

World Bowls Performance Standards for Flat Green Bowls Surfaces

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With technical assistance from:



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Foreword

This Standard has been prepared at the initiation of World Bowls in conjunction with the Centre for Sports Technology (GB) and New Zealand Sports Turf Institute and in total comprises a performance standard for flat green bowls surfaces.

The Standard is primarily intended to be of relevance to clubs and local authorities requiring guidance when purchasing a synthetic sports surface for flat green bowls. The performance requirements given in this Standard are intended to meet top level competition and club standards but are also suitable for recreational needs.

Whilst this Standard details the performance requirements of a synthetic bowling green, it does not address materials, ageing and changes in performance, durability or environmental characteristics for which appropriate national standards may apply, or individual site requirements and methods used during the construction of an installation.

The characteristics detailed in this Standard may be influenced by the entire structure of a facility and not just the synthetic sports surface. It is important when testing surfaces or reviewing test results that the surfacing and its supporting layers are representative of the entire construction being considered.

A site should be investigated before a facility is constructed, with a view to ensuring its suitability. The investigation should include a measurement of existing site dimensions, site levels, contact with statutory services (gas, electricity, water etc) and for outdoor greens, determination of the ground's load bearing capacity, its ability to drain and the soil structure. From this data, a design for the Green's construction should be drawn up. If expertise is not readily available for this type of work, help should be sought from technical experts.

Prior to the laying of the carpet or synthetic turf on a bowling green, the base should be surveyed by an independent third party to make sure that the green will meet the surface evenness (Section 6.3), design level (Section 6.4) and dimensions criteria (Section 5.0) in this document. The only way an engineered base of a bowling green can be rectified once the carpet is installed is to remove the carpet (which can be extremely heavy in the case of a sand filled green) and the surface re-levelled and the carpet re-laid, which can be a very costly exercise.

Part 1 ■ Performance Standards for Flat Green Bowls Surfaces

1.0 SCOPE

This Standard specifies requirements for flat green bowls surfaces, in particular synthetic surfaces. The requirements apply to the complete installation including the synthetic surface, base, sub-base, sub-grade and drainage system.

Note: *For the purpose of this Standard an essentially continuous surface produced by a manufacturing process from a natural material (for example, coconut fibre) is considered synthetic.*

2.0 NORMATIVE REFERENCES

This 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 amendment to, or revisions of, any of these publications apply to this Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

World Bowls et al, Laws of the Sport of Bowls - Crystal Mark Edition.

British Standards Institute, BS 903: Part A8:1990 - Method for Determination of Rebound Resilience.

British Standards Institution, BS903: PartA26: 1969 - Determination of Hardness.

British Standards Institution, BS7044: Section 2.2: Methods for Determination of Person/Surface Interaction.

British Standards Institution, BS7044: 1991 Section 2.5: Miscellaneous.

Netherlands Sport Federation, N/F5.1: Underfoot Friction.

3.0 DEFINITIONS

For the purpose of this Standard, the following definitions apply:

Green The playing area is defined in the Laws of the Sport of Bowls - Crystal Mark Edition.

Rink A division of the Green normally not more than 5.80m or less than 4.30m wide.

Surfacing Top layer or layers, including any shock-pad or other shock absorbing or load spreading layers, which directly provide the sports performance and bio-mechanical response qualities.

- Green Speed*** The number of seconds taken by a bowl from the time of its delivery to the moment it comes to rest approximately 27.4m from the mat line.
- Draw*** A measure of the distance between the trajectory of a rolling biased bowl and a straight line between its starting and finishing points.
- Cushioning*** The ability of the surface to deflect and absorb energy as a player walks on it.
- Infiltration Rate*** The rate at which water enters the green surfacing.
- Design Level*** A comparison of theoretical and actual levels of an installation at defined locations.

4.0 CLASSIFICATION

In this Standard, surfaces are classified by their performance characteristics.

The Green Speed must be within the range of 10s to 18s.

Additionally, it is necessary for the purchaser to specify whether the playing surface and supporting layers is to be permeable or non-permeable.

