

The
SMART GUIDE
to
SYNTHETIC SPORTS SURFACES
Volume 5: Maintenance of Synthetic Long Pile Turf



Acknowledgements

Smart Connection Consultancy is extremely grateful to the sport peak bodies, valued suppliers and manufacturers who have provided information, photographs and case studies for this Smart Guide to Synthetic Football Fields.

Without their support, we would not be able to achieve our goal to enhance the knowledge of the industry on synthetic sports turf fields. We would also like to thank our colleagues, clients and organisations that we have completed work for in the sports industry. It is your appetite for change and progress that makes our job so rewarding.

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ISBN: TBC

Disclaimer

Smart Connection Consultancy do not accept any liability for the accuracy of the information provided. All material and information that is provided from the third parties is done so in good faith to assist organisations understand the key issues around synthetic sports surfaces. We will continually update the Smart Guide to attempt to keep the industry updated.

About the Smart Guide to Synthetic Sports Surfaces

Smart Connection Consultancy is committed to sharing knowledge and learnings with the industry and has produced a number of volumes of the Smart Guide to Synthetic Sports Surfaces which can be downloaded free of charge from our website

www.smartconnection.net.au.

The volumes of the Smart Guide to Synthetic Sports Surfaces include:

- Volume 1: Surfaces and Standards (2019)
- Volume 2: Football Turf – Synthetic and Hybrid Technology (2019)
- Volume 3: Environmental and Sustainability Considerations (2019)
- Volume 4: Challenges, Perceptions and Reality (2019)
- Volume 5: Maintenance of Synthetic Long Pile Turf (2019)

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Welcome and Purpose

The popularity of synthetic sports surfaces used by many sports, local governments and within the education sector has significantly grown within the last two decades. Historically there was a perception that synthetic sports turf needed no maintenance and could also be played 24/7.

As users, owners and the general community are now aware, all surfaces need maintenance and synthetic sports fields need programmed and periodic maintenance linked to the type, the intensity and purpose of use, combined with the type of surface (e.g.; long grass (3G) or Hockey wet carpet etc.), and not forgetting the recommendations by the manufacturer.

By embracing a proactive and scheduled maintenance program the field should reach its expected life expectancy. Failure on the other hand can reduce its life expectancy by up to half of its life!

Smart Connection Consultancy is passionate about working with organisations that are keen to encourage their community to be more active. Sport is one of the vehicles to achieve this and provides many physical, social and health benefits.

Smart Connection Consultancy has embraced synthetic sports surfaces as a vehicle to promote and provide the community with opportunities to be more active more often.

When organisations invest in synthetic sports fields it is crucial that they invest in the Whole of Life (WOL) of the surface to maximise the possible increased patronage. This is achieved by having an appropriate maintenance strategy in place for the usage levels of the field and will maximise the Return on Investment for the synthetic field.

This Smart Guide aims to provide the reader generically with:

- An understanding of why maintenance is critical;
- What maintenance should be considered;
- The latest trends and thinking on maintenance approaches;
- Maintenance for specific surfaces; and
- Examples of a maintenance manual.

It is anticipated this Smart Guide Volume will assist your organisation achieve its goal to encourage more people, to play more often, on your fields and the fields due to effective maintenance. This document should be read with the manufacturers Maintenance Manual and Guide and should not be used to replace it.

1. Introduction

1.1. The Importance of Maintenance

Thousands of synthetic sports fields are installed globally annually. It is important to maximise the opportunity to achieve each field's life expectancy through effective maintenance. Short-term benefits of an appropriate maintenance program include:

- Enhanced playability – ensuring it can maintain the performance standards it was installed against;
- Aesthetically optimised appearance;
- Safety achieved and risk management mitigated; and
- Compliance with manufacturer's warranty requirements.

The Smart Guide to Synthetic Surfaces - Volume 5: Maintenance of Synthetic Long Pile Turf has been developed for the growing number of sports, education establishments, commercial operators and local governments who are installing synthetic sports fields for various sports and recreational facilities. It is expected these organisations may benefit from an enhanced understanding of why maintenance is important and what commitments should be made.

Although it is generally recognised that synthetic turf has a major advantage over natural turf in respect to the reduced level of maintenance and need for annual field rejuvenation, there is still a need for programmed routine and special maintenance activities.

When maintenance is not conducted by the field owners the life expectancy can be significantly reduced. Although no rigorous research can be found the authors, through their experience and with evidence from testing laboratories¹ and International

Federations² have provided input to the impacts of limited or no maintenance, including:

1. Unable to achieve recertification against sports performance standards;
2. Reduced life expectancy;
3. Increased safety concerns;
4. Dilapidation of product; and
5. Voiding of warrantee.

With most International Federations, performance standards maintenance manuals must be provided by the installer/manufacturer for the field to guide the owners on their roles and responsibilities for maintenance and upkeep. The manufacturer's manual will be linked with the manufacturer's warrantee, so if different verbal advice to reduce maintenance is received, it should only be accepted in writing otherwise the warrantee may be invalidated.



Photo 1: Turf not maintained adequately is showing the yarn is being bent over due to lack of infill and weeds are being allowed to grow

1.2. Benefits of Shockpads for Maintenance

In late 2014 The European Synthetic Turf Organisation (ESTO) produced a Research Paper, which stated³:

- *“When a Football Turf (World name for synthetic football field) system is regularly and adequately maintained all systems (with and without shock*

¹ Labosport International – National Synthetic Surface Conference – Alastair Cox, 2014

² FIFA – National Synthetic Surface Conference – Dr Eric Harrison, 2014

³ ESTO Shockpads Working Group: Information Update (11th Sept 2014)

*pad) did retain an acceptable level of performance;
and*

- *Within the range of tested samples, we see that the systems containing a high quality shock pad were likely to show less deterioration than the system without a shock pad in cases where the maintenance was not done correctly.”*

The members of the ESTO shockpad working group stated they strongly advise that:

“when there is the smallest doubt the maintenance will not be done at the necessary level, a serious consideration has to be made to use a system with a shock pad and thus to keep the performance at an acceptable level during the lifetime and to eliminate as much as possible safety risks (injuries)”.

This provides clarity around the debate on whether shockpads are critical or not. Therefore, we recommend shock pads for projects that have the following characteristics:

- The governing body of the sport encourages the use of shockpads;
- Where the participants could fall from heights such as Rugby Union and Australian Rules Football;
- Where there is any chance the level of maintenance may not be relative to the amount of usage on the field; and
- Where the field is in a public open space and likely to receive excessive and intense usage.

1.3. Key Principles of Maintenance

To optimise the balance between maintenance need and usage the following key principles are recommended:

1) Maintenance investment needs to be linked to usage of the fields;

The more usage a field receives, the more maintenance is required. The intensity of the usage may be around specific areas (e.g. goal mouths for Football, Scrum line for Rugby etc.) which may need more maintenance than the rest of the field.



Photo 2: The more usage the more maintenance is needed (Source: FFV)

2) Maintenance should focus on ensuring playability and performance

Lack of maintenance significantly impacts on the performance characteristics such as; ball speed, uneven roll of the ball, ball bounce and for the player; poorer grip on the surface and harder running due to compaction of the infill.



Photo 3: Organic infill displaced after rain, needs to be brushed to redistribute infill by using specialist machinery that can collect it and redistribute it accordingly. (Source: Smart Connection Consultancy)

3) Pre-Installation design

‘Hot spots’ are evident on any field and influence players or machinery in a way that increases the need for additional maintenance. This can be mitigated at the design stage and include:

- Player entry point(s) – with only a single entry point the field area will become very congested and infill compacted.
 - Suggest using a number of gates to dissipate the intensity of wear and tear
 - Consider hard wearing mats/mesh on the outside of the gate to reduce ‘soil’ being brought in and ‘infill’ being taken out. Make this area at least 2m x 2m



Photo 4: Player entry point at Victorian Council site (Source: Smart Connection Consultancy)

- Integration between synthetic and natural turf – try and have a concrete/asphalt pathway so that grass does not easily integrate into synthetic turf
- Machine entry points – consider reinforced base solution to ensure adequate access, possibly two gates to alternate entrance/egress of machinery
- Fences to assist security and reduce opportunist crime such as cars entering the field
- Cross-field pitches – for training/recreational games so that the high wear areas (e.g. goal mouths) are rested
- Rubbish bins outside fence – to alleviate excess rubbish entering the field of play
- Installation of boot cleaners close to entrance gates
- Warm-up Areas – off the field, so that there is no need to warm up on the field

4) Installation of field acceptance

As part of the installation there should be critical hold points (e.g. completion of pavement base) that is tested and achieves the required performance standards. On completion the field needs to be tested and pass the sports certification process. Failure to consider either of these stages may provide problems to the operator and no matter how much maintenance is invested; the field will never achieve the required performance standards.



