



**GUIDE TO THE USE OF SYNTHETIC TURF
FIELDS FOR RUGBY LEAGUE IN AUSTRALIA**

Performance and Construction Standards 2021





These Performance and Construction Standards have been developed to guide the use of synthetic turf fields for Rugby League in Australia. It will provide clubs, administrators, planners and developers to the best practice approach for the planning, design, procurement and required standards for the construction of a Rugby League field in Australia.

Prepared and developed with the support of the Rugby Football League (UK) and transposed on behalf of the National Rugby League (NRL) by Martin Sheppard, Smart Connection Consultancy (www.smartconnection.net.au).



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The Standards

Introduction

The development of synthetic turf surfaces that replicate the playing qualities of a high quality natural turf with technology that allows for significantly increased usage and intensity has been embraced by Rugby League. To ensure these surfaces provide a satisfactory playing environment that will not increase the risk of injury to players and are of adequate durability to perform for a period of time that makes the economic investment viable, the National Rugby League (NRL) has worked with the UK's Rugby Football League (RFL) to adapt their synthetic surfaces standards for use in Australia. The NRL Standard was first published¹ in 2014. This 2021 edition reflects improvements made in a number of the test methods used to assess the performance and characteristics of synthetic turf surfaces.

As it is likely that many synthetic turf Rugby League pitches will also be used for Football or Rugby Union the Standard has been aligned with the requirements of FIFA² (as adopted by FFA) and World Rugby Regulation 22³ (as adopted by Rugby Australia), wherever possible.

General

This NRL Performance and Construction Standard (Standard) details the requirements for synthetic turf surfaces used for Rugby League (training and competition). It comprises two parts:

Part 1 comprises a series of laboratory tests that are designed to assess the ability of a synthetic turf surface to provide the required levels of player/surface and ball/surface interaction, together with tests that assess the durability and quality of materials used to form the surface. Ideally a pitch intended for Rugby League will be surfaced with a synthetic turf surface that complies with Part 1 of the Standard.

Part 2 details the performance requirements for an installed field that will be tested on site. NRL competition and training regulations require all fields to be periodically tested to verify they are providing the appropriate levels of player protection and performance. A new synthetic turf field should be tested by an NRL approved test agency, who also holds the FIFA/World Rugby Test institute status, before it is played upon for matches and training.

The field needs to continue to hold an NRL certificate to demonstrate compliance against this Standard throughout the course of the field's life.

Implementation

The NRL Standard becomes effective from 1 June 2021 and any synthetic turf surface submitted for product approval testing from that date onwards shall be tested in accordance with this edition of the NRL or RFL Standard.

Any new fields built in 2021 may be surfaced with products that have been tested to the 2017 or 2021 editions of this Standard. Any fields constructed after 1 July 2021 should be surfaced with a synthetic turf that has been tested and type approved in accordance with this edition of the NRL Standard.

Existing fields requiring certification for the first time or fields requiring re-certification shall be tested in accordance with the edition of the Standard that was approved at the time the field was built.

¹ NRL Performance and Construction Standards for Synthetic Turf Rugby League Competition and Training Pitches
² FIFA Quality programme for Football Turf: Handbook of Requirements (October 2015 edition)
³ World Rugby: Rugby Turf Performance Specification 2016

Normative References

This NRL Standard incorporates by dated or undated reference provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this Standard only when incorporated into it by amendment or revision. For undated references, the latest edition of the publication referred to applies.

Test Laboratories

Laboratory and pitch tests shall only be undertaken by laboratories operating a quality system accredited to ISO 17025 for the principal sports performance tests. A list of suitable laboratories may be obtained from the NRL. The laboratory appointed to undertake a pitch test shall not have been involved in the design, specification, or procurement of the pitch.

Definitions

A synthetic turf surface comprises the synthetic turf carpet and infill plus shockpad and any supporting layers that are designed to influence the sports performance or biomechanical response of the surface. Tests shall be made on all elements of the construction that influence the sports performance or biomechanical response of the surface.

