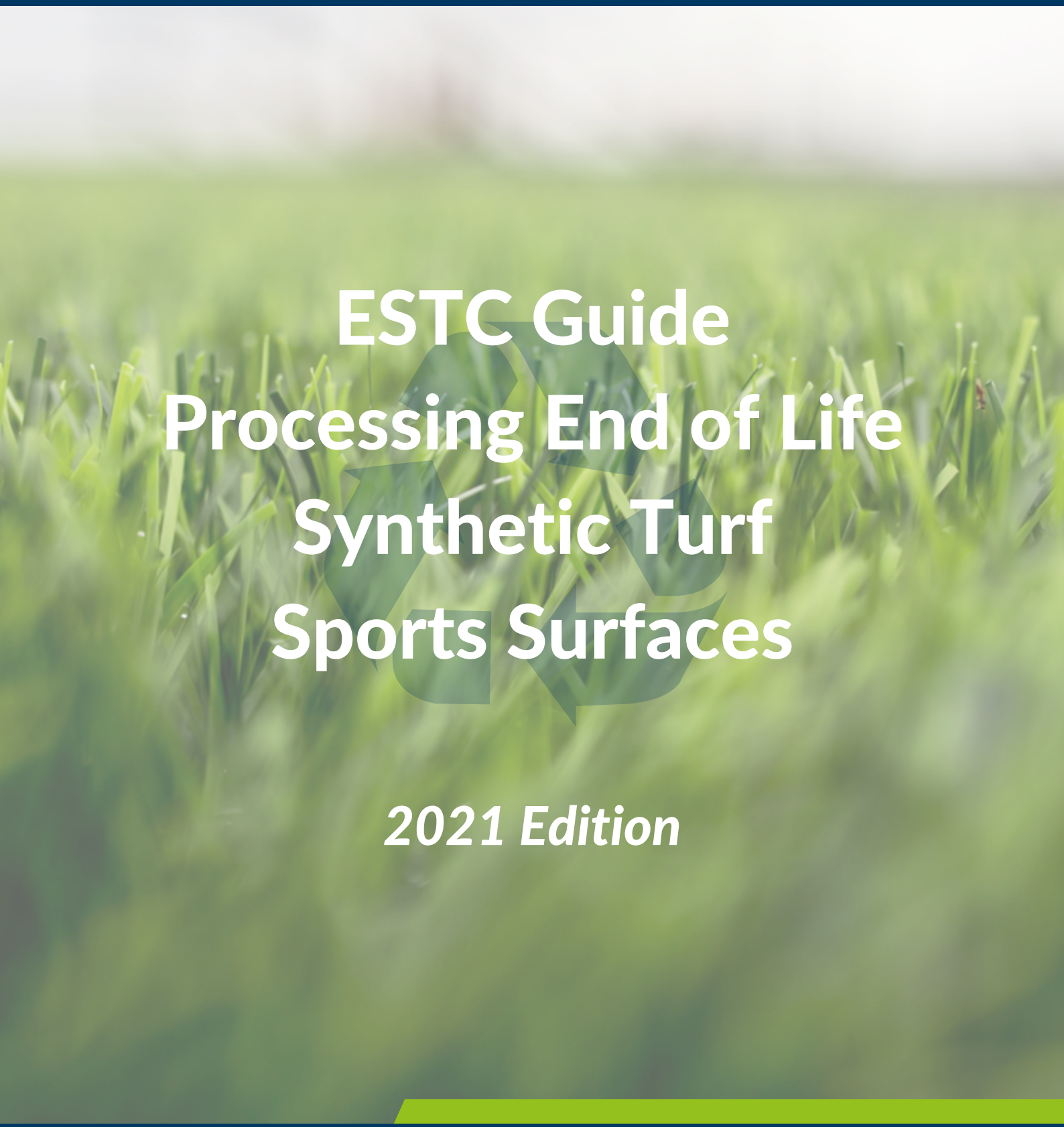


ESTC Guide Processing End of Life Synthetic Turf Sports Surfaces

2021 Edition

CONTENTS

1 ABOUT ESTC

ESTC is the trade association for the synthetic turf industry in the EMEA region. Its objective and purpose is to serve, promote, develop, grow and advocate for the synthetic turf industry. We work in both the sports and landscaping sectors.

ESTC fulfils its role by means of close collaboration with all parties involved; members, end-users, sports governing bodies and legislators.

ESTC is focused on the regions of Europe, Middle East and Africa. Via our partnership with the Synthetic Turf Council (STC) in North America, ESTC also helps its members achieve a global reach. On a local level, ESTC works closely with national industry associations to accomplish our goals and objectives.

Our members are at the core of everything we do and are the driving force of the organization. The strategy of ESTC can best be visualised in a 4-pillar model, consisting of Advocacy, Knowledge, Marketing and Networking. Our vision is to build a circular model taking into account sourcing of raw materials, regeneration, and responsible end-of-life processing to close the loop in our supply chains. ESTC is focused on working with members according to a circular economy model.

2 INTRODUCTION

Synthetic turf sports surfaces provide many benefits to society. They allow larger numbers of people to play sport, maximising land utilisation; they allow sport to be played safely in most weather conditions; and although not maintenance-free, they require fewer resources to maintain them in an acceptable playing condition, without using chemical treatments, fertilisers, etc.

Today there are a diverse range of synthetic turf surfaces used for sports such as football, hockey, tennis, rugby, cricket, American football and baseball. Precise numbers are hard to establish but estimates suggest there are over 30,000 full size sports fields and 70,000 smaller fields and courts in use today across Europe.

Surface constructions differ depending on their intended use. Generally they can be split into two main groups; long pile synthetic turfs that are designed to replicate the playing characteristics of natural grass, and used by sports such as football and rugby, and short pile surfaces that have evolved to provide the playing characteristics required by sports such as tennis, hockey, korfball, futsal and cricket.