Photo 5: No matter how well a field is maintained, if the design and pavement base is not appropriate, a quality field will not be created

5) Maintenance can only be achieved successfully with appropriate machinery and trained staff

The technology of the synthetic turf systems need appropriate machinery and trained staff, which is why many fields have the majority of the ‘machine maintenance’ aspects sub-contracted. See Section 4 for details of the equipment to use.

6) Maintenance plans should be specific to each field

A generic approach will not work and may need to be changed according to the season (summer – lighter use; winter – heavy use); the age group of use (e.g. primary, junior and senior); the sport; and the intensity. This will ensure that the scheduling of maintenance is specific to the fields’ needs and not just to suit the operator.



Photo 6: Maintenance between two different surfaces means that two different schedules or plans to ensure success are required

7) Clarity of responsibilities of maintenance

Roles and responsibilities between the owner, operator, home club and maintenance company need to be clearly defined so there is no ambiguity between any of the stakeholders.

8) Management actions on how the field is used will impact on maintenance needs

Management actions can increase the need for maintenance such as allowing all coaching to be conducted in the same spot all of the time, as opposed to rotating it to low-use areas. Other suggestions may include:

- Establish signage and training for local regular users on 'local rules' on how the field should be used;
- Do not use footwear that is not allowed;
- Do not use non-approved equipment on the fields e.g. stages, fireworks, tables and chairs etc.;
- Ensure each hiring 'cleans up' after usage; and
- No smoking on the field.

9) Annual Review of Field

Each year, preferably at the end of the heaviest season (e.g. winter) conduct a thorough review of the field. If possible, use an independent expert to assist the first time so that you know what you should be looking for

– typically by walking up and down the field every 5m, you should identify most problems.



Photo 7: Regular walking over the field will identify key maintenance and risk management issues

If problems are found early, they should be rectified quickly as part of any annual rejuvenation of the field.

This may include finding issues around:

- Compaction in high-wear areas;
- Seams coming apart;
- High-wear along lines (sometimes due to high UV on white lines);
- Trip hazards;
- Excessive loss of yarn from areas;
- Reduction/displacement of infill;
- Movement of base pavement; and
- Ponding of water not draining adequately.

10) Financial Investment appropriate to Life of Surface

The importance of continued financial investment into maintenance should not be compromised as this will only impact on the expected life of the fields.

11) Plan Ahead When Selecting the Synthetic Turf Product

The following should be considered when investing in synthetic long pile surfaces:

- High quality thicker pile yarns are significantly more resistant to pile splitting and flattening;

- Carpets with higher stitch rates are more resistant to pile flattening and infill dispersion; and
- Synthetic turf systems that incorporate shockpads or elastic layers generally suffer less from infill compaction than systems without.

Annual Review

To conduct an annual review of the field, walk the field, approximately every 5m apart and with a dozen passes, key issues should be identified.

We normally walk by sliding our shoes along, to enable the feel of anything under foot, work shoes are better than trainers.

What items to look for:

- Flattened grass in high wear areas;
- Seam joins parting and in need of re-sewing or regluing together;
- Trip hazards around penalty spots, corner flags or areas where high build-up of infill which has been displaced from middle of field;
- Compaction of infill;
- Additional wear areas, such as goal lines, white lines, goal box, etc.;
- Any defibrillation of yarn fibres in high wear areas such as goal mouths, line referees on side of field etc.; and
- Displacement of infill from high wear areas.

By taking a scaled drawing during the walk of the field, key issues can be identified and compared annually.

The drawing will also act as evidence to develop a strategy for any repairs or increased maintenance regime.

Smart Connection Consultancy can complete these on behalf of clients and ensure that the field can have the best chance of achieving its life expectancy.

SMG – MANUFACTURER OF MACHINES FOR THE INSTALLATION OF SYNTHETIC SPORTS SURFACES, MAINTENANCE AND RECLAMATION OF ARTIFICIAL TURF



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2. General Maintenance Considerations

2.1. Introduction

There are different kinds of long pile synthetic sports turf which require tailored maintenance. In particular around the length of the fibres ranging from 40 mm to 70 mm, whether they are monofilament, fibrillated, or combined. Most are filled with rubber infill, but some have sand or organic infill, thus specific guidance on maintenance, in writing, is always needed from the installer and manufacturer.

In addition, there are general considerations common to most surfaces, including:

2.2. Key Performance Issues

If the field needs to be maintained to certain performance criteria such as FIFA or World Rugby certification it is important to appreciate what impacts on that criteria and how the maintenance can enhance and keep the field playing to the performance standards. Table 1 provides a summary of the influences of the surfaces playing characteristics:

Table 1: Influences on Performance Criteria

| | Property | Carpet pile | Performance infill | Stabilising infill | Shockpad |
|-------------------|---------------------|-------------|--------------------|--------------------|----------|
| Player safety | Shock absorption | | ✓ | ✓ | ✓ |
| | Deformation | | ✓ | ✓ | ✓ |
| | Rotational friction | ✓ | ✓ | | |
| | Linear friction | ✓ | ✓ | | |
| | Skin friction | ✓ | ✓ | | |
| | Hic Test | | ✓ | ✓ | ✓ |
| Playing qualities | Ball rebound | ✓ | ✓ | ✓ | ✓ |
| | Ball roll | ✓ | ✓ | | |
| Construction | Water permeability | ✓ | ✓ | ✓ | ✓ |
| | Surface regularity | | ✓ | ✓ | ✓ |

The key issues that maintenance needs to address include:

- Pile flattening
- Infill dispersion
- Infill compaction
- Infill contamination
- Joint failures
- Algae and bacteria growth

2.3. Field Usage

It is important for a field owner to understand that certain activities, usage and other circumstances may impact the field's quality, wear and tear, appearance, warranty and performance. As the field becomes older, more emphasis on maintenance is required as the yarn may not have the same resilience or durability. If any doubt exists, the field builder should be consulted.



Photo 8: Intense training in one area, such as futsal or 5-a-side fields will need far more maintenance

The following are some of the suggested considerations for the field owner:

Usage of your field: It is anticipated the field will be a success with increasing demand. Remember that as the usage of the field increases the frequency of maintenance also required to increase the life expectancy of the playing surface. To reflect the actual usage patterns maintenance and sinking fund scheduling need to be adjusted.

Monitor the performance: Monitor your field throughout its life with periodic field testing and frequent inspections.

Type of activities: Certain activities may damage the synthetic turf such as:

- bicycle traffic, track and field events, golf activities, concerts;
- special events and activities should be reviewed with the field builder before the event occurs to ensure that damage is not prevalent;
- accidents, vandalism, spiked shoes, animals, wire brushes, fires, fireworks, floods;
- chemical reactions, the use of dry cleaning fluids or improper cleaning methods, high pressure sprays exceeding 500 psi, storage of heavy materials on the field, non-approved infill materials.

Consulting with a company that provides field maintenance may need to be considered.



Photo 9: Heavy wear area of penalty spot that needs replacing as dangerous trip hazard (Source: Smart Connection Consultancy)

Footwear — Suitable footwear should always be used. Metal spikes should be prohibited and cleats are

preferred. Flat-soled rubber shoes greatly intensify the wear and tear on the synthetic turf.

Use patterns — It is very important to spread the field use to various locations on the field to prevent uneven or accelerated wear in certain areas.

Vehicles – Do not park vehicles on the field, especially in the heat of the day, or leave vehicles on a wet or hot field for long periods of time. Engine exhausts should not be faced down toward the playing field, and a hot muffler or exhaust pipe should not touch the surface. Use lighter vehicles with Low Ground Pressure tyres with round edges to prevent rutting. Do not use cleated or traction tyres. Heavy vehicles (over 150kg) should have a maximum tyre pressure of 2.5 bar (35 psi).

Concert stages and other non-sporting uses, etc. – Stage or other set-ups for special events or activities, such as graduations, are normal. Proper field protection of the synthetic turf must be provided to prevent damage. Use plywood, interlocking plastic panels or similar weight distributing materials under all chairs and tables – consult the manufacturer or a field protection company.



Photo 10: Terraplas field protector as used at Wembley Stadium (Source: www.terraplas.com)

Use field protection that does not have a dimensional profile, e.g., corrugation, because the profile will transfer onto the turf and require heavy grooming to remove. It is imperative that no anchoring spikes, posts

or footing be driven into the turf. Once the field protection is removed, the area should be groomed and swept with a magnet to remove any misplaced or dropped nails, screws, etc.

