

GC2030



Golf Course 2030

Golf Green Quality Standards

A Framework for Sustainable Golf Courses



Introduction.

This document aims to provide an overview of what golf green standards are, why they are relevant and beneficial for the evolution and development of courses, whilst outlining the process of developing tailored, course specific green standards.

The R&A facilitates and funds an international research programme, Golf Course 2030, over a three-year cycle. It focuses on key sustainability priorities including – sustainable agronomy; resource management; biodiversity; and climate – to create evidence-based best practices and solutions within the golf industry.

Project conducted by:



For standards to work, they need to be realistic, set to meet site specific objectives and yet be reflective of an authentic playing surface.

Golf green standards can be an emotive topic. Some can see that they are a rod to hit turf managers or key decision makers over the head with. Some can see them as a means to set aspirational targets that are not supported by the infrastructure on the course or its resource capabilities. However, for standards to work, they need to be realistic, set to meet site specific objectives and yet be reflective of an authentic playing surface.

This document aims to provide an overview of what golf green standards are, why they are relevant

and beneficial for the evolution and development of courses, whilst outlining the process of developing tailored, course specific green standards. This document is not about setting a set of standards that all greens should attain, irrespective of situation or reality. That way is fraught with disappointment, disillusionment and more than likely will be counter productive to what golf green standards are there to achieve. Instead, it is about an enlightened understanding of how golf greens function and how this relates to playability, consistency and resilience.



Playing Quality – The Traditional View.

Whilst the nature of ball impact and roll are of key importance to how a green plays, there are other factors that must be considered.

A putting surface can be assessed based solely on the physics of how a golf ball interacts with the turf surface.

In other words, how a golf ball impacts and rolls on the green surface. This is a mechanistic way of viewing the quality of a golf green, that looks to assess the functional aspects of golf green performance. There are devices available that can be used to scientifically measure these parameters, e.g. firmness, smoothness, friction or speed.

However, whilst the nature of ball impact and roll are of key importance to how a green plays, there are other factors that must be considered. This is because they either directly affect ball impact and roll or because quality as a concept is more than just the sum of the functional elements of a surface. Unfortunately, “quality” is a somewhat woolly and ill-defined concept. This is primarily because quality also encompasses aspects of aesthetic appearance, architectural design, utility of the surface and user perception. All of which feed into this concept that we call “quality”.

It is useful to look at dictionary definitions of terms often used to describe the quality of a playing surface (taken from The Concise Oxford English Dictionary):

Quality – “the degree of excellence of a thing”

Performance – “the capabilities of a thing”

Standard – “the degree of excellence required for a particular purpose” and also “a measure serving as a basis to which others conform or by which the quality of something is judged.”

These definitions all contain elements of subjectivity as part of their composition, in terms of what is defined as “excellence”. Therefore, it is important to understand that it is impossible to have a basis of quality that is purely objective, as this has to account for characteristics or facets that include elements of subjectivity. How the more subjective elements of good putting surfaces integrate with the scientific measurements of golf ball interaction is a key aspect of understanding and communicating what characteristics define good quality golf greens.

The traditional industry view of golf green quality has tended to focus on both agronomic/maintenance impacts on greens and on surface performance/playing quality. To this end a number of tools have been developed over the past 80 or so years to help with assessment of green quality, the first of which is acknowledged as the Stimpmeter. There are a range of tools available to measure/assess various aspects of playing quality and agronomic characteristics. What follows is a summary of the type of units available for measuring different playing surface and agronomic characteristics.

