

SYNTHETIC FIELDS

A guide to synthetic surfaces for Football



FOOTBALL
WEST

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Football West Limited in consultation with Football NSW Limited has produced this Synthetic Fields Guide to provide general guidance to clubs and associations in Western Australia to assist them with the selection, construction and maintenance of synthetic fields. The contents of this Guide should not be used for any other purpose or reproduced or communicated without our consent. The information contained in this Guide has been sourced from a third party (Synthetic Field specialist Martin Sheppard), and Football West makes no representation or warranty about the accuracy or completeness of the information contained in this Guide. You should not rely solely on the information in this Guide and should make independent inquiries, including seeking professional advice. To the extent permitted by law, Football West disclaims any responsibility and liability for any cost, expense, loss or damage incurred by any entity or person relying on the information contained in this Guide.

Foreword

Synthetic football fields are revolutionising the game in WA with administrators now able to schedule more matches in all weather and players praising the regular frequency of games and the true, predictable bounce the surface provides.

On average, a synthetic surface allows three times the frequency of use compared with a grass surface and while regular maintenance is a necessity, generally the time and money required is significantly less than maintaining a grass field. A synthetic field's durability and versatility also allows clubs to hire the ground out and generate additional revenue.

As the technology used in synthetic field construction continues to evolve, this Guide contains advice on best practice construction and maintenance of synthetic fields.

This Guide also addresses issues which have arisen as synthetic surfaces become more prominent.

The process of planning and construction of synthetic fields can be complicated and while this is not a "how to" Guide it is designed to streamline the procedure and help clubs engage with councils to choose the best type of synthetic surface for their particular needs and appoint the most suitable contractor for construction and ongoing maintenance.

This Guide was compiled by Football West in association with Football NSW and Synthetic Field expert Martin Sheppard, Managing Director of Smart Connection Consultancy.



Introduction

The popularity of Synthetic Football Turf, as it is commonly known, has grown over the past 30 years or so, with FIFA now holding various junior and senior World Cup Final competitions and matches on synthetic fields, including the 2015 FIFA Women's World Cup in Canada.

Football West as the governing body for the game has embraced the technology and promotes it as a solution for some environments, where usage is greater than natural grass fields can cope with.

With investment by local and state government, and the education and sports sector, there will be approximately 100 synthetic football fields in Australia by the end of 2015.

This Guide aims to provide the Football Community in WA with an explanation of the importance of synthetic technology and how it works.

“Most countries around the world will play on artificial turf one day because it can be used 24 hours a day, seven days a week”

Evolution of Synthetic Football Turf

The technology has evolved significantly since 1964 when the First Generation turf, which was knitted nylon carpet with foam backing, was introduced for indoor Gridiron in America.

The Second Generation carpet promised to be more aligned to 'natural turf' with sand replacing the soil and 20 -35mm of tightly packed polypropylene blades of grass being used which looked similar to natural grass but didn't perform like natural grass.

The 1980's version also had some drawbacks including:

- Playability – the sand infill and yarn combination didn't let the ball have the same playing characteristics as on natural turf. It bounced unpredictably and the roll was far faster; and
- Safety – the friction on skin was significant and caused 'skin burns' which then developed into wounds if not treated.

The durability of this second generation Football Turf for community football pitches (5-a-side facilities) was excellent and allowed many more people to play the game. In the UK, 5-a-side football had larger participation rates than 11-a-side, and so this had a positive outcome in the UK.

Four English professional football clubs invested in synthetic turf in the 1980's: Queens Park Rangers (Loftus Road), Luton



Town (Kenilworth Road), Oldham Athletic (Boundary Park) and Preston North End (Deepdale).

At the end of the 1980's the European governing body for football, UEFA, ruled that professional level games should not be played on synthetic turf.

In the 1990's the major manufacturers of Synthetic Football Turf understood the benefits the technology could offer to the community and elite sport, but could not convince the world's sports governing bodies by themselves.

In the 1990's FIFA made it clear that the playability and performance needed to reflect the standards of natural turf.

After much research, the end of the 1990's saw a new generation turf, using a softer yarn, polyethylene, with rubber granules as the key infill component and sand now used more as ballast.