2.4. Educate the Players

Educating the users of the field in good practice is important for the maintenance regime of the field. Encourage users to wear the correct footwear, not to drop litter, gum and nut shells on the surface, to report areas of low infill, split carpet joints, etc. Encourage users to consider the field is theirs and to treat it as if it was their responsibility.

- Do not allow users to wear boots with metal studs
- Do not allow users to wear bladed boots
- Do not allow users with flat soled trainers



Photo 11: Guidance for usage (Source: Alastair Cox Associates)

2.5. The Issue of Pile Flattening

The most common challenge facing field owners is that of pile flattening in high wear areas where there is insufficient levels to hold the yarn upright. The effects of this could include:

- Increased risk of skin burns → player dissatisfaction, infected wounds and compensation claims
- Low grip due to lack of stud penetration → player dissatisfaction and increased risk of injury
- Increased fibre wear and tuft lose

- Excessive ball roll → surface becomes too fast = biggest cause of FIFA Quality Certified field failures
- Inability to de-compact infill leading to loss of shock absorption, excessive ball bounce and reduced water permeability
- Glare – issue for TV and spectators in Stadia

The causes of pile flattening include:

- Concentrated play in high wear areas for a field
- Use of flat soled sports shoes
- Low quality pile yarns
- Inadequate maintenance

2.6. Routine Monitoring and Inspection

It is important that the field is walked regularly to ensure that any debris is removed, that there are no playing hazards any unknown issues are identified and assessed/repaired as appropriate. This should ideally be done daily.

When conducting a routine inspection emphasis should be on:

- Heavily used areas of the field, checking any displaced infill and redistributing or replacing the infill to the recommended depth;
- Any foreign debris on the field or surrounds that may impede play or spectators; and
- Any damage to the surface or equipment.



Photo 12: Example of seam becoming undone and can cause a trip hazard (Source: Alastair Cox Associates)

On a weekly basis the inspection should also check seams and joints as open joints/seams can quickly become a trip hazard. In addition, keep a close eye for algae invasion on un-filled pitches, especially in warmer climates.

2.7. Open Joints

Open joints can create a tripping hazard and should immediately be repaired - discuss with your field builder in advance of any self-repair techniques to see if they are recommended or may invalidate your warranty.



Photo 13: Seam has come apart, needs specialist to sew and or re-glue

Note that any open joints greater than 300mm in length should be reported to the field builder as they may indicate a larger scale defect.

Note any deteriorating grass fibre or infill conditions, visual or excess wear, drainage or performance concerns, etc. and report them to the maintenance company or the installer.

2.8. Debris Removal

A regular daily walk of the pitch will identify any foreign matter including twigs, leaves, rubbish, tape, gum etc. A leaf blower is normally a desirable addition to enable loose litter to be blown to one side of the field, but the operator needs to be experienced as to not damage the litter or blow away the infill. It can be collected with a plastic lawn brush/rake and removed. Alternatively, a

soft-sided drag mat can be used, preferably not a rubber one or one with any hard edges that could damage the tips of the yarn. Any organic matter, such as faeces, soil/mud and food should be removed by hand where possible and then washed away with warm/hot soap and water.



Photo 14: Poor design and installation means that additional maintenance and monitoring is needed

If allowed to remain on the surface for any length of time, debris will migrate into the system, inhibit drainage and cause infill compaction. This will impact on shock absorption, increasing risk to players; reduced foot grip which could cause foot injuries and unnatural playing conditions. Consider covering the field with pre-approved tarp when it is not in use.

2.9. Stain Removal

Most stains can be removed with hot water and soap (e.g. household detergent). If specific stains are left, the following recommendations are made:

- Blood/human tissue – use disinfectant (weak) to discard blood, faeces etc.;
- Oil – use a cloth with white spirit applied;
- Chewing gum – Make gum brittle with proprietary aerosol freezing the material and carefully remove. Ensure the yarn fibres are not broken at the same time. If the gum has spread across numerous fibres, peanut butter will soften and breakdown the gum so that it can be wiped off; and

- Weeds/seeds – Hand pick as soon as sighted.
Treatment with an annual herbicide may be needed if a constant supply of weeds is found.
Approval from supplier needs to be sought first.

2.10. Chemicals

The manufacturer/supplier will provide guidance on what chemicals should be used on synthetic grass, as they will appreciate acceptable concentration of the alkaline or acid compound nature.

Generally, any product that has an acid compound (i.e. pH less than 3), contains Halogens (e.g. chlorine, bromine etc.) sulphur or nitrogen are likely to react. In addition, any product that has oxidising characteristics, such as bleach, peroxide also has acidic characteristics when combined in the presence of water. To summarise:

- All products that are classified as ‘non-acidic’ or ‘non-oxidising’ should not cause a problem;
- Anything that contains “Halogens”, Acids or sulphur are unsuitable;
- Pesticides and weedkillers should be pH neutral and preferably organic; and
- Most detergents should be suitable (e.g. dishwashing liquid).

2.11. Treatment of Algae and Moss

In some environments, due to seasonal variations, shade, humidity, algae and moss can become established on the surface and can then penetrate the infill.

The treatment of algae, which is a natural occurrence, caused by humidity and is more prevalent on water-based hockey fields and organic infilled long grass or 3G fields in warmer climates. This is most common in pitches that are not cleared regularly and thoroughly. Usually the first sign is brown slippery patches appear.



Photo 15: Specialist machinery is becoming easily available in Australia for synthetic sports turf by specialist maintenance companies

As a preventative measure, talk to your maintenance operator or installer to identify an approved algae killer and to ensure that the right concentration is used. To prevent or protect any disease being spread (prophylaxis) it is recommended to program an annual (or appropriate schedule if more prevalent) dosage/spray. In water/organic based fields a dosage system can be added to the sprinkler/cannon systems.

Moss is normally found around the perimeter and other non-trafficked areas, especially if it has shade from trees, walls, building etc. The field suppliers will provide guidance on what local proprietary product should be used. The product should be oil-based.

If moss does not become established, it should be treated immediately to kill the spores and re-applied until eradicated completely. High pressure cleaning may be needed and should only be operated by qualified and experienced handlers.

Regular use, maintenance and an annual prophylactic application of moss-eradicator will render moss an unlikely occurrence.

2.12. Treatment of Weeds

Weeds are a natural expectation in open parkland, where airborne seeds can travel and establish. In organic infill systems these are most likely to establish, as the infill reflects their growing environment.

An even greater emphasis is required for regular monitoring and inspections of organic infill systems. Most weeds could be removed by hand and if brushed frequently will most probably be ‘uprooted’ through this process. Localised areas of weed seed infestation, such as expected in organic infill fields should have a regular weed-killer applied.



Photo 16: Weeds will grow vigorously if field not maintained

2.13. Maintain Proper Infill Levels from Dispersion

The correct amount of infill is vital to the safety of players and performance of the field; too low and turf pile will be damaged and wear more quickly. Too high and players will find the surface unstable with inadequate grip which can result in serious injuries (e.g. ankle and ACL injuries) due to low rotational resistance and poor foot grip. Also, if too low there will be reduced shock absorption which could lead to higher risk of injury.

The infill also helps keep the pile standing upright which gives the desired ball pace and reduces the risk of carpet burns occurring. Ask the field installer for the recommended infill levels.

Be aware that high use areas are prone to greater infill displacement. Infill may accumulate at the edges of a field. If so, clean the material prior to brushing back into

the main field. Higher stitch rates can assist with maintaining infill easier in high wear areas.

The preferred way to measure infill depth and consistency is to use an infill depth gauge or a nail and tape measure on a grid pattern.

Drag mats and brushes can help redistribute infill evenly.

2.14. Acceptable Footwear for Users

Some manufacturers and suppliers of long grass synthetic fields provide varied advice on the use of different types of footwear for synthetic fields. The UK’s peak body, The Chartered Institute for the Management of Sport and Physical Activity’s Guide Note: GNO11⁴, produced the following table and recommendations, which will impact positively on the maintenance needs of surfaces.

Table 2: Acceptable Footwear

| | Studs (Moulded) | Studs ≤15mm (Screw in) | Studs ≥15mm (Screw in) | Blades | Dimpled (e.g. Hockey) | Flat Soled (e.g. trainers) |
|-----------------------|--|---------------------------|---------------------------|--------|--------------------------|-------------------------------|
| 3G / Long Grass | ✓ | ✓ | ✓ | ✗ | ✗ | ✗ |
| Sand- dressed | ✗ | ✗ | ✗ | ✗ | ✓ | ✓ |
| Key: | ✓ = Acceptable ✗ = Not acceptable | | | | | |

Table 2 should be used to educate the user as part of the booking procedure and on notice boards, detailing acceptable and not acceptable footwear; e.g.:

- Do: wear boots with a moulded stud;
- Do not: wear bladed boots;
- Do not: wear boots with metal studs; and

⁴ Acceptable sporting footwear of users of synthetic sports surfaces (Dec 2013), CIMSPA

- Do not: wear flat soled trainers.

