Artificial Grass Pitches in a Rugby League Environment

Proposal to RFL On-Field Group

RUGBY FOOTBALL LEAGUE

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Recommendation

The following proposal provides background information on Artificial Grass Pitches (or Synthetic Turf Pitches) and the categories and recommended usage that will form part of Guidance Notes developed by Sport England, The FA, The RFU, England Hockey Board and the RFL. There are 3 main categories of AGP that we are proposing should be used by Rugby League:

- 65mm Long Pile with Shock Pad (IRB22)
- 55mm-60mm Long Pile (FIFA One Star)
- 40mm Short Pile (FIFA One Star) – hockey compatible

65mm Long Pile with Shock Pad (IRB22)

To be used for training and competition at all levels of the game

55mm – 60mm Long Pile (FIFA One Star)

To be used for training and competition at all levels of the game

40mm Short Pile (FIFA One Star)

To be used for recreation and training but NOT full contact

Information is provided within this document on the structure of an AGP and the standards specified within IRB22 and FIFA One Star. There is no existing standard that specifies the minimum requirements for a natural turf Rugby League pitch.

Introduction and background (kindly provided by Dr. Colin Young SAPCA)

The majority of traditional sports were developed from participation on a natural outdoor environment using natural turf as a surface. The desire to make sports less dependent on external influences, shortage of space, ability to grow grass and the propensity to reduce operating and maintenance costs led to the development of man-made surfaces. However, these new surfaces had effects which were neither expected nor planned on both the participant and sport itself.

The performance aspect of sports changed with the introduction of synthetic turf pitches including the magnitude and direction of forces acting on the human locomotion system. While these effects altered the way in which many sports are played some of the underlining scientific principles are still not fully understood. Although synthetic turf pitches have been around since the late 1960s and widespread since the early 1980s there is a real dearth in knowledge into how and what influence their behaviour (Young, 2005). There are many manufactures of synthetic turf pitches all of whom make claims to the benefits of their particular surface. However, there is a lack of good quality public knowledge to support or refute these claims.

History of Synthetic Pitches

Outdoor sports surfaces can be split into two categories: natural and artificial. A natural surface is one formed by the suitable preparation of an area of land, which includes grass, ice, snow and loose mineral layers. An artificial surface is one constructed with materials which were prepared by human work, using synthetic or manufactured materials, which can include wooden boards, synthetic products or bituminous products (Nigg 1987). Within each of these groupings there are many sub-categories of surfaces which are used for a multitude of different sports.

The majority of outdoor sports evolved in environments using natural turf (Baker 1993). Restrictions on available land, increasing participation in sport, the need to lessen external environmental influences and the desire to reduce operating and maintenance costs have led to alternatives becoming more widely used (Tipp and Watson, 1982). The most recent figures suggest that the UK has over 1500 full size outdoor synthetic turf pitches in use (Sport England, 2010).

Natural turf ensures an acceptable degree of player and ball interaction at the highest level of competition and Bartlett (1999) states that “natural turf is the ideal sports surface”. Unfortunately playing sport on natural turf requires an intensive maintenance regime to ensure it retains its performance characteristics. If allowed enough recovery after each use, and if properly maintained, grass has a life-span that far exceeds any alternatives, as it is a living material with the ability to regenerate. However, the frequency of use is limited, otherwise wear damage can be considerable (Bartlett, 1999). Furthermore, when used in adverse weather conditions, such as heavy rain, grass is susceptible to damage and some conditions (freezing & arid with irrigation) can render it unplayable (Bell 1985; Baker 1989).

In the late 1970s there was a large demand for sports facilities which fuelled the growth in artificial alternatives (Tipp and Watson, 1982). Difficulties maintaining natural turf and a shortage of available space (especially for inner cities) further amplified the demand for artificial surfaces. Many approaches were made in the search for an appropriate substitute for grass which could sustain a high level of use, required little maintenance, and yet still provided a suitable surface that offered desirable playing characteristics. The one development that has had the greatest impact was the use of plastics and rubber surfacing systems (Tipp and Watson, 1982).