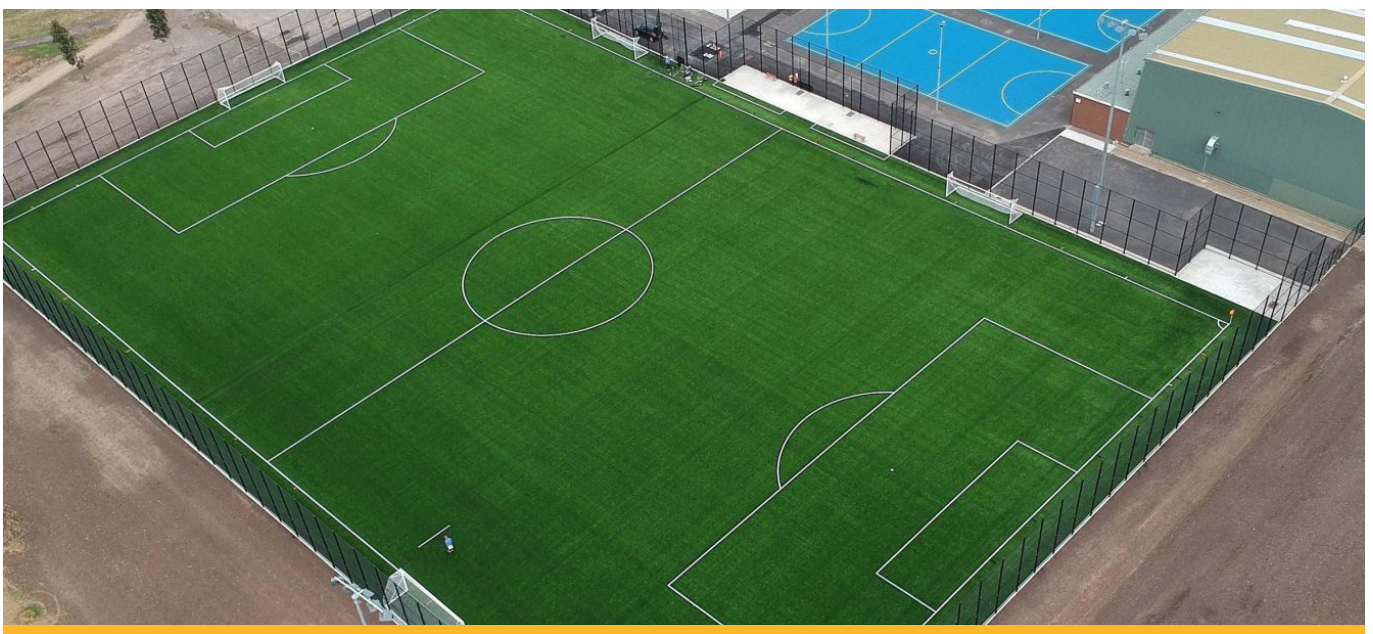
In the past decade the sophistication of Synthetic Football Turf has resulted in the emphasis on development being based on:-

- **Infill** – to ensure ball, boot and player interactions play as a natural field;
- **Yarn** – to reflect blades of grass, being designed to stay vertically upright and soft on players skin; and
- **Shock pad** – introduced to provide a safer and more consistent playing surface.

The result is that synthetic football fields are now being embraced by both community teams and elite players, both in Australia and globally.

Football West Embraces Synthetic Turf

Football West is committed to developing the game at the grass roots level and appreciates how the use of Synthetic Football Turf can assist local clubs, associations and local government meet the growing demand.



Benefits and Considerations of Synthetic Football Turf

Benefits

The key reasons given for installing a synthetic surface for sport and recreational use are:

- **Climatic:** Under drought and water restrictions or excessive rain conditions, it can be difficult to maintain a safe and suitable natural grass surface. Synthetic sports surfaces in general are not affected by reduced or increased rainfall;
- **Usage:** There is a limit to the hours natural turf can be used before there is a significant impact on surface condition. A high quality natural turf surface may only withstand use for up to 20 hours per week before it starts to deteriorate. Synthetic surfaces can sustain significantly higher use than natural grass with 60 hours plus per week as an acceptable expectation;
- **Maintenance:** Maintaining a natural turf surface can be time consuming, expensive and generally requires a qualified person to do it. Synthetic surfaces require lower ongoing maintenance than natural turf surfaces;
- **Consistency and quality of play:** Synthetic surfaces provide a consistent and safe surface all year round for all sports to play on, improving the quality of performance for each sport compared with natural playing surfaces; and
- **Health:** By allowing play on the surface more often and under safer conditions, it enhances physical health of participants;



