: none">• Polymeric infills made from virgin rubbers and plastics• ELT granules enclosed within an outer coloured polyurethane coating• Vegetal (or organic) infills made from an increasing range of materials including:<ul style="list-style-type: none">- Granulated cork- Blends of granulated cork and coconut fibre- Blends of granulated cork and olive stone husks- Chipped timber- Crushed olive stone husks <p>See questions 17, 18 and 20 for more details on vegetal infills.</p>
6.	Why is ELT infill the most commonly used?	ELT infill has many positive attributes including: <ul style="list-style-type: none">• Low cost and being readily available in the UK• Good elastic properties that help ensure player comfort and protection• Very good durability and resistance to climatic degradation

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

7.	Does ELT infill pose a risk to human health?	<p>This question has been the subject of significant investigation since first being raised in the USA in 2015. The concerns identified relate to potential risk of exposure to polyaromatic hydrocarbons (PAHs) that are contained in ELT granulate.</p> <p>PAHs are a widely occurring group of chemicals that people are most commonly exposed to through breathing air contaminated with motor vehicle exhaust, cigarette smoke or wood smoke. People also ingest PAHs when they eat grilled or charred meats or foods. High or prolonged exposure to PAHs can cause cancers.</p> <p>In 2016 the European Chemical Agency (ECHA) launched a study to assess whether the concerns were justified and if restrictions on the use of ELT infill were required. The stakeholders listed on page 1 of this guide contributed to the study.</p> <p>In 2017 ECHA published their report¹ which concluded:</p> <p><i>“ECHA has found no reason to advise people against playing sports on synthetic turf containing recycled rubber granules as infill material”.</i></p> <p>In 2020 the results of a major pan-European scientific study undertaken by internationally respected independent researchers, and published in the scientific journal <i>Science of the Total Environment</i>², concluded:</p> <ul style="list-style-type: none">• <i>No health concerns were found for AGPs with ELT-derived infill material.</i>• <i>Cancer risks for exposure to PAHs were below 1 in 1 million.</i>• <i>Risk characterisation ratios (RCRs) for non-carcinogenic substances were below 1.</i>
8.	Are there standards or legal frameworks that currently regulate the chemical composition of infill used in artificial grass surfaces?	<p>Tyres sold within the European Union and UK have been subjected to regulations that limit their PAH content since 2011; this is why ECHA found that the ELT infill being used in the UK and European Union did not pose an unacceptable risk to human health.</p>

¹ Annex XV Report – An Evaluation of the possible health risks of recycled rubber granules used as infill in synthetic turf sports fields, ECHA, February 2017

² ERASSTRI – European risk assessment study on synthetic turf rubber infill, Schneider, Bierwisch, Kaiser. May 2020

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<p>However, infill is produced around the world and the quality standards in some regions are not as robust as those in Europe. To prevent infills with unacceptable levels of PAH from entering the European market ECHA proposed a new legal restriction limiting the combined total content of the eight key PAHs to no more than 20 mg/kg (0.002%). This new EU regulation entered into European law in July 2021.</p>
9.	<p>But with the UK leaving the EU before their new regulation became law it does not apply here, so how do I ensure infill used on UK fields is also safe?</p>	<p>Anticipating the new UK regulation would not be automatically transferred over to UK law, the stakeholders listed on page 1 of this FAQ encouraged the UK industry, represented by the Sport and Play Construction Association (SAPCA), to develop a quality control protocol for sports performance infill³. Launched in 2019, this protocol replicates the criteria of the EU regulation, ensuring the same levels of protection. It also includes additional criteria to ensure infill materials do not contain hazardous amounts of heavy metals; the criteria being the same as that used for children’s toys.</p>
10.	<p>How do I ensure the infill being laid on my 3G pitch complies with the SAPCA Protocol?</p>	<p>Field owners and operators and those designing, building and maintaining 3G pitches each have a duty of care to ensure their pitch does not create unnecessary risks to players, match officials and those undertaking maintenance.</p> <p>As a condition of membership, SAPCA requires companies to comply with its Codes of Practice and Protocols. This means whenever you employ a SAPCA member to design, build, or maintain your pitch, only an infill that is been registered on the SAPCA Infill Protocol will be specified/used.</p> <p>In 2021 SAPCA launched their Code of Practice for the Selection and Use of Sports Performance Infills which further strengthens the requirement for members to use infills registered on the Infill Protocol.</p>

³ [Sports performance infills for 3G surfaces – SAPCA](#)