Characteristics under assessment	Tools	Agronomic or playing quality specific tools
Ball roll (distance rolled)	<ul style="list-style-type: none"> • Stimpmeter • Peltzmeter • Lodge Ramp • Greenstester 	Playing quality tools
Ball roll (evenness and geometry of roll)	<ul style="list-style-type: none"> • STRI Trueness meter • Holing out Test • Parrymeter • Visual rating of ball movement (word pictures) • Ball spread tests (distance between balls) 	Playing quality tools
Ball impact	<ul style="list-style-type: none"> • Fieldscout Trufirm • Clegg Soil Impact Hammer • Ball impact firmness meter 	Playing quality tools
Soil profile	<ul style="list-style-type: none"> • Round corers • Rectangular profile corers • Knife (to take cake wedge) 	Agronomic assessment
Soil organic matter	<ul style="list-style-type: none"> • Ruler and corer to measure thatch depth • Laboratory measure (loss on ignition or wet oxidation) 	Agronomic assessment but with a strong influence over playing quality
Soil drainage (infiltration)	<ul style="list-style-type: none"> • Infiltrimeters • Disc permeameter 	Agronomic assessment but with a strong influence over playing quality
Soil compaction	<ul style="list-style-type: none"> • A wide range of penetrometers that work on either impact with the surface or impact on a probe being pushed into the surface or the operator pushing a probe into the surface. 	Agronomic assessment but with a strong influence over playing quality
Soil water content	<ul style="list-style-type: none"> • Wide range of digital probes using TDR technology or similar such as Delta-T Theta probe or Stevens Pogo or Spectrum TDR200/300 • Laboratory measured on soil cores 	Agronomic assessment but with a strong influence over playing quality
Turf colour/health	<ul style="list-style-type: none"> • Visual observation • Colour charts • NDVI or colour meters 	Agronomic assessment
Sward height	<ul style="list-style-type: none"> • Prism gauge • Height disc or gauge 	Agronomic assessment
Sward composition	<ul style="list-style-type: none"> • Visual estimation • Frame quadrat methods • Point quadrat methods 	Agronomic assessment with this characteristic influencing playing quality

It is important to note that readings from different tools are often not comparable, often due to how they operate. For example, there are a wide range of soil water probes available on the market, but whilst many take readings in a similar way, how the reading is taken and the calibration of the output often results in differences in values among units. Therefore, when setting targets as part of developing standards, understanding the devices that will be used is vital and that the same type of unit is used for all readings.

Of course, it is important to understand what the numbers mean. It is vital that guidance is given on what would be considered to be “normal” for different types of greens. To this end various standards have been proposed, such as those developed by Baker et al (1996)¹ from the golf standards project. In the late 2000s, the STRI Programme was developed, which was the natural evolution of golf green agronomy. The aim was to marry greenkeeping

and agronomic expertise and experience with the scientific rigour used in turf research. This process took a number of years to develop and field test, but at its heart it involved measuring key surface playability characteristics and interpreting these data, alongside agronomic factors to allow informed decisions on turf maintenance to be made. With over twelve years of successful greens testing and informed agronomy, the target ranges developed as part of STRI Programme have been proven to be effective and robust, making them a sensible place to start (Table 1).

However, as with all standards on natural turf surfaces, how measurements are taken and natural variation is key. Time of year and other environmental factors are crucial and lead to their own impacts on variation. We have to understand the sheer level of natural variation in golf courses compared to say a winter games pitch. The latter can have different levels of construction specification leading to different

drainage potential, but they are relatively small and flat (or at least flattish) areas of highly maintained turf. The construction, architecture and topography, as well as the growing environment are hugely variable between golf courses, often between the 18 greens on the same course. This variation and what are “normal” or “acceptable” on each individual course will be different. This must be embraced in advice and how we think about what a good quality golf green on each course will look like and how it will perform. This leads us to a site-specific approach for each course which, as we have learnt from experiences with STRI Programme, can often use generic target ranges as a baseline, but these should be tailored and adapted to reflect a whole host of local factors. How these factors should fit together into a Quality Framework is outlined in the next section.

Table 1:

STRI Programme Target Ranges						
Course type	Speed (ft and in)	Firmness (gravities)	Soil water content (% vol)	Smoothness (mm/m)	Trueness (mm/m)	Organic matter at 0-20 mm (% LOI)
Parkland	8 – 9 ft 6 in*	85 – 120	20 – 25**	19 – 25	7 – 10	3 – 6
Heathland	8 ft 6 in – 10 ft *	90 – 120	15-25	19 – 25	7 – 10	3 – 6
Links	8 ft 6 in – 10 ft *	90 – 130	15-20	19 – 25	7 – 10	3 – 6

* green speed targets should be set specifically for each course based on club requirements and agronomist guidance

** a wider range of 15-30 can be used to account for weather fluctuations but is not the target to be managed for

¹ Baker, S.W., Hind, P.D., Lodge, T.A., Hunt, J.A. & Binns, D.J. (1996). A survey of golf greens in Great Britain. IV. Playing quality. J. Sports Turf Res. Inst. 72, 9-24.

Golf Green Quality Framework.