Negative Perceptions

There is a significant lack of understanding about the technology, with some community concern around how the technology is made, managed and/or how it integrates into the local environment. The major concerns include:

- **Environmental integration** – whether there is a negative impact on the environment;
- **Player comfort and safety** – for injuries, overall safety and impact between the surface and the player ;
- **Loss of open space** – some Local Government authorities (LGA's) have found that some sections of the community believe synthetic installations will translate to loss of open space. This needs to be considered in the design of parkland;
- **Cost** – the initial cost (estimated around \$1-1.2m per full-size football pitch) is high but compared with the number of participants and the cost per hour of use, the synthetic surface could be as little as 25 percent of the cost of an equivalent natural turf over the life of the surface.

Health, Safety and Risk, Perceptions and Reality

The health and safety of all sports facilities is a concern to Football West, asset owners and sports program providers. At times there is a perception that if the surface is not natural grass, it is not safe. In Australia, local community groups have expressed concern at the prospect of natural grass being replaced by synthetic surfaces.

What may not be understood by these groups is that if many community level natural grass surfaces were tested to the same rigour as synthetic sports turf surfaces, they would not pass the performance criteria that are set for synthetic sports turf. Therefore, synthetic sports turf is far safer than most heavily used community playing fields.

The key concerns for health and safety are:

- Player safety and injuries
- Surface playability
- Health risks to community
- Heat management

Player Safety and Injuries

There is a perception that there are more sports injuries on synthetic grass surfaces than on natural turf. A number of studies show that this is not the case. For example the [New York State Department of Health](#) provides specific guidance from its research.

Of the various independent studies reviewed from 2006 to 2011, the common finding is that there is not an increase in the number of injuries associated with synthetic sports turf when compared to natural turf. Seemingly the only negative consideration is where sports people alternate between surface types which may result in varied and increased injuries. This may be similar to long distance runners who run on synthetic tracks then on asphalt, which are more susceptible to shin soreness.

Surface Playability

FIFA commissioned a number of Pro-Zone Studies to study the surface playability comparisons between natural and synthetic turf. These were conducted at a number of UEFA Cup, Champions League and Dutch League games, as well as at the 2007 FIFA U-20 World Cup.

The findings revealed that “synthetic turf does not dramatically affect the pattern of the football match, and the collective data reveals clear similarities to that of tournament games played on natural grass.”

Providing sport has performance criteria that address playability and safety standards, this will ensure that as long as the pitch is adequately maintained, there should be no issue with confidence in safety levels.

“There is a common perception that there are more sports injuries on synthetic than on natural turf athletic fields. Many factors influence the rate of sports injuries, including the type of playing surface. The many kinds of synthetic turf surfaces and changes in the turf products over the years complicate the assessment of how the playing surface affects injury rates”.

Health Risks to Community

New York State Department of Health

There has been significant interest from local communities on the perceived health risk of synthetic sports turf. A number of synthetic safety and risk assessments have been completed.

In 2010, the [California Office of Environmental Health Hazard Assessment \(OEHHA\)](#) issued a safety study of synthetic sports turf containing crumb rubber made from recycled tyres. The study was founded by the Department of Resources Recycling and Recovery (CalRecycle) and examined the possible human health risks of outdoor athletic fields made from artificial turf containing recycled crumb rubber with respect to skin abrasions, bacteria harbored by the turf, inhalable particulate matter, and volatile organic compounds. The report concluded these fields do not pose a serious public health concern, with the possible exception of an increased skin abrasion rate on artificial turf relative to natural turf. This can be overcome with adequate maintenance ensuring that the synthetic fibres stand upright.

Heat Risk

The temperature of synthetic surfaces does rise significantly more than natural turf, especially on days where the temperature is above 30°C and there are no clouds in the sky to shelter the sun's rays.