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<p>The Football Foundation have incorporated the SAPCA Infill Protocol into the requirements of their framework contract for new 3G pitches meaning any project they fund has to use a registered infill.</p> <p>If you maintain your pitch yourself, you should ensure that the infill being used for topdressings, etc is a product registered on the SAPCA Infill Protocol.</p>
11.	Should I keep records showing what infill is laid on my pitch?	<p>As long-term traceability of the infill materials laid on a pitch are likely to become increasingly important, especially at the end of the surface's life, it is recommended pitch owners and operators retain records showing the brand of infill used and its conformity to the SAPCA Infill Protocol criteria.</p>
12.	Do performance infills create a microplastic threat to the environment?	<p>Microplastics are defined as non-biodegradable polymeric (rubber or plastic) materials that are 5mm or less in size.</p> <p>Microplastics may be intentionally added to products (e.g. micro-beads in cosmetics) or unintentionally occur through wear and tear (e.g. micro-fibres from clothing) or through the breakdown of discarded polymeric products.</p> <p>Polymeric infills meet the definition of an intentionally added microplastic. If they are allowed to migrate from a pitch into the surrounding neighbourhood, they become a microplastic pollutant. See Q15 for information on how to significantly reduce any loss of infill.</p>
13.	How serious a problem is infill pollution of the environment?	<p>The potential environmental threat caused by infill was first identified in Scandinavia. Studies there showed up to 900 kg of infill could be lost from a pitch each year. But importantly, approximately 50% of this was due to the repeated clearance and disposal of snow containing infill during the Scandinavian winter months. The same studies also showed that the other methods of infill migration that could occur in UK,</p>

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		and highlighted in Q14 can result in around 500 kg of infill leaving a full size pitch each year.
14.	How does infill migrate from a pitch?	<p>Studies have shown the major infill transportation routes from 3G pitches are:</p> <ul style="list-style-type: none"> • On maintenance equipment, especially brushes • Migration through use and maintenance to side of pitches and beyond • On players' clothing and footwear • Surface water run-off
15.	How can I ensure my infill does not become a microplastic pollutant?	<p>Independent studies⁴ have shown that through good field design, operation and maintenance, infill migration from an artificial grass pitch can be reduced by up to 98% from typical worst-case situations. BSI Standards⁵, working with the European Committee for Standardisation (CEN), have developed a Technical Report describing the procedures that should be used to control infill migration. These include:</p> <ul style="list-style-type: none"> • Fitting containment barriers on a pitch's perimeter fencing • Installing decontamination grates and boot cleaning brushes at all player and vehicle entrance gates • Ensuring all stormwater drains around a pitch have suitable microfilters to capture any infill being carried by surface run-off, etc • Keeping a dedicated maintenance brush within the boundaries of the pitch, so it cannot carry infill into the surrounding environment

⁴ Determining the effectiveness of Risk Management Measures to minimize infill migration from synthetic turf sports fields, Magnusson & Mácsik, EcoLoop, August 2020 [Knowledge Centre – ESTC – EMEA Synthetic Turf Council](#)

⁵ BS PD CEN/TR 17519 Surfaces for sports areas – Synthetic turf sports facilities – Guidance on how to minimize infill dispersion into the environment, [BSI Shop - Buy British Standards. \(bsigroup.com\)](#)

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<ul style="list-style-type: none">• Thoroughly removing any infill from maintenance tractors, etc. before they leave the pitch <p>Further and more detailed information can be found on guidance published by SAPCA⁶ and the European Synthetic Turf Council (ESTC)⁷.</p> <p>FIFA, World Rugby and the International Hockey Federation (FIH) have all included the recommendations of CEN into their certification programmes for artificial grass pitches. Contractors building fields that require certification should therefore include the measures within their designs.</p> <p>As with polymeric infills (see question 10), SAPCA members should now ensure all fields designed or built comply with the recommendations of the SAPCA Code of Practice for the Selection and Use of Sports Performance Infills in 3G Artificial Turf and incorporate infill containment measures.</p> <p>The Football Foundation have also incorporated the recommendations of BSI Standards CEN Technical Report into the requirements of their framework contract for new 3G pitches meaning any project they fund should now include appropriate containment measures.</p>
16.	These containment and management measures sound expensive, are they?	<p>The cost of the necessary containment measures are becoming lower as the market evolves, and more companies develop products specifically for this application. Currently the measures are typically adding up to £20,000 plus VAT to the cost of a new full-size field. As many of these features should function for at least 20 years, their life cycle costs are not considered to be disproportionate for the environmental benefits they bring.</p>

⁶ The selection and Use of Sports Performance Infills in 3G Artificial Turf, SAPCA, 2021 [Codes of Practice – SAPCA](#)

⁷ Synthetic turf infill control [Knowledge Centre – ESTC – EMEA Synthetic Turf Council](#)