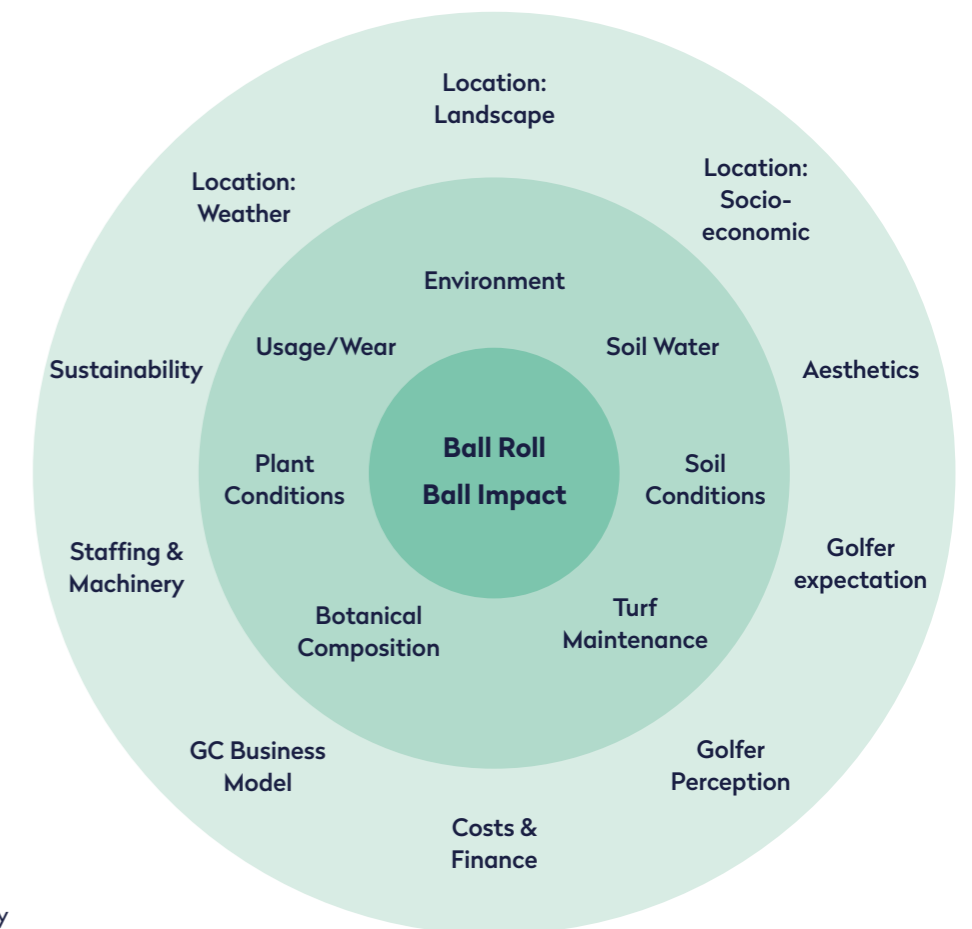
It is important to say that the Golf Green Quality Framework is not an answer to the quality of golf greens.

Rather, it is a way of getting to an answer and conceptualising the complex interactions between the various characteristics that influence golf green quality. The aims are to outline the factors that need to be considered when looking at golf green quality at an individual course and to help guide turf managers, agronomists and club officials in shaping what good quality means for their course and how they can work towards achieving and maintain this.

Having a bespoke, site specific standard will help the club define what it expects from the golf greens and provide a realistic approach for accountability in the delivery to that standard. By having a tailored approach, various factors over and

above how the ball interacts with the surface can be considered.

As acknowledged earlier, quality of golf greens is built on the foundation of golf ball interactions with the surface. However, a wide range of factors outside of ball-surface interactions need to be considered and used to shape what good quality means for the greens on an individual golf course. These will, undoubtedly, be different between courses and the factors will have a different weighting dependent on the objectives the club has with regards the product it wants to sell to its customers (members and visiting golfers). A conceptual model of how these factors fit together is given below:



- Key surface performance characteristics
- Factors that have a direct effect on surface performance
- Important factors affect surface performance but maybe less directly

As this conceptual model demonstrates, the role that ball roll and impact characteristics have on the functional quality of a golf green need to be at the heart of any discussions on golf green quality. These have been well studied and a number of methods exist that can be used to assess these characteristics. As with all methods, there are pros and cons for each. The method selected must be able to assess the differences being investigated, repeatable and practical for those carrying out the testing. This forms the foundation of playing quality of golf greens.

