BRITISH STANDARD

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Recommendations for Turf for general purposes

ICS 65.020.20

Committees responsible for this British Standard

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Agricultural Development and Advisory Service
Amenity Grass Marketing Association
British Land Reclamation Society
British Society of Soil Science
British Vermiculite Association
Composting Association
Consumers' Association
Department of the Environment, Transport and the Regions — Town and Country Planning Directorate
Department of the Environment, Transport and the Regions — Central Transport Group
Horticultural Research International
Horticultural Trades' Association
Institute of Groundsmanship
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John Innes Manufacturing Association
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Local Authorities' Co-ordinating Body of Trading Standards
National Farmers' Union
Peat Producers' Association
Royal Society for Nature Conservation
Scottish Agricultural College
Sports Turf Research Institute
UK Ecolabelling Board
United Kingdom Forest Products' Association
Water Services' Association of England and Wales

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution.

This British Standard has been prepared by Technical Committee AW/20.

Supersession

BS 3969:1998+A1:2013 supersedes BS 3969:1998, which is withdrawn.

The start and finish of text introduced or altered by Amendment No. 1 is indicated in the text by tags ▌A1⟩ and ⟨A1▐. Minor editorial changes are not tagged.

Information about this document

This revision takes account of improvements in the general quality of turf since the standard was first issued. It is intended for producers of turf for transplanting and for users of turf in all branches of amenity horticulture and on domestic lawns. It gives recommendations for a basic grade of turf which is acceptable for general landscaping, domestic lawns and some sports uses. It also provides guidance for producers who wish to develop ready-made turves of a higher grade for specialized uses and for users who want to set more stringent specifications for high-quality turf.

Two alternative methods of description are given, one which gives the seed mixture used in producing the turf and the second which gives the sward composition at the time of sale.

The recommendations for sward ground cover assessment and declaration do not apply to complex swards, only to simple, weed-free swards. This standard applies only to turf acceptable for normal uses, although rare types of turf are not excluded. For example, if the characteristics of “wild flower” turf cannot be defined according to **3.2** a), they could be defined according to **3.2** b).

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with a British Standard cannot confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 10, an inside back cover and back cover.

1 Scope

This British Standard gives recommendations for the characteristics and handling of turf composed of a typical mix of grass species. It gives a simplified indication of seed/cultivar combinations in mixtures, and some appropriate uses for the kinds of turf produced from these mixtures.

NOTE Turf is normally grown from seed mixtures sown for the purpose, as opposed to swards of indigenous ecotypes cultured in sea marshes and similar areas. However, some turf is produced specially sown or cultivated, for the propagation of herbs and wild flowers.

These recommendations apply to all types of turf, as mentioned, which are grown on natural soil, with or without reinforcing material incorporated in the cut and lifted turves, or with or without the natural soil still being present or removed by washing (washed turf).

The recommendations are not necessarily adequate for special seedling turf products, or for turf grown on special substrates, although some or all of the recommendations could be applied or adapted.

2 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

2.1

cultivar

assemblage of cultivated plants, subordinate in classification to species, which is clearly distinguished by any characters (morphological, physiological, cytological, chemical or others), and which, when reproduced (sexually or asexually), retains its distinguishing characters

2.2

ground cover

proportion of ground occupied by the perpendicular projection of the material above it

2.3

soil texture

proportions of mineral particles of various sizes (sand, silt and clay) in a soil, which determine its physical character, in particular its water retention and drainage characteristics

NOTE 1 The soil particle size ranges are as follows:

— clay: less than 0.002 mm;

— silt: 0.002 mm to 0.06 mm;

— sand: greater than 0.06 mm to 2.0 mm.

NOTE 2 For many turf uses, especially sports areas designed for predictable performance, it is important to know the soil particle size class of the turf to be laid. The mechanical analysis of a soil will give the percentage by mass of mineral matter in various specified categories below 2 mm in diameter. The proportions of the three main kinds of particle; sand, silt and clay, can be translated into a soil particle size class by the use of Figure 1.

NOTE 3 Soil particle size classes can be combined in groups as follows:

— sands: sand and loamy sand;

— light loams: sandy loam and sandy silt loam;

— light silts: silt loams;

— medium loams: sandy clay loams and clay loams;

— medium silts: silty clay loams;

— clays: sandy clay, clay and silty clay.