Due to limited Australian standards in this environment, the NRL is embracing the European and any other specific global standards that are used by other sports codes or leaders in the industry. The designation EN used to reference test procedures in this Standard, refers to documents published by the European Standards Committee (CEN).

The designation ISO used to reference test procedures in this Standard, refers to documents published by the International Standards Organisation (ISO).

The designation FIFA TM used to reference test procedures in this Standard refers to a test method detailed in the FIFA Quality Programme for Football Turf—Handbook of Test Methods.

Laboratory Test Specimens

Test specimens shall be prepared strictly in accordance with the manufacturer's instructions and BS EN 12229. If required, this may include additional consolidation of the infill by means of a conditioning roller or other means (up to a maximum of 250 passes by the roller). The same conditioning procedure shall be used on all test specimens being prepared for player/ surface and ball/surfaces tests.

Laboratory Test Bases

Unless a synthetic turf surface is laid on a base that is designed to contribute to the dynamic performance of the surface, laboratory tests shall be carried out on test specimens laid on a rigid flat floor.

If a synthetic turf surface is laid on a base that is designed to contribute to the dynamic performance of the surface the measurements of shock absorption, vertical deformation, energy restitution, HIC and ball rebound shall be made on a test specimen comprising the synthetic turf surface and the base, laid to the depth specified by the manufacturer or supplier.

Laboratory Test Conditions

Laboratory tests shall be made at an ambient laboratory temperature of $23 \pm 2^\circ \text{C}$.

Test specimens shall be conditioned for a minimum of 3 hours at the laboratory temperature prior to test.

Laboratory Test Specimen Conditioning

Laboratory tests shall be made on dry and wet test specimens, as specified in the appropriate test method.

Wet Test Specimens

Wet specimens shall be prepared by evenly applying to the test piece a volume of water that thoroughly soaks the specimen (if in doubt this should be equal to the volume of the test specimen). Care shall be taken when applying the water to ensure it does not disturb the infill within the carpet; the use of a fine hose spray or fine rose on a watering can is recommended. Following wetting the test specimen shall be allowed to drain for 15 minutes and the tests carried out immediately thereafter.

Resistance to simulated use

Test specimens shall be conditioned to simulate use using a Lisport XL in accordance with FIFA Test Method 15 (as specified in the FIFA Quality Programme for Football Turf Handbook of Test Methods October 2015 Edition incorporating all subsequent amendments. The number of conditioning cycles shall be 6,010 cycles and dispersed infill shall be reapplied to the test specimen in accordance with the test method.

Water ageing

Test specimens shall be conditioned in accordance with EN 13744.

Air ageing

Test specimens shall be conditioned in accordance with EN 13817.

Resistance to artificial weathering

Test specimens shall be conditioned in accordance with EN 14836 for and exposure of $9600 \pm 125 \text{ kJ/m}^2/340\text{nm}$.

Tests shall be undertaken on each colour of synthetic turf being offered, including field of play, perimeter run-offs and line markings.

Results obtained previously on a family of yarns may be carried forward providing the tests were undertaken by an ISO 17025 accredited test institute and the following conditions are met:

- a. The Differential Scanning Calorimetry trace of the yarn, when tested in accordance with FIFA TM 22 shows the same profile. The main points of reference when comparing yarns shall be obtained from the second heating of the polymer sample and comprise the peak temperature, peak area and overall curve shape, all of which should be similar (peak temperature $\pm 3^\circ$).
- b. The thickness of the yarn shall be at least 90% of the previously tested yarn, when tested in accordance with FIFA TM 25.
- c. The shape of the yarn is the same.

Head Injury Criterion (H.I.C.) Tests

H.I.C. tests shall be made in accordance with BS EN 17435 (currently in draft format).

Tests undertaken in the laboratory to assess the performance of a synthetic turf surface shall be undertaken in accordance with Method A.

Tests undertaken to assess the performance of a synthetic turf field shall be undertaken in accordance with Method B.



Ball Rebound

Ball rebound shall be measured in accordance with EN 12335. As the shape of a Rugby League ball prevents reproducible results, tests shall be made with a football.

