

Artificial Grass For Sport



Front cover photographs courtesy of Australian Hockey Association (hockey player),
Sydney Low Photography on behalf of Football Federation Victoria (soccer players),
and Tiger Turf (rugby players).

Minister's Foreword

Message from the Minister for Sport and Recreation

It gives me great pleasure to present the Artificial Grass for Sport guide.

Victorian communities are increasingly looking to more sustainable solutions to help keep their sports thriving in the face of weather extremes and increasing participation rates. Artificial grass surfaces are proving to be a viable alternative.

They don't require watering, are easy to maintain, durable and most importantly allow up to three to four times as many hours of use than natural turf surfaces.

That's great news for Victorian clubs, schools and communities looking to accommodate greater numbers in their sports.

Recent experience, however, has shown us that there's been inadequate information and support for local councils and their communities to plan for, select, and install new artificial grass surfaces.

As a result we've consulted with the sports industry to develop what will undoubtedly become an indispensable tool for future artificial grass projects.

This guide will assist you in all aspects of artificial grass installation from selecting the most appropriate site and surface, to preparing the site, choosing the right professionals, planning, and the best way to lay and maintain your surface for years to come.

It brings together current best practice, industry standards, and professional tips gathered and drawn from a range of sporting associations and leading Australian and international artificial turf experts.

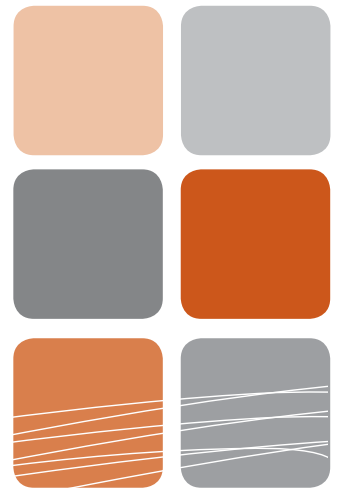
By sharing our artificial grass experience with all Victorians we hope to further enhance the work of local councils, sporting clubs, schools, and communities in their development of quality, durable and accessible artificial grass venues.

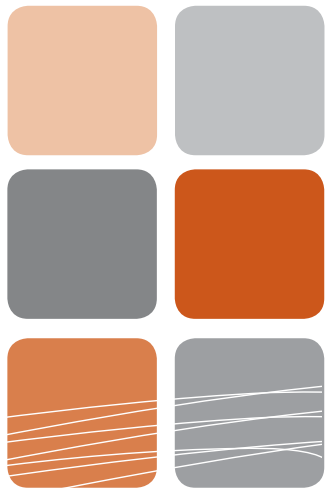
To get the most out of your current or future artificial grass project I strongly encourage you to utilise this fantastic resource - Artificial Grass for Sport.



HUGH DELAHUNTY MP

Minister for Sport and Recreation





Purpose of the Guide

Sport and Recreation Victoria (SRV) has been supporting local government authorities for decades in the funding and development of infrastructure for sport and recreation. Artificial grass surfaces for sport and recreation have been popular during this period given their resilience to weather, their availability for intensive use, and the consistency of their playing characteristics.

The popularity of the artificial grass sub-category of synthetic sports surfaces took off in Australia in the 1980s, principally used for hockey, tennis and lawn bowls. This sporting use continues strongly today, and has expanded in more recent years into provision for sports such as football (soccer) and rugby, and now the expansion into Australian rules football and cricket ovals.

The interest in artificial grass has been further heightened due to the prolonged drought conditions and associated water restrictions, which have made it challenging to maintain good quality, safe playing areas.

It is evident that some local councils, sporting organisations, and schools may not have sufficient information to plan for, select, and install artificial grass surfaces. Further, due to the continual technological development of artificial grass it can be difficult for organisations contemplating artificial grass for the first time to comprehend and deal with the broad range of issues confronting them.

The overall intention of this publication is to provide a sound base of information so that informed decisions can be made at all stages of artificial grass project development.

Structure of the Guide

This publication provides guidance, as well as highlighting 'best practice' for the planning, design, selection, installation, management, maintenance and replacement of artificial grass surfaces for sport. The document is structured accordingly so readers can quickly find the information that is relevant to their enquiry.

Sections 2 – 7 follow in a sequential order, whilst Section 1 is both a traditional introductory collection of subjects (glossary, history, product types, etc), but is also inclusive of several key subject matters brought to the front of the guide for greater emphasis (quality assurance, funding strategies, professional support, research and development, etc).

Overall, whilst the presentation of issues flows in a logical, almost chronological process, it has been kept in mind that many users will want to 'dip in' to the guide for selective reading, and so to support that need some small areas of information and advice have been repeated as deemed appropriate.

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1.1 Construction Profiles

The diagram and text provided in Figure 1 (overleaf) is indicative only. These drawings and written summaries (and the glossary of terms that follows) are provided as an introduction and explanation of basic artificial grass terminology and construction profiles.

It is important when contemplating an artificial grass project, or when the subsequent project delivery team is in place, that they feel comfortable with their knowledge of basic terms and practices.

Do not regard these drawings as suitable for an actual project. Each circumstance is unique and deserving of individual investigation and resolution.