2.4

sward

above-ground and below-ground parts of a population of grass or other herbaceous plants, characterized by a relatively short habit of growth and relatively continuous ground cover

2.5

thatch

intermingled organic layer of dead and living shoots, stems and roots, developing between the zone of green vegetation and the soil surface

NOTE Thatch includes matter termed as “grass litter”, “mat” and/or “fibre”.

2.6

turf

sward, mown closely and regularly enough to have developed a well-knit layer of plant material at and immediately below the soil surface and capable of being re-laid to form new grassed areas

NOTE 1 The term is not normally used in the plural sense and the use of North American “turfs” is deprecated.

NOTE 2 The plural is “turves”.

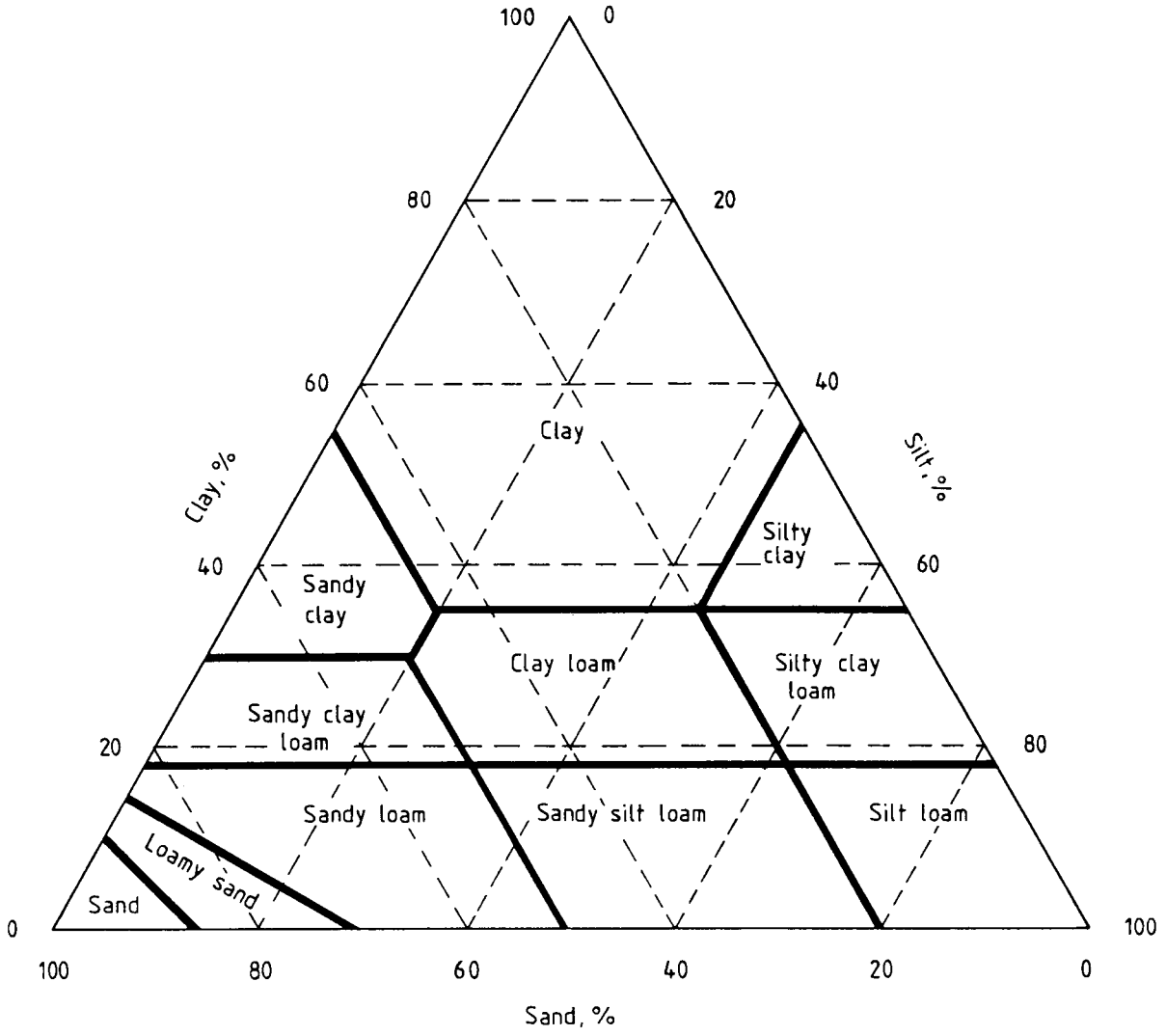


Figure 1 — Particle size distribution diagram showing texture class

3 Characteristics

3.1 The following recommendations for turf quality apply unless modified by written agreement between seller and purchaser. They should apply uniformly throughout a delivery, and a purchaser should be entitled to take reasonable steps, before unloading, to verify that the quality of delivered turf is as expected.