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

17.	What are vegetal (organic) infills?	Vegetal infills are made from vegetation or plant materials. As listed in Question 5 an increasing range of materials are being used. The materials are shredded or granulated to provide an infill with the required particle grading and density.
18.	With all of the concerns around polymeric infills should I consider a vegetal infill?	<p>The UK artificial grass market is starting to see an increasing range of vegetal infill materials being introduced. Many of these infills have been used in other European countries for a number of years, but experiences of them in the UK climate and on UK pitches, with their high levels of use are still quite limited.</p> <p>If you are considering a vegetal infill, you should assess the pros and cons thoroughly before deciding. There is nothing like real-life experiences to provide assurances you are making the best choice for your pitch; after all the decision will remain in place for many years.</p>
19.	What are the principal advantages to using a vegetal infill?	<p>The principal benefit of using a vegetal infill is that it is a naturally occurring material that does not contain chemicals and will eventually bio-degrade and not have any long-term impact on the environment. For many, these are good enough reasons to use this type of infill.</p> <p>Some types absorb less radiant heat from the sun meaning the turf is cooler than when a dark coloured infill is used.</p>
20.	What are the principal disadvantages to using a vegetal infill?	<p>Reported disadvantages include:</p> <ul style="list-style-type: none"> • Some types of vegetal infill float making them susceptible to dispersion in periods of heavy rain; this increases a pitch’s maintenance requirements • Some types have slower drainage properties, meaning surfaces can become waterlogged in very wet conditions.

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<ul style="list-style-type: none"> • Some types may freeze in cold winter conditions. • As the materials bio-degrade, they may need replacing partway through the life of the turf carpet; this could increase your on-going maintenance and life cycle costs • Fungal and algae growth can be a problem and may need chemical treatments to control persistent problems • Generally, they are more expensive than ELT infill, although costs are reducing • Many vegetal infills are produced overseas meaning they have a higher CO² transportation impact on the environment
21.	Can I remove a polymeric infill and replace it with a vegetal infill without changing the turf surface?	A synthetic turf system is designed to provide playing and safety properties required for the sports to be played on it. Vegetal infills generally provide less energy absorption to players falling onto the surface than polymeric infills, meaning the turf systems in which they are used need to include a shockpad underlayer. If an existing field does not have a shockpad (of suitable quality and performance) changing from a polymeric to a vegetal infill is likely to result in an unsatisfactory and potentially unsafe playing surface.
22.	If I use a vegetal infill, do I still have to worry about infill migration?	Although vegetal infills do not create a microplastic pollution concern, they can still become a source of environmental pollution as they are not a naturally occurring material in the UK environment.
23.	Are there any standards for the various types of infills now being offered on the market?	BSI Standards is currently working with the European Committee for Standardisation to develop a standard for synthetic turf (artificial grass) infill materials. The standard ⁸

⁸ prEN 15330-5 Surfaces for sports areas: synthetic turf and textile sports surfaces Part 5: Specification for infill materials (draft under development)

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		is currently in draft format. It is hoped that it will be approved for publication in Q3 or Q4 of 2022.
24.	If vegetal infills are not the total answer to my concerns, should I be considering a 4G artificial grass surface?	<p>Responding to environmental concerns, a fourth generation of artificial grass surfaces have been developed. These are long pile (typically anything between 30 mm and 60 mm) artificial grass that either have no infill (non-filled) or are only partly filled with sand (sand dressed).</p> <p>4G turfs have a much denser primary pile, and often a secondary pile or thatch zone, both of which are designed to ensure the primary pile is supported and remains standing upright.</p> <p>To date, testing has shown 4G surfaces are not able to satisfy the FIFA criteria for artificial grass football surfaces and the World Rugby criteria for artificial grass rugby surfaces. This is primarily due to the surfaces' inability to satisfy the criteria for skin/surface friction, meaning there is an increased risk of a player suffering from a carpet burn when they slide on the surface. Low foot grip has also been found to be problem with some 4G turf systems.</p> <p>Currently 4G surfaces can comply with British Standard EN 15330-1⁹. It is worth noting, however, that this standard is currently being updated, having been published in 2013 and enhanced tests for foot/surface and skin/surface friction might be introduced to assess the ability of 4G surfaces to perform as players desire.</p>
25.	When an artificial grass surface needs replacing, what happens to the artificial grass and its constituent parts?	The artificial grass industry is increasingly developing methods of recycling all components of the surface. The European Synthetic Turf Council has published a

⁹ BS EN 15330-1: Surfaces for sports areas. Synthetic turf and needle-punched surfaces primarily designed for outdoor use. Specification for synthetic turf