Irrespective of the pile length, the surface may contain an infill, or it may be non-filled. Depending on the type of surface, the infill may be a single layer acting as a stabilising ballast (normally a rounded sand), or two layers of infill may be used, the lower one being a stabilising infill and the upper one a performance infill. The performance infill can be made from rubber or plastic granules, or some form of organic granulate (cork, coconut fibre, wood chips etc).

Depending on the intended use, the synthetic turf surface may be laid over a shockpad or elastic underlayer, or it may be laid directly onto the base pavement of the field or court.

Today, these surfaces provide high quality, durable cost-effective solutions for many communities wishing to play sport, but like all man-made products, there comes a point in time when the surface needs to be replaced. Not all of the components in a synthetic turf sports surface will necessarily need changing at the same time, but at some point, each will need to be replaced.

Synthetic turf sports surfaces have been in use now for over 50 years and for most of this time, when they needed changing, they have been lifted and disposed of in the most economical and convenient way. Often this has meant the surfaces ended up in landfill or being incinerated. Today, society is much more environmentally aware, and this is encouraging governments, policy makers and suppliers to look at new ways of doing business. Legislators are beginning to make policies which require that sustainability and full life cycle impacts are considered in procurement and supply chains.

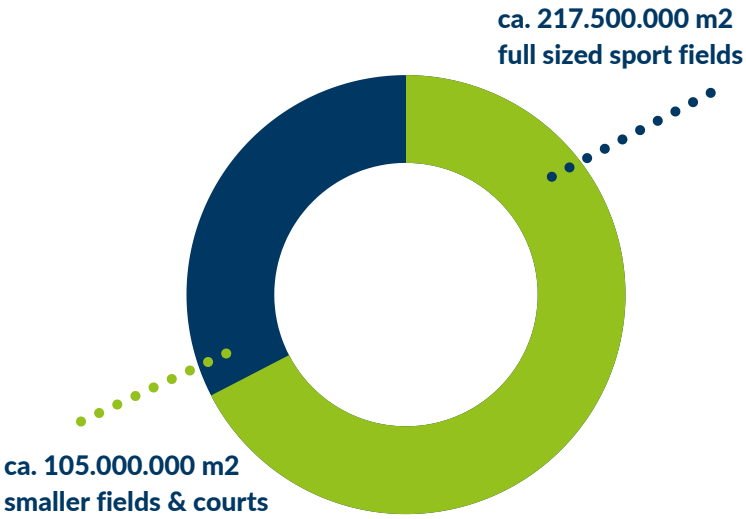
ESTC and its members endorse these trends and welcome the opportunities to innovate and develop the new technologies they create. Synthetic turf surfaces are typically expected to last for at least 10 years, but well-maintained fields and courts are often used for much longer. This means that today we are faced with disposing of surfaces that were developed and installed in the 2000s - at that time, future end of life disposal was not a major consideration for many when they bought a synthetic turf sports surface.

As the demand and need to dispose of end of life synthetic turf surfaces in an environmentally-sensitive way grows, ESTC members are making major investments in new technologies that are allowing the surfaces to be reprocessed in an environmentally-sustainable way for the first time. Recognising and wishing to encourage these developments, ESTC has produced this guide to assist everyone involved with the end of life disposal of synthetic turf sports fields. It highlights current options and best practice and gives an overview on the legal obligations that need to be considered before a surface is disposed of.

Alongside the use of synthetic turf surfaces for sports applications, there is a growing use of synthetic turf in the landscaping and recreational sectors. The market, often residential or commercial, and the square meterage used for each installation are very different to that used in the sports sector. This means that end of life disposal of these surfaces is handled in different ways. ESTC is currently producing guidance on the best ways to dispose of these forms of synthetic turf surfacing.

As the synthetic turf industry continues to respond to the environmental agenda, and introduces new and innovative products and processes, this guide will be kept under frequent review and updated editions will be published.

ESTIMATED SURFACE USED FOR SPORTS FIELDS AND COURTS



3 THE IMPORTANCE OF PROTECTING OUR PLANET

The United Nations, the European Union and leading national governments are all determined to protect our planet so that it can support the needs of present and future generations. Recognising this need, ESTC is delighted to be working with the European Commission to develop an industry-wide procedure to analyse the life cycle and environmental impact of synthetic turf sports surfaces.

From production of the raw materials from which the surfaces are made, through manufacturing of the surfaces, their installation, operation & maintenance, and finally end of life disposal, the Product Environmental Footprint Category Rules (PEFCR) being developed will become the standard by which all synthetic turf sports surfaces will be assessed.

A key component of the European approach to reducing human impact on the planet is the circular economy. This is a model of economic, social and environmental production and consumption that aims to build a sustainable society through the use of recyclable and sustainable resources. This requires design, production and consumption to be undertaken in a sustainable way. ESTC and its members fully support this concept and are now committing significant resources to developing new ways of manufacturing synthetic turf surfaces that can be more easily reused or recycled in the future.

4 TERMINOLOGY

Like many other sectors, the synthetic turf and waste disposal industries have developed a multitude of new terms and designations. For clarity, ESTC has adopted the following, which are used in this Guide:

END OF LIFE (EOL)	The point in time where the product is no longer able to fulfil the function for which it was designed.
WASTE	Any substance or object which the owner discards or is required to discard. In terms of a synthetic turf sports surface, this is normally when the surface or components reach the end of their life and they are lifted to enable replacement.
SYNTHETIC TURF SPORTS SURFACE	Sports surface comprised of a carpet of tufted, knitted or woven construction.
TURF	The synthetic turf carpet which comprises a number of components including: • Pile yarns typically made from polyethylene, polypropylene or nylon • Primary backing – a textile cloth through which the pile yarns are looped. The cloth may be made from polypropylene, polyester, polyethylene or a combination of these. It may also include a glass fibre reinforcement scrim • Secondary backing – a coating applied to the base of the primary backing to anchor the pile yarns in place. It may be manufactured from SBS latex, polyurethane, polyolefin or acrylics
SHORT PILE SYNTHETIC TURF* < 30 mm	A synthetic turf sports surface having a pile length of 30mm or less. The surfaces may be filled, dressed (partly filled) or be non-filled.
LONG PILE SYNTHETIC TURF* >30 mm	A synthetic turf sports surface having a pile length of more than 30mm in height. The surfaces are normally partly filled with a lower layer of stabilising infill and an upper layer of performance infill.