2.15. 'Playing In' a New Field

Due to the dynamic nature of the infill during the first 2-3 months the infill will be 'settling-in' between fibres and so it would not be normal to have it tested during this period. The best way of 'Playing In' the field is to use it continually, so that the infill settles down. During this time regular inspections and maintenance is required. There will likely be more displacement of infill than expected, this is normal. Brushing will correct this initial period, to ensure that the pile remains vertical after heavy use.

The Sports and Playing Contractors Association (SAPCA)⁵ state for long grass fields "during construction every effort is made to ensure even distribution of infill over the whole pitch". Experience shows however that increasing the frequency of grooming, in the early weeks is beneficial in creating the final playing surface.

If areas are found which are short of infill, it should be possible to brush infill from adjacent areas of surplus material, provided this is conducted within the first four weeks. If the under-filled areas are extensive or do not respond to this treatment the installer should be called immediately, to add more infill.

When the settling-in period is over the pitch has reached its optimum playing condition, the frequency of grooming can be reduced.

2.16. Playing Lines

Most of rectangular playing fields will have many of the straight permanent lines tufted into the design. Additional lines such as circular lines (e.g. centre circles etc.) are inlaid during the installation process. Indeed,

some shorter 'dotted' lines may also be inlaid during this process.

Lines that are inlaid during the installation process could have 'weak points' and if the adhesive is not working perfectly could come 'undone' and cause trip hazards. These lines should be monitored regularly and reported to the installer, as they may be covered under the warrantee.

Some white lines may show more wear than the rest of the field as in certain parts of the world the UV is so strong it impacts the white coloured yarn before the green colours. This needs to be checked annually, reported to the manufacturer and should be covered under warrantee. The actual play lines should be maintained as the rest of the field.



Photo 17: UV degradation of white lines in Melbourne Football field

2.17. Snow and Ice

Snow and ice are not harmful and commonly can be permitted to melt through. If snow is to be removed, brushes and wooden scrapers should be used to minimise any damage to the yarn. Rock salt and chemical de-icers should not be used as these will damage the yarn.

Generally, snow and ice should be left to melt and drain from the surface without assistance. At times, however, it is necessary to remove snow or ice to

⁵ Code of Practice for the Maintenance of Synthetic Sports Surfaces – April 2004, SAPCA

make the field playable for a scheduled event. The working principle for removing snow is to do so as near to game time as possible. This reduces the likelihood of new snow build-up and will reduce the risk of ice from cold winds whipping across a damp, newly cleared surface. Ice and wet snow removal is particularly difficult, it is important that measures are taken to prevent build-up.

Use only pneumatic tyres on the equipment used for the removal of ice and wet snow. If a snow plough is used, ensure the blade is guarded with PVC pipe and corner elbows or rubber tips, and the height is adjusted to leave 5-10mm of snow on the surface. This is to avoid surface damage.

The remaining snow should be left to melt in the sunlight as brushing the remaining snow may also remove the infill. Avoid using a cover on the field during freezing weather. Covers, unless vinyl or poly-coated, can freeze to the surface, and will be very difficult to remove.

In some cases, it may be necessary to use a weighted lawn roller over the field to break up ice. The broken ice can then be swept off the field. Generally, if the sun is out and the ice or frost is not excessive, it tends to melt rapidly, especially when players are on the field.

In Europe underground heating systems are now being installed for places where the fields may have frozen water held.



Photo 18: Regular maintenance with specialist machine, SMG's SportChamp

2.18. Event Management

Some clients many consider the technology as being able to host major events including concerts and market days, which could have a detrimental impact on the surface unless the right protection is in place.

With a significant number of people wearing daily shoes they could damage the yarn, or with heels cause problems for the wearer as they would sink into the performance infill.

It is suggested that a Turf Protection System (TPS) be used that allows both vehicles to be used on the surface as well as daily shoes. This normally means the TPS rests on the infill and not the yarn, thus not bending the yarn over as this would reduce the life expectancy.

3. FIFA Maintenance Research

3.1. Introduction

FIFA is committed to continuous improvement as part of the FIFA Quality Concept for Football Turf, and continually invests in research on how to improve the performance standards, durability, longevity of the turf, playability and management.

In 2013 FIFA conducted research on Maintenance of Football Turf⁶ where they assessed the effects of different maintenance machines on the synthetic Football Turfs in France. The fields had similar daily usage, located within the same region of France and exposed to similar environmental and climatic conditions, with an age of 3-9 years and two fields also had shockpads.

The aim of the testing was to test the fields prior to the maintenance procedure, immediately after and then one month later (after usual play). Each field was divided into four quadrants, with three different machines being used and the fourth quadrant maintained simply by a triangular brush or straight vertical brush. The basic machines used were:

- Combined heavy vertical brush with a steel spring tine rake attached behind;
- Oscillating brush system;
- Rotating brush system; and
- Triangular brush.

3.2. Key Performance Criteria Tested

Tests were undertaken against its performance criteria for Football Turf (2011)⁷, against key aspects of:

- Force Reduction
- Deformation
- Ball Rebound
- Ball Roll
- Rotational Resistance

3.3. Key Findings – Technical Results

1. FORCE REDUCTION

Force Reduction is a measure of the impact attenuation provided by the playing surface. It is measured using a mechanical simulation of the loading an athlete places on the surface when running. The peak impact force is measured and compared to the peak force measured on concrete. The value reported is the percentage reduction in the peak force, the higher the value the greater the percentage reduction compared to concrete.

| | | | |
|---|--|--|-----------|
| FIFA Quality: Performance Criteria | 55% - 70% | FIFA Quality PRO: Performance Criteria | 60% - 70% |
| What impacts this test? | Compaction and displacement of infill | | |
| What would cause this to fail? | Compaction of the infill within the synthetic turf Loss of infill within the synthetic turf Contamination of the infill within the synthetic turf | | |
| Average results: FIFA Quality | 55 – 60% | Average results: FIFA Quality PRO | 60 – 65% |
| Suggested maintenance needed to improve | Keeping infill levels topped up Removal of detritus before it becomes incorporated in the infill Periodic decompaction of infill through deep grooming | | |

⁶ FIFA Maintenance Research 2013 Results equipment suppliers: FIFA (17.12.2013)

⁷ FIFA Quality Program Manual (2011)

2. DEFORMATION

Deformation is a measure of the degree the playing surface deforms during the mechanical simulation of the loading an athlete places on the surface when running. The greater the reported value the greater the deformation. If a deformation is too great players will find the surface tiring and unstable and it may induce injuries. If the deformation is too low players will find the surface jarring when they run on it

| | | | |
|---|---|--|-----------|
| FIFA Quality: Performance Criteria | 4mm – 11mm | FIFA Quality PRO: Performance Criteria | 4mm – 9mm |
| What impacts this test? | The stiffness of the synthetic turf system | | |
| What would cause this to fail? | Incorrect infill depths – excessive infill will result in a very soft and unstable surface Compaction or low infill depths will cause the surface to stiffen | | |
| Average results: FIFA Quality | 6 – 8mm | Average results: FIFA Quality PRO | 5 – 8mm |
| Suggested maintenance needed to improve | Keep infill levels to correct depth and periodically decompact through deep grooming | | |

3. BALL REBOUND

Ensuring the ball bounces in a similar way to that found on a natural turf field is a very important aspect of gaining player acceptance of a synthetic turf field. The test measures how high the ball rebounds when dropped from a standard height onto the surface.

| | | | |
|------------------------------------|---|--|-------------|
| FIFA Quality: Performance Criteria | 0.6 – 1.0m | FIFA Quality PRO: Performance Criteria | 0.6 – 0.85m |
| What impacts this test? | Infill depth and compaction Pile resilience Hardness of layer beneath the synthetic turf – is there a shockpad? | | |
| What would cause this to fail? | Infill compaction Loss of infill depth Carpet pile flattening | | |

| | | | |
|---|--|-----------------------------------|--------------------------------|
| Average results: FIFA Quality | 0.9 – 1.1m (above 1.0m fails) | Average results: FIFA Quality PRO | 0.75 – 0.90 (above 0.85 fails) |
| Suggested maintenance needed to improve | Keep infill levels to correct depth and periodically decompact through deep grooming Brush surface to keep free pile standing upright | | |