FIFA has conducted significant research and will be launching in late 2015 a heat standard for synthetic fields. The majority of synthetic turf manufacturers are presently developing heat reduction components within these turf systems which should see the reduction of heat on those hot days around Australia.



The Synthetic Football Turf System

Introduction to the System

A synthetic sports turf system has a number of components that have to be in place for fields to play in accordance with the performance stipulated by the sport. Each manufacturer has its own system, but the latest generation of synthetic fields generally comprise a synthetic grass carpet containing a layer of stabilizing sand, topped with in-fill, which is most usually rubber but can also include organic matter. This is then laid on a shock pad – if the system uses one – and then onto a suitable base, which is crucial for the overall quality and lifespan of the system. This can comprise a pavement constructed upon a sub-base.

Third Generation Football Turf

The third generation Football Turf is normally made from either a polyethylene or polypropylene fibre, which is extruded from polymers in a manner that allows them to be strong enough to stand upright, which is assisted with infill, similar to natural blades of grass. The balance between thickness (normally over 300 micros) and softness is critical to achieving a durable and playable finish.

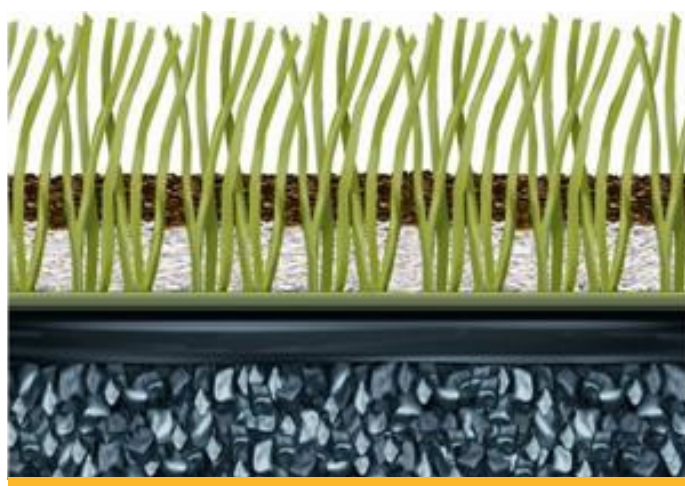
The impact of UV in the harsh Australian summers is critical, as some cheaper variants may not have been tested to appropriate levels. Some yarns also offer 'cooler grass technology', to reduce the likelihood of heat retention. The yarn is tufted through a polyurethane backing which keeps the yarn in place and allows water to filter through to the drainage medium.

Infills

The infill for football fields assist the performance of the whole grass system, with the aim of replicating soil in a natural pitch where the grass/synthetic yarn is held upright. The infill can be compiled from sand, rubber (either recycled or virgin) or even organic infills.

The amount of fill is normally determined by the manufacturer when they consider the length of the grass yarn, the performance outcomes, and use of shock pad and purpose of the field. There are five options with various combinations as follows:

- i. **Crushed Rubber (SBR)** – The most popular and most cost effective choice in the Asia Pacific region, derived from recycled motor vehicle tyres. The crumbed rubber is normally 0.5mm-2mm in size. The colour is black, which means that there is tendency to retain heat compared to lighter infills.
- ii. **Sands** – Most surfaces will use silicon sand, which is rounded, non-toxic and chemically stable, and many companies use this as ballast and have the rubber on top. By itself it can be hard on the players over time.
- iii. **Virgin Rubbers** – There are a few options in this space including:
 - **TPE** – Thermo Plastic Elastomer compressed into shape, including long life and can come in many



Source: FIFA quality concept for Football Turf

colours. This needs to be UV tested before installation in Australian conditions as some cheaper versions lose their colour quickly;

- **TP** – A similar compound to TPE with similar characteristics
- **EPDM** – This is an excellent infill, made from three monomers; ethylene, propylene and diene. It is odourless and some companies are getting their infill voluntarily tested against the German standard ZEK 01.4 – 08, which is accepted as a benchmark product safety certificate by consumers in that country.

- iv. **Organic** – There still seems some experimentation on this within the Australian climate with the use of water cannons to keep the infill moist, which precludes it from many open parklands. Certainly this would be the optimum surface for heat reduction, as the organic infill is damp. The downside is that some organic mixes (e.g. coconut husk/cork) are light and with strong rain, cause floating effects. The breakdown of organic fibres, increased likelihood of weeds, and need for substantial watering means a big question mark remains over this option for Australian local governments.