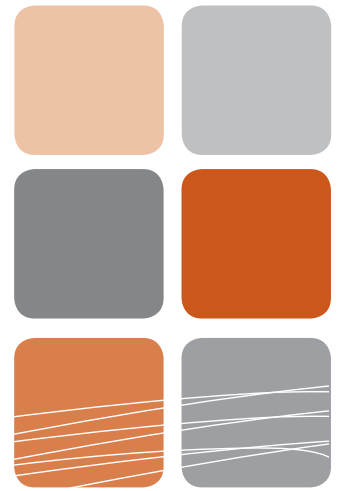
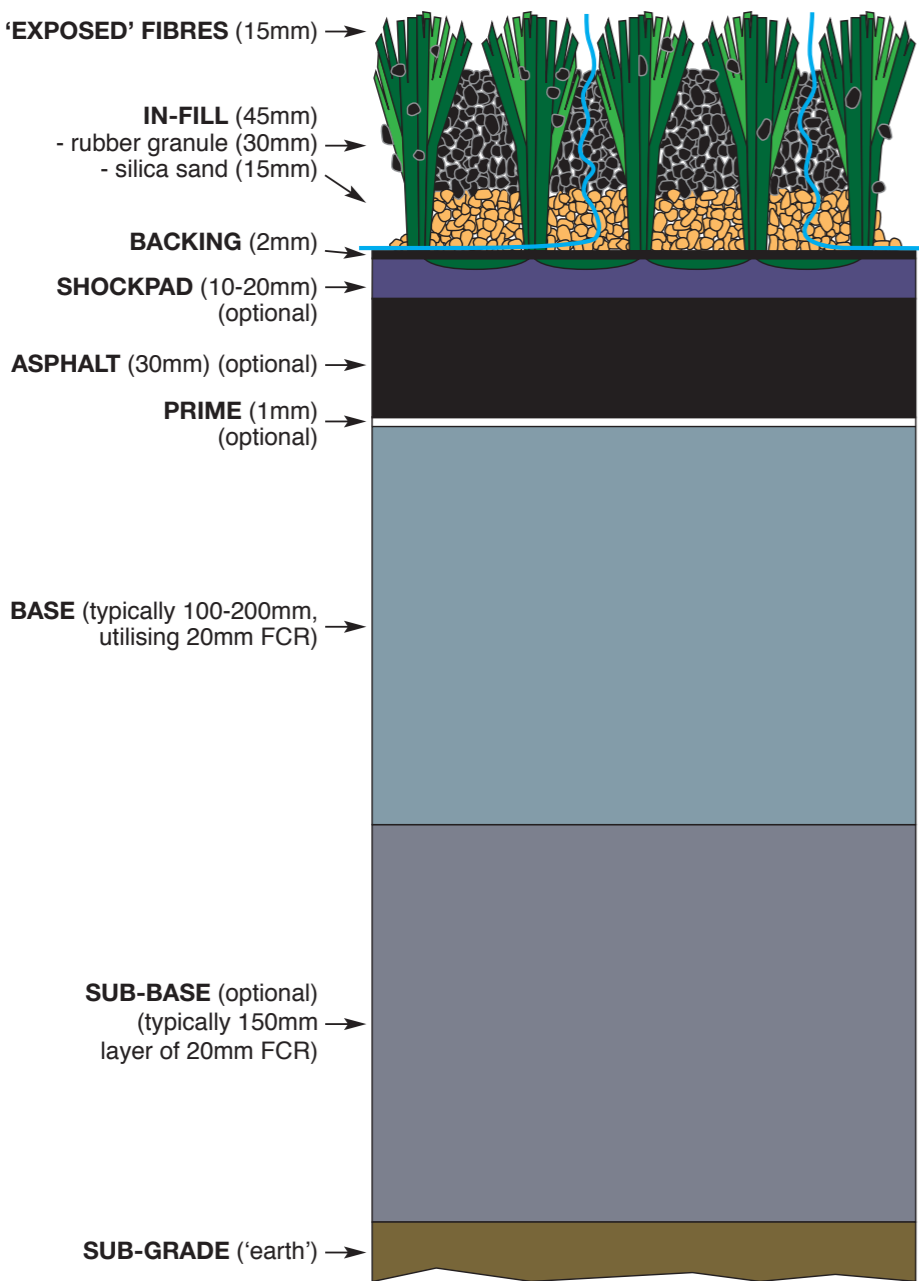


Figure 1

Indicative Construction Profiles

Horizontally draining surface

Typical 3rd generation pitch.
 Note: Australian rules football fields have shockpads but prefer not to have rubber in-fill, whereas soccer fields have rubber in-fill, and only sometimes a shockpad.



What are the 'layer' options?

- **CARPET** made up of:
 - Fibres:** The yarn filaments (artificial grass blades) that rise above the backing cloth.
 - Backing:** The 'primary backing' is the fabric through which the yarn is looped. The underside of the backing is coated with latex or polyurethane which holds the fibre tufts in place. This coated layer is called the 'secondary backing'.
- **IN-FILL** one or several of:
 - Silica sand
 - Rubber granules / rubber crumb
 - Artificial clay
 In-fill mediums are placed there to both hold the fibres up straight and also to help create the desired player/surface and ball/surface characteristics.
- **SHOCKPAD**
 - Rolled out:** Utilising rolls or mats of rubber pre-formed in a factory.
 - In-situ:** Paved on-site using a mix of rubber granules and binder (usually polyurethane).
- **ASPHALT**
 A composite material consisting of asphalt binder (bitumen) and mineral aggregate. Commonly used for construction of pavement and roads.
- **PRIME**
 A thin bitumen spray that soaks into and binds the top layer of crushed rock.