Grass species and seed mixtures are given in Table 1.

NOTE Purchasers are advised to obtain a sample or inspect growing turf before placing an order.

3.2 The seller of turf should follow either a) or b).

a) The seller should declare the seed mixture (the percentage of species and cultivars) sown to produce the turf, and the delivered material should, at the time of sale, show the following.

1) At least ⟩A1⟨ 90 ⟩A1⟨ % of total ground cover should recognizably consist of the species included in the declared mixture, when estimated using test 1 (see **A.3**).

2) Less than ⟩A1⟨ 5 ⟩A1⟨ % of total ground cover should recognizably consist of annual meadow-grass *(Poa annua)* or any other unsown species (unless declared present by the seller), when estimated using test 1 (see **A.3**).

b) The seller should declare the approximate sward composition at the time of sale, as follows.

1) All species comprising more than 5 % of the sward should be named, and percentage cover given as accurately as possible, at least to the nearest 10 % (see note 1).

2) All species comprising 1 % to 5 % of the sward should be named and percentage cover given as "1 % to 5 %" (see note 2).

3) ⟩A1⟨ Species deliberately sown should be indicated as "deliberately sown". ⟩A1⟨

3.3 The grass should have been regularly mown and the height at final cut before lifting should be not more than 35 mm, measured using test 2 (see **A.4**). The grass should form a dense and closely-knit sward with a healthy green colour, of the shade expected from the constituent species. It should not be visibly affected by weeds, diseases or insect pests.

3.4 The soil in which the sward is growing ⟩A1⟨ *Text deleted* ⟩A1⟨ should be free from stones over 15 mm in any dimension. Information on the soil particle size classes (either as the result of a mechanical analysis or as a statement of group or class) should be given to the purchaser on request. The soil should be reasonably uniform throughout any single delivery.

The turf should be chosen so that its soil matches that on which it is to be laid, unless deliberately decided otherwise.

3.5 If turf is lifted in very wet conditions, particular care should be taken to prevent damage. In dry conditions, the turf should be watered before lifting.

3.6 For the purpose of manual handling each piece of turf should:

a) have no more than 10 mm thatch on average, when assessed using test 3 (see **A.5**);

b) be of uniform thickness, with soil thickness below the thatch of not less than 7 mm and not greater than 18 mm;

c) be rectangular, with the shorter sides not less than 300 mm;

NOTE Typical sizes for cut turf are:

⟩A1⟨ 1 640 mm × 610 mm (square metre);

16 in × 81 in (square yard);

750 mm × 27 000 mm (big roll). ⟩A1⟨

d) weigh not more than 20 kg per piece ⟩A1⟨ (except rolls above one square metre in size) ⟩A1⟨ when delivered, (except as a result of exceptionally wet conditions when the seller should demonstrate that the turf in a normal condition for handling or laying would not weigh more than 20 kg);

e) be capable, when in a normal condition for handling or laying, and when being held at the corners of a shorter side, of being lifted to hang clear of the ground without tearing, in 19 out of 20 times;

f) be free from harmful substances.

[1] Availability information from Sports Turf Research Institute, St Ives Estate, Bingley, West Yorkshire, BD16 1AU. Tel 01274 565131.

4 Delivery

4.1 Turves should be packed to avoid drying-out in transit and should be rolled or laid flat (grass to soil).

4.2 Turf should be delivered to the site within 24 h of lifting.

NOTE In spring and summer this period should be reduced to ensure that turf is fresh and green on delivery.

4.3 Care should be taken whilst transporting, to avoid deterioration due to bad stacking, covering or excessive temperature.

4.4 Turves should be stacked on cleared ground and to a height of not more than A1 1.75 A1 m.

5 Treatment of turf after delivery

Turf should be laid within 18 h in spring or summer and within 24 h in autumn and winter.

NOTE If this is not possible turf should be laid flat outdoors and watered.