EPDM Bionic Infill - Similar To That Used At The AIS Football Field

- v. **Combined Options** – Some suppliers are being imaginative and balancing the desires of some clients to be environmentally conscious and are applying a sand/SBR mix and a 'top dressing' of either virgin rubber or cork. This offers a great outcome at an affordable investment.

Shock pad

Shock pad considerations

The shock pad is an elasticated layer (E-layer) between the pavement base and the synthetic grass carpet. It is used by many suppliers to provide a degree of comfort, meet sports' requirements for critical fall height and extend the life of the pitch.

Types of shock pad

The types and thickness of shock pads need to be considered as part of the overall synthetic surface system. This is to ensure that the important requirements of international sports standards regarding shock absorption, energy restitution and vertical deformation are met. There are two kinds of shock pads:

The European Synthetic Turf Organisation (ESTO) issued the **outcomes of a thorough research project** that recommends that shock pads should be used when there is any doubt that the maintenance will not be kept up with usage. Due to the majority of fields in Australia being in the open domain of parklands which encourages even greater use, it is recommended to have a shock pad. The decision is made in light of other considerations, including the length of the yarn and the quantity of infill.

PRE-FABRICATED SHOCK PADS

There are a number of products on the market, including 5m roll out sheets or matting (2m x 1m) with interlocking functions.

IN-SITU SHOCK PADS

This surface infill mix comes in a variation of thickness between 35mm and 10mm and consists of a polyurethane binder mixer combined with rubber crumb (SBR) or shredded rubber (e.g. soles of training shoes). The mix needs to be perfected with the infill for the system to be optimised.

Pavement

It is critical to ensure that the sub-base and pavement is designed by a civil engineering specialist so that it can support the synthetic surface system. The design should be based against data from the location/field inspections including an expert geotechnical report, topographical survey, drainage study etc.

The focus of the sub-base and pavement base design must be able to achieve the following:

- Support the vehicle load during the construction, maintenance and replacement phases;
- Integrate with the synthetic surface to ensure that the sports' performance criteria is achieved;
- Support the load on the pitch once in use, including players and maintenance machinery to ensure no negative deformation of the surface; and
- Protect the surface from other sub-grade movement or water.

Drainage

Drainage is critical to the success of a synthetic turf system, and any system that does not have an engineered solution which meets the sport's standards for porosity should not be considered. The two most common bases are vertically draining and shaped, horizontal draining bases.

FIFA Synthetic Football Turf Standards

To ensure that the quality of Synthetic Football Turf is consistent across the globe FIFA developed the [FIFA Quality Concept](#) in 2001 and regularly modified to meet the latest guidelines.

Football NSW stipulates that all synthetic fields used for elite competitions must be FIFA approved and this standard is also recommended for grassroots football.

FIFA recommended 1 Star Rating applies to national training and match play and municipality use and the FIFA recommended 2 Star Rating applies to top clubs, stadia and international match play.

The FIFA Quality Programme for Artificial Turf is a rigorous test program for football turf that assesses the ball surface interaction, player surface interaction and durability of the product. FIFA has produced two guides for testing of synthetic fields: [Handbook of Requirements](#) and [Handbook of Test Methods](#).

Standards for the Sport

The performance standards measured are the same for both categories, although the acceptable criteria range differs slightly. This allows the FIFA 1 Star Recommended field categories, which only have to be tested every four years, to have greater latitude (less than 5 percent difference in most categories) to meet the needs of the intensity that a 40 - 60 hour usage pattern would expect.

The re-testing of fields is recommended every four years for FIFA 1 Star Recommended pitches and every 12

months for FIFA 2 Star Recommended pitches.

Licensee / Preferred Producer Program

FIFA has developed a two-tier accreditation program for manufacturers and suppliers of football turf to the industry to ensure that the client is purchasing from a reputable supplier.