5.0 DIMENSIONS

The dimensions of the Green shall be as detailed in the Laws of the Sport of Bowls – Crystal Mark Edition, Section 2 – The green, ditch and banks, as published by World Bowls:

The Green

- The green should be either rectangular or square.
- The length of the green in the direction of play shall be between 31m and 40m.
- The green should have a suitable level playing surface.
- The playing surface should be either vegetative or a synthetic surface approved by a Member National Authority.
- For domestic play Member National Authorities can decide the standards for greens constructed in line with previous editions of this law.

The Ditch

- The green should be surrounded by a ditch.
- The ditch should be:
 - Between 200mm and 380mm wide.
 - Between 50mm and 200mm deep.
- The ditch should have a holding surface which is free from obstacles and made of a material which will not damage the jack or the bowls.
- For indoor greens, only the end ditches in the direction of play should meet the standards mentioned in paragraphs 2 and 3 above.

The Bank

- The ditch should have a bank against its outer edge.
- The top of the bank should be at least 230mm above the surface level of the green.
- The bank should be vertical and set at a right angle to the surface of the green, or sloped at an angle of not more than 35° from the vertical.
- The surface of the face of the bank should be made of, or be covered with, a material which will not damage the jack or the bowls.
- There should be no steps that could interfere with play either cut into or positioned against the face of the bank.

5.1 Division of the Green

The green shall be divided into sections called rinks, each not more than 5.80m, nor less than 4.30m wide. They shall be identified in order (e.g. using numbers, letters, Roman numerals etc) with the centre line of each rink being marked on the bank at each end by a peg, disc or other suitable device.

The four corners of the rinks shall be marked by white or brightly coloured pegs made of material which will not damage the jack or bowls and fixed to the face of the bank and flush therewith, or alternatively, fixed on the bank no more than 100mm back from the face thereof.

The corner pegs may be connected by a green thread drawn tightly along the surface of the green, with sufficient loose thread to reach the corresponding pegs on the face or surface of the bank, in order to define the boundary of the rink.

6.0 PERFORMANCE

The surfacing shall comply with Clauses 6.1 to 6.5 of this Standard as appropriate.

Unless indicated by the manufacturer or supplier, the surfacing shall meet the appropriate parameters in all climatic conditions in which it may reasonably be expected to be used. In countries in which surfacing could be expected to be damp for significant periods of the year, tests shall be carried out on damp areas. In countries in which the surfacing could be expected to be dry for significant periods of the year, tests shall be carried out on dry areas.

Note: *World Bowls or their accredited laboratories shall determine in advance of testing which surface condition should apply.*

Before commencement of verification tests a facility should be maintained in accordance with the supplier's detailed procedures to the satisfaction of the supplier and facility owners/users.

Greens shall be tested in locations detailed in each test method. If the results obtained are variable or border-line, the test officers shall use their discretion and select additional field locations to evaluate the whole green's ability to comply with this Standard.

If a green is only designed to be used in two opposing directions the test locations for Green Speed and Draw shall be adjusted accordingly.

If an installation is not designed as a full green but only comprises one or more rinks, each rink shall be assessed in the directions of play as appropriate.

6.1 *Green Speed*

The Green Speed of the surface when measured in accordance with Test Method WBB-01 shall be in the acceptable World Bowls competition range of 10s and 18s. The Green Speed obtained in each test location shall be within ± 0.5 s of the mean Green Speed.

For carpet-based systems the test location is limited to the direction of tournament play which is across the seams. On a carpet-based system the Green Speed obtained from the tournament direction locations shall be ± 0.5 s of the mean Green Speed.

It is up to each Club and installer to decide what speed is appropriate dependent on the level (international, national

or Club level events) of use required and the expectations of the end users (i.e. the bowlers).

6.2 *Surface Draw*

The maximum Draw, when measured in accordance with Test Method WBB-02, of surfaces having Green Speeds in the range 10s to 14s shall be greater than 750mm, whilst the maximum Draw on surfaces having Green Speeds in excess of 14.1s shall be greater than 1000mm.

The maximum difference between pairs of left and right maximum Draws shall be less than 40%.

6.3 *Surface Evenness*

Undulations found on the surface shall be no greater than 3mm, when measured using a 3m straight-edge in accordance with Test Method WBB-03. Undulations of up to 6mm are permissible providing they do not affect the trajectory of a bowl, particularly as it rolls slowly. Undulations greater than 6mm should not occur anywhere on the Green.