Table 1 — Grass species and seed mixtures for producing three kinds of turf (seed percentage by mass)

Grasses (see note 1) **Amenity cultivars of the following grasses**	**Fine sports or ornamental turf** % *(m/m)*	**General purpose utility turf, without perennial ryegrass** % *(m/m)*	**General purpose utility turf, with perennial ryegrass** % *(m/m)*
Perennial ryegrass (*Lolium perenne)*	0	0	20 to 50
Smooth-stalked meadow-grass (*Poa pratensis*)	0	30 to 40 (see note 2)	0 to 50
Fine fescues			5 to 30
Chewings fescue (*Festuca rubra* ssp. *commutata*)	40 to 80	20 to 35	
Slender creeping red fescue (*F. rubra* ssp. *litoralis*, etc.)	0 to 40	20 to 35	
Strong creeping red fescue (*F. rubra* ssp. *rubra*, etc.)	0	0	
Bentgrasses	10 to 20	5 to 10	0 to 5
Browntop bent (*Agrostis tenuis*, *A.castellana*)			
Creeping bent (*A. stolonifera*)			

NOTE 1 Information on amenity cultivars is given in the booklet "*Turfgrass Seed*" published annually by the Sports Turf Research Institute [1]

NOTE 2 A lower proportion of smooth-stalked meadow grass, or its complete absence, may be appropriate in some cases. To compensate for this, the proportions of other species should be increased.

Annex A (normative)
Test methods

A.1 Introduction

A.1.1 This annex gives guidance on appropriate methods for making the measurements referred to in clause **3**.

A.1.2 A sampling procedure appropriate for all tests which require the collection of values to represent a given area is described in **A.2**.

A.2 Sampling procedure

A.2.1 *Areas of continuous turf (growing in production fields, or after laying)*

A.2.1.1 These tests require reliable random sampling of the turf area. They describe the minimum number of operations (measurements, placings of [A1] optical point quadrat [A1], removals of a core, etc.) to give the following:

— reasonable estimates for areas, (however small);

— an upper limit which ensures adequate representation of a large continuous area of turf.

A.2.1.2 Sampling locations should be distributed evenly across the whole area, e.g. in a W-pattern as shown in Figure A.1, with as many regularly-spaced stops for sampling as the area requires. (In Figure A.1 the number of stops shown, is purely for example purposes.)

A.2.1.3 Whereas the general pattern of sampling stops should be regular and evenly spaced, the actual location of the place to take a measurement or quadrat assessment should not be deliberately chosen. For example, when a sampling spot is nearly reached, the measuring stick should be thrown a little way ahead and measurement made where the zero end comes to rest.

A.2.2 *Separate pieces of turf*

A.2.2.1 The number of turves to be taken as a representative sample is dependent on the number in a lot or delivery, as given in Table A.1. Turves should be taken at random.

For more than 100 turves, the number of turves in the sample should be the square root of the total number, rounded up to the next highest whole number.

A.2.2.2 Each separate turf should constitute one sampling location for the purposes of the following tests. All turves in a sample should be tested, even if the number exceeds the maximum stipulated for areas of continuous turf.

Table A.1 — Total number of turves in a lot and the number of turves required for sampling

Turves in a lot	Turves required for sampling
1 to 4	All
5 to 16	4
17 to 25	5
26 to 36	6
37 to 49	7
50 to 64	8
65 to 81	9
82 to 100	10