FIFA Licensee

The two-tier system entry level is known as a FIFA Quality Program Licensee, which indicates that the company is committed to the FIFA Quality Program, has quality systems in place and has fields ready to test. The pre-requisites for application are focused on the company's quality assurance, experience, product declarations, achievements of the defined standards and qualifications of staff and on the company's intentions as a FIFA Quality Program Licensee.

FIFA Preferred Producer

To provide greater certainty to purchasers of Synthetic Football Turf, FIFA introduced a second tier accreditation program in 2004 to focus on "Whole of Life" quality assurance of the installation of the field.

The eligibility criteria for a FIFA Preferred Producer (FPP) are more onerous than a FIFA Licensee's accreditation. Applicants must have been a FIFA licensee for a minimum of two years, have a minimum of ten FIFA-certified fields at the moment of application, comply with the Code of Conduct of the WFSGI (World Federation of the Sporting Goods Industry), and have no legal action or dispute in the past two years by or with FIFA or a member association of FIFA.

The key aspect of this FPP status is that the manufacturer has to ensure that their distributors, partners, affiliates or anyone representing them install a quality product or, as the parent company/FPP, they may have to ensure that any corrections or repairs are conducted. For the end consumer the main advantage in using a FIFA Preferred Producer is that they only have to deal with one company for the whole installation from construction planning to maintenance.

Within Australia/New Zealand the following FPP's offer their products directly or through licensees:

- | | |
|--------------------------------|---------------------------------|
| • CC Grass (Tuff Turf) | • Limonta (Greenplay Australia) |
| • FieldTurf (Turf One) | • Polytan |
| • Greenfields (HG Sports Turf) | • Saletx Oy (HG Sports Turf) |

Full details of contacts for both FIFA Licensees and FIFA Preferred Producers are [here](#).

The Importance of Testing

The importance of having the field tested is linked to both achieving performance standards and risk mitigation, with some re-testing needed depending on the quality of the field purchased.

The benefits of testing include:

- Peace of mind that it meets the required standards;
- Ensuring that the durability of the product lasts the planned life expectancy;
- There will be reduced risks associated with the system;
- The maintenance is being carried out adequately; and
- The ongoing performance characteristics are being achieved.



The performance tests measure three key aspects of the turf in the field:

- Ball/surface Interaction: The reaction of a ball to the surface.
- Player/surface Interaction: The reaction of a player to the surface.
- Durability: The resistance of the surface to wear and tear and the environment.

Durability Considerations

If the field is to be used intensely (in excess of 50 hours per week), such as for junior coaching, it is worth requesting a higher durability cycle. This is measured with the Lisport Test as shown on the previous page, where the machine replicates the impact of studded boots on the turf.

To ensure the durability of the field meets the needs of intensive use (in excess of the 20,200 requested for the FIFA 1 Star Recommended Pitches) many tenderers now require the Lisport Test to measure at least 50,000 cycles.

Each test comes with a laboratory report and this should be sought at the procurement stage.



Lisport Test in Laboratory



Financial Investment Needed

Capital Investment

The Whole of Life Expense Commitment

To appreciate the investment needed, there are three stages of a field's whole of life (WOL) cycle which need to be considered as shown below. These are for a FIFA 1 Star recommended pitch and include ancillary equipment such as goal posts, fencing and floodlights. The three stages are:

- **Capital Investment** – including field and ancillary items, fences, lights etc.
- **Maintenance Costs** – depending upon the level of use.
- **Replacement Costs** – considered over 10 and 20 years.

Within each of these WOL stages, the tables have considered the following aspects:

Capital Investment and Installation Costs

Consider the following indicative design and construction costs for a field of 7,810m² to a FIFA 1 Recommended Pitch standard. These are estimates only, and costs can vary greatly depending on the site and any issues encountered. In addition, ancillary items such as fencing, lighting, goals and coaches boxes have been considered and therefore costed in.