6.4 *Design Levels*

The green shall be level. The finished level of the green shall not deviate from the design level when measured in accordance with recognised civil engineering practice, using an optical or laser level, by more than ± 5 mm.

The difference in height between adjacent spot levels shall not be greater than 3mm.

Note:

1. *The design level of any point within a green should be referred to a temporary bench mark.*
2. *Finished levels should be checked against design levels by taking levels referred to the temporary bench-mark on a 2m grid.*

6.5 Infiltration Rate

The green surfacing shall have an infiltration rate, at the time of construction, greater than 100mm/hr when tested in accordance with BS 7044 Section 2.5:1991 or WBB-04. The locations of test positions are shown in WBB-04. Such surfaces shall be designated 'Permeable'. The infiltration rate of greens over 12 months old shall be greater than 50mm/hr.

Note: *Comparative data between the two test procedures is not available. Test data from one procedure should not be compared with test data from the other.*

7.0 TEST REPORT

The test report shall contain the following:

- a. The title and date of this Standard: World Bowls Performance Standard for Flat Green Bowls Surfaces.

- b. Complete identification of the surfacing tested, manufacturer's reference and previous history.
- c. The ambient temperature of test(s) and relative humidity, if tested.
- d. The values of Green Speed and maximum difference between the Green Speed in each test location.
- e. The mean Green Speed.
- f. The values of maximum Draw and percentage difference between left and right draws in each test location.
- g. A plan showing all areas where the surface evenness exceeds 3mm.
- h. The values of infiltration rate, if tested.
- i. The values of surface friction, if tested.
- j. The values of surface cushioning, if tested.
- k. A plan showing the finished levels of the Green.
- l. The designations *Very Fast*, *Fast*, *Medium* or *Slow* and *Permeable* as appropriate.
- m. The individual test results, if required.
- n. Details of any deviation from the specified procedures.
- o. The condition of the surface at the time of the test, i.e. wet or dry.

- p. The procedure used to measure infiltration rate.

Note: Meeting “World Bowls Performance Standard for Flat Green Bowls Surfaces” on or in relation to a product represents a manufacturer’s declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of this Standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third party certification of conformity, which may also be desirable.

8.0 ESSENTIAL INFORMATION

The following information shall be supplied by the manufacturer to the purchaser. This information should also, as far as possible, be included in any test reports.

- a Details of which types of paint and/or tape can be applied effectively and without damage to the surface or significantly affecting the sports performance and bio-mechanical response, or other making methods available, e.g. inlaid or woven lines.
- b The method and substances to be used to carry out regular maintenance or cleaning of the surface.
- c The details of any other periodic maintenance, e.g. care during non-playing season, pre-season maintenance, storage, topping up the level of particulate infill and, where appropriate, the materials that may be used.

- d An assurance that the surface does not contain in its finished state any substance which is known to be toxic or carcinogenic when in contact with skin and that no toxic or carcinogenic substance(s) will be released as a vapour, dust or solution during normal use.
- e An assurance by the manufacturer that the surface is capable of being disposed of in a safe manner at the end of its useful life.

Part 2 ■ Methods of Test

This part of the Standard outlines the test methodology for determining the performance of flat green bowls surfaces, in particular synthetic surfaces. A full description of the methodology can be found in 'World Bowls Performance Standards for Flat Green Bowls Surfaces – Test Methodology'.

WBB-01 Method of Test for the Determination of Green Speed

1.0 SCOPE

This method is suitable for testing all types of sports surfaces, both on test pieces in the laboratory and surfaces installed on site. The results obtained give a measure of the Green Speed of a rolling bowl on a sports surface.

2.0 PRINCIPLE

A bowl is made to roll along the surface under test by being released down a ramp from a specific height onto the surface. The distance the bowl rolls is measured and the Green Speed calculated from a standard calibration curve.

3.0 APPARATUS

3.1 *Bowl*

An unbiased standardised test bowl of mass $1475 \pm 2.5\text{g}$ and of diameter $125 \pm 5\text{mm}$.