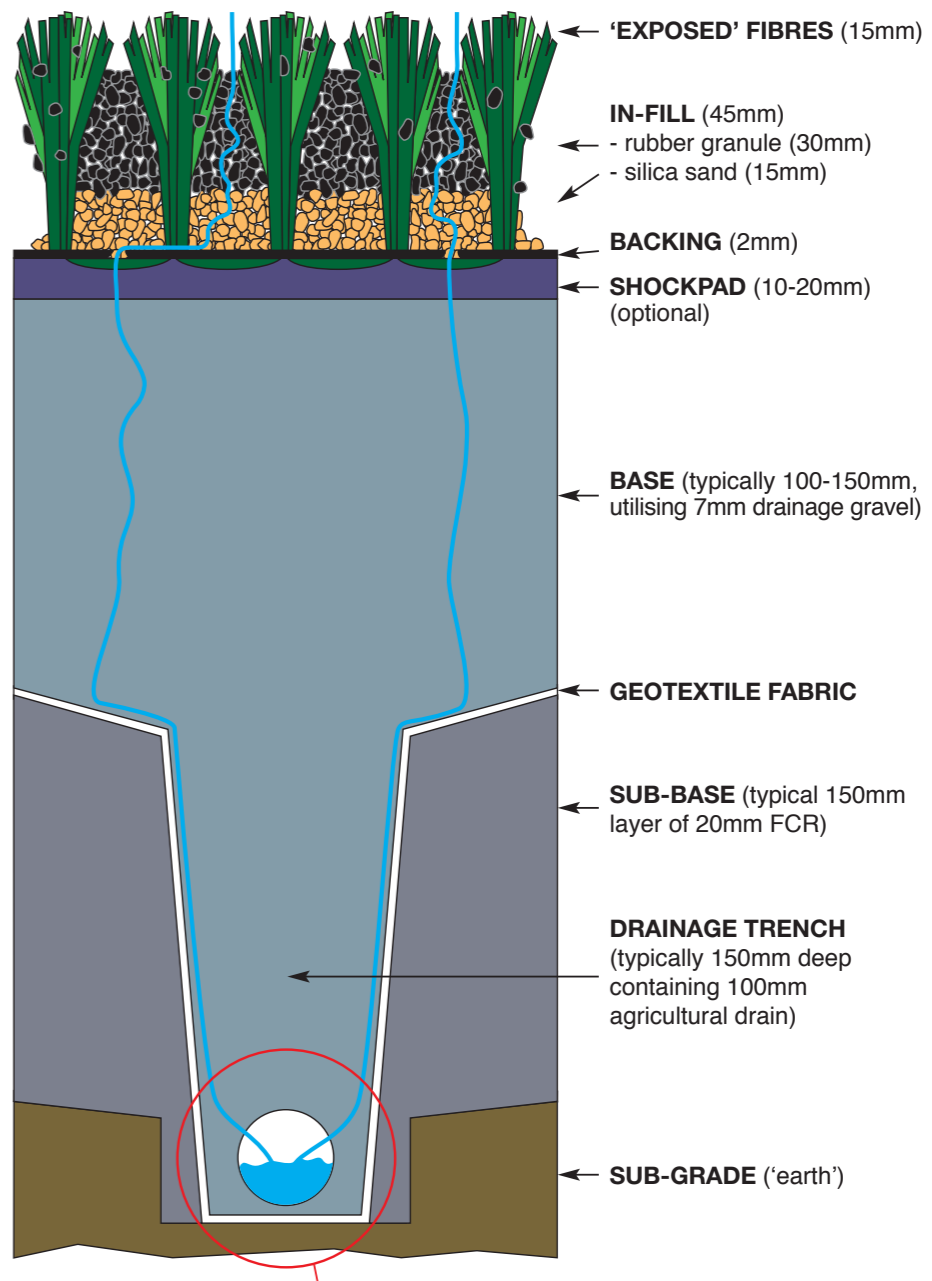
Note: A stone seal can be an alternative. This seal consists of a thin spray of bitumen with stone aggregate spread over it.
- **BASE**
 A constructed intermediary layer between the subgrade (earth) and the asphalt or shockpad layer. Critical to the whole life-cycle and quality of a pitch. Typically Class 2 Fine Crushed Rock (FCR).
- **SUB-BASE**
 A secondary base layer where additional depth of base/pavement is required. Often added where the subgrade conditions are inconsistent. Typically Class 3 Fine Crushed Rock (FCR).
- **GEOTEXTILE FABRIC**
 A separating barrier between layers. Prevents one type of material blending into another.
- **SUB-GRADE**
 The prepared surface of the natural ground onto which the base pavement and carpet system are laid. This is generally the existing natural clay.

When should I drain vertically?

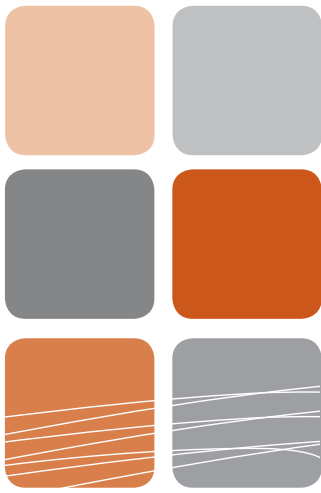
- Vertical drainage should be considered in situations where:
1. The field is large (larger than a hockey field) and it would take too long to drain horizontally. Slow surface drainage can result in different moisture levels between the centre of the field and the wings/ends.
 2. The surface shape allows just one direction of drainage, again potentially leading to the differential moisture levels between one area and another.

Vertically draining surface

Typical 3rd generation pitch.
 Note: Australian rules football fields have shockpads but prefer not to have rubber in-fill, whereas soccer fields have rubber in-fill, and only sometimes a shockpad.