Artificial alternatives have not been met with the same reaction in all sports e.g. soccer (Baker et al., 1983) despite their practical and financial advantages (less maintenance). However, field hockey has completely adopted artificial surfaces to the extent that natural turf is no longer sanctioned for use at national or international competitions. Since the 1976 Montreal Olympics field hockey has used artificial surfaces for international competitions. This has filtered down to national and club level competitions to the extent that field hockey is rarely played on natural turf. Rugby Union (IRG regulation 22) and Soccer (FIFA Quality Concept) have started to use synthetic turf more commonly in recent years with the introduction of 3G surfaces.

The first installation of an synthetic turf pitch (STP) is accredited to the Monsanto Company in the USA; it was designed and constructed with sponsorship from the Ford Foundation at Moses Brown School, Providence, Rhode Island in 1964 (Crawshaw, 1989; Tipp and Watson, 1982). The first mainstream installation was at the 'Astrodome' in Houston, Texas, in 1966. Artificial turf was considered because natural grass would not grow indoors under artificial lighting and survive heavy usage. With the success and versatility of this system it soon became prevalent in the USA for both indoor and outdoor use. The first artificial pitch was installed in Britain in 1971 as a non-commercial football facility for Islington Borough Council, London. An STP was considered because of the durability/cost ratio and the limited availability of land (Crawshaw 1989). After this installation the introduction of STP's became widespread in the UK.

STP's have evolved over the past four decades since the first installation, which was a warp-knitted carpet with a polyamide pile and foam backing (Crawshaw 1989; Tipp and Watson, 1982). In the early 1980s sand was introduced into the pile (Knauf, 1995), followed by water in the mid 1990s and then a mix of sand and rubber granules at the turn of the century. Sand filled pitches quickly became popular in the late 1970s early 80s mainly due to lower costs (Tipp and Watson, 1982). Sand filled pitches, although popular, are often constructed as a compromise as they can be used for several sports (Crawshaw, 1989). While this is cost effective it can often lead to a trade off in surface performance as the requirements for different sports are often in conflict e.g. Tennis requires a resilient surface for ball rebound of between 40 – 60 %, whereas Field Hockey requires between 20 – 40 % rebound heights (Bell et al., 1985; Sports Council, 1978 and 1984). The compromise and conflict between performance requirements has led to the development of specific sports standards (e.g. ITF, 1997; FIH, 1999; FIFA, 2001; UEFA, 2002; IRB, 2004 ;) that a surface must achieve before it can be used for sanctioned competitions.

The most recent development in artificial turf is a long pile carpet. The carpet pile is longer than usual (in the region of 40 to 70 mm although there are many variations) and filled with rubber crumb (or sand and rubber crumb mix). This type of surface system is commonly known as 3rd generation or 3G (SAPCA, 2001) and is normally used for soccer and rugby.

Constituent Layers

The pitch system comprises many layers. From the bottom-up the layers are consolidated soil (or compacted fill), often the natural soil found on site; a geo-synthetic layer (to prevent the migration of particles between layers); two layers of crushed broken stone (normally a compacted graded aggregate); two layers of asphalt (a hot-rolled blend of aggregate and stiff bitumen binder); a shock absorbing layer often termed shockpad; and the carpet layer. Variations on this design are not uncommon.

The synthetic turf and shockpad (occasionally) layers are the only prefabricated part of the system, the other layers being formed from their constituent parts in-situ. The compacted fill (often the natural soils found at the site), the sub-base, and the asphalt layers form the pitch foundation. The foundation needs to provide a stable platform for construction vehicles, provide through pitch drainage, and remain very flat for its design life of 25 years or more. The shockpad and synthetic carpet form the surface system and together provide the player-surface and ball-surface characteristics. The shockpad can be formed from recycled shredded rubber particles bound together on site and laid with a similar method to the asphalt (termed an in-situ shockpad), although it can be provided in the form of a foam layer as part of the carpet backing (termed an integral shockpad).