4. BALL ROLL

This test measures the rolling resistance of speed of the surface. A ball is rolled down a standard ramp and the distance it rolls measured. Generally synthetic turf surfaces are considered to be too fast as the pile of the surface does not offer adequate resistance to the rolling ball. This means the players find it hard to adjust when moving from natural to synthetic turf surfaces.

| | | | |
|---|--|--|-----------------------------------|
| FIFA Quality: Performance Criteria | 4m – 10m (12m for retests) | FIFA Quality PRO: Performance Criteria | 4m – 8m (10m for re-tests) |
| What impacts this test? | The degree to which the free pile of the synthetic turf carpet is standing upright The thickness / stiffness of the pile yarn The density or number of tufts per unit area | | |
| What would cause this to fail? | Pile flattening – this test is normally the first to fall out of tolerance and is extremely sensitive to inadequate maintenance | | |
| Average results: FIFA Quality | 10m – 15m (above 12m is a failure) | Average results: FIFA Quality PRO | 8m – 11m (above 10m is a failure) |
| Suggested maintenance needed to improve | Regularly brush the surface to lift the carpet pile Periodically power brush to aid lifting the pile | | |

| | |
|--|---|
| | Do not allow the use of flat soles shoes Keep infill levels at the right depth – do not allow them to become too low |
|--|---|

5. ROTATIONAL RESISTANCE

This test is a measure of the grip the surface provides to the player. It is measured by measuring the torque required to cause a studded test foot to rotate. If the value is too high foot grip can be a problem resulting in ligament injuries. If it is too low players will find it hard to twist and turn without falling over.

| | | | |
|---|---|--|-------------------------------------|
| FIFA Quality: Performance Criteria | 25 – 50Nm | FIFA Quality PRO: Performance Criteria | 30 – 45Nm |
| What impacts this test? | The ability of the boot's studs to penetrate into the infill and the carpet's stitch rate – a more open carpet will result in less or inadequate resistance. A very dense carpet can result in excessive grip | | |
| What would cause this to fail? | Incorrect infill depth Pile flattening – can the boot's studs penetrate through the pile into the infill? Moisture – a surface holding water will potentially be slippery | | |
| Average results: FIFA Quality | 25 – 40Nm | Average results: FIFA Quality PRO | 35 – 50Nm (above 45Nm is a failure) |
| Suggested maintenance needed to improve | Keep the carpet's pile standing upright through regular brushing Keep the infill depths at the correct levels. | | |

3.4. Key Conclusion of Findings

FIFA identified the following conclusions⁸

1. Without the continued correct maintenance from the installation through the lifetime of the field it was not possible to ensure that the surfaces tested remained within the limits defined by the FIFA Quality

Programme (FQP) even after the use of more sophisticated maintenance techniques.

2. The use of the shockpads on these fields without maintenance but with significant usage could only guarantee certain characteristics of the FIFA Quality Programme. The most significant being the performance characteristics relating to impacts namely Force Reduction and Ball Rebound.

3. Four maintenance techniques were assessed, namely drag brush, drag brush/steel rake, rotating brush and oscillating brush. The most significant overall improvement on the various surfaces on Ball Roll was achieved with the oscillating brushes. The least effect albeit an improvement in Ball Roll was with a basic drag brush. However even with the oscillating brush it was not possible in the timeframe in which the machines operated to return all the fields to within the requirements of the FQP.

4. The changes to Force Reduction achieved by the maintenance techniques in general had only a marginal effect on the Force Reduction values recorded. There were no noticeable long-term effects from the maintenance techniques employed. It would therefore appear that the intensity of use and long-term lack of maintenance has a more pronounced effect on the loss of Force Reduction of the field than a singular use of a more sophisticated maintenance technique.

5. An overall decrease in Deformation immediately after maintenance would appear to imply that the techniques used are consolidating the infill for most of the systems. Less pronounced changes to Deformation appear to be associated with the two systems that had shockpads.

⁸ FIFA Maintenance Research 2013 Results equipment suppliers

6. Conversely a decrease in Energy Restitution after maintenance was recorded. Most of the systems suggest that the performance infill was less compacted and “looser” in structure resulting in a dissipation of the impacting force.

7. Significant changes to Ball Roll can be achieved by all the techniques; the most effective change was produced by the oscillating brush and the least by the triangular brush.



Photo 19: Least impact on Ball Roll was found on the Triangular Brush

The effects achieved are only sustainable if maintenance is continued on the fields as the evidence would indicate that the fields will return to their original condition if they continue to be neglected after a relatively short period of time. From the maintenance undertaken the presence of a shockpad would appear to have no specific effect on retaining Ball Roll over time. Ball Roll is a sensitive indicator to the condition of a Football Turf field and if the field is under-maintained and over-used this is one characteristic of the surface that will inevitably fall out of the limits of the FQP and it is not always possible to retrieve the correct level of performance even with advanced maintenance techniques.

8. When testing Ball Rebound those fields with high usage and little or no regular maintenance the fields tested with shockpads remained above the minimum

FQP requirement for all techniques. Certain specific techniques that raise the fibres, oscillating and rotating brushes and to a lesser extent rakes and drag brushes, can have a long-term effect on certain locations however the effect is not guaranteed for all locations without continued maintenance.

9. After the initial maintenance it would appear that in five of the fields the infill is being loosened and less resistance is experienced by the studs resulting in a reduction in torque and a lower value for Rotational Resistance. In two fields the infill has been loosened and the studs are likely penetrating into the sand layer and thus increasing the torque. The loosening is a temporary effect and after one month the numbers have increased again due to heavy usage and a lack of maintenance.



Photo 20: Setting the tines length to decompact a flat grass surface

4. The Equipment

The equipment needed to maintain synthetic surfaces is specialised and designed to complement the synthetic surface technology and the maintenance challenges that the technology may face. Some of the equipment can be attached to wide-wheeled tractors or ride-on machines, whilst others are specific machines for specific tasks. This section explores some of the equipment, what it is used for.

4.1. Inspection Tools

- **Free Pile Height Gauge**

Ensuring the pile of the synthetic turf surface is standing upright is important for sports such as football where the speed of the surface is controlled by the resistance the turf's pile offers to a rolling ball. In addition to other sports where carpet burns can occur if the pile is standing upright. As a result, players slide across the plastic pile and not through the mobile infill.

A simple way of checking if the pile is standing vertically is with a Free Pile Height Gauge.



Photo 21: Free Pile Height Gauge

- **Infill Depth Gauge**

Ensuring the correct depth of infill is present within the synthetic turf surface is essential if the correct levels of impact protection and ball response are to be provided by the surface.

A simple Infill Depth Gauge can be used by the Grounds Staff to check infill depths across a field.

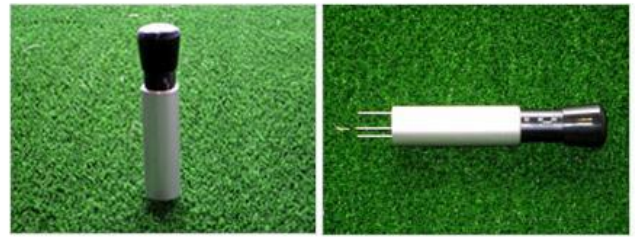


Photo 22: Infill Depth Gauge

4.2. Brushing Equipment

The pile of the synthetic turf will flatten through use, the degree this occurs will depend on the levels of use and types of footwear being worn by players. Lifting the pile is essential to retain optimum playing conditions.

Whilst there are many different types of brushes on the market, research has shown that oscillating brushes and rotating brushes are the most effective.

The main focus of brushing equipment is to ensure uniformity of the surface and in doing so brushes displace infill to the acceptable level.



Photo 23: Tines being used to decompact infill and redistribute infill

A number of designs are used with different degrees of effectiveness, including drag brushes, triangular in design; 'S' shaped and straight edged. Some designs are integrated with a complete cleaning machine;

others can be attached behind small tractors or garden machines.