Maintenance Costs

The maintenance costs will be determined by the level of usage and the recommended maintenance schedule from the field supplier. As a guide, the following categories should be considered:

- Less than 40 hours weekly usage = 6 hours maintenance
- Between 40 and 60 hours usage = 8 hours maintenance
- Over 60 hours usage = 10 plus hours Maintenance

CAPITAL INVESTMENT AND INSTALLATION COSTS	
Component	Aud \$ cost
Pitch Costs	
Design	\$10,000
Site establishment, documentation & project management	\$60,000
Sub grade works	\$70,000
Drainage, gutters and concrete works	\$165,000
Base pavement and asphalt	\$335,000
Synthetic surface	\$260,000
Shock pad installation	\$155,000
Pitch sub total	\$1,055,000
Ancillary costs	
Fencing	\$80,000
Lighting	\$250,000
Equipment	\$25,000
Ancillary costs sub-total	\$355,000
TOTAL COST FOR FIELD	\$1,410,000

Table 1: Capital Investment Required

Replacement Costs

The life expectancy of fields will be determined by the quality of product, although most should last up to eight to ten years provided recommended maintenance schedules are adhered to, and good manufacturers will provide guarantees for a period of eight years plus. The following are indicative replacement costs over a 10 and 20 year period.

MAINTENANCE COSTS			
Component	Aud \$ cost		
Pitch Costs	Under 40 hours	40 - 60 hours	Over 60 hours
Routine maintenance grooming	\$12,000	\$16,000	\$20,000
Professional service grooming	\$3,000	\$4,000	\$5,000
Algaecide / Weedicide materials	\$500	\$500	\$500
TOTAL COST FOR FIELD	\$15,500	\$20,500	\$25,500

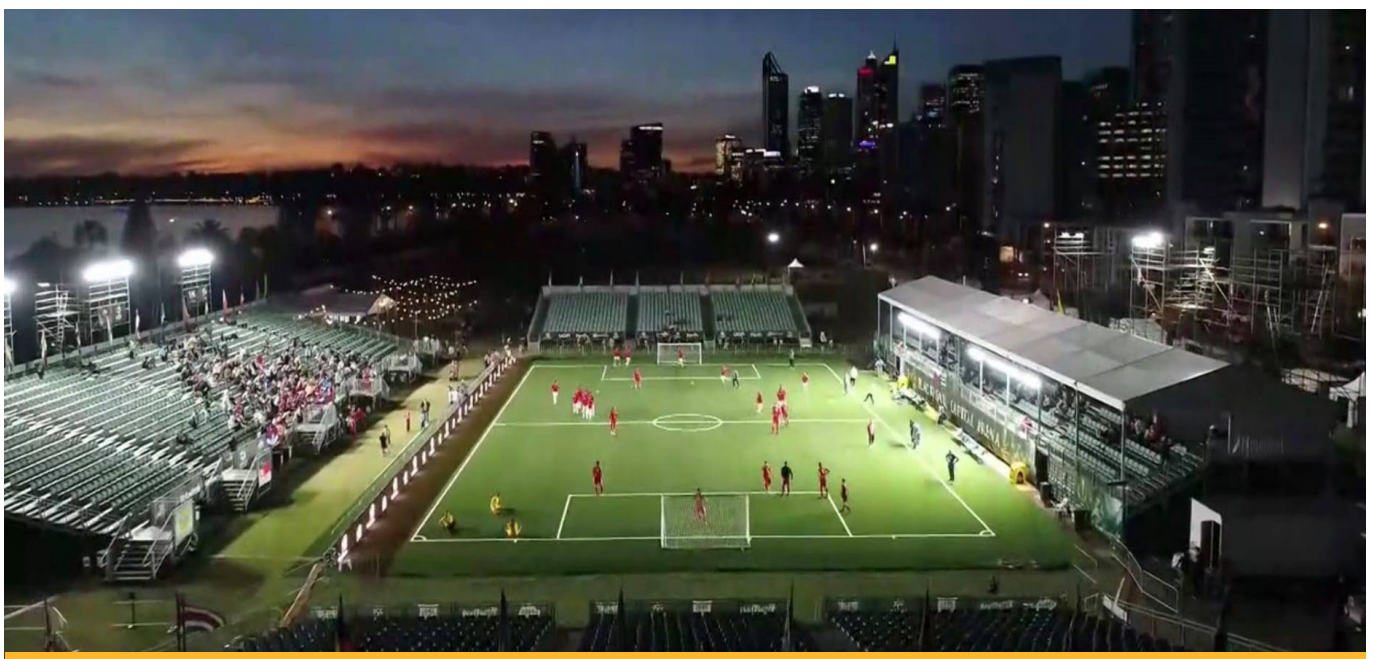
Table 2: Maintenance costs typically associated with a Synthetic Turf Field

Income Offset Costs

If a club or council pay for the installation from Capital Works then the revenue/cost of use can be calculated per hour of use. If the field is used approximately 40 hours per week annually, the cost per hour of use would be \$31 per hour. With 24 players using the field for an hour that is only \$1.30 each.