Representation only - not to scale



1.2 Glossary of Terms

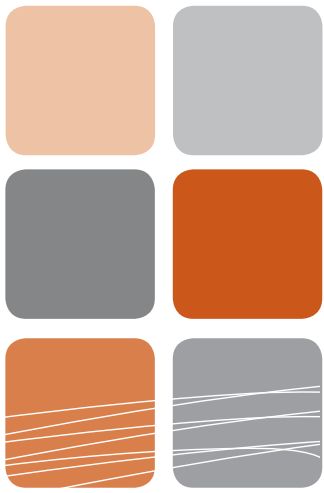
Terminology can represent a hurdle for many people/organisations, particularly for those inexperienced in dealing with civil engineering matters, construction project delivery, sports facility planning

and management, and synthetic sporting surfaces. To help understand this guide, below are some frequently-used terms and their meaning.

Term	Definition
A	
Abrasion	The damage caused by aggressive grooming equipment, heavy traffic with inappropriate footwear, improper vehicle traffic or infill materials that 'irritate' or wear the yarn fibre surfaces.
Accessibility	Ease of access into and from an area – specifically dealing with accessibility as defined by the Disability Discrimination Act.
Acrylic	A quick-drying thermoplastic used for coatings and adhesives.
Adhesives	Viscous properties that are used to stick materials together permanently. Adhesives must be selected under various specification criteria: moisture, temperature variances, backing and flooring materials, indoor or outdoor use, conditions of installation, hazardous handling conditions, flammability, contact timeframe. Always ask for a MSDS (Materials Safety Data Sheet).
Aggregate	Aggregate base materials consist of several different sizes and/or types of crushed quarry rock and dust. Larger, coarser gravels can range from .8 cm up to 3.8 cm in average size (radius) and the materials will always be mixed with quarry fines (also known as crusher dust). When used as imported base materials, compaction should occur every 5 to 10 cm lift or as base materials change.
Amortisation	The allocation of a lump-sum amount to different time periods, particularly for loans and other forms of finance, including related interest or other finance charges. Similar to the creation of a sinking fund.
Anti-static	The ability of the fibres to disperse electrostatic charges and reduce the build-up of static electricity.
Anti-microbial	Yarn or surface materials chemically treated to reduce the growth of common elements. Additives treat specific challenges such as bacteria, fungi, yeast, mould and mildew.
Approved (turf) product	A specified and unique combination of carpet and shock pad which has been tested in/by an accredited laboratory and verified as meeting the sports-defined requirements and licensing agreement conditions.
Artificial clay	Artificial/synthetic clay tennis surfaces are artificial grass-based carpets that are overfilled (by 1mm to 2mm) with a red coloured sand product (artificial clay) to simulate the appearance and playing characteristics of a clay or red porous tennis court.
Artificial turf/ synthetic grass	A carpet that is woven, knitted or tufted using coloured fibres (normally polypropylene, polyethylene or nylon) to simulate natural grass.
Asphalt	A composite material consisting of asphalt binder (bitumen) and mineral aggregate.
B	
Backings	The materials that make up the underside of finished turf. The primary backing anchors the pile yarns, while the secondary backing provides extra dimensional stability and locks in the stitches.

B Cont.	
Base	Fill, either bound or unbound, placed on the sub-grade/sub-base to influence the engineering and playing characteristics of the whole construction. Provides the camber for the pitch and therefore the surface drainage characteristics.
Base materials	Imported job materials that will be used to construct the foundation over the existing sub-grade (native soils or other surfaces) or sub-base. Base materials may be comprised of, but not limited to the use of, crushed, clean gravel, mine rock and fines, compactable aggregates and road base.
Bill of Quantities	Is a construction industry tendering document which should detail the terms and conditions of the construction or repair contract and itemises all work to enable a contractor to price the work for which they are bidding.
Binder	In-situ rubber shock pads are made from a mixture of black Styrene Butadiene Rubber (SBR) granules (2-6mm in size) and a polyurethane binder.
Bound base	Fill (inclusive of a binding agent) is placed on the sub-base to produce one or more cohesive layers, often then sealed with a bituminous layer.
Brooming	Another term for de-fibrillating or brushing-up the blades of grass or to describe the use of a broom to work infill materials into the surface (brooming in the infill – brooming up the turf fibres).
C	
Camber	Another word for slope or gradient. Designed into the field to encourage horizontal drainage.
Carpet (artificial grass)	<p>Manufactured from a polymer yarn, artificial grass carpets are either tufted or needle-punched. Third generation carpets are almost always 'tufted' carpets. With tufted carpets the pile is formed by looping yarn through a backing material and cutting it to the required length (usually between 35mm and 65mm). The underside of the backing material is coated with latex or polyurethane, which helps hold the tufts in place and provides structural stability to the carpet. Holes are pierced through the backing to assist with drainage where vertical drainage is desired.</p> <p>Carpets can vary in terms of the type of yarn used and density (stitching rate). Most carpets use a single form of yarn while some might use a mixture. The yarn is generally made from either polyethylene (PE), which is soft and less abrasive, or from polypropylene (PP), which is stronger and is often used for low-impact sports such as tennis. Generally the denser the carpet, the more durable the product.</p>
Certified pitch/field	An on-site built pitch/field which has been tested by an accredited laboratory and verified as meeting the sport's defined requirements and licensing agreement conditions.
Clay soils	An earthy fine-grained soil that can retain moisture, and when moist can almost be the consistency of putty, i.e. workable in the hand. When dry, clay soils are notably dusty, hard and unworkable. Devoid of any organic materials, clay-rich soils generally drain slowly, if at all. When saturated, clay-rich soil surfaces can easily deform and rut, particularly under heavy weight loads.
Compaction	The act of compressing the surface materials to reduce air content, decrease percolation and increase density and hence surface stability. Also refers to the common observation on sand infilled carpets over time where maintenance/rejuvenation of the sand layer is not carried out effectively – making the surface hard and unforgiving.