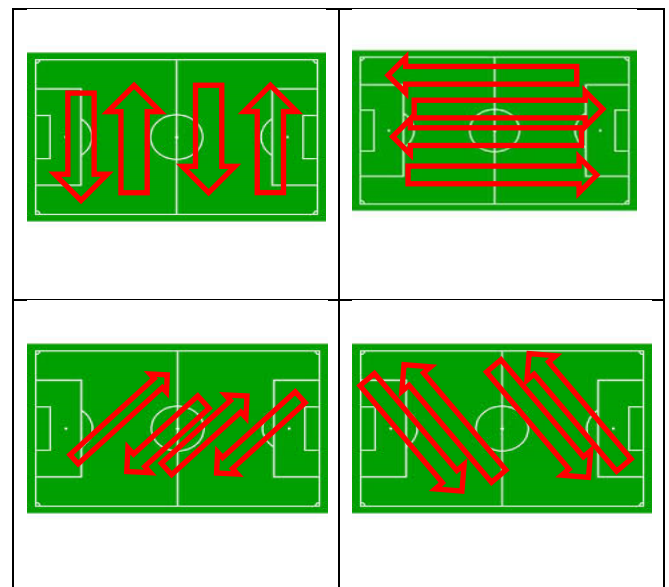
The brushes have a number of purposes:

- Uniformity of surface level of infill;
- Prevention of yarn lean or yarn flattening;
- Collection of larger pieces of debris/rubbish;
- Reduction of surface area of the yarn exposed to UV radiation;
- Utilisation of oscillating brushes which are becoming more common. They are hydraulically controlled and rotate forward and in reverse. These brushes are especially effective for raising the yarns. Emphasis of use would be in high wear and use areas of the field around the penalty spot, goal area, corner flags, centre circle, Ref side lines etc. A field should be walked first to ensure that the right kind of brushing is done for the right area; and
- Provision of a drag mat. A traditional way of redistributing infill that has been displaced is using either a drag mat, with many maintenance companies now finding the benefits of a power brush instead of the Drag Mat.
- Friction Sweeper - An alternative to a drag mat is the use of a Friction Sweeper, which is far softer than a drag mat and which can quickly be dragged behind a small machine over a field to pick up all organic matter, litter, and obstructions as opposed to just walking the field daily. A good option.



Photo 24: Friction Sweeper– Soft grass covered under-surface (source: Friction Sweepers International)

Brushing should be conducted in dry and not in wet weather. It is recommended that the field is groomed (brushed) in four directions each time as shown below to maximize the effectiveness of brushing. The Manufacturers Manual should guide the approach specific for each installation.



In addition, the oscillation brush should be used initially in high-wear areas in both a forward/reverse direction to get the fibres standing.

In some football codes such as Rugby League and Rugby Union where skin friction is more important than say Football (Soccer) the yarn needs to be vertically

standing so that the skin does not rub against the whole yarn, if folded over. Some manufacturers are developing the yarn so that it's soft, but thicker and can stand upright longer.

If you were having a game of Rugby Union of League than before the games at a weekend it may be worth considering using the Oscillating Brushes to ensure that the yarn is upright.

4.3. Power Brushing

Specialised machinery has now been designed and integrated machines are now available for users.

The majority of quality/suppliers offer this surface to their clients. The power-brushing have several purposes:

- Removes any contamination in the first 2-5mm of infill;
- Improves fibre and infill uniformity, with drag brush attachments;
- Provides oscillating brushing;
- Decompacts the infill by using a tine attachment; and
- Vacuums up impurities.



Photo 25: Power brushing machine

4.4. Vehicle Use on Field

Depending upon the base design, it would be expected that the field should be able to withstand the weight of a medium sized vehicle (e.g. Ambulance, Cherry Picker etc.). that said the way that the vehicles are driven on the field is important to the maintenance to the field, to reduce the risk of causing damage to the synthetic sports turf. The following recommendations are made:

- Ensure that the pavement base is designed to accommodate the weight of an ambulance, normally the load bearing pressure of 480kpa;
- Vehicles to be fitted with the pneumatic rubber tyres as normal road tyres will most likely damage the surfaces and base;
- Turning of the wheels should NOT be started while the vehicle is in a static position, as this will both displace the infill and can rip the yarn out of the backing;
- Turning of the vehicle should be on a wide radius;
- Drive at a constant slow speed, avoiding heavy breaking, sudden acceleration and spinning of the wheels
- Ensure that the vehicle wheels are clean before they enter the field of play, so that no organic matter is transported onto the field.; and
- Check that there is no leaks of oil or hydraulic fluid before the vehicle enters the field of play.

4.5. Vehicle Leaks and Spills

Prevent leaks or spills by checking equipment and its components thoroughly before use on turf; do not fill fuels, oils, fluids while equipment is on the field. Wipe any excess grease from any/all fittings. Petroleum-based spills can damage the synthetic turf.

Use only the newer biodegradable forms of Hydraulic fluid, if available for your equipment – do not use

petroleum-based fluids. Check with the equipment manufacturer to verify if biodegradable fluid is compatible with the equipment and its warranty. If a leak occurs when using petroleum-based fluids it is important to minimise the damage by stopping and capturing as much fluid as possible. If it leaks on the turf, use spill leak towels to soak up the majority of the fluid. Vacuum the infill in the affected area and use a solution of household dishwashing liquid and water to break down and clean any remaining fluid from the turf. Once the turf is clean, a new infill will be required to install.

Do not refuel equipment while it is on the synthetic turf; do not overfill as newer equipment has an overflow tube that drains directly under the equipment and onto the ground. Use a catch pan while filling to prevent accidental spillage.

Use grease sparingly and wipe any excess off all fittings, bearings, chains, etc.

4.6. Spare Performance Infill

The performance infill (normally some form of rubber granules) will be dislodged from the surface, especially in high use areas such as penalty and corner spots. These areas should be topped up to their optimum depth as and when required. Infill needs to be left on site at handover for ongoing top ups and the site needs to allow for suitable storage of it on site – 3 Tonnes is the amount recommended at handover of a standard pitch football field (8,500m²) these days. It is sometimes hard to get the virgin rubbers so keep them on site to allow the maintenance company and club to have access to the top up material.

There will be a need to do a significant top up at some point in the field's life and the associated costs – 5-10 Tonnes at about 4-5 years has been the experience of

one of Australia's leading companies experience to date. Sometimes sooner on fields that are not well maintained, and field owners need to be prepared for this need.

4.7. Boot Cleaners and Entrance Mats

Minimise the risk of dirt and contaminants entering the playing surface by providing boot a cleaning kit as below, for players to use as they approach the field.

Consider access ways – where possible prevent players from walking across dirt or grass areas to reach an entrance gate.



4.8. Goal Posts and Maintenance

Consider Sporting Equipment that is on the field e.g. – on soccer fields the main goals should be a hinged system, so you can fold up the net and groom behind easily.

Temporary goals are important for the game and skill development but the weighted bags that are needed to ensure that they don't topple over are normally sandbags (filled with sand or other heavy contents). These should be put away at the end of each session off the field of play to ensure that the bags do not split and contaminate the infill flatten the yarn.

5. Maintenance for Long Turf

5.1. Introduction

Maintenance can be scheduled into a seasonal or annual program linked to usage, with regular maintenance (suggest one hour) linked to every 10 hours of play. It is recommended by some commercial operators⁹ to have two to three hours maintenance weekly for every 30 hours use for long (3G) grass usage. Although FIFA suggest weekly¹⁰, our view is that it needs to be linked to:

- The level of use per week;
- The type of usage (e.g. adult, junior);
- Intensity of the area used (e.g. 5-a-side needs more than 11-a-side); and
- The type of sport activity (e.g. Rugby scrums will impact surface displacement).

5.2. Initial Maintenance and Settling In Period

After the field is handed over from the installer / builder the infill needs approximately 40 hours of play to 'settle the system in'. This normally allows the infill to be firmed up and reduce in height as it receives a gentle compaction with the initial usage. Many clients invite the local school children to play on it for a few days to get the feet running over it.

This many mean that the initial look of the fields may look a little overfilled on handover, but with the initial usage this should settle down accordingly. The independent Test Institute shouldn't come and test until after this 'settling in period' to ensure that the test results are more accurate.

A handover meeting on the field attended by all stakeholders is critical, it allows a Q&A session + a

maintenance demonstration + public agreement on who will be responsible for what.

5.3. Routine Maintenance

Whatever the circumstances, a regular monitoring inspection will identify the routine needed for each specific field. Table 2 provides some guidelines.