STABILISING INFILL* 	A granulate material (normally sand) used to provide weight and stability to the synthetic turf surface.
PERFORMANCE INFILL* 	A granulate material used in surfaces to help provide the playing characteristics required from the surface.
POLYMERIC INFILLS 	Performance infills made from rubbers or plastics or having polymeric coatings, including end of life tyre (ELT) granulate, EPDM rubber granulate, and thermo-plastic (TPE and TPV) elastomer granulate.
ORGANIC OR VEGETAL INFILLS 	Performance infills made from materials such as cork, coconut fibre, timber granulate, nut husk granulate, and olive stone granulate.
SHOCKPAD * 	Prefabricated rolls or tiles or in-situ laid underlays that are designed to contribute to the required sports performance characteristics.
REUSE 	A process where a product is turned into a new version of the same product (e.g. aluminium drinks cans into new aluminium drinks cans). This process is also known as primary or closed loop recycling.
RECYCLING 	The process of converting end of life (or waste) materials into new materials and products.
MECHANICAL RECYCLING 	The process that mechanically converts (cleaning, cutting, grinding, agglomeration, etc) EOL materials into new products. This is also known as open loop recycling.
CHEMICAL RECYCLING 	The process in which a polymer is chemically reduced to its original monomer form so that it can eventually be processed (repolymerized) and made into new plastic materials that go on to be new plastic products. This is also known as tertiary recycling.

REPURPOSING	Using the end of life product for a new or secondary purpose.
RECOVERY	End of life disposal options primarily based on incineration with energy recovery. These processes utilise the inherent energy stored in the materials, therefore reducing the consumption of virgin fuels.
DISPOSAL	A means of disposing of end of life product, which includes landfill or incineration without energy recovery.

* As specified in EN15330-1 Surfaces for sports areas - Synthetic turf and needle-punched surfaces primarily designed for outdoor use - Part 1: Specification for synthetic turf surfaces for football, hockey, rugby union training, tennis and multi-sports use

5 WHEN SHOULD YOU REPLACE YOUR SYNTHETIC TURF PLAYING SURFACE?

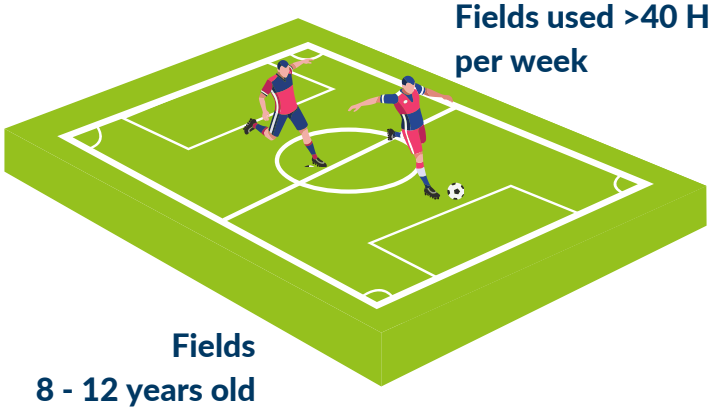
Deciding when your synthetic sports surface needs to be replaced is often a difficult decision for field owners. Different fields have to meet different requirements and player expectations, and what one facility will consider to be acceptable, another will find totally unacceptable.

Maximising the use of the field and extending its service life as far as possible ensures the facility is economically and environmentally sustainable. Ensuring the surface is suitably maintained throughout its life is key to achieving this objective, but there will come a point when the surface is no longer fit for purpose and needs replacing.

Inevitably, fields subject to high use, inadequate maintenance or harsh climatic conditions – especially exposure to stronger levels of UV radiation - will need replacing sooner.

Synthetic turf technology continues to improve, but the fields needing replacement today are likely to be between eight and twelve years old and have typically received around 40 hours use per week throughout their usable life.

WHEN TO REPLACE A FIELD?



FACTORS THAT WILL DETERMINE WHEN A SURFACE NEEDS REPLACING INCLUDE:

- An inability to satisfy the sporting and player safety criteria required for the facility. This might mean the surface is no longer able to comply with sport's governing body's standards and sporting regulations, or those detailed in EN 15330-1, which are often referenced in personal injury compensation claims resulting from injuries occurring on a synthetic turf sports field or court.
- Repeated and significant failures of carpet and line joints. Whilst localised failures can be repaired there will come a point when the severity and frequency of failures is not practical.
- Repeated tearing of the synthetic turf carpet, especially in the higher use areas of a field or court.
- Significant pile wear or tuft loss, leading to the primary backing of the turf being exposed
- A significant reduction in surface drainage that means water starts to stand on the playing surface. Whilst drainage issues can be partly rectified using rejuvenation processes, these are really only viable if the turf is still strong enough to withstand the process and has a long enough future life expectancy to justify the cost

With an increasing focus on protecting the environment, it is also important that wear and tear of the synthetic turf surface does not result in debris migrating from the surface into the surrounding environment. This is most likely to occur when the yarn forming the pile of the turf is allowed to weaken excessively due to weathering, or when excess infill lies on the surface and is not contained within the pile of the turf.

Sometimes, a synthetic turf sports surface will be lifted to enable it to be relocated and installed for continued use as a sports surface. A typical example is when a surface laid in a stadium is replaced and the old surface is transferred to a training or community field. Determining the suitability of a surface for lifting, transportation and reuse will always have to be determined on a case by case basis.

Factors that need to be considered include the ability of the relocated surface to provide satisfactory sporting characteristics, the condition of the surface – is it strong enough to be lifted, rolled, transported and relaid without significant damage; how many more years is the surface likely to perform adequately before it needs replacing – are the sustainability benefits of relocating significant enough to offset any environmental impact?