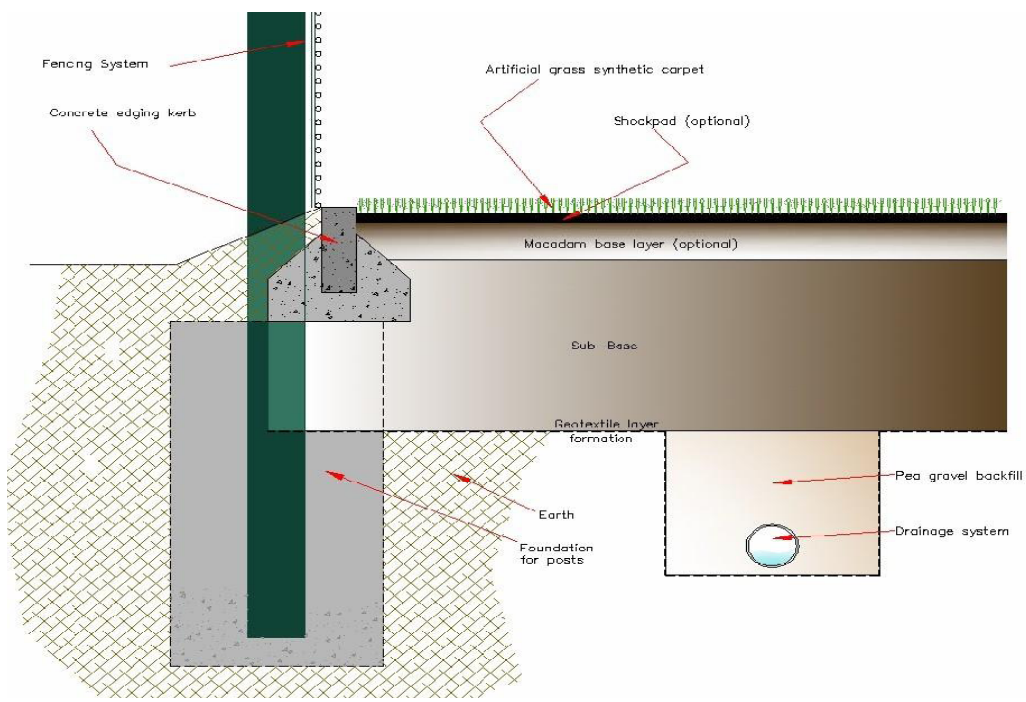

FIGURE 1 CONSTITUENT LAYERS

Sub-grade

The pitch structure must reduce the stresses (and hence strain) transmitted to the sub-grade to a level that ensures that there is only very limited deformation at the end of the design life. The magnitude of stresses transmitted to the sub-grade at formation level is influenced by the elastic stiffness of the sub-grade and the layers above. The stiffness controls the strains developed. The most common way to measure the strength and stiffness of sub-grade in highway engineering is by the California Bearing Ratio (CBR) (Barnes, 2000).

Sub-grade construction is typically achieved by removal of the topsoil. A cut and/or fill process occurs which uses earth taken from nearby embankments to reach the required pitch level which is monitored by a laser level. A minimum number of passes by a vibrating roller is required to compact the fill which improves the surface strength. Finally, drainage channels are dug diagonally across the pitch (often with a slight fall) and perforated pipes laid into them, which are then filled with gravel and compacted.

Sub-base

The sub-base is a structurally significant layer comprising of compacted high quality well-graded granular material. Once placed, it provides a working platform on which the surfacing materials can be transported, laid and compacted. It also acts as a regulating course and insulates the sub-grade against the action of frost (Powell et al., 1984). Compaction should create good particle packing and interlocking to give a high density, high strength and high stiffness layer. However, to allow rapid drainage the sub-base is often specified on the coarser side of the grading envelope (i.e. a particle distribution with a bias towards coarse stone), which affects the achievable density and hence strength/stiffness. The thickness of the sub-base required is usually derived from the sub-grade CBR. A layer of coarse aggregate is placed above the sub-grade, which is spread by an excavator whilst a process of grading and rolling occurs to achieve a level surface to the required thickness. A second layer of finer aggregates is then laid onto the coarse stone. This layer is often thinner than the first but more care is taken to achieve the required thickness and level tolerance of the pitch to then accept the asphalt.

Asphalt Layer

The asphalt layer provides a stiff and strong uniform layer consisting of aggregates bonded together with a (bitumen) binder. The aggregate grading, consistency of grading, binder type, binder content and mix temperature can all influence its quality. The asphalt is usually installed in two layers: firstly the base course (typically 40 mm thick) which provides a stable, well-shaped flat platform on which to allow good compaction of the wearing course (typically 25 mm thick). The build quality and grading of the asphalt can improve the longevity of a pitch through improved compaction and drainage (SAPCA, 1999). The porosity of the layer is vital to ensure the rate of drainage is achievable.