Table 2: Guidelines for Maintenance

| Suggested Routine Tasks | Playing Hours Per Week | | |
|------------------------------------|------------------------|----------------------|-----------------------|
| | <20hrs | 20-40hrs | ≥40hrs |
| Pitch inspection monitoring | Daily | Daily | Daily |
| Litter removal | Daily | Daily | Daily |
| Refilling high-wear areas | Weekly | Weekly | 2-3 times a week** |
| Drag brushing heavily used areas | Monthly | Fortnightly | Weekly |
| Rotating Brush – high-wear areas | Quarterly | Monthly | Weekly to Fortnightly |
| Osculating Brush – high wear areas | Quarterly | Monthly or as needed | Monthly or as needed |
| Rotating Brush – whole pitch | Six monthly | Quarterly | Monthly or as needed |
| Weed/moss/algae treatment | Annually | Annually | Annually |
| Seams inspection | 2 weeks | 2 weeks | 2 weeks |
| Surface de-compaction | Six monthly | Six monthly | Quarterly |

** we would strongly recommend that after heavy use, e.g. training or end of matches that the high wear areas are topped up and brushed in

5.4. Daily Maintenance and Monitoring Checks

Prevention is the best science to prolong the life of a field. This starts each day when someone should walk the field of play to ensure that it is safe for the next user

⁹ Long Pile Synthetic Sporting Surfaces Maintenance Manual (2014) - Grassports

¹⁰ FIFA Maintenance Guide (FIFA Maintenance Portal – sourced Nov 2014)

and identify any simple maintenance rectifications needed (e.g. penalty spot top up)

Either ground staff or a club representative should walk the field and maintain the surface, including:

- Removing any sharp objects from the surface, e.g. glass, syringes, metal, plastics etc.
- Remove large pieces of organic matter e.g. twigs, spoil by the gates etc.
- Top-up areas around penalty area, corner flags, line out areas with performance infill and sand
- Check the equipment – such as the goalposts, nets, interchange boxes ensuring that equipment is safe and not damaged

When applying ‘top-up’ infill it is suggested that the applicator should use a medium stiff brush or general plastic leaf rake, to agitate the yarn before sowing the infill into the carpet, then rake over and then sow again evening in the depleted area. Gently do this enough times until the infill stands slightly proud of the rest of the infill around it. The walk across it a few times to softly compact it until it’s the same level as its surrounding infill. Then lastly apply the soft brush to bring the fibres upright again.

5.5. Groom the Surface

Regular brushing is an important function that must not be overlooked or neglected. Brushing helps to maintain uniform infill levels, keep the grass fibres upright, remove debris, and improve the field appearance.



Photo 26: Brushes towed behind small tractor machine is better than a drag mat

Conversely, the flattening of grass fibres will increase the pace of the surface consequently the field no longer plays like a natural turf field, increases the risk of carpet burns when players slide on flattened pile, and can create a possible acceleration of wearing of the playing surface, thus shortening its life.

Use only synthetic fibre bristles of recommended stiffness. Do not use metal or wire bristles. Ensure the bristles are set to the correct depth so they do not:

- Snag the pile tufts and pull them out of the carpet backing;
- Tear the backing of the synthetic turf carpet; and
- Pull the stabilising sand layer from the bottom of the infill to the surface.

The brushes can be mounted to specialist plant or behind a general tractor (or mini-tractor) unit. To avoid the risk of contaminating the playing surface the tractor should only be used on synthetic turf surfaces. The use of six-wheel vehicles is not recommended.

Do not use maintenance equipment before receiving proper use and safety training. Use equipment and vehicles that are approved by the field builder.

Frequency: Ask your manufacturer for the recommended grooming frequency. In general, the frequency will be related to the intensity of use;

however, excessive brushing can cause fibre damage which over time will compromise the field's performance characteristics and longevity.

Method: An average all-purpose vehicle that brushes a standard sized football field will take about an hour and a half. The vehicle speed should be low and sharp turns must be avoided.

Direction of Brushing: The surface should be brushed in a number of directions, alternating the direction for each maintenance programme, but generally in the direction of the individual panels to avoid crossing over the main seams. On different days, start at different locations so as to alternate the brushing direction for each panel (see Section 2).

Brush Height Setting: The optimum brush height setting will depend on the model and type of equipment. Do not set the brush so low that it digs into the turf pile or backing. Too low a setting can damage the turf, the seams and disturb the infill.



Photo 27: Modern machine providing height options for the Tines to be used into the turf by an experienced operator

Time: It will typically take around two hours to thoroughly walk and check the field and then groom a full-size football / rugby field.

5.6. Scheduled Maintenance

Over the life of the synthetic turf system, the system may need further scheduled maintenance and remediation. The 'tell-tale signs' of this may include

the following points and may be noticed more frequently in the regular monitoring inspections:



Photo 28: Vandalism can entail a whole section being cut out and replaced

- Yarn becoming significantly bent, flattened and not standing upright;
- Playing surface becoming hardened and more compacted;
- Dirt and debris accumulating within the infill and between the yarn, despite the routine maintenance being performed;
- Seams are becoming loose; and
- Infill levels are becoming more uneven and stay in this position for a longer period.



Photo 29: The yarn has been exposed to UV and the tips are breaking down and covering the maintenance machine

These are signs that specialist work needs to be performed and may include:

- Professional field inspections – development of a corrective action plan that identifies the effect and the cause, with strategies to address the problems;
- Decompaction of infill – using specialised equipment (e.g. SMG SportChamp) designed to decompact the infill, which will assist with playing performance of the system with the ball and the player's boots;
- Major rejuvenation – measuring the infill depth against the supplier's recommendations and then redistributing or 'topping-up' in key areas;
- Deep cleaning – using specialist equipment to brush and vacuum the contaminants from the infill; and
- Removal and reinstallation – if the field has become significantly impacted, specialist machines can remove key amounts of infill, clean and then replace it by removing embedded contaminants and decompacting the system, thus improving performance and drainage.

Metal Removal

Use a magnet attached to the maintenance equipment to remove ferrous metal objects from the field.



Photo 30: Machinery including the metal magnet at rear

5.7. Replacement of Higher Wear Areas

High wear areas (penalty spots and corner markings are likely to wear more rapidly than the surrounding field); especially if infill levels are not regularly topped up. If left unattended, these areas will eventually tear and become a safety hazard to players.

Localised patching can be conducted when these areas show signs of significant wear. To reduce the rate of wearing, consider using a reinforced carpet panel. To minimise colour differences, it is suggested samples of carpet for patching be obtained when the field is initially laid.



Photo 31: Replacement penalty spot due to excessive wear

5.8. Static Electricity

In hot dry conditions, static electricity can cause the infill to stick to the pile yarns and increase infill migration. Surfactants like liquid laundry fabric softeners can be applied to the surface to reduce static electricity.

5.9. Micro-Plastics

Micro-plastics (infill migration and now fibre wear) is receiving increasing media and political attention in Europe. Much of this is due to poor maintenance practices when moving snow, but equally migration through dispersion on clothing, flooding, etc. is a cause.

The latest consultant's report¹¹ prepared by the EU states that 72,000 tons of infill are dispersed annually through Europe.

In Australia we have seen several strategies being recommended to reduce the breakdown of the fibre and loss of the infill including:

- Grates and carpets at the entry and exit points around the field of play to reduce the level of infill leaving the field
- Basket strainers pre the storm water exits to capture any movement
- Using soft drag mats as on older fields the UV component mix isn't as high, and the tips of the yarn have been slowly damaged and broken with the heavy rubber ones
- Increased UV testing for the yarn in Australia

5.10. Maintenance Log

The Maintenance Log should be provided by the Field Supplier and is normally linked to the Warranty of the field, which means that completion of this Log Book is critical, not only when you first receive the field but for every day, week and month until the field is replaced. It is also a condition of the FIFA certification program and it is good practice to show that the field is being maintained.

Typically, a Log Book would record this following information, and a more sophisticated form and report can be seen in Figure 1 opposite:

| Synthetic turf field maintenance log | | | | |
|--------------------------------------|---------------|----------------|---|----------|
| Usage | | | Maintenance | |
| Date | Hours of play | No. of players | Maintenance activity | Operator |
| 12/6/13 | 4 | 22 | Field inspection, localised infill top up | GW |
| 13/6/13 | 6 | 3 x 16 | | |
| 14/6/14 | 7 | 3 x 16 | Field inspection, localised infill top up & grooming and drag mat | FS |
| 15/6/14 | 5 | 22 | | |
| 16/6/14 | 4 | 3 x 16 | Field inspection, localised infill top up | GW |
| 17/6/14 | 7 | 2 x 16 | | |
| 18/6/14 | 6 | 3 x 16 | Field inspection, localised infill top up & grooming and drag mat | GW |

Smart Synthetic Sports Field Inspection and Maintenance Report

| Field & Client Details: | | | |
|---|--|-------------------------------|--|
| Name of field | | | |
| Address of field | | | |
| Client organisation | | | |
| Client contact | | Contact Tel | |
| Date of visit | | Time of visit | |
| Notes re field | | | |
| Contractor Details | | | |
| Contractor org. name | | | |
| Operators name | | Operators Tel | |
| | | | |
| | | | |
| Inspection Details | | | |
| Outstanding issues | | | |
| Condition of field on arrival | | | |
| Details of maintenance carried out | | | |
| Key Findings (Write findings against each category) | | | |
| Surface | | Contaminants / rubbish | |
| Infill | | Penalty spot/ high wear areas | |
| Seams | | Hazards | |
| Gates/fencing | | Sports equipment | |
| Rectifications recommended | | | |
| 1 | | | |
| 2 | | | |
| 3 | | | |
| 4 | | | |
| 5 | | | |
| 6 | | | |
| Impacts if rectifications are not followed? | | | |
| Contractor signed | | Client signed/dated | |

¹¹ Swedish sources and pathways for microplastics to the marine environment A review of existing data (Kerstin Magnusson, Karin Eliasson,

Anna Fråne, Kalle Haikonen, Johan Hultén, Mikael Olshammar, Johanna Stadmark, Anais Voisin; March 2017)

Smart Connection Consultancy

Smart Connection Consultancy offers an innovative approach that delivers outcomes to enhance the experience of participation in physical activity, recreation and sport in local communities.