When it has been decided that a surface needs replacing there are an increasing number of options and solutions that need to be considered. This guide has been produced to help you make the best decisions and ensure your end of life surface is processed in the most sustainable way possible.

6 LEGAL CONSIDERATIONS

From a legal perspective, in most countries when an EOL synthetic turf surface is lifted for processing (in whatever form), it meets the definition of WASTE and needs to be treated accordingly.

Increasingly, disposal of waste is covered by legislation and the handling and processing of waste is tightly regulated. Strict rules and protocols need to be complied with and there are often severe penalties for those that do not comply.

As a general rule, the owner of an EOL synthetic turf surface has the sole responsibility to transfer ownership of the waste materials to a certified waste disposal company, and to then ensure that the field is properly disposed of.

This legal obligation cannot be transferred and has to be based on valid documentation which can be verified with the national enforcement or regulatory authorities. Failure to comply with these regulations can result in owners being heavily fined for non-compliance. Therefore, it is of the utmost importance that you choose a waste handling partner with a verified and proven process.

Within the European Union and United Kingdom, the Waste Framework Directive **(Directive 2008/98/EC)** applies. This sets out the basic concepts and definitions related to waste management, such as definitions of waste, recycling, recovery, etc. It explains when a product becomes waste, when waste can cease being classified as waste and becomes a secondary raw material, and how to distinguish between waste and by-products. The Directive lays down basic waste management principles:

It requires that waste be managed without endangering human health and harming the environment

Countries have interpreted the waste directive legislation in different ways. This makes the interpretation of local law and policies on handling, transportation and processing of EOL synthetic turf surface complex, meaning that a field owner should always take specialist advice when planning for the removal of an EOL synthetic turf surface. Outside of the European Union, an increasing number of countries are developing their own national waste management regulations, meaning that specialist advice also needs to be taken on a country by country basis.

A key part of the many waste framework regulations is the Waste Hierarchy. This aims to ensure that the management of waste is undertaken in as responsible and sustainable a way as possible. The waste hierarchy illustrates the various options available and ranks them according to what has the best outcomes for the environment. The hierarchy has five stages.

WASTE HIERARCHY

PREVENTION

Prevention is very much focused on forward planning and taking measures to stop an item from becoming waste in the future. As this guide is aimed at those wishing to remove an existing synthetic turf sports surface, they are faced with a product that was manufactured and produced many years ago, meaning prevention is not an option.

PREPARATION FOR USE

Preparation for reuse is the refurbishment of items to extend the period they can be used for the application they were designed. Reuse is considered a better option than recycling as it creates less pollution, reduced consumption of virgin materials and reduces waste, making it a more sustainable process. In terms of synthetic turf sports surfaces, shockpads and infill materials currently offer the greatest potential for re-use when a new synthetic turf surface is installed.

RECYCLING

Recycling is the most popular of the Waste Hierarchy stages; and in many cases is the best option for EOL synthetic turf surfaces. Recycling involves the conversion of EOL products into either new products intended for different applications, or materials that can be used to produce new products.

RECOVERY

Recovery describes waste-to-energy processes. It is primarily aimed at waste that cannot be recycled and has a high calorific value. The waste acts as a fuel source to allow energy generation. It is used in applications such as:

- **cement kilns, where the waste is used as a co-fuel in the manufacture of cement**
- **electricity production**
- **district or municipal central heating systems**

The main components of a synthetic turf surface have a calorific value similar to heating oils and therefore allow reduced consumption of virgin fuels.

DISPOSAL

Disposal is the process of last resort and should only be used for anything that cannot be reused, recycled or recovered. Disposal includes incineration (without energy recovery) and landfill. Today, in many countries the disposal of EOL synthetic turf and particularly performance infills, is prohibited. Additionally, where still allowed, disposal by landfill is progressively becoming more expensive. Disposal is very much the least desirable option for EOL synthetic turf surfaces and ESTC recommends that it should be avoided at all times.

Falling outside of the waste hierarchy because it is not addressing the final processing of a product, repurposing has become a common outlet for EOL synthetic turf surfaces. The surfaces are being sold for a multitude of secondary applications from lining golf bunkers to stabilising cattle walkways. Whilst this approach has the merit of extending the life of the product, it is also transferring responsibility for the final processing/disposal to others, and this often means the ability to recycle the materials is lost due to the much smaller volumes of material being available. ESTC does not endorse or recommend repurposing of synthetic turf surfaces or their components.

7 YOUR SYNTHETIC TURF WASTE PROCESSING OPTIONS

When removing a synthetic turf sports surface, you have two principal choices. Do you lift and move the EOL sports surface as one entity with any infill retained within the turf carpet, or do you separate the carpet and infill materials on site to ease handling and allow processing by different companies operating at different locations?

Transportation issues relating to moving EOL synthetic turf products are discussed in **Section 9** of this guide.

Irrespective of whether some initial processing takes place on site or everything is undertaken at the recycling facility, the main processes for each component are similar, and the various options and their environmental desirability are as described below.

7.1 SYNTHETIC TURF CARPETS

Synthetic turf carpets are made from a mixture of plastics and polymers and these materials represent a valuable source of mixed polymers for recycling. Various technologies to recover these have been developed or are under development.

The most common approach today is mechanical recycling; this basically consists of various processes including shredding, cleaning, agglomeration, extrusion and grading to recover the polymers. The quality of the recovered polymers is now of sufficient quality to allow them to be used in a range of products including:

- Sports fencing rebound boards and infill containment barriers for synthetic turf sports fields
- Leisure furniture
- Residential decking

Looking ahead, new technology is showing that mechanical recycling and agglomeration can be complemented with chemical treatments that produce polymers that are suited to applications such as landscaping and recreational turfs. Ultimately, industry hopes to be able to produce polymers of sufficient quality to be used in new sports turfs.

Chemical recycling is also gaining momentum due to its ability to treat plastics from various sources, meaning the processing plants are not dependant on a restricted supply chain. This technology basically breaks down the molecules in waste plastics into hydrocarbon oils, which can then be used as replacements for conventional fossil-based oils in the production of virgin polymers and plastics.