There is a strong similarity between the design and construction of an STP base structure and a thinly surfaced road. Thus, the principles of highway engineering and analysis can be applied to determine the influence of changes in design relatively simply. However, highway engineers have guidelines with respect to the ‘failure’ criteria for the road so that designs can be made safe and structural assessment data (e.g. for maintenance) can be benchmarked. The most important principle in highway engineering is that of limiting elastic strains in the materials to below acceptable limit(s) to avoid accumulation of damaging plastic strains from the repeated traffic loads. The strains caused by loading of the road surface are estimated from simple analytical models, and the layer thickness (and stiffness) adjusted to meet the limiting strain criteria. In addition, the deflection of the road structure as a whole, under a controlled load, can be used to identify its structural capacity to carry heavier and more frequent loads in the future. The strain and deflection criteria were developed partly from back-analysis of field measurements and many years of observation of long-term road trials.

Shock Absorbing Layer

A wide variety of cushion underlay or shockpad have been offered for use with synthetic turf systems. The three main types of shockpad currently available are cast in-situ, prefabricated and integral (to the carpet). The shockpad provides resilience, reduces injuries from falls, and helps provide the required playing characteristics (Tipp and Watson, 1982; Dixon, 1999; Brown, 1987). To be effective, the properties of the shockpad must not only be correctly chosen, but also be retained over the range of temperatures and other climatic extremes in which it is to be used and throughout its service life (Tipp and Watson, 1982). There is a significant dearth of recent information relating to shockpad; many manufactures are unwilling to supplying information on their products but freely make claims as to their performance which is impossible to substantiate.

In the UK the most common type of shock absorbing layer are in-situ shockpad. These are made on site from a combination of elastomeric binder and rubber crumb (normally from recycled vehicle tyres). The mix design, thickness and compaction determine its characteristics. Advantages of in-situ construction include the seamless layer, freedom of mix type and layer thickness. Problems with this type of shockpad are quality control which can include material inconsistencies, mix ratio and achieving the desired thickness.

Prefabricated and integral shockpad are expected to be more consistent than in-situ pads as they are manufactured in a controlled factory environment. Prefabricated pads are rolled out on site and often adhesively bonded to the base foundation. However, over time, seams can part and create gaps or ridges on the surface. They are available from manufactures in a variety of profiles but they have limitations on thickness unlike in-situ pads. Integral shock pads are generally made from a closed cell foam neoprene and like prefabricated pads should be less liable to inconsistencies. They are integral to the carpet which means they can't move and cause gaps or ridges under it like prefabricated pads but if a gap originates between carpet seams then that means a gap in the shockpad also. Furthermore, integral pads can become expensive, as they are required to be replaced at the same time as the carpet which generally has a shorter life span than the shockpad. However, without a whole life cost analysis the relative merits of each system is impossible to ascertain.

Synthetic Turf Layer

Synthetic fibres or ribbons are woven or knitted into a backing fabric (strands interweave) or tufted into previously made backing fabric. The pile strands are secured to the backing by a rubber latex binder to provide flexibility and dimensional stability and, for tufted products, structural integrity (Bartlett, 1999). Although used for a variety of sports there is no agreement on the size and shape of the pile for optimum playing characteristics nor on sand, rubber or water filling and other important aspects (Bartlett, 1999). Agreement will be unlikely due to the different performance requirements for each sport which has led to the development of sport specific surfaces i.e. water based for field hockey and 3G for soccer as two examples recent examples. Once more, published information about products is difficult to obtain, manufactures produce datasheets with information on pile weight, density, and several other empirical measurements. However, this information does not give any insight as to how the carpet will play or what influence it will have on certain playing requirements. Product approval schemes run by various sports governing bodies give a brief insight into carpet behaviour.

There are a number of fibre polymers used for synthetic turf, which can vary in structure depending on desired properties. The polymers used at present are all constructed from organic chemicals, with various combinations of carbon, hydrogen, oxygen and nitrogen (Tipp and Watson, 1988). Different combinations of these chemicals can influence polymer behaviour; at present the most commonly used polymers are Nylon, Polypropylene and Polyethylene. Polymer engineering can be used to manufacture many different specifications of each material. For example Nylon-6 and Nylon-6-6 have quite different properties, the melting point of Nylon-6 is 40ºC less than Nylon-6-6, it has a lower tensile strength and glass transition temperature which makes it more compliant but less able to withstand heavy usage than Nylon-6-6.