Shock Absorption and Vertical Deformation

Shock absorption and vertical deformation shall be measured in accordance CEN TS 16717.

Environmental and Toxicology Properties

To protect the natural environment, while ensuring the safety of users of the facilities, the NRL encourages all designers of synthetic Rugby League fields to ensure that the following standards are embraced:

Synthetic Turf Carpet

The synthetic turf carpet shall comply with the requirements of the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH) regulations Annex XV11 Entry 50.

Performance Infill

Performance infill placed within the synthetic turf carpet should comply with the draft REACH⁴ restriction requirements of the European Chemical Agency (20mg/kg of the REACH 8-PAHs)⁵.

Microplastics

To minimise the impact of microplastics from synthetic Rugby League fields, the design, procurement, construction and management for the fields needs to comply with ASTR 17519:2020. In addition, it is recommended that the “Smart Guide to Minimising the Impact of Microplastics on the Environment” is used.

Requirements

Categories of Performance

Two categories of performance are specified. The category designated **Stadium** is intended to replicate the playing qualities of top-level natural turf playing surfaces used for Rugby League and is intended for pitches used for professional matches and training.

The category designated **Community** has wider ranges of acceptability that are intended to replicate the playing qualities found on good quality community natural turf fields.

Product Tests

For a synthetic turf product to comply with the *NRL Quality Recommendations for Synthetic Turf Surfaces* it shall satisfy the requirements of Table 1 and product identification tests, as detailed in Table 3 shall be undertaken.

The results of the product identification tests shall be within the tolerances specified in Table 3 when compared to the manufacturer’s declared values for each property. The manufacturer’s declared values shall be reported in the laboratory test report.

Pitch Tests

For a pitch to comply with the *NRL Performance and Construction Requirements for Synthetic Turf Pitches* it shall satisfy the requirements of Table 2. All the tests detailed shall be undertaken in positions 1 – 9 as shown on Figure 1. HIC and Rotational Resistance tests shall also be measured in positions A to J. Tests may also be made in additional positions if the performance is of concern.

Infill depths and free pile heights shall be measured on a 10m grid across the pitch and end zones.

All tests shall be made under the prevailing site conditions. The surface and ambient temperatures and the ambient relative humidity at the time of test shall be recorded and reported.