EOL RATINGS – OPTIONS FOR SYNTHETIC TURF

PROCESS		ENVIRONMENTAL RATING	AVAILABILITY
RECYCLING	MECHANICAL		Increasingly available in larger markets. These facilities also have capacity to handle surfaces transported from elsewhere in Europe
	CHEMICAL		New technology now starting to be introduced to the European market that should allow wider localised access to recycling facilities
RECOVERY			Readily available in many countries
DISPOSAL			Currently available but increasingly being restricted due to its poor environmental rating. Disposal should be considered as an option of last resort

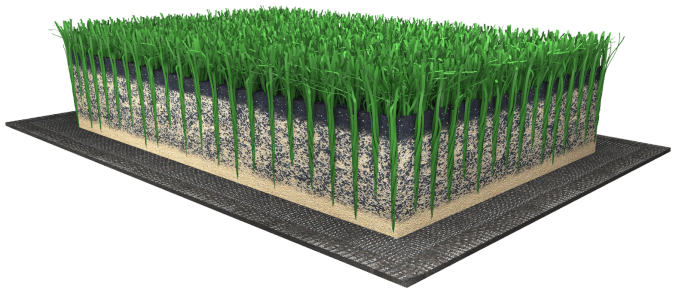
7.2 INFILLS

All infills within the pile of a synthetic turf will have become contaminated over time. This means the infill will always need to be processed or cleaned before being considered suitable for reuse. This means that between being lifted and processed the infill is still classified as 'waste'.

7.2.1 STABILISING INFILL

Many synthetic turf sports surfaces contain a stabilising infill. Some are partly filled whilst others are fully filled. The stabilising infill is normally a rounded sand and can comprise the highest weight component in the turf system (up to approximately 50%).

Stabilising infill is probably the simplest component in a synthetic turf surface to process for reuse. During the removal of the synthetic turf surface, the sand can be separated from the turf and/or the performance infill. The sand will have become contaminated with silt and detritus over the years. After cleaning, washing and sieving, the sand can be used again as a stabilising infill, or be recycled for other applications in the landscaping, construction & building industries or similar applications.



If the sand is to be reused as a stabilising infill it is very important that it is thoroughly checked to ensure the particle grading, shape and bulk density are still in accordance with the sports surface supplier's specification. Additionally, irrespective of the intended use, checks should be made to ensure the sand complies with all applicable national environmental criteria (zinc, heavy metal content, etc). Sampling of the stabilising infill for testing should be undertaken in accordance with European Standard EN 17409.

Testing should be undertaken using internationally recognised test methods such as:

EN 933-1	Tests for geometrical properties of aggregates — Part 1: Determination of particle size distribution
EN 14955	Surfaces for sports areas — Determination of composition and particle shape of unbound mineral surfaces for outdoor sports areas
EN 1097-3	Tests for mechanical and physical properties of aggregates — Part 3: Determination of loose bulk density and voids

EOL RATINGS – OPTIONS FOR STABILISING INFILLS

	ENVIRONMENTAL RATING	AVAILABILITY
PREPARE FOR REUSE (CLOSED LOOP RECYCLING)		**Increasingly available**
RECYCLE – PROCESSING FOR USE IN SECONDARY APPLICATIONS		
DISPOSAL	**Not considered necessary for these materials**	

7.2.2 NON-ORGANIC PERFORMANCE INFILL

Since the introduction of long pile synthetic turf surfaces, a performance infill has been added to the turf to improve playing characteristics and player safety.

Worldwide, end-of-life tyre (ELT) granulate is the most widely used performance infill. As the name states, this infill is a second life product that has been recycled from end-of-life car and truck tyres. This means that by the time a synthetic turf surface needs replacing the granulate may be 12 to 15 years old.

In addition to ELT granulate, a range of synthetic elastomers are also used as performance infills. These include EPDMs, and thermoplastic infill materials like TPE, TPS and PE. At the time they were produced (typically around eight to ten years ago) it would probably have been assumed that they would be replaced when the turf surface was changed, therefore it cannot be assumed they will have adequate technical properties for a similar period again.

In some markets, where the reuse of infill is more established, new and reclaimed material are blended together (e.g., 60:40 mix, etc) to reduce the risk of a premature performance failure in the future. Additionally, as more synthetic turf systems are utilising shockpads within their construction to provide some/most of the impact attenuation properties the sports surfaces need, the elasticity of the infill becomes less important.

The suitability of all of these different infill materials for reuse needs to be assessed on a site by site basis. All infill materials will deteriorate through their life and lose performance. Exposure to harsh climates, especially high ultraviolet radiation and heat, can adversely affect many rubber and plastic based materials.

At present, the European Standards Committee (CEN TC 217) responsible for establishing European Standards for sports surfaces, is developing a new standard for infill materials. This will specify how an infill material (new or recycled) should be tested and define the limits of acceptability. Until this work is completed it is difficult to give precise guidance on what tests should be undertaken as internationally recognised and verified test methods do not yet exist. Therefore, the following is recommended:

1. RECOVERED INFILL

Recovered infill materials should always be tested to verify compliance with European and national regulations on environmental and toxicology aspects (e.g., REACH, etc). Increasingly regulations are being introduced that control the chemical content of infills so that they are not a threat to human health or the environment. Many of these regulations. would not have applied when an existing field was installed, meaning that it cannot be assumed that the infill can automatically be removed from a surface, taken for processing (recycling) and used again as an infill material.

2. QUALITY & PERFORMANCE

The quality and performance of all recovered infill materials should always be approved by the synthetic turf surface producer before being reused. The synthetic turf surface producer has developed the quality requirements for each of the components used in their sports surface system and they should always have the final say on whether the recovered material can be used without affecting their warranty for the surface.

3. COMPLIANCE WITH EUROPEAN STANDARDS

The quality and performance of any recovered infill materials should comply with any recommendations made in European Standards or the quality standards issued by sports' governing bodies, etc for the performance of the surfaces on which their sports are played.