We specialise in the planning, development, management and procurement of synthetic sports surface technology. We see this technology as complementing natural grass and encouraging more people to be active, play and achieve success in sport because of its extended durability.

By embracing the skills sets and knowledge of our collaborative consultants, we can provide an integrated and holistic approach to our client's projects.

Smart Connection Consultancy is the Technical Consultants for the Rugby Australia, Football Federation Australia, the National Rugby League and sits on the AFL technical committee.

"Smart Connection Consultancy has been an invaluable source of information for both the federation and our affiliated clubs. Martin specifically has responded to requests at short notice, provided valuable insights and produced quality pieces of work that have allowed the football community to achieve deadlines and desired outcomes – we will certainly be using him again".

Chris Brophy, CFO/Business Support Manager – Football Victoria

Field of Expertise

In collaboration with industry experts, we provide our clients with high level quality service that is offered for a very affordable investment.

We work with synthetic and natural surfaces for the following sports facilities:

- Australian Rules Football Ovals

- Athletics Tracks
- Bowling Greens
- Cricket Fields and Wickets
- Football (11-a-side, Futsal and 5-a-side)
- Golf Courses
- Hockey Fields
- Multi-sports Areas
- Rugby Union Fields
- Rugby League Fields
- Tennis Facilities

Commitment to Knowledge Building

We are committed to providing leading edge advice and knowledge so that the industry and our clients can appreciate how synthetic sports turf can complement their natural turf options.



Photo 32: Martin Sheppard hosting an industry seminar in Kingston

We offer the industry and our client's advice, mentoring and knowledge sharing so they can contextualise the opportunity and strategically consider options. Our approach provides rigor and we use independent research as a base to ensure that the most appropriate options are determined.

These services include:

- Knowledge sharing master classes April/May 2015 (Brisbane, Perth, Melbourne and Sydney)
- Planning and facility development workshops
- Business case workshops linked to Whole of Life Asset management costing strategies and income generation strategies

- Sports participation growth strategies linked to synthetic surfaces
- Synthetic field installation tours - Practical reality
- National Synthetic Surfaces Conference and Expo 2013, 2014 and 2016
- International European Study Tour 2015

Feasibility and Funding Advice and Solutions

Completing a Business Case to justify the need of a synthetic surface can be streamlined by using our *Smart Whole of Life Costing Model*. We support clients in developing financial strategies, funding applications and where applicable offer funding packages with major financial institutes. Our offering includes:

- Financial strategy development to address WOL costings
- Funding applications for government grants
- Funding solutions with major lending institutes

We understand the use of supply modelling by using demographics of the local community, the needs and the opportunities for activating and retaining them in active recreation and sport which is paramount for a Feasibility Study or Business Case.

Our supply and demand modelling is critical in determining the needs for sports facilities, including:

- Supply and demand analysis
- Community consultation options

Masterplanning and Design Solutions

We will work with you in exploring the site parameters and constraints together with the opportunities to ascertain the best design and management options for your park or venue.

Smart Connection Consultancy has been collaborating with SportEng since 20016 to provide the civil

engineering aspect of each design and procurement project. Our collaboration can offer:

- Stakeholder consultation and technical approval
- Concept design options and strategy
- 3D design and fly through options
- Geotech analysis and assessment
- Councilor presentations
- Cost estimate for concept design

We can mentor your team to understand how to best manage the facilities once built, as this is vital if the funding is based on your organisation's ability to generate revenue.

We can support program development and provide advice on how to maximise the balance between club, school, commercial and your own programs, including:

- Program development strategies
- Price benchmarking
- Performance reviews



Photo 33: Moore park Multi-sports field (NSW)

Procurement and Project Management Support

Over 20 years' experience in procurement and in collaboration with SPORENG we offer a full procurement service, including:

- Procurement strategy development
- EOI and RFT document development
- Design & Construct or Detailed Design options

- Tender evaluation facilitation
- Comprehensive tender evaluation tools to ensure a rigorous and transparent process to procure the best product which is fit for purpose and achieves best value for the community

Collaborating with SPORTENG, we provide the detailed civil engineering hold points to ensure that every step of the installation meets the appropriate civil and performance standards, including:

6. Site inspections and reports
7. Witness and critical hold points
8. Respond to construction RFI's
9. Attend practical completion and defect inspections
10. Site assessments and conditional audits



Photo 34: Chatswood High School NSW

Our Clients

We have successfully completed a significant number of sports performance standards reviews, sports strategies, master plans, feasibility studies, business cases and procurement projects. Our client base includes:

International Federations

- FIH
- FIFA
- World Rugby (IRB)

National and State Sports Organisations

- National Rugby League

- Rugby Australia
- Golf Australia
- Australian Sports Commission
- Hockey ACT
- Capital Football
- Football Federation Victoria
- Football NSW
- Bowls ACT

Local Governments

Victoria – more than 50 partners including: Cities of Monash, Whittlesea, Knox, Moonee Valley, Melbourne, Banyule, Melton, Kingston, Bayside, Stonington, Boroondara, and Shires of Yarra Ranges and Surf Coast.

NSW & ACT — more than 25 partners including: Cities of Marrickville, Campbelltown, Willoughby, Warringah, North Sydney, Port Stephens, Ryde, Sutherland Shire and ACT Department of Sport and Recreation.



Qld & WA – more than 10 partners including: Moreton Bay Regional Council and City of Swan.

Others – organisations include: mariners FC, Macarthur Football Association, Delfin Lend Lease, Veneto Club, Monash University, Southern Cross University, Queensland University of Technology and University of Queensland.



SYNTHETIC SPORTS FIELD HEALTH CHECK

Review your field, understand risks and extend life expectancy

Australia's leading synthetic sports surface consultancy is now offering the **Smart Sports Field Health Check**, for clients who wish to find out what condition their synthetic fields are in and what is the probable life expectancy.

Smart Connection Consultancy has been involved in over 70% of all the synthetic sports fields developed and installed in Australia in the past five years. We work closely with our clients to maximise their usage and life expectancy of their fields.

The **Smart Sports Field Health Check** consists of:

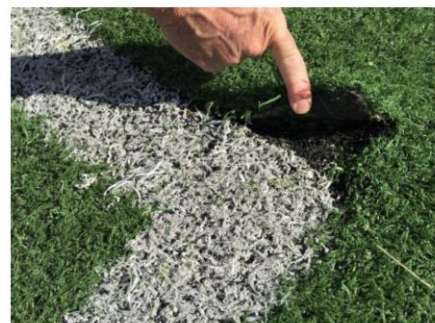
- ✓ Conducting a site analysis and field review to ascertain its current status;
- ✓ Assessing current maintenance practices to explore if this can extend the life of the field;
- ✓ Reporting on findings with improvement strategies;
- ✓ Risk assessment with mitigation strategies; and
- ✓ Predicting life expectancy.



Assessment Report provided within 48 hours of field assessment.

"The Smart Sports Field Health Check allowed us to appreciate the challenges we had, reduce our risks by adopting the risk mitigation strategies identified and we believe that we have extended the expected life by two years by adopting the recommendations for remediation and maintenance." (Mick Roberts, Sports Grounds Manager, ACT Government)

Call 03 9421 0133 and talk to Martin Sheppard or email martins@smartconnection.net.au to find out how the **Smart Sports Field Health Check** can extend the life of your synthetic sports field.



SPORT INSPIRES A NATION

Synthetic & Hybrid Sport Surfaces Create Opportunities for The Next Generation



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