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<p>comprehensive guide to the end-of-life options for synthetic¹⁰ turf sports surfaces including the various types of infill discussed in this document.</p> <p>Polymeric infills can, after careful cleaning and processing, often be reintroduced into the market to be used again as an infill material. The British European standard for infill materials that is currently under development (see question 18) will contain performance and quality criteria for the reuse of infill materials. Until this standard is published, the advice of the artificial grass surfacing manufacturer should always be taken; they will be able to advise if an infill is suitable for reuse in their turf.</p> <p>Providing a vegetal infill does not contain polymeric components (some include rubber granules) and it has not been treated with herbicides, etc, it can often be used as a compost or mulch, before being allowed to degrade naturally.</p>
26.	<p>In September 2022 the European Commission published their recommendations on restricting the use of intentionally added microplastics onto the European market which includes polymeric infill. What will the impact be on the UK market?</p>	<p>The European Commission has plans to restrict “intentionally added microplastics” being sold on the European market, due to environmental concerns. Included within this definition is polymeric granulate (often from recycled tyres) used as sports performance infill within 3G pitches.</p> <p>The European Commission is proposing a six-year transition period before the new restriction becomes effective. The proposal is currently being discussed by the EU member states and the transition period will commence once the proposal has been adopted in EU law (potentially some time in 2023).</p> <p>As the UK has left the European Union, the Commission’s recommendations will not have a direct effect on the UK market. Post-Brexit the regulatory framework now sits at a UK level (except for Northern Ireland, which will continue to follow EU REACH</p>

¹⁰ ESTC Guide End of Life Synthetic Turf Sports Surfaces, June 2021 [Knowledge Centre - ESTC - EMEA Synthetic Turf Council](#)

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<p>requirements) and UK government has not announced plans for measures to limit the sale or use of infills in synthetic turf.</p> <p>UK REACH will carry out an assessment to determine whether the restriction measures are needed in the UK. At the time of writing, this work is ongoing.</p> <p>With the continued use of polymeric infill in the UK, the market has been adopting the infill containment measures (outlined in question 15) on new build pitches as best practice along with advocating improved maintenance measures (for all pitches) to ensure that infill does not leave the confines of the facility. The use of these options for containment should be considered essential where sports performance infill is in use.</p>
27.	So, in light of the developments with the European Commission and the ongoing assessments being undertaken by UK REACH, what is the UK industry doing to be proactive in terms of alternatives and the potential future impact of any future restriction?	<p>The Stakeholders listed on page 1 of this guide are in regular dialogue with each other and with Defra to understand the 'direction of travel' in Europe and the UK.</p> <p>The Stakeholders are keen to understand the suitability of possible alternatives to polymeric infill with AGP systems, and the Football Foundation are leading a two-phase research project.</p> <p>In Phase One, SAPCA were commissioned to produce a report outlining the different AGP surfacing systems and alternative infills that are currently available in the UK marketplace. This research also considered the cost of these options and their suitability for the UK climate.</p> <p>In Phase Two, the Football Foundation has commissioned a research project to assess alternative infills and system types through a live site testing centre.</p> <p>A site has been identified in Sheffield which combines a series of small-sided pitches where different combinations of pitch systems will be assessed, both through</p>

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		<p>industry standard performance testing but also player analysis and feedback. The site is currently under development and should be live in 2023.</p> <p>The testing hub forms part of a wider Action Plan agreed by the Stakeholders who have also agreed an Action Plan to understand:</p> <ul style="list-style-type: none"> • the efficacy of containment measures. • the role of the planning system to enforcement delivery of containment measures. • the potential financial and socio-economic implications arising from possible approaches in the UK. • the microplastics risk of hybrid pitches. • options for non-infill carpet AGPs.
28.	<p>With this Stakeholder Group Action Plan agreed at the end of 2022, what specifically is now being delivered by the Group to better understand the ever-changing marketplace and the potential impact on AGP's for 2023 and beyond?</p>	<p>The Action Plan has been developed into a set of manageable work programmes with series of practical outcomes to guide and advise the Stakeholder Group and allow an assessment of the principles (outlined in question 27). In practical terms this includes the following:</p> <ul style="list-style-type: none"> • The development of an Invitation to Quote (ITQ) has been completed in Q1 2023, for a piece of work to consider a series of scenarios to plan for the financial and socio-economic impact of any proposed restrictions that the UK may consider. • A further ITQ is under development to allow an assessment of the use of and efficacy of Risk Management Measures (containment measures) as a practical methodology to better manage the containment of infill and fibre loss. The delivery of this work will commence in 2023. • The development of an enhanced Communications Plan for 2023 including the production of a revised position statement for the Group and additional

Frequently asked questions – use of infill materials in 3G artificial grass pitches (AGPs)

		FAQs to focus on the work programmes currently underway and in planning for 2023. Thus ensuring that the Stakeholder Group can guide and advise all parties on the current developments in the marketplace.
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