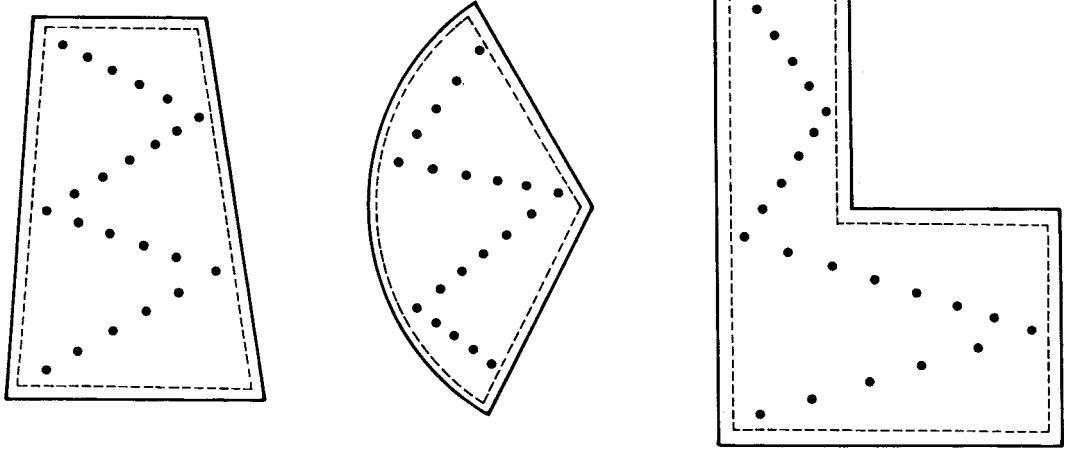


Figure A.1 — General patterns for sampling turf

A.3 Test 1. Methods for estimating the percentage of ground cover, weeds, bare patches, etc.

A.3.1 *Apparatus*

A.3.1.1 *Optical point quadrat*, consisting of a free standing frame with a row of ten pairs of pins, the points of which can be used to sight down on to the turf to assess its botanical composition (see Figure A.2).

A.3.2 *Use of optical point quadrat*

A.3.2.1 *General*

Place the frame on the turf to be assessed, with the pins parallel with the ground. It is designed to be used on grass of different heights of cut, though not with grass that is taller than the pins, so use it either way up with the pins as close to the turf as possible.

Sight down each pair of pins in turn, noting what is directly beneath the tips of each pair of pins and recording a tally of "hits" on a scoring sheet. The numbers of "hits" for each plant species in the turf, bare ground, moss, etc., can be converted to a percentage value.

The usefulness of this technique depends on the accuracy of noting exactly which species is directly beneath the tips of the pins and being completely impartial in the choice of position of the instrument. Therefore, do not deliberately aim to avoid or include particular areas of turf.

Repeat assessments on the same area of turf ought to give repeatable results. If this is not the case conduct additional assessments.

A.3.2.2 *Assessing large areas of turf*

To enable the whole area to be sampled, use the conventional "W" pattern of sampling that is used in soil sample collection, with not fewer than approximately 5 stops for sampling for each hectare of area. For example, a 5 ha. field would be assessed in at least 25 separate locations. Ensure that the number of assessments gives a true representation of the turf.

Assess areas where different plant associations are obvious, such as in wet areas or headlands of fields, separately from the rest of the area and make the harvesting teams aware of this so that the appropriate declaration can be supplied to customers.

To introduce an element of randomness into choice of the location of the sampling position when used to assess a field of turf, allow the optical point quadrat to fall gently onto the ground, rather than being carefully placed.

A.3.2.3 *Assessing individual turves or consignments of harvested turf*

The optical point quadrat may be used in the same way as in **A.3.2.2** on an individual turf or on groups of turves. Use not fewer than twenty placings of the frame, which gives 200 assessment points.

A.3.3 *Methods of estimating the percentage of various ground cover components, or of bare ground*

A.3.3.1 *General*

For percentage estimates, the exact size of the frame or piece of turf is not critical (see **A.3.1.1**) provided that it is equally subdivided.

A frame or grid may be used in two ways, depending on whether the items to be counted are smaller or larger than the subdivisions.

Estimate the percentage of small weed plants, or scattered spots of bare ground by the method described in **A.3.3.2.** Alternatively, estimate the percentage of plant cover as compared with extensive, bare areas, or the area occupied by large weeds, moss patches, etc. by the method described in **A.3.3.3.** provided that there are at least 25 subdivisions.

All estimates should represent the cover visible from vertically above; i.e. the total of all cover components should be 100 %, and no account should be taken of overlap.

A.3.3.2 *Cover components less than subdivision size*

Estimate how many cover components are required to "fill" a subdivision (i.e. 1 %, 2 %, etc, of the frame), count the number of cover components in the whole area being examined. From these data calculate the total percentage within the frame or piece of turf.