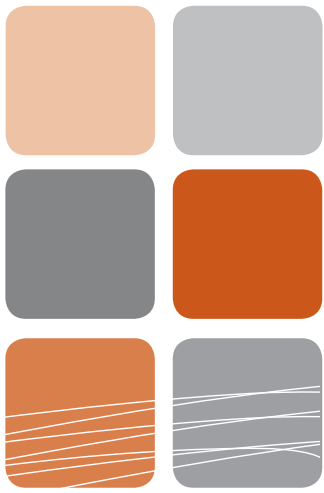




C Cont.	
Conditioning surfaces	The removal of any static electricity charge that remains in the artificial grass. Can happen via the application of fabric softener (see Maintenance Section) or through passage of time.
Contamination	Contamination of the playing surface occurs from mud and other materials brought from outside the playing area, reducing performance. If the synthetic surface is not fenced there will be a higher potential for contamination from players and other park users walking across the surface (mainly from debris in shoe soles). This will necessitate a high level of maintenance and cleaning to prevent the formation of a drainage inhibiting skin within the surface and the establishment of algae and moss.
Crimping	The processing of yarn, by heat or air pressure, to fix a wavy texture into the yarn and increase its apparent bulk.
Crumb rubber	Granules of new or recycled rubber materials used for infill or for top dressing on synthetic grass materials. Granules are specified as either new or recycled rubber, and are sized by the smallest and largest average radius of the granules contained in the packaging. Size of granules used will depend upon the application; golf putting green surfaces require smaller grain size than larger field areas. Typical range is 0.5 – 2.5mm.
Crush recovery (also called 'Fibre Resilience')	Crush recovery describes the ability of the synthetic grass fibres to rebound back upright after being walked on, or after having dead weight from furniture (such as moveable goal posts) or other elements. To encourage good recovery, all synthetic grass surfaces made for lawn and landscaping will benefit from some amount of infill materials that provide horizontal and vertical stability as well as UV protection for blades and backing.
Cut to fill	The act of cutting material from the high side of a slope and placing it in compacted layers at the low side to create a level platform.
D	
Delamination	Separation of the secondary backing or attached cushion from the primary backing of the artificial turf.
Degrade, Degradation	Loss of physical property or performance. The 'weaking out' or weakening of a system or substance, i.e. 'The effectiveness of UV protection, the strength of fibres, backing and the porosity of a surface might degrade during the life of the turf.'
Dimensional stability	Refers to the ability of the finished turf surfaces to retain their original size and shape, and resist lateral movement caused by cyclic temperature changes or movement pressure (participants/ traffic).
Disposal of carpet/pad	If it cannot be re-used (eg. training venues, kindergartens, playgrounds), it would need to be disposed of in a landfill site.
Drainage falls	Where a specific slope is designed into a sports surface so surface water will drain away from the playing area.
Dressed (hybrid) pitches	Pitches using a carpet of woven, tufted or knitted synthetic yarn partly supported or stabilised by the addition of filling material (eg. sand and/or rubber granules – generally filled to around 60% of the pile height and therefore sometimes referred to as a sand-dressed pitch). Usually 16-20mm pile, crimped down to a playing height of 12-13mm. Generally used in relation to hockey surface systems.
Durability	The capacity of the synthetic system to resist degradation by factors such as abrasion, indentation, fatigue, UV, chemicals, fire, staining, delamination and so forth. Durability can vary, depending on the quality of materials used, construction methods, the intensity of use of the pitch, effective maintenance, etc.

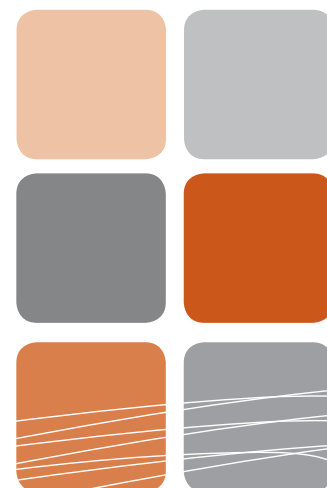
E	
E Layer	Meaning varies internationally but generally refers to an engineered base that has a mixture of resilient particles and granular material that forms a more deformable resilient structural platform for artificial grass surfaces.
Expression of Interest (EOI)	Preliminary process that teases out potential commercial interest in tendering for a project.
F	
Fabric	Materials used under and throughout the construction of a synthetic grass project. Woven and non-woven, commercial grade materials provide additional horizontal and vertical stability to the installation.
Face	Also known as the nap or the pile of the surfaces of turf. It describes the total visible surface of the finished turf materials.
Face weight	Refers to the weight of the yarn that is visible above the carpet backing (refer to Section 1.4 for calculation formula).
Fibre material	Yarn fibres can be manufactured from various natural and synthetic materials. Synthetic grasses and artificial turf are typically made from one or a combination of two or more of the following fibre materials; nylon, polypropylene or polyethylene.
Fibre size/shape	The cross-sectional area and shape of individual ribbons of fibre vary considerably from product-to-product. The unit of measurement for the weight of the fibre is dtex (1 dtex = gram weight per 10,000 metre average). The shape of the fibres can vary from fibrillated flat ribbon yarns to highly-varied shapes of monofilament yarns. The quantity of yarn used to form the pile will have a significant effect on the cost, performance and durability of the carpet. This is measured as face weight. It will also have a significant impact on the stability of the infill medium in a carpet, and the 'crushability' (or fibre resilience) of new 'shaped' fibres.
Fibre width	The width of the fibre is measured across its face and can affect the colour, shine, vertical recovery and durability of the fibres under extreme conditions; especially field applications.
Fibrillated pile/yarn	Yarn ribbon which is cut from a sheet and is then split or slotted to a variable pattern before twisting into a yarn strand. Designed to influence performance. Looks like a honeycomb when held open.
Filament	A single, continuous strand of synthetic fibre.
Filled pitches	Pitches using a carpet of woven, tufted or knitted synthetic yarn fully supported or stabilised by the addition of filling material (eg. sand and/or rubber granules). Generally loose laid, not stuck to the layers below (except at the seams).
Fines	Very small particles of matter (sand, soil, etc). Not used where porosity is important (may clog vertical drainage).
First Generation Turf	Developed in the 1960's and 1970's: Low-profile carpets (8-12mm), high-density fibres.
Foundation	Comprises of the layers beneath the shockpad and carpet – the asphalt, base, sub-base and sub-grade.
G	
Geotechnical report	A report on the ground conditions prepared by an appropriately-qualified geotechnical engineer. This will ideally report such factors that could affect the construction of a pitch, such as subgrade state, drainage capacity, compaction, moisture levels, and the potential for the ground to swell or shrink as moisture levels change.