4. PERFORMANCE

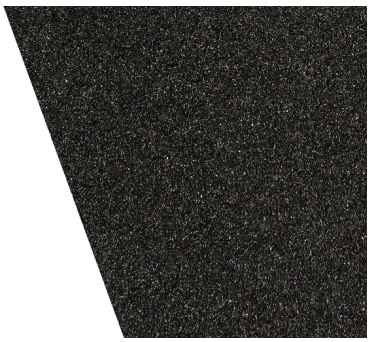
There needs to be certainty that the recovered infill materials will be able to perform as required for the life of the new synthetic turf surface, typically a further 10 years.

5. SAMPLING & TESTING

Sampling of the infills for testing and checking should be undertaken in accordance with European Standard EN 17409.

If, after testing, a performance infill is found to no longer be suitable for use in a synthetic turf sports surface, it can otherwise be used after processing, in a number of alternative applications including:

- prefabricated shockpads
- athletic track surfaces
- protective rubber tiles and flooring
- moulded rubber products
- carpet underlays
- applications in the road construction and building industries



Additionally, new technology developments like pyrolysis and chemical recycling are opening up new options to utilise these materials in a more beneficial way than energy recovery or disposal.

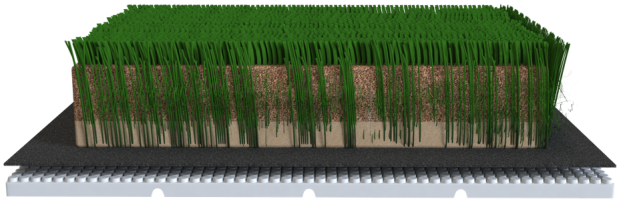
Finally, some performance infills, and especially ELT, have high calorific energy values and can be used as a fuel for incineration processes.

EOL RATINGS – OPTIONS FOR POLYMERIC INFILLS

		ENVIRONMENTAL RATING	AVAILABILITY
PREPARE FOR REUSE (CLOSED LOOP RECYCLING)			Increasingly available in larger markets
RECYCLING	MECHANICAL		
	CHEMICAL		New technology now starting to be introduced
RECOVERY			Readily available in many countries
DISPOSAL		Currently available but increasingly being restricted due to its poor environmental rating. Disposal should be considered as an option of last resort	

7.2.3 ORGANIC PERFORMANCE INFILL MATERIALS

Organic infill materials have become popular in the last few years. A number of different organic infill mixtures are available often containing cork, bark, coconut, nutshells, olive cores, etc. These organic mixtures are usually biodegradable and can be disposed of through composting, etc.



Some organic infills are blended with synthetic infills, meaning the rubbers and plastics need to be removed to ensure they do not become microplastic pollutants within the compost.

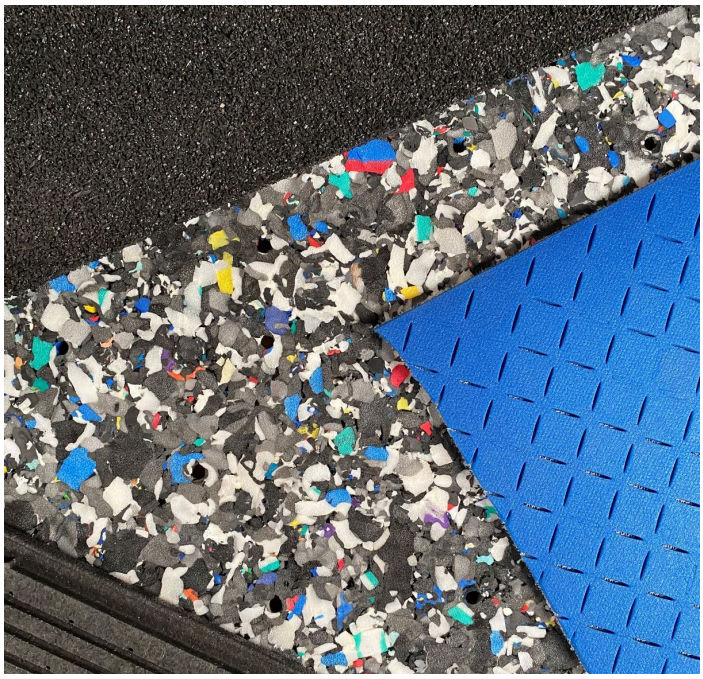
EOL RATINGS – OPTIONS FOR ORGANIC INFILLS			
		ENVIRONMENTAL RATING	AVAILABILITY
RECYCLE	COMPOSTING		Readily available in most countries
DISPOSAL		Not considered necessary for this material	

7.3 SHOCKPADS

Shockpads are either manufactured in-situ or in the factory.

In-situ shockpads are produced by mixing rubber granules (and occasionally blended with a small quantity of stone chippings) and a binder before the material is wet-laid onto the prepared base.

Prefabricated shockpads are produced in factories and then transported to the field. They can be made from a variety of materials including closed-cell polyethylene foams, open-cell polyurethane foams, expanded polypropylene beads, bound rubber granulate, etc. Prefabricated shockpads are supplied as rolls or tiles. All shockpads are produced in various thicknesses depending on their specific usage.



The quality of shockpads continues to improve, meaning those on the market today should be able to function adequately under at least two synthetic turf carpets (so typically 15 to 20 years). This has not always been the case, and the shockpads laid under turfs in the past might need replacing when the initial turf is replaced. At some point, however, all shockpads will need to be replaced, and currently the following options are available:

- In-situ rubber shockpads can be granulated to allow the rubber to be re-used, either in new shockpads or other applications such as playground safety surfaces, athletics tracks and moulded rubber products, etc.

- Polyethylene and polyurethane foam shockpads can also be shredded into foam chips that can be used to make new shockpads and other reconstituted foam products.