Polymers are susceptible to damage from a variety of sources. It is therefore often necessary to introduce additives, plasticizers and stabilisers during the manufacturing process to reduce potential damage and/or degradation. Ultra-violet radiation from the sun, air pollution (e.g. acid rain) and soilage from dirt and wear from user traffic can all contribute to the premature ageing of the turf (Brown 1987).

Perceived behaviour of Synthetic Turf Pitches

Nigg and Yeadon (1987) suggest sports surfaces can be assessed with respect to technical specification, sport functional properties, safety consideration, and cost factors. However, players' requirements should be considered when developing and testing a playing surface, to ensure it meets their needs. In general, current sports surfaces are designed and built based on the experience of what has worked well in the past. However, new products are emerging in the market, and many make great claims for their improved playability properties. Players need to be comfortable and confident with the sport surface they play on i.e. it should be safe, consistent and allow them to perform and maximise their skills during a game. A better understanding of the surface's playing characteristics, and their importance to the players, will aid both design and assessment of the sports surfaces in use and help develop surfaces for the future.

Currently in the UK each pitch is constructed on a site-specific basis and to the requirements of the user/operator, although all the pitches, when new, must pass a series of (mainly) mechanical playing performance related tests. However, many of the pitches key components can vary in design and be further affected by construction techniques. Feedback from users and general anecdotal evidence suggests that pitches differ in the way they play and 'feel' during play. There is little objectively measured information to substantiate these claims and no way of utilising player feedback in the design of further pitches in any systematic way. There is a lack of published peer reviewed data regarding the design and performance of artificial sport surfaces, and as a result a difficulty in validating designs, innovating materials, and determining the efficacy of claims made by the manufacturers about their products. Also, there is little to support mechanical tests as being suitable to what players perceive, and consequently their relevance.

To date no published literature exists that assesses perceptions objectively for the playing surface for Rugby League.

Comparison of IRB performance Specification for Rugby Union and FA Performance Standard for AGPs

The following chart is available from the FA and RFU and was prepared by LABOSPORT

Comparison of IRB Performance Specification for Artificial Surfaces for Rugby and the FIFA 1 star Quality Concept	IRB requirement	FIFA 1 star	Comment
Player / surface interaction			
Force Reduction / Shock Absorbency	60 to 75%	55% to 70 %	The IRB requires a higher level of shock absorbency than the FA; this will be to accommodate the greater impact forces encountered in rugby. The IRB requirements are more in line with those of the FIFA Two Standard (March 2005). To obtain and maintain, these requirements many surfaces will require a shockpad, which has cost implications for football. The use of shockpad for both sports is considered advantageous by many as they help prevent longer compaction and loss in performance.
HIC	> 1.0 m	No requirement	This test simulates a head impact with the surface. It is a more severe test than that used by football, which replicate players running on the surface. To comply increases the need of many surfacing systems to include a shockpad and also increases the disadvantage of using an engineered base in construction (due to increased rigidity of the base).
Vertical Deformation	4 – 10mm	4mm – 12mm	The minimum test requirements are the same but FIFA 1 star has a slighter higher allowable tolerance.

Traction	30 – 50 Nm	25 – 50 Nm	The test and requirements are virtually the same.
Slip Resistance	0.6 –1.0μ	120 to 220 (3.0 G to 6.0 G)	FIFA selected an alternative means of measuring the linear friction of surfaces. The test specified by the IRB is unlikely to cause problems for football surfaces. The FIFA test could be incorporated by the IRB in the near future.
Abrasiveness	No scratches on film	0.35 – 0.75 – no scratches on film	As many football surfaces can achieve the requirements it is not considered a problem for dual use surfaces, indeed its inclusion helps overcome concerns about skin abrasion / friction burns on artificial surfaces.
Energy Restitution	30 – 50%	No requirement	FIFA do not have any requirement for this property. Based on our knowledge of this type of test no significant conflict is envisaged.
Ball Surface interaction			
Vertical ball rebound	30 – 50%	60cm (30%) – 100cm (50%)	The requirements are the same for both sports.
Angle ball (pace)	50% - 70%	45% - 80%	The requirements are the similar.
Ball roll	Not applicable	4m to 10m	The increased pile length required by rugby (see below) will reduce the distance a ball rolls. As most artificial surfaces struggle to achieve and maintain the distance specified by FIFA this should be advantageous