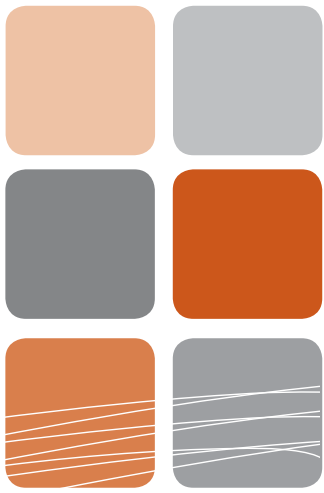




G Cont.	
Geotextile	Material used to support, separate, filter. Used to strengthen compacted ground, provide a filter barrier around drains, etc.
Granulated rubber	Rubber materials that have been processed into small grains of rubber for use in a variety of finished goods including synthetic grass infill materials. See Crumbed Rubber.
H	
Heat radiation	Most synthetic turf surfaces radiate temperature at approximately 1.8 times ambient temperature where as natural turf radiates at 1.3 times ambient temperature.
Hold points	Key stages of a project at which point works should cease, allowing inspection/sign-off of the stage of work just undertaken.
Horizontal stability	Horizontal stability is the ability of the sub-base, base and turf systems to work together to keep the installation from stretching, shrinking or collapsing. Horizontal stability is engineered into the project by the selection of the site, base materials, edging, trim elements, base construction, drainage and final grade. Horizontal stability in a synthetic grass material refers to the stability of the primary and secondary backing materials to keep the synthetic grass surfaces from stretching, shrinking or buckling over time.
I	
Infill	The infill is generally silica sand, rubber granules, or a combination of both, and its function is to support the pile of the carpet, help the pile to remain vertical and contribute to the playing and cushioning qualities of the surface (ball rebound, shock absorption and vertical deformation). Some infill systems use stratified and segregated layers of rubber and sand granules, and others a mixture of sand and rubber. Some new granular rubber infill products may be useful in Australia in reducing radiated heat.
Installation	The installation of a complete synthetic surface system, including the construction of a fully-designed base/drainage system, will take about 16 weeks (two to four weeks for earthworks, six to eight weeks for base works, two weeks for a shock pad and two to three weeks for the carpet and infill). Fencing and floodlight installation can overlap with these phases.
Irrigation	The application of water to an artificial grass carpet is sometimes done for hockey (to aid ball traction and player sliding) and lawn bowls (green playing speed).
K	
Knit-de-Knit (KDK)	After initial production, the yarn is then knitted into socks and heat-set. This process gives the finished yarn a curly appearance. The purpose of Knit-de-Knit yarn is to reduce the impact of fibre direction in the grass surface. Pile nap (lean) is overcome with KDK yarns.
L	
Latex	Latex is a natural product used as a secondary backing material to lock stitches in place and provide additional dimensional stability.
Licensed Manufacturer	An artificial grass manufacturer who has entered a licensing agreement with a sports governing body or other organisation. Can sometimes include a supplier who is partner to a licensing agreement but does not manufacture artificial grass.