In some cases, the shockpad may have lost structural and performance characteristics, meaning it is unsuitable for re-use. In such cases the materials can be used for energy recovery through incineration. Looking ahead, chemical recycling will also create opportunities for these materials to be processed into hydro-carbon oils and waxes that can be used in the production of new polymers for use by industry.

EOL RATINGS – OPTIONS FOR SHOCKPADS

		ENVIRONMENTAL RATING	AVAILABILITY
RECYCLING	MECHANICAL		Increasingly available in larger markets
	CHEMICAL		New technology now starting to be introduced
RECOVERY			Available in some countries
DISPOSAL			Currently available but increasingly being restricted due to its poor environmental rating. Disposal should be considered as an option of last resort

If it is intended to retain a shockpad for further use it should be checked to ensure it will provide the necessary performance for a further eight plus years. This should include checks on:

- shock absorption and deformation (EN TS 16717) or (EN 14808, EN14809)
- tensile strength (EN 12230)
- dynamic fatigue (EN 17324)
- surface regularity (EN 13036-7)
- and water permeability (EN 12616).

Whilst some of these tests are made on the installed shockpad, others require samples to be taken from a field to the laboratory for testing. Assessments are normally made in a number of locations over a field to assess areas of high, medium and low use. As the tests and samples are made/taken directly on the shockpad it means that either the existing turf has to be cut and peeled back to expose the shockpad, or the tests are made when the carpet has been removed (but this can cause budgetary problems if a shockpad is found to be unexpectedly unsuitable for reuse).

EN TS 16717	Surface for sports areas. Method of test for the determination of shock absorption, vertical deformation and energy restitution using the advanced artificial athlete
EN 14808	Surfaces for sports areas. Determination of shock absorption
EN 14809	Surfaces for sports areas. Determination of vertical deformation
EN 12230	Surfaces for sports areas. Determination of tensile properties of synthetic sports surfaces
EN 17324	Surfaces for sports areas. Test method for the determination of the resistance to dynamic fatigue of shock pads and sports surfaces
EN 13036-7	Irregularity measurement of pavement courses: the straightedge test
EN 12616	Surfaces for sports areas. Determination of water permeability

8 SELECTING SUPPLIERS AND CONTRACTORS

As environmental awareness grows, this is creating commercial opportunities, and an increasing number of companies are entering the market offering waste handling and processing services. Not all companies work to the same professional standards, therefore in addition to complying with all legal requirements, it is important that checks are made to verify that the environmental credentials and benefits being offered are actually deliverable.

It is recommended that you check to ensure the waste handling process being offered by a company has been independently verified under a recognised environmental certification programme. These take two forms; some, which are the preferred option, are based on on-going (e.g. annual) independent audits. These include with:

- EN ISO 14034
- EN 15343

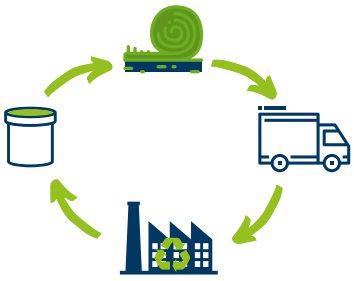
Others are based on a one-off audit of a process to verify its environmental credentials. Examples include:

- the European Union's Environmental Technology Verification (ETV) pilot programme
- the Plastics Recyclers Europe EuCertPlast programme, or equivalent.

In addition, it is recommended the company operates an environmental management system certified to EN ISO 14001 and a quality management system complying with EN ISO 9001 .

The leading European synthetic turf recycling companies are all members of ESTC, and their details can be found at www.estc.info.

Operating throughout Europe, these companies provide services which mean EOL synthetic turf fields can be processed in environmentally sustainable ways.



9 TRANSPORTATION

9.1 VEHICLE MOVEMENTS

To minimise the environmental impact of moving waste materials, the weight and proportions of the various components should be considered, and an assessment made as to whether it is preferable to separate the turf and infill materials on site (when local regulations allow) or ship them as one item to a recycling location for separation and processing.

There are pros and cons to both lifting and transporting filled rolls of turf for processing or removing the infill (when present) on site either for processing on site or transportation to a central processing plant. These include:

PROCESS	BENEFITS	DISADVANTAGES
CUT AND ROLL METHOD (turf cut into 2, or 4m wide strips and rolled up with infill still in carpet)	• Quick & cost effective (for this process step) • Equipment normally readily available locally	Heavy loads during pick up and handling process. This requires: • good site access • suitable base construction to field to prevent damage • larger site equipment to handle filled rolls
SEPARATION OF TURF AND INFILL ON SITE	• Individual components can be steered in different recycling streams and locations to minimise transportation • Possibility (where regulations allow) to process on site for reuse, eliminating transportation	• Slower process • Increased bureaucracy due to multiple waste permits, etc • Purity of on-site materials may be inferior to those produced in factory under more controlled conditions

The table below gives an indication of possible bulk figures based on average weights for transportation purposes, but in each case, the quantities need to be looked at individually:

		NON-FILLED HOCKEY TURF	SAND FILLED SYNTHETIC TURF	LONG PILE SYNTHETIC TURF	
				60mm PILE	40mm PILE
SYNTHETIC TURF CARPET		2.2kg/m²	2.2kg/m²	2.6kg/m²	1.5kg/m²
PERFORMANCE INFILL		NO INFILL	NO INFILL	18kg/m²	6kg/m²
STABILISING INFILL		NO INFILL	15kg/m²	18kg/m²	18kg/m²
SHOCKPAD	**15mm IN-SITU**	18kg/m²	18kg/m²	NO PAD	18kg/m²
	10mm FOAM	2kg/m²	2kg/m²		2kg/m²

Based on a full size field of 7000 m2, and depending on the make-up of the surfacing system, this will typically equate to the following number of (24 tonne) truck movements:

CARPET CONTAINING INFILL	13
CARPET ONLY	2
PERFORMANCE INFILL ONLY	5
STABILISING INFILL ONLY	6
SHOCKPAD ONLY	3

To minimise the risk of polymeric performance infills polluting the surrounding environment, all processing operations should either be undertaken within the confines of the field or in a designated area with suitable spillage containment barriers.