REPLACEMENT COSTS		
Component	Year 10 costs	Year 20 costs
Pitch Costs		
Removal & disposal of existing synthetic grass surface	\$19,000	\$19,000
Shock pad rectification	\$26,000	
Synthetic surface installation	\$260,000	\$260,000
Shock pad replacement every 20 years		\$156,000
Pitch Sub total	\$305,000	\$435,000
Ancillary Costs		
Fencing (replace chainmesh)	\$15,000	\$15,000
Lighting	\$48,000	\$48,000
Equipment	\$7,000	\$7,000
Ancillary costs sub-total	\$70,000	\$70,000
TOTAL COST FOR FIELD	\$375,000	\$505,000

Table 3: Replacement Costs Capital Investment required



The Importance of Maintenance

Maintenance is critical to ensure the life expectancy of the field, reduction of injuries, playability standards, ability to achieve re-testing, and to ensure terms of the warranty are met.

FIFA provide excellent guidance documentation for [synthetic field maintenance](#), as do Smart Connection Consultancy with their [Smart guide to maintaining synthetic sports turf](#), including these general principles:

- Promote the benefits of developing a documented and policed maintenance regime linked to the level of use.
- Educate in relation to the different protocols and procedures needed.
- Emphasise the need for regular monitoring and inspection.
- Recognise the need to refer to experts.
- Ensure that maintenance is considered as part of the procurement process.

Each option needs to provide a maintenance manual for the purchaser which guides them on periodic, regular maintenance.

The responsibility for maintenance normally falls between routine and specialist maintenance where specific machinery is needed. This is best explained in Table 4 below.

MAINTENANCE ACTIVITY	RESPONSIBILITY	EXAMPLES
Regular	<ul style="list-style-type: none"> • Ground staff • Field owners 	<ul style="list-style-type: none"> • Daily inspections • Weekly grooming
Specialist	<ul style="list-style-type: none"> • Surface installer • Trained technician 	<ul style="list-style-type: none"> • Surface de-compaction • Rotating brush and infill cleaning • Infill rejuvenation • Repairs • Algae treatment

Table 4: Maintenance Activity

DAILY ROUTINE MAINTENANCE	WEEKLY ROUTINE MAINTENANCE	MONTHLY ROUTINE MAINTENANCE	SCHEDULED MAINTENANCE
<ul style="list-style-type: none"> • Fixtures and fittings scheduled • Typical maintenance monitoring and inspection • Make sure gates are shut and secure • Top up levels at key places (penalty area etc.) 	<ul style="list-style-type: none"> • Clean natural debris and any rubbish • Clear any weeds, especially around fences • Brush surface of field 	<ul style="list-style-type: none"> • Infill levels • Seams of inlaid lines checked • Drag brush 	<ul style="list-style-type: none"> • Treat pitch for moss and weed • Power brush • Deep clean • Surface de-compaction (6 monthly)

Table 5: Typical maintenance schedule

Key Australian Contacts

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To provide Clubs and Associations with opportunities to obtain further information and advice on the matters addressed in this Guide, Football West has identified the above suggested contacts. These are, however, suggested contacts only and their inclusion in this Guide should not be taken to suggest that Football West endorses or recommends any specific organisation.

Acknowledgements

California Department of Resources, Recycling and Recovery
Crumb-Rubber Infilled Synthetic Turf-Fact Sheet
European Synthetic Turf Organisation
FIFA NSSCE Conference
FIFA Quality Concept for Football Turf
FIFA Technical Studies
New York State Department of Health
Scandinavian Journal of Medicine and Science in Sport
Smart Connection Consultancy
Sports Medicine; Surface related injuries in soccer
Sports Turf Institute
Synthetic Turf and Grass: a comparative study. Am J Sports Med
Football New South Wales



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Grass Field Maintenance

Project Management

Provider Procurement & Management



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