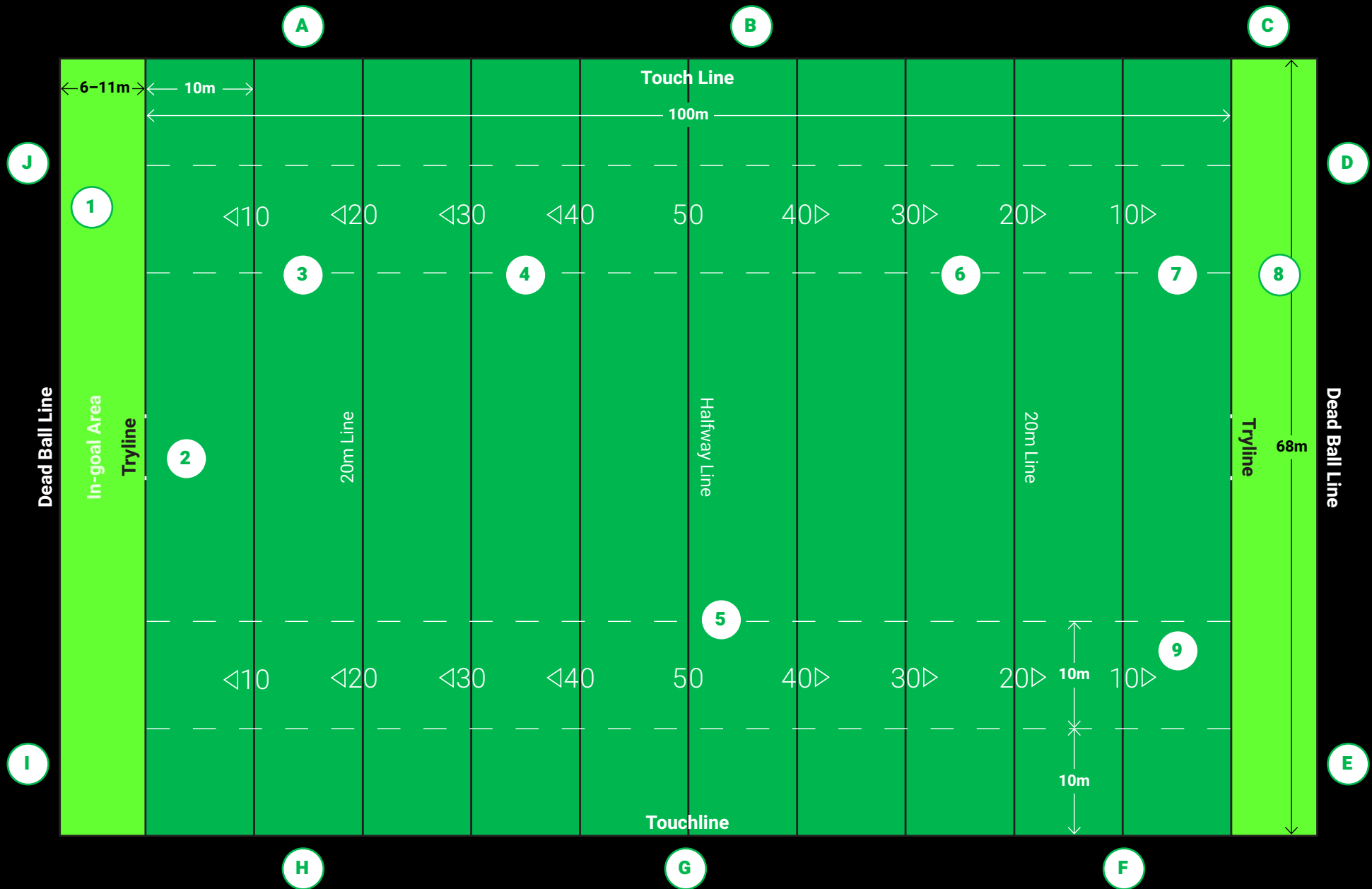
The results of all pitch tests shall be detailed on an NRL Synthetic Turf Pitch Test Report (see Appendix A), a copy of which shall be submitted within three weeks of a pitch test to the NRL at footyfacilities@nrl.com.au.

Note: in order to ensure the components of the synthetic turf surface installed on a pitch are the same as those previously tested in the laboratory the NRL recommends the initial pitch test also include the identification tests detailed in Table 3. The maximum variation between the installed materials and the manufacturer’s declared values shall be as specified in Table 3.

⁴ Reference to the draft REACH restriction requirements shall always refer to the latest edition applicable at the time a product is tested.

⁵ Infills listed in the SAPCA Quality Control Protocol for Sports Performance Infills published by the UK Sports and Play Construction Association (SAPCA) are considered to satisfy the draft REACH requirements. These are available from Australia’s Sport and Play Industry Association (SAPIA) at www.sapia.org.au

Figure 3—Test Positions



Logos

If a pitch is to incorporate permanent logos within the playing area or end zones the logos shall be manufactured from the same quality of synthetic turf carpet and infill as the main playing area.

Table 1—Laboratory Test Requirements

Property	Test Method	Test Condition	Requirement	
			Stadium	Community
Complete Synthetic Turf Surfacing System				
Head Injury Criterion	EN 17435	Dry	≥ 1.3m	
		Wet		
		After simulated use		
Shock Absorption	EN TS 16717	Dry	50% – 65%	50% – 70%
		Wet		
		After simulated use		
		-5°C	≥ 50%	
		50°C	50% – 65%	50% – 70%
Vertical Deformation	EN TS 16717	Dry	3.0 – 8.5mm	<11.0mm
		Wet		
		After simulated use		
Rotational Resistance—Traction	FIFA TM 06 or 06a	Dry	35 – 50Nm	25 – 55Nm
		Wet		
		After simulated use		
Skin Friction	FIFA TM 08	Dry	≤ 0.75μ	
		After simulated use		