Durability etc			
Abrasion resistance / durability	No change for: shock absorbency, deformation, traction, Abrasiveness	Small reductions allowed to reflect hardening of pitch as result of compaction	To remain within the requirements of newly installed surface a product will require initial results to be at the softer end of scale and probably require a shockpad.
Joint strength	25N/mm tension	15N/mm tension or 0.25N/mm peel	IRB standard requires a much high levels of joint strength than football. This reflects the increases stresses placed on the surface by the game.
Product stability	25 N/mm	No requirement	The increased stresses placed on a rugby surface require a stronger carpet backing. Whilst increasing costs this will not have an adverse affect on the performance of football surfaces
Pile height	>65mm	No requirement	The IRB requirement for a minimum pile height is based on the need to prevent studs penetrating the primary backing of the artificial grass carpet, presumably in the scrum and ruck. Football has no such requirement.

			Many football surfaces will not satisfy this requirement meaning that a joint use facility would have to be surfaced with a rugby grade of carpet or this requirement be ignored. If a surface satisfies the joint strength and product stability requirements this should remove the need for the minimum pile height (or allow a reduced value (e.g. 55mm).

Specification conflicts

The above chart shows that, in most cases there is little significant difference between the specification requirements of FIFA (the FA) and the IRB (RFU). However there are 5 main areas of conflict between FIFA One Star and IRB22 specifications which are Shock Absorbency, Head Impact Criteria, Pile Height, Joint Strength and Product Stability.

Shock absorbency

The RFU's IRB22 standard includes a higher minimum Force Reduction/Shock Absorbency percentage requirement (60%) than the FA requires (55%). The measurement determines the behaviour of the surface under a load in order to predict how it will perform during player impacts in comparison to the same impact on concrete. Shock Absorbency is related to foot/surface interactions and is a biomechanical test and not a safety test. It is a measure more of comfort and performance. There is a clear requirement to ensure that the surface is comfortable whilst not being so absorbent that it significantly reduces running performance.

As Rugby Union players often have a greater mass than Football players the increased force reduction requirements have been specified to increase comfort levels of the surface. As Rugby League is generally a high speed sport and there are more opportunities to run some distance at speed with the ball than in Rugby Union, it could reasonably be assumed that Rugby League priorities in this area are slightly different to Rugby Union's. It is therefore proposed that a Force Reduction of 55% would provide an adequate balance between comfort and performance.

It must also be borne is mind that this measurement, if applied to natural turf Rugby League pitches, would result in many pitches being deemed unsuitable.

Head Impact Criteria

Head Impact Criteria relates to impacts of the head and shoulder on the ground and is a safety test linked with acute injuries, for example concussion. The requirement of Rugby Union is largely related to line-outs with the risk of head/shoulder impacts from greater heights. In terms of Rugby League the concern would centre more on player-on-player impact with the surface which is more of a risk factor than for football. However there is no research available in this area at the moment and this is something we should aim to redress with our own studies. Again it should be borne in mind that this assessment is not carried out on natural turf pitches and many AGPs would compare favourably.

Pile Height

Rugby Union specify a 65mm Pile Height largely due to the length of studs on Rugby boots and the impact on the backing, seam and tufts on the surface due to the ruck/scrum. A 55mm Pile with the appropriate joint strength and product stability requirements should remove the issue for Rugby League in terms of damage to the carpet, however a short pile of 40mm will clearly require different footwear. Guidance on footwear would need to be provided for AGPs.

Joint strength and Product Stability

The increased requirements of Rugby Union are largely related to the long term wear and tear on the product from the ruck/scrum and the generally greater mass of the athlete. Whilst it is reasonable to assume there may be more wear and tear during Rugby League activity than Football it will not be as significant and there will be no impact on safety assuming maintenance and safety tests are carried out to schedule.

Discussion

Rugby League is a high speed, high impact collision sport and requires a surface that is safe, resilient and comfortable and that does not negatively impact on running performance. Rugby League has traditionally been played on natural turf pitches with a considerable variation in quality. During wet weather natural turf pitches are soft and less stable impacting on the ability of athletes to run at speed and control the ball, whilst dry pitches can be uncomfortable to play on. Frozen, extremely wet or dry pitches result in matches being postponed for either safety reasons or to protect the natural turf. This not only affects the playing/training programs, it can also result in loss of players and has financial implications for clubs.