However, we have to acknowledge that to achieve “good” playing quality we have to expend effort, resource and finance in the form

of turf maintenance. Maintenance must achieve aesthetic standards of presentation, yet we also need to understand that golf greens need to fit into the wider landscape of the golf course and not look out of place. The driver of these aesthetic qualities cannot always be the turf manager, and the role that other stakeholders have in this process, such as golfers and club officials, must be acknowledged. All of this needs to be achieved within the course maintenance and development budget. In essence, the integrity of the playing surfaces has to be maintained and aesthetic/presentational characteristics need to match realistic resource requirements to achieve this and the overall sustainability objectives of the golf course.

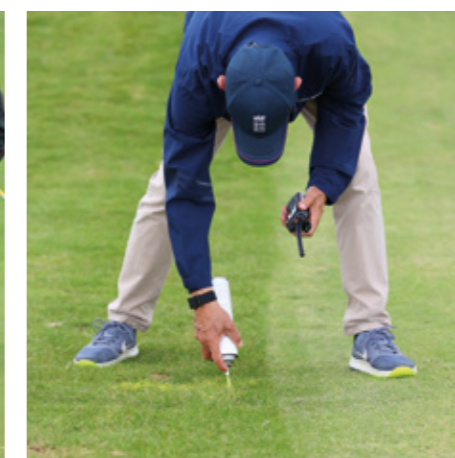
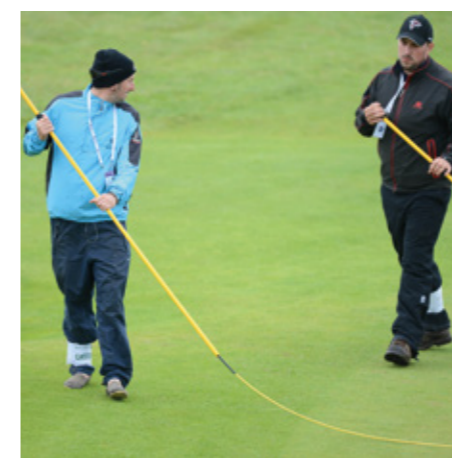
It is vital for the ultimate success of any golf green quality standards that there is full engagement with all stakeholders in a golf club and that at the start of the process clear objectives are set that are specific to that club. This can then form the basis of a statement of what the club is looking to realistically achieve within the constraints that affect all golf courses (resources, finance, time, infrastructure and ability to follow through with the necessary actions). Often this is based on what is needed to either maintain the current level of greens quality or in some way improve the level of quality. This could involve tackling particular issues such as drainage, organic matter, winter playability or looking to improve consistency over time or around all greens.

This can be a difficult process and it will not happen overnight. Often expert advice is needed and guidance sought on green condition to set the benchmark at the start of the process. This should identify issues to be addressed, the implementation of necessary changes and improvements. The timing and the length of time over which quality improvements are to be achieved are critical. It is often the trajectory of the condition of the greens and their quality over time that is important. However, as a cautionary note, as with all improvement objectives, they must be achievable and the conditions for success created, whether that is through infrastructure upgrades, resource availability, political willingness in the club or just

setting realistic timeframes and achievable objectives. There also needs to be monitoring processes put in place to assess the relative success or otherwise of the current improvement strategy. This is essential to allow adjustments to that strategy to be made in an informed way and to demonstrate a successful outcome.

The next question is how can this information be used to create golf green quality standards for a specific club? It is important to look long and hard at what quality means to an individual club. There will be a wide range of variation in what quality means to a club, its golfers and course manager. There needs to be agreement at the outset of this process as to what greens quality

means to the club and a definition of what this means in practice. This must be realistic for the club, its location, golfers, business model, maintenance resource, and sustainable objectives.



The golf green quality framework can be used to identify specific factors of relevance for an individual club.

These factors will be the ones that interact with and govern green quality at that particular course. The process for assessing greens quality and pathways for improvement are summarised below:

Create a quality statement of what good quality greens means to that club, its golfers and turf managers. The desired quality needs to be sustainable, not only from an environmental point of view, but also from the standpoints of the business and turf management.

Set quality objectives that clearly state to all stakeholders which key factors are being used to assess greens quality on that course, making sure they are realistic and achievable (incorporating all three zones of the quality framework diagram).

Assess the current condition of greens and factors that affect this on the course (the green and blue zones on the quality framework diagram).

Identify improvements by analysing current quality against the quality statement and objectives.