Property	Test Method	Test Condition	Requirement	
			Stadium	Community
Skin Abrasion	FIFA TM 08	Dry After simulated use	≤ 30%	
Ball Rebound	EN 12335	Dry Wet After simulated use	0.70 – 1.10m	0.60 – 1.10m
Water Permeability	EN 126161	After simulated use	≥ 300mm/h	
Infill Splash	FIFA TM 16	Unaged – Dry	≤ 10%	–

Synthetic Turf Carpet

Joint Strength	EN 12228 Method A	Unaged After water ageing	≥ 2500N/100mm	
	EN 12228 Method B	Unaged After water ageing	50N/100mm	
Resistance to Tuft Withdrawal	ISO 4919	Unaged	≥ 40 N	
Tensile Strength of Carpet	ISO 13934-1	Unaged	Mean: ≥ 25 N	
		After water ageing	Minimum in any direction: 15N	

Pile Yarn(s)

Tensile Strength	EN 13864	Unaged and after artificial weathering	Mono-filament yarns	≥ 8 N per strand
			Fibrillated yarns	≥ 30N
Change in Tensile Strength After Artificial Weathering	EN 13864	After artificial weathering	≤ 25%	
Colour Change	EN ISO 20105-A02	After artificial weathering	> Grey scale 3	

Property	Test Method	Test Condition	Requirement		
			Stadium	Community	
Polymeric Infills					
Colour Change After Artificial Weathering	EN ISO 20105-A02	After artificial weathering	≥ Grey scale 3		
Composition After Artificial Weathering	Visual assessment	After artificial weathering	No change		
Shockpads and Elastic Layers					
Tensile strength	Shockpads and Elastic Layers Less Than 25mm Thick	EN 12230	Unaged	≥ 0.15 MPa	
				% loss in strength compared to unaged result ≤ 25%	
	Shockpads and Elastic Layers 25mm or Thicker	FIH Hockey Turf and Field Standards Part 3 Clause 8.17.1.2	Unaged	≥ 0.10 MPA	
			After air ageing	% loss in strength compared to unaged result ≤ 25%	
	Shockpad with Channels and Slots	FIH Hockey Turf and Field Standards Part 3 Clause 8.17.1.3	Unaged	≥ 0.10 MPA	
			After air ageing	% loss in strength compared to unaged result ≤ 25%	
Resistance to Dynamic Fatigue	ESTO Performance Guide for Shockpads – Annex D	Change in shock absorption	± 5% FR		
		Loss of thickness	≤ 15% of initial thickness		
		Physical damage	There shall be no tearing, splitting or delamination of the shockpad		
Resistance to Bowing and Curling	Resistance to bowing and curling	Maximum degree of bowing or curling	5 mm		

Table 2—Field Test Requirements

Property	Test Method	Stadium Category Fields	Community Category Fields
Head Injury Criterion	EN 17435	≥ 1.3m	≥ 1.3m
Shock Absorption	EN TS 16717	50% – 65%	50% – 70%
Vertical Deformation	EN TS 16717	3.0mm – 8.5mm	≤ 11.0mm
Rotational Resistance—Traction	FIFA 06 or 06a	35Nm – 50Nm	25Nm – 55Nm
Ball Rebound	EN 12335	0.70m – 1.10m	0.60m – 1.10m
Vertical Free Pile Height Above Infill	FIFA TM 18	Within ± 5mm of manufacturer's declared value	Within ± 5mm of manufacturer's declared value
Infill Depth	EN 1969	Within ± 5mm of manufacturer's declared value	Within ± 5mm of manufacturer's declared value

Notes:

Vertical free pile height is the height of the pile standing upright above the infill. It is important because pile lying flat increases the potential for carpet or skin burns. The manufacturer's declared value is normally in the range 15 – 20mm. If they specify 20mm this means all measurements need to be in the range 15 – 25mm.