3.2 *Bowl Roll Ramp*

A ramp consisting of two parallel bars mounted a fixed distance apart at an angle to the horizontal on a rigid frame, down which a bowl may be rolled onto the surface under test. At their lower ends the radius of curvature of the bars must be sufficiently large and become tangential with the ground to ensure that the bowl does not bounce when it meets the surface.

The bowl roll ramp used for this test should be approved as being fit for purpose by either World Bowls, New Zealand Sport Turf Institute or Centre for Sport Technology.

3.3 *Tape Measure*

A tape measure, at least 30m in length graduated in increments of 0.01m or smaller.

3.4 *Wind Measurement*

Means of determining wind speed to an accuracy of 0.1km/hr or equivalent.

4.0 TEST PIECE AND TEST LOCATIONS

For tests in the laboratory, a piece of surfacing of length greater than the expected distance of bowl roll and of minimum width 1m shall be used. Where information on the expected bowl roll distance is not available, a piece of surface 35m in length shall be used. The test piece shall be taken in the directions of intended use. The surface shall be seamed and attached to the supporting layers using the recommended methods of seaming and attachment in accordance with the manufacturer's instructions.

When testing an installation, existing rink markings can be used for each direction of test but, in the case of any dispute, the Green shall be divided into rinks of equal width not less than the minimum permitted by the Laws of the Sport of Bowls – Crystal Mark Edition ignoring the outer 2m on each side of the Green.

5.0 CONDITIONING

For tests in the laboratory, condition the test piece for a minimum duration of 3 hours at the test temperature of $23 \pm 2^{\circ}\text{C}$. For tests on dry surfaces, where the material is known to be sensitive to humidity, condition the material for a minimum of 88 hours at $50 \pm 5\%$ RH at the test temperature.

Tests on site shall be made at the ambient temperature and humidity.

WBB-02 Method of Test for the Determination of Surface Draw

1.0 SCOPE

This method is suitable for testing all types of sports surfaces on both test pieces in the laboratory and surfaces installed on site. The results obtained give a measure of the Draw of a rolling bowl on a sports surface.

2.0 PRINCIPLE

A bowl is made to roll along the surface under test by being allowed to roll down a ramp from a specified height onto the surface. The trajectory of the bowl is monitored and the Maximum Draw and consistency of Draws calculated.

3.0 APPARATUS

3.1 *Bowl*

A standard bowl issued by World Bowls.

3.2 *Bowl Roll Ramp*

An inclined ramp as described in WBB-01.

3.3 *Maximum Draw Measurement*

Means of determining the value of maximum Draw during the trajectory of the bowl to an accuracy greater than

±50mm without causing the bowl to significantly deviate or decelerate.

Note: *The use of either six equidistant fine chalk lines (or masking tape) or video analysis of the bowl as it passes under six graduated markers, located in the anticipated area of the maximum Draw of the trajectory have proved satisfactory.*

3.4 Tape Measure

A tape measure graduated in lengths of 10mm or smaller.

3.5 String Line

String line, minimum 30m in length.

3.6 Wind Measurement

Means of determining wind speed to an accuracy of 0.1km/hr or equivalent.

4.0 TEST PIECE AND TEST LOCATION

For tests in the laboratory, a piece of surfacing of minimum length 35m and minimum width 4m shall be used. Test pieces shall be taken in the directions of intended use. The surfacing shall be seamed and attached to the supporting layers using the recommended methods of seaming and attachment in accordance with the manufacturer's instructions.

When testing an installation existing rink markings can be used but, in the case of any dispute, the Green shall be divided into rinks of equal width not less than the minimum permitted by the Laws of the Sport of Bowls – Crystal Mark Edition, ignoring the outer 2m on each side of the Green.

5.0 CONDITIONING

For tests in the laboratory, condition the test piece for a minimum duration of 3 hours at the test temperature of $23 \pm 2^{\circ}\text{C}$. For tests on dry surfaces, where the material is known to be sensitive to humidity, condition the material for a minimum of 88 hours at $50 \pm 5\%$ RH at the test temperature.

Tests on site shall be made at the ambient temperature and humidity.

WBB-03 Method of Test for the Determination of Surface Evenness

1.0 SCOPE

This method is suitable for testing the surface evenness on all types of sports surfaces. The result obtained gives a measure of the extent of localised surface undulations that may affect bowl roll behaviour.