If carpet rolls are to be lifted and moved with the infill still in place, precautions should be taken to ensure that infill cannot spill out during movement and transportation. These should include:

- Wrapping/packing the rolls in reusable bags/sleeves (avoiding single use plastic packaging materials)
- Make use of closed trucks / containers
- Not using temporary storage sites where recycling/processing is in place
- Loading the turf rolls directly from the field in the trucks
- Always cleaning the area at the venue where any turf is placed before being lifted for transportation

9.2 CHAIN OF CUSTODY DOCUMENTATION

Generally, the following principles apply to the handling and processing of EOL synthetic turf. Legal and contractual responsibility for who is responsible for ensuring that each stage is completed will differ country to country, but the overriding responsibility for ensuring an EOL surface is disposed of correctly, will always remain with the owner of the facility from which it is being lifted.

1

EOL SYNTHETIC TURF SURFACE SCHEDULED TO BE LIFTED

Apply for Waste Transfer Note/Consignment Note. These are issued by the local environmental protection agency (EPA) or local governmental body responsible for waste regulations. It will describe the waste, producer of the waste and the disposal point. Within the European Union, a standard coding system is used to classify and describes the type of waste, these are known as European Waste Codes (EWC).

2

MOVEMENT OF EOL SYNTHETIC TURF SURFACE

Appoint a waste handling company to move the EOL synthetic turf surface. Ensure the waste handling company has the appropriate licence to transport the waste.

If the waste materials are to be transported across European borders, this needs to be done under a pre-approved European permit system involving all the countries through which the waste materials are being moved.

3

TEMPORARY STORAGE OF EOL SYNTHETIC TURF SURFACE PRIOR TO PROCESSING

If materials are temporarily stored at an intermediate location, ensure the location is licensed and has the correct waste permits to allow the storage of this form of waste. Ensure all subsequent movements of the waste are reported to the local regulatory body, so they know where the waste resides.

4

PROCESSING OF EOL SYNTHETIC TURF SURFACE WASTE

Ensure the company taking ownership of the waste material for processing has the appropriate certification and is licenced to act as a waste handling company for the processing of the specific type of waste that incorporates EOL synthetic turf surfaces.

To demonstrate and ensure compliance with the appropriate waste handling regulations, it is recommended that whenever an EOL synthetic turf surface is being lifted, a chain of custody document is established. Starting with the project owner, through the site contractor, waste management company, etc this document should identify the transfer of the waste materials from one organisation to another. The documentation should accompany every load of waste removed from a site and should identify the intended end of use option (i.e. to be reused recycled, recovered, etc).

10. FURTHER INFORMATION

We hope this Guide has been informative and will assist you in planning for the environmentally sympathetic disposal of your EOL synthetic turf sports surface. If you have any questions or require further information, please contact us at info@ESTC.info.

CASE STUDIES

In addition to the guide a series of case studies highlighting the various EOL processes offered by ESTC companies can be found on the **ESTC website (ESTC Knowledge Centre / EOL Processing).**

Historically, any synthetic turf surfaces have been made from a mix of different plastics, making recycling difficult. Today, ESTC members are increasing looking at ways to produce synthetic turf surfaces that can be fully recycled. This includes innovative ways of manufacturing the carpets and reducing or eliminating the use of infill materials. The trends will simplify EOL processing in the future and anyone purchasing a synthetic turf surface today is encouraged to ask challenging questions of their potential suppliers about how the surfaces being offered can be disposed of when they reach the end of their usable life.

ACKNOWLEDGEMENTS

The ESTC Guide to Processing End of Life Synthetic Turf Sports Surfaces has been prepared by the ESTC End of Use Task Group working group comprising:

ERIC O'DONNELL	SPORTS LABS (CHAIR)
DANIEL MULLER	BASF
ERIC VAN ROEKEL	GBN BV
STEFAN HOFMAN	GREENMATTER BV
PAUL FRASER	FIELDTURF TARKETT SAS
GERT-JAN KIEFT	KIWA ISA SPORT
MARKUS DEIMLING	PR RECYCLING GMBH
STEFAAN FLORQUIN	RE-MATCH
TOM BECK	SPORTS GROUP HOLDINGS GMBH
PIETER GEEURICKX	TOTAL
COLIN YOUNG	TENCATE GRASS
LUCA GIRELLI	TROCELLEN
ALASTAIR COX	ESTC
STEFAN DEDERICH	ESTC
NATASJA FAELENS	ESTC

Gratitude is extended to the following members whose comments and suggestions helped shaped the guide: Alastair Cox, Markus Deimling, Stefaan Florquin, Gert-Jan Kieft and Paul Fraser.

COPYRIGHT

European Synthetic Turf Council (EMEA). All Rights Reserved. No part of this document may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopy, recording or any information storage or retrieval system now known or to be invented, without permission in writing from the Synthetic Turf Council (EMEA), except by a reviewer who wishes to quote brief passages in a review written for inclusion in a magazine, newspaper or broadcast. The Synthetic Turf Council (EMEA) is a non-profit, educational organization and possesses all rights pertaining to this publication.

DISCLAIMER

A Guideline to End of Life Synthetic Turf Sports Surfaces (this "Document") provides options and guidelines (collectively, the "Guidelines") to consider when making choices whether and how to recycle, reuse, repurpose and/or remove the synthetic turf. The Guidelines, however, are not exhaustive and there is a range of possibilities that may need to be considered that are not covered in this Document. The Guidelines are not, and should not be considered as, standards. This Document does not imply, suggest or in any way guarantee that performance issues could not arise if any or all of the Guidelines are followed and does not imply or suggest that if any or all of the Guidelines are not followed that performance issues will arise.

PHOTOS CREDITS

ESTC would like to thank ESTC member companies, Stargum, Ekotrend and Brooks for images supplied.

CONTACT

40, rue Belliard,
B-1040 Brussels
Belgium

www.estc.info

info@estc.info

+32 2 880