Create a plan of works needed and the timeframes necessary to carry out the identified improvements.

Monitor progress objectively and track whether the trajectory of change of improvement works are on schedule. If not, then re-evaluate the plan and make the necessary adjustments.

Critical thinking and flexibility are key to the process. Look at the situation and assess whether the improvement plan is working or whether adjustments are needed.

Document the process (including images and video) to help with the objective assessment of trajectory of change and to demonstrate when improvements have achieved the resultant improvement in quality.

Know when you achieved the objectives and reassess if there are further improvements needed to maintain this level of quality or whether it is appropriate and sustainable (environmentally, financially and socially) to attain the next step change in quality improvement.

In following this process through, and taking the necessary advice where needed, what quality means at a club can be clearly defined from a high-level policy standpoint and by setting quality indicators that can be used as measures of quality of the greens. It is important that quality is assessed routinely to document the levels of quality and how they vary between greens and over time. A set of agreed standards produced at a club will help guide strategic greens and course development and informs practical turf management decisions.

The best standards have to reflect the realities of the situation, as well as the aspiration.

The level of detail and specificity of quality indicators and standards will be determined by the requirements of an individual club. They need to consider the situation and circumstances of the club and be realistic. How the tailored green standards will be used at each course will depend on the club's objectives and could include the following:

- **to assess** the day to day playing quality of greens
- **to establish changes** in green performance over time
- **to inform maintenance decisions** based on green condition and quality
- **to highlight problem areas** on greens and the extent of the problem
- **to provide information** on the underlying causes of green performance issues
- **to assess the resilience** of green quality due to various factors such as seasonality, adverse or extreme weather, climate change etc.
- **to monitor progress** of improvement programmes and allow works to be adjusted
- **to establish if there is a need** (due to construction for example) to have seasonal standards that reflect what "good quality" looks like in winter months as well as the main playing season.



The best standards have to reflect the realities of the situation, as well as the aspiration.

It is likely that guidance will be needed to help shape the club-specific green quality standards and the need to dynamically reflect current and future requirements and challenges, such as those related to climate change, resource constraints and regulation as described in Golf Course 2030. Assistance is readily available from a number of sources, such as:

- The R&A
- Golf Unions
- Agronomists and consultants
- Industry bodies and advisers
- Peers within the industry
- A wide range of publications and websites.

The key message is you are not alone when trying to set course specific standards. Get help, seek advice and often a different set of eyes on a problem can yield that breakthrough needed. Also, don't think that these standards are set in stone. The best standards have to reflect the realities of the situation, as well as the aspiration. They will undoubtedly need to be adjusted in response to circumstances and changes in situation on the course. However, they should be tweaked and modified for the right reasons and not to suit a short-term purpose.



Summary.

Golf green standards can be a powerful tool to help with the evolution, development and day to day management of golf courses.

Golf green standards can be a powerful tool to help with the evolution, development and day to day management of golf courses. They are not there to be unattainable but should reflect the realistic aspirations of all stakeholders in a club. This document has not given the ultimate set of standards that all greens should meet. Rather, it has outlined what golf green standards should mean to clubs, how they can be created and how they can be used.

The take home messages from this green standards document can be summarised as follows:

- It is vital that standards are site specific and tailored to the needs of individual clubs.
- Target values from STRI programme have been given as a potential starting point for setting course specific standards.
- Ensure that standards that are set are relevant to the tools being used to assess playing surface and agronomic characteristics.
- Consider more than ball-surface interactions when setting site specific standards. This is the foundation of the game of golf, but other factors will also be important, and therefore standards should reflect this.
- There needs to be engagement with all stakeholders and the objectives and implementation of standards should be communicated, with this reinforced over time.
- Standards must reflect the socio-economic and physical/agronomic conditions of the course. They can be aspirational but be attainable within the resourcing and constraints of the club.
- They must be practical and be enshrined in operational decision making. Use them to assist with informed decision making and monitor progress towards developmental objectives.
- Standards should be clear and relate to strategic objectives of the club. They should relate to day to day operations, as well as course improvement project work.
- Standards are not set in stone. They will need to be adjusted to reflect the realities on the ground and hopefully improvements in golf green resilience and conditions. These adjustments must be discussed with and communicated to stakeholders.
- Make sure standards are applied and tied to practical outcomes. They also need to be linked to green performance monitoring goals.





**GOLF
COURSE
2030**