2.0 PRINCIPLE

A 3 m long straight edge is laid on the surface. A graduated wedge is used to measure the maximum gap between the straight edge and the surface.

3.0 APPARATUS

3.1 *Straight-edge*

A straight-edge 3m in length.

3.2 *Graduated wedge*

A graduated wedge with a range of 0-30mm and a resolution of 0.25mm.

WBB-04 Method of Test for the Determination of Infiltration Rate Using a Disc Permeameter

1.0 SCOPE

This method is suitable for testing most types of synthetic sports surfaces, both on test pieces in the laboratory and surfaces installed on site, that have a permeability rate of less than 1000mm/h. It is not suitable for artificial materials with impermeable backings where water movement takes place through large perforations, unless the spacing of the perforations is 150mm or less in any direction. It is also not suitable for installations with impermeable bases. The results obtained reflect the permeability of the surface and base layer.

***Note:** This method of test is due for review as it has been found unsuitable for carpet based green surfaces.*

2.0 PRINCIPLE

Water is applied to the artificial surface under tension via a sealed reservoir tube attached to a circular acrylic disc using a constant supply pressure less than, or equal to, zero. Contact sand is used to ensure that the base of the permeameter is uniformly in contact with the surface. Infiltration rate is calculated from the measurement of the unconfined three dimensional flow from the base of the disc.

3.0 APPARATUS

3.1 *Permeameter*

A disc permeameter capable of supplying water at pressures of less than, or equal to, zero shall be used.

3.2 *Contact Sand (for sand filled greens only)*

Clean, rounded or sub-angular silica sand with a minimum of 90% of particles in the 0.125-1mm size range shall be used. The sand shall have a minimum saturated hydraulic conductivity of 1000mm/h and an air entry pressure of -300mm \pm 5mm.

Note: *Sand should not be used on a carpet-based green.*

3.3 *Stop Watch*

An electronic stopwatch, recording to a resolution of 0.1 seconds.

4.0 TEST PIECE AND TEST LOCATIONS

Tests in the laboratory shall be carried out on a piece of surfacing of minimum width 1000mm and minimum length 1000mm. The surfacing and supporting layers shall be attached using the recommended method of attachment in accordance with the manufacturer's instructions. Four replicate tests shall be made on the one piece of material.

Tests on installations shall be carried out at four locations on a Green, each position being midway between two corners and 6m in from the ditch.

5.0 CONDITIONING

For tests in the laboratory, condition the test piece for a minimum duration of 3h at the test temperature of $23 \pm 2^{\circ}\text{C}$. The material and sub-base materials shall be in a wet condition as outlined in test procedure WBB-05.

Tests on installations shall be made at the ambient temperature. The material and sub-base materials shall be in a wet condition as outlined in test procedure WBB-05.

WBB-05 Wetting Procedure

The sample under test, or, in the case of on-site tests, an area larger than necessary for the test which is to be carried out, shall be saturated by the application of an excess of water.

For laboratory tests, the application to the test piece of a layer of water of equal thickness to the sample will ensure saturation. On site, a similar principle may be followed, provided that information is available on the construction of the facility. In the absence of any such information, the surface should have 50L/m² of water applied to the test area with the test commencing within 5 minutes of full drainage of any surface water.

WBB-06 Method of Test for the Determination of Surface Cushioning

1.0 SCOPE

This method is suitable for testing all types of sports surfaces, both on test pieces in the laboratory and surfaces installed on site.

2.0 PRINCIPLE

An indenter is dropped onto the test piece and the deceleration during the impact monitored. The deceleration profile is processed to give specific energy absorption data.

3.0 APPARATUS

0.5kg Clegg Impact Soil Tester.

4.0 TEST PIECE

Tests in the laboratory shall be carried out on a piece of surface of minimum length 1000mm and minimum width 1000mm in conjunction with the supporting layers to be used in service, using the recommended method of attachment in accordance with the manufacturer's instructions.

5.0 CONDITIONING AND TEST TEMPERATURE

Condition the test piece for a minimum of 3 hours at the test temperature except, where the material is known to be sensitive to humidity, in which case condition for a minimum of 88 hours at 50 \pm 5% RH at the test temperature. Unless otherwise specified the test temperature shall be 23 \pm 2°C.