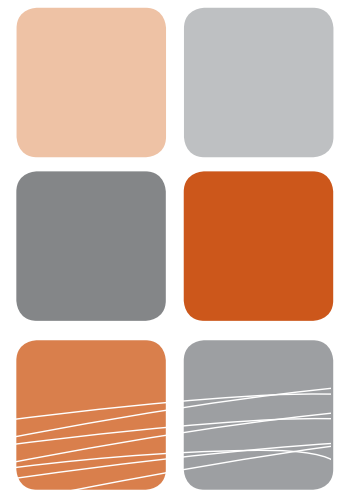
L Cont.	
Licensing agreement	The formal agreement entered into by an artificial grass manufacturer and a sports governing body concerning the conditions under which approval of artificial grass products for that sport specifically may be granted.
Lifecycle costs	The lifecycle cost of a surface consists of three different costs: <ul style="list-style-type: none"> • Initial capital • Maintenance • Replacement
Lifespan	The typical period of time that the item lasts before requiring replacement.
Long-pile pitches	Third to fourth generation surfaces exceeding 35mm pile height.
M	
Macadam	Another name for asphalt. See Asphalt.
Matting	Matting is the usually irreversible adhesion of turf yarn caused by traffic or dirt. Matting can be minimised by exercising the turf with either power brushes or manually raking it back to height.
Monofilament yarn	Individual strips of yarn which are cut from a sheet and twisted or wrapped together to form a yarn strand.
MUGAs	Acronym for 'Multi Use Games Areas'. Generally involves a compromise in some properties to suit several sports.
N	
Needle-punched carpet	Carpet where the fibre in the pile forms both the pile structure and the majority of the backing cloth. The fibres are needled into a flat primary cloth, then secondary needled to pull through/angle the fibre to a felt-like structure of the desired quality/configuration of pile.
Non directional yarn	Yarn can be crimped (twisted) so that it does not end up leaning one way and therefore influencing the direction of a moving ball.
P	
Perforations	Perforations define the holes drilled or heat punched into the backing of some synthetic turf materials. The perforations provide a passage for surface water flow through the impermeable carpet backing into the structure beneath.
Permeability	The ability of a material to allow water to pass through. Determined by percolation (infiltration) tests.
Pile	The full depth of tufts or loops of yarn which form the carpet.
Pile crush	Loss of pile thickness by compression (matting) and bending of tufts caused by high traffic or heavy weight. Grooming turf surfaces will often lift the pile back to original height. All turf will crush to some degree during its lifespan.
Pile density	Determined by multiplying the number of tufts per unit area by the unit weight of each tuft.
Pile length	The length of the extended tufts measured from the primary backing top surface to their tips. Pile tuft should be gently extended but not stretched during this measurement.
Playing characteristics	The ball/surface and player/surface interaction of a surface system.
Playing speed range	Refers to the preferred range of time in which a rolled bowl (lawn bowls) will reach the other end of the green.
Polymer	In synthetics, the basic chemical unit from which fibres are made. It is made of large complex molecules (polymer chains) formed by uniting simple molecules (monomers).

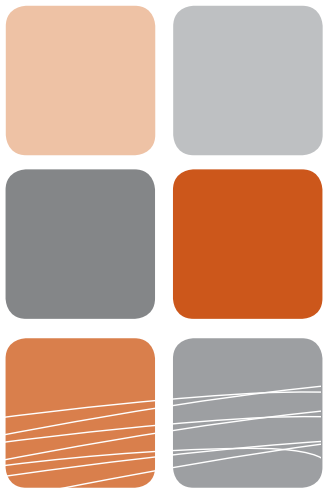




P Cont.	
Polymeric surfacing system	Plastic surfacing system.
Polyethylene	Polyethylene or polythene or polymethylene is the most widely used plastic, with an annual production of approximately 80 million metric tons. Its primary use is in packaging (notably the plastic shopping bag).
Polypropylene	Synthetic, thermoplastic polymer used for moulded items, sheets, films and fibres. The polymer is made by stereo specific polymerization of propylene. Most polypropylene turf fibres are solution dyed and sometimes contain ultraviolet stabilisers for outdoor use. The turf fibre is available as both bulked continuous filament yarns and staple for spun yarn production. Slit-film polypropylene is used on woven turf backing.
Polyurethane	A binder (used in shockpads also) used as a secondary backing on synthetic grass materials. Applied as a viscous coating, the polyurethane is sprayed across the surface to help lock-in fibre stitches and increase the horizontal stability of the synthetic grass materials. The secondary backing process is one of the last in the link of steps to producing finished synthetic grass.
Porous/ Porosity	Porosity is a measure of void space in a material. <u>Note:</u> Not to be confused with permeability which is a measure of the ability of the material (such as rocks) to transmit fluid.
Powerbroom or brush	A tool used during the construction and grooming of synthetic grass installations. A powerbroom or brush was developed for use with concrete and asphalt sweepers and adopted by the synthetic turf industry as a tool to help defibrillate (or broom) synthetic grass surface materials and help to distribute infill materials across the surfaces.
Primary backing	The material into, or onto, which the yarn is attached to form the carpet.
R	
Reactive soil (also called 'high plasticity')	The property of soil that causes it to swell when moisture content increases and shrinks when moisture content reduces. The resulting ground movement may cause damage to a poorly-designed surface.
Resilience	The capability of the turf to bounce back to its original characteristics after being used. How well a turf can handle high traffic or compressive force is determined by several factors; resilience of fibres and yarn materials, denier (dtex) and infill system of the turf system.
Rubber granule infill	Used as a shock-absorption layer within the carpet, to help the carpet fibres to maintain an upright position, and as a contributor to the desired surface playing characteristics (bounce, traction, etc).
S	
Styrene Butadiene Rubber (SBR)	SBR is manufactured from recycled tyres and other rubber products. It has been used as a major component in turf infill systems, resurfacing of sports activity areas, parks, field and track surfaces, horse tracks and a variety of other coatings and formed rubber products such as mats, bumpers and flooring products for restaurants, day-care centres and the hospitality industry.
Seams/ seaming	The line formed where two pieces of turf are joined. The action of setting the turf and seaming using one or more methods; adhesives, sewing or tacks.