Skin friction is an important property for players. Pitches should be maintained in accordance with the surface manufacturer's instructions to ensure satisfactory performance of this property. If concerns or complaints about excessive friction or skin abrasion are received the pitch shall be tested under dry conditions in accordance with the specified test methods and the field shall comply with the requirements detailed in Table 1 for these properties.

Table 3—Product identification tests

Component	Property	Test Method	Maximum Variation Field Sample / Laboratory Sample / Manufacturer's Declaration
Synthetic Turf	Mass per unit area	ISO 8543	≤ 10%
	Tufts per unit area	ISO 1763	≤ 10%
	Tuft withdrawal force	ISO 4919	≥ 90% of lab sample result
	Pile length	ISO 2549	≤ 5%
	Pile weight	ISO 8543	≤ 10%
	Pile dtex	FIFA TM 23	≤ 10%
	Pile yarn characterisation	ISO 11357-3 and FIFA TM 22	Same polymer
Shockpad or E-Layer	Shock Absorption	EN TS 16717	± 5% (FR) of lab sample
	Thickness	EN 1969	≥ 90% of lab sample result
Performance Infill	Particle grading	EN 933 – Part 1 and FIFA TM 20	60% within d and D
	Particle shape	EN 14955	Similar shape
	Bulk density	ISO 1097-3	≤ 15%
	Thermo-gravimetric analysis	% organic / % inorganic	± 5%
Stabilising Infill	Particle grading	EN 933 – Part 1 and FIFA TM 20	60% within d and D
	Particle shape	EN 14955	Similar shape
	Bulk density	ISO 1097-3	≤ 15%



Pitch Construction Requirements and Tolerances

Pitches should be designed and built to the following requirements.

Construction Standards

Pitches shall be constructed in accordance with the Code of Practice for the Construction and Maintenance of Synthetic Turf Pitches, published by SAPCA. Available through SAPIA in Australia.

Surface Regularity

The field shall be constructed and maintained so that when it is assessed with a 3m straightedge and graduated wedge, in accordance with EN 13036-7, the maximum undulation is 10mm.

Noting that infill dispersion can result in localised undulations occurring, up to 15 deviations (for full size pitches pro-rata for smaller areas) are considered permissible providing no deviation is greater than 15mm and does not form a potential hazard to players or detract from the playing experience.

Any undulations greater than 1m in length shall be considered multiple deviations of 1m intervals.

Gradients

The gradient of a pitch shall be no more than 1.0% in any direction.

References

- 1 *FIFA Quality Programme for Football Turf*
- 2 *World Rugby Rugby Turf Performance Specification*



Appendix A—NRL Synthetic Turf Pitch Test Report

Synthetic Turf Pitch Test Report

Type of test	Initial <input type="checkbox"/>	Retest <input type="checkbox"/>
Club (if applicable)		
Pitch location		
Site contact		
Tel.		
Email		
Synthetic turf surface name		
Surface manufacturer		
Installation contractor		
Date of pitch construction		
Test laboratory		

Test laboratory project reference		
Laboratory email address		
Date of test		
Surface condition (dry or wet)		
Surface temperature (°C)	Min.	Max.
Humidity (%RH)	Min.	Max.
Stadium category pitch	Pitch passed <input type="checkbox"/>	Pitch failed <input type="checkbox"/>
Community category pitch	Pitch passed <input type="checkbox"/>	Pitch failed <input type="checkbox"/>
Criteria that failed (if any)		
Signed by Laboratory Director		
Date		

Section 3—Detailed results

Property	Specified range		Test Position																	Pass / fail		
	Stadium Category	Community Category	A	B	C	D	E	F	G	H	I	J	1	2	3	4	5	6	7		8	9
Head Injury Criterion	> 1.3m	> 1.3m																				
Shock Absorption	50% – 65%	50% – 70%																				
Vertical Deformation	3.0 – 8.5mm	<11.0mm																				
Rotational Resistance –Studded Sole	35 – 50Nm	25 – 55Nm																				
Ball Rebound	0.70 – 1.10m	0.60 – 1.10m																				