Tests on site shall be made at ambient temperature and humidity.

Participating Organisations

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Optional Standards for Synthetic Bowls Surfaces

In addition to the playing and construction requirements detailed in this Standard, potential purchasers of synthetic bowls surfaces may wish to consider the frictional and cushioning characteristics of the surfacing.

Surface Friction

The frictional characteristics of the surfacing may be assessed using one of three methods. These, together with suggested requirements, are detailed in *Table 1*. When evaluating facilities the tests should be carried out in the locations referred to in WBB-05.

Table 1 – Person/Surface Friction Values (Wet or Dry)

Method of Test	Friction Values
BS 7044 Section 2.2 Method 5	min 60-140 max
BS 7044 Section 2.2 Method 1	min 0.30-1.0 max
N/F5.1	min 0.3-0.9 max

All tests shall be carried out using a smooth rubber test sole. If any of the BS 7044 tests are used the rubber shall meet the requirements of *Table 2*.

Table 2 – Properties of Rubber Test Soles

Property	Test Procedure	Physical Requirements
Resilience at 5 °C at 23 °C at 40 °C	BS 903: Part A8 21 ± 2% 24 ± 2% 28 ± 2%	
Hardness	BS 903: Part A26	96 ± 2 IRHD at 23 ± 2 °C

Surface Cushioning

The surface cushioning or hardness of a synthetic bowls surface may influence players' views of the surface's acceptability. If this particular aspect of a surface construction is considered important, the cushioning characteristics should be determined using the procedure detailed in WBB-05. Surfaces that have impact value of less than 320 gravities are considered to offer a degree of cushioning that may assist player comfort.

Manufacturers/Suppliers of Synthetic Bowls Surfaces

PROCEDURE FOR PRODUCT APPROVAL

- 1 A manufacturer/supplier should make application to an accredited laboratory to have the product tested at its own expense at a fee to be agreed between the laboratory and company.
- 2 Testing will only be carried out on a facility that is between three and twelve months old.
- 3 Testing will be undertaken under either dry or wet conditions as agreed between the laboratory and company in advance.
- 4 The product approval testing will include:
 - Green speed on one rink in two directions
 - Draw on one rink in two directions
 - Infiltration rate in two locations
 - Surface cushioning in two locations
 - Surface friction in two locations
 - Levels - survey of the whole green
 - Regularity - survey of the whole green
- 5 On completion of the test the laboratory will issue a technical report to the company and a summary report to World Bowls.

- 6 The company may then apply to World Bowls for inclusion on the approved list of products.
- 7 Approval will be valid for a period of 38 months.
- 8 Fee for approval of products - contact World Bowls for the current fees.
- 9 At the end of this period a further facility will be tested to ensure that the product still offers the same level of performance.

See the World Bowls website for a list of approved manufacturers/suppliers of artificial outdoor bowls surfaces.

Conditions for Synthetic Flat Green Bowls Surface

PRODUCT ENDORSEMENT

An approved manufacturer/supplier will be permitted to append the logo of World Bowls to both named product(s) and appropriate advertising material and to include reference to such approval in any correspondence or advertising material issued to prospective and actual customers. Furthermore the said company's product(s) will be included on any list of approved products issued by World Bowls, provided that the company has fulfilled the following conditions:

- The manufacturer/supplier must have his product tested and approved by an accredited laboratory and a valid copy of the laboratory's report must be lodged with the Chief Executive of World Bowls.
- The manufacturer shall supply a reference sample, measuring 100mm square, to World Bowls, the test laboratory of the surface and any under-layer.
- The appropriate fee must be paid within one month of it becoming due each year and following receipt of invoice from World Bowls.
- The manufacturer/supplier must make his product available at any time for inspection by a representative of World Bowls.

- The manufacturer/supplier is expected to provide an appropriate after sales service to clients and to provide written instructions on the care and maintenance of the product.

- Any complaint regarding World Bowls' endorsement must in first instance be directed in writing to the Chief Executive of World Bowls. An appeal against any decision will be considered by World Bowls provided that it is submitted in writing within six months of its occurrence.