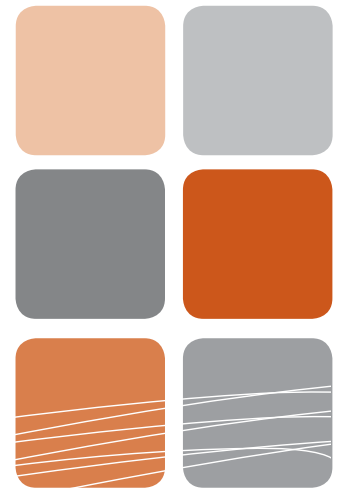
S Cont.	
Second Generation Turf	Introduced in the 1980s. Sparser density of fibres, medium pile height (10-35mm), sand-filled.
Secondary backing	The material used to coat the back of the carpet after the yarn has been attached to the primary backing.
Shedding	New turf appears to shed some fibres after installation. Many of these blades are cut away during normal installation and hidden during job site cleaning. They work their way to the surface during use. Regular blowing and grooming will resolve this problem.
Shrink (See also 'dimensional stability')	Synthetic grass surface materials, like most woven products, can shrink or shift under certain conditions. Where temperature variances can change from extreme cold to extreme heat, synthetic grass surfaces can expand and contract. A minor amount of shrink can also occur on surfaces as they age. Shifting of turf surfaces is more often noticed and can be misidentified as shrink.
Shock pad	<p>If required, a shock-absorbing layer is placed over the base, directly under the carpet. It is used to provide a degree of comfort to players underfoot, but also to reduce peak forces for head impacts, and to create defined playing characteristics for specific sports. The two main installation methods of shock pads are:</p> <ul style="list-style-type: none"> • In-situ: hot mix of rubber shreds/crumbs bound with polyurethane and laid using a small highway type paving machine. • Pre-formed: supplied in rolls and fixed in place by gluing. <p>A shock pad will significantly increase the cost of installing a synthetic surface but may last for several surface replacements (two to three surfaces – 20 years).</p>
Sinking fund	A fund into which an organisation sets aside money over time to pay for the replacement of an asset in the future. Also called a Capital Replacement Fund.
Soft spots	Areas of ground that have lower than typical strength. Typically, these could be areas where tree roots have been removed and insufficient attention has been paid to compaction when the holes were filled. Soft spots may also be caused by moisture collecting in fine grained clay and silt soils.
Spoon drains	Surface drains (generally around or at the end of the sports surface) designed to collect water and direct that water to collection points.
Stability	<p>Horizontal (left to right and reversed) and vertical (up to down and reversed) stability is important to a synthetic grass installation. Turf materials, their backings, the base and sub-base construction of the job all relate to standards of horizontal and vertical stability. A project's sub-base and base construction should maximise horizontal stability to carry weight load. Synthetic grass primary and secondary backing materials aid the turf system's surface materials by: providing additional horizontal stability and providing the required stability needed to suit the project objectives.</p> <p>To achieve vertical stability, synthetic turf systems are helped by the use of infill materials to stand blades upright and provide resilience and cushion underfoot.</p>
Static electricity	Cold and low humidity often create isolated motionless charges of electricity, and some turf products can provide static resistance. See Maintenance Section for treatment advice.





S Cont.	
Slip resistance/traction	Measures of a finished surface related to sufficient grip underfoot to accelerate and decelerate, adequate slip to turn, etc.
Sub-base	A secondary layer of bound or unbound fill placed on the sub-grade to influence the engineering and playing characteristics of the whole construction. Is in addition to the base course, added where the sub-grade conditions are inconsistent.
Sub-grade	The prepared surface of the natural ground onto which the base pavement and carpet system are laid. Provides the ultimate support and sometimes the required surface profile to the base. The strength and stability of the sub-grade are particularly critical for pitches/fields/courts/greens built over filled sites.
Surface system	The composite of the individual layers of materials used in the construction of a sports surface – the base, surface seal, shock pad, artificial grass carpet, and infill (where appropriate).
T	
Tape	Seaming tapes or backing are materials used under the edges of two pieces of synthetic grass which will be used as a part of a seaming system to attach the two pieces of synthetic grass together.
Tender	A process that provides information about a proposed project (via drawings/specifications) and seeks prices from bidders to undertake the project.
Tensile Strength	The resistance of a material to a load applied in tension (as opposed to compression).
Texturised yarn	The term given to yarn which has a crimp (see crimping). This crimp is made by texturing the yarn in a special machine, using heat, rather than knitting the yarn. The finished product has a different appearance and performance when compared with products made from Knit-de-Knit yarns. Texturised yarns help prevent pile 'nap' (where the pile falls in one direction) but do not fully overcome it.
Third Generation (3G) Turf	Introduced in the late 1990s – comprising a longer pile (35-65mm), lower density of fibres infilled with sand/rubber granules or both. Generally loose laid, not stuck to the layers below (except at the seams).
Twist	Twist is the winding of the yarn around itself. More twist improves turf performance (especially in cut pile).
U	
Unfilled pitches	Pitches using a carpet of woven, tufted or knitted synthetic yarn in which the density of the pile is sufficient to maintain yarn vertically without support or stabilisation by other materials. Usually 10-13mm pile height. May be stitched seams, or usually fully adhered to the shock pad beneath, and usually needs to be wet to achieve playability.
W	
Warranty or product guarantee	A written undertaking by the supplier and/or installer that the product will be fit for its intended purpose for a stated time period from the date of supply or installation, and that any imperfections will be addressed during the period of time that the warranty is valid.

W Cont.	
Water-based pitches	An unfilled pitch (generally low-pile height, high-density of fibres) most often used for hockey, that is played on 'wet' to help keep the ball on the carpet surface, provide some controlled foot-slide when players need to stop/turn, and to allow players to fall on the surface without risking friction burns.
Water Harvesting	Collecting and reusing water that drains from the surface system.
Y	
Yarn	A continuous strand of twisted fibres.



Mill Park Secondary College (Refer to case study - Page 126)