Infill Depths (mm) Measured on Pitch

Position	Manufacturer's Declaration										Permitted Range		
	End Zone	0	10	20	30	40	50	60	70	80	90	100	End Zone
0m													
Variation*													
10m													
Variation													
20m													
Variation													
30m													
Variation													
40m													
Variation													
50m													
Variation													
60m													
Variation													
68m													
Variation													
	Field Passes						Field Fails						

*Variation from manufacturer's specification

Vertical Free Pile (mm) Measured on Pitch

Position	Manufacturer's Declaration										Permitted Range		
	End Zone	0	10	20	30	40	50	60	70	80	90	100	End Zone
0m													
Variation*													
10m													
Variation													
20m													
Variation													
30m													
Variation													
40m													
Variation													
50m													
Variation													
60m													
Variation													
68m													
Variation													
	Field Passes						Field Fails						

*Variation from manufacturer's specification

Product Identification (Initial Pitch Tests Only—Recommended but Optional)

Component	Property	Site sample	Manufacturer's declaration	Variation	Tolerance	Pass / Fail
Synthetic Turf	Mass per unit area				$\leq \pm 10\%$	
	Tufts per unit area				$\leq \pm 10\%$	
	Tuft withdrawal				$\geq 90\%$ of reference	
	Pile length above backing				$\leq \pm 5\%$	
	Total Pile weight				$\leq \pm 10\%$	
	Pile dtex				$\leq \pm 10\%$	
	Yarn characterisation					Same polymer
Performance Infill	Particle Size				$\leq \pm 20\%$	
	Particle Shape					Similar shape
	Bulk Density				$\leq \pm 15\%$	
Stabilising Infill	Particle Size				$\leq \pm 20\%$	
	Particle Shape					Similar shape
	Bulk Density				$\leq \pm 15\%$	



Appendix B—Synthetic turf pitch pre-match maintenance checks

Experience has shown that poorly maintained synthetic turf fields can be detrimental to player welfare and not perform as the game desires. It is therefore very important that a synthetic turf field is maintained in accordance with the manufacturer's instructions and a log of the maintenance undertaken.

Whilst the NRL expects all synthetic turf pitches used for Rugby League at any level of play to be adequately maintained it is not practical for them to monitor this is happening on a regular basis.

The following pages allow a record of the checks to be reported and copies should be retained by the Club. Copies should also be submitted to the NRL or their Match Officials as requested.

Review of inspection data and appropriate actions to ensure the playing surface complies with the turf manufacturer's recommendations and NRL competition regulations always remains the sole responsibility of the Club.



Maintenance Checks

Synthetic Turf Pitch Pre-Match Maintenance Checks

Club Name / pitch location

Date and time of game

Date and time of pitch inspection

Measurements made by Name

Position

Measured infill depth (mm)

Manufacturer's declaration

Tolerance ± 5mm of manufacturer's specification

Grid position

	Run-off	Touch line	20	40	60	Touch line	Run-off
Run-off							
In-goal							
0							
20							
40							
60							
80							
100							
In-goal							
Run-off							

Note—ideally vertical free pile heights will be within +/- 2mm of the manufacturer's specification. If values are found outside this range additional maintenance is advised.

Measured vertical free pile height (mm)

Manufacturer's declaration

Tolerance \pm 5mm of manufacturer's specification

Grid position

	Run-off	Touch line	20	40	60	Touch line	Run-off
Run-off							
In-goal							
0							
20							
40							
60							
80							
100							
In-goal							
Run-off							

Note: ideally vertical free pile heights will be within +/- 2mm of the manufacturer's specification. If values are found outside this range additional maintenance is advised.

Statement of compliance

The data recorded above is a true record of the condition of the synthetic turf pitch at the time of test.

Name _____ Signature _____

Copies of this completed form shall be retained by the Club. Copies shall be submitted to the NRL or their Match Officials as requested. Review of inspection data and appropriate actions to ensure the playing surface complies with the turf manufacturer's recommendations and NRL competition regulations remains at all times the sole responsibility of the Club.



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