Accidents and injuries are generally accepted as a normal part of the game on natural turf, however within a man-made environment there is a risk of legal action and an additional responsibility on NGBs to ensure that they have taken reasonable measures to ensure any product that they recommend is suitable for their sport. This needs to be balanced with consideration of the advantages of AGPs; Artificial surfaces are not adversely impacted by the weather to the same extent as natural turf, the surface remains largely consistent throughout the year and can also be used within indoor or covered sports facilities where a natural turf pitch would not grow.

The substantial number of new AGP surfaces that will be installed at school sites nationally as part of the Building Schools for the Future program offers a unique opportunity to Rugby League and other pitch based sports to increase participation and performance across the game.

Further Research Requirements

It is recommended that the RFL conduct its own research into Artificial Surfaces to develop specifications particularly suitable for Rugby League whilst also ensuring that the game is able to take advantage of as many surfaces as possible. The following areas of research are recommended:

Research Aim: To investigated the feasibility of using artificial surfaces for Rugby League and identify the impact this has on the player and the wider game.

Research Objectives:

Objective 1: Review the specific requirements of Rugby League as a high-impact and high-speed collision sport. In particular focus on player surface interactions both controlled (during locomotion) and uncontrolled (during falls/tackles and other similar surface impacts).

Objective 2: Elicit perceptions from players, coaches and performance staff when using artificial surfaces. This should be compared to natural turf and to their ideal playing characteristics.

Objective 3: Develop a sophisticated system to monitor injury occurrence, severity and cause when using both artificial and natural turf.

Objective 4: Review existing performance standards for artificial turf (IRB Reg 22 and FIFA 1 star) and adopt or produce new requirements based on the findings of objectives 1 and 2.

Objective 5: Assessment of clubs in the Superleague, Championship and Community who have access to AGPs and the subsequent impact they have on the clubs in terms of performance and participation. Develop example business models to assess the short, medium and long term benefits or costs of using artificial surfaces.

Objective 6: Investigate the impact of artificial surfaces on junior, amateur, women and school Rugby League.

Categories of Artificial Grass Pitches

Sport	Long Pile 3G (65mm and shock pad)	Long Pile 3G (55-60mm)	Short Pile 3G (40mm)	Sand Filled	Sand Dressed	Water based
Comments	Rugby Surface	Preferred Football Surface	Acceptable surface for some competitive football and hockey	Acceptable surface for competitive hockey and suitable for football training	Preferred surface for competitive hockey and suitable for football training	High ;evel competitative hockey and suitable for football training if pitch irrigated
Hockey	□□□□□□	□□□□□□	□□□□□□ Surface must comply with FIH Standard (insitu tested)	□□□□□□ Surface must comply with FIH Standard (insitu tested)	□□□□□□ Surface must comply with FIH Standard (insitu tested)	□□□□□□ Surface must comply with FIH Standard (insitu tested)
Rugby League	□□□□□□ RFL currently evaluating surface standard - see website for latest information	□□□□□□ RFL currently evaluating surface standard - see website for latest information	□□□□□□ not full contact	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only
Rugby Union	□□□□□□ Surface must comply with IRB 22	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only	□□□□□□ * Can be used for Tag and Touch/Handling skills only
Football	□□□□□□ Surface must comply with FIFA 1 star	□□□□□□ Surface must comply with FIFA 1 star	□□□□□□ Surface must comply with FIFA 1 star	□□□□□□ BSEN...	□□□□□□ BSEN...	□□□□□□ BSEN...

Note: All users should refer to the individual NGB guidance, available on line, for specific information on the preferred categories

□□□□□□	Not suitable for use
□□□□□□	Acceptable to play modified games/training on but not suitable for serious training/competiton
□□□□□□	Acceptable surface for training/recreational use
□□□□□□	Acceptable surface for training and for some competition
□□□□□□	Suitable artificial surface for competition and training
□□□□□□	Preferred surface for competition and training (regional/national)
□□□□□□	Required surface for high level hockey competition/training (national/international)

Further information

- FIFA Test Manual - provides information on the tests and methodologies used by FIFA
- The FA - Artificial Grass Pitch Information – an FA document that provides information on the development of Artificial Grass Pitches
- The RFU - Artificial Grass Pitches – an RFU document that provides information on Artificial Grass Pitches
- Sport England - MUGAs – a Sport England document that provides information on Multi-Use Games Areas and includes information on surface types