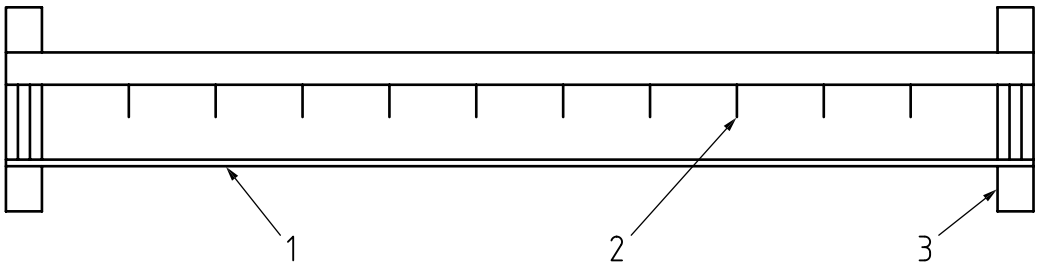
A.3.3.3 *Cover components of subdivision size or larger*

Count how many subdivisions in the frame or grid are wholly filled, or more than half-filled by the component being assessed. Ignore all subdivisions less than half-filled as "empty". Provided there are at least 25 subdivisions, the "full" and "empty" subdivisions can be assumed to balance out with adequate accuracy, so that the "full" subdivisions can be used as the basis for the required percentage figure. If there are fewer than 25 subdivisions, extra care should be taken in estimating each subdivision.

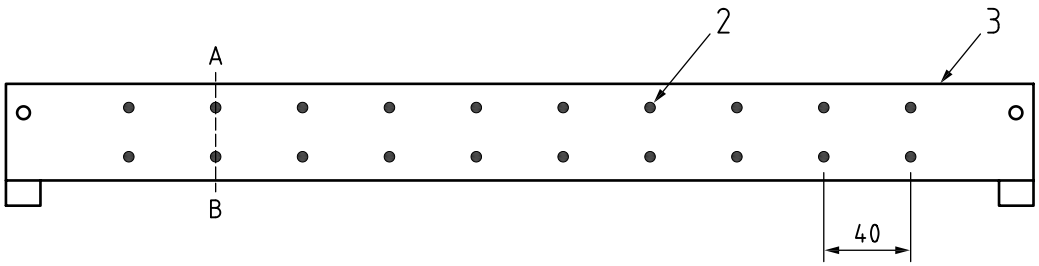
A.3.4 *Number of estimates*

When using a optical point quadrat on an area of continuous turf, make at least five placings at random on areas of less than 100 m^2, make five to 20 placings at random on areas of 100 m^2 to 5 000 m^2 as appropriate, and make 20 placings at random on areas of 5 000 m^2 or more. To ensure a representative distribution of random placings, follow the procedure in **A.2**. When assessing pieces of turf, examine the whole of every piece of turf sampled (see **A.2.2**).

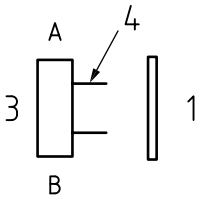
Dimensions in millimetres



a) Plan of working position



b) Front elevation



c) Section A-B. (Pin diameter exaggerated for clarity.)

Key

1 Perspex guard

2 Pins in pairs

3 Frame

4 Pin

NOTE 1 Reproduced from Laycock and Canaway [2].

NOTE 2 Commercially available optical point quadrats for turf are based on this drawing, and are reversible as described in this standard to allow use on turf of various lengths, but are used in the same way.

Figure A.2 — Optical point quadrat

A.3.5 ***Test results***

Take the mean of the estimates to represent the percentage of each component.

A.4 Test 2. Method for measuring height of grass

A.4.1 ***Apparatus***

A.4.1.1 *Measuring stick or ruler*, calibrated in millimetres and cut off to read zero at one end, with as small a cross-section as possible at that end, e.g. a stick with a rounded point or a flat ruler cut obliquely at the end.

A.4.2 ***Method of test***

Place the zero end of the ruler on the sward, in a location chosen at random. Hold the ruler vertically, resting firmly on the soil or thatch surface but not pressing into it. Read, in millimetres, the height of the nearest adjacent erect grass leaf blade.

A.4.3 ***Number and distribution of readings***

On areas of continuous turf, take at least 10 readings from random placings on areas of less than 100 m^2, take 10 to 40 readings, as appropriate, on areas of 100 m^2 to 5 000 m^2, and take 40 readings on areas of 5 000 m^2 or more. To ensure a representative distribution of random placings, follow the procedure in **A.2**. When assessing pieces of turf, make one measurement in a random position on every piece of turf in the sample.

A.4.4 ***Test results***

Take the mean of all readings (in millimetres) to represent the grass height.

A.5 Test 3. Method of assessing thickness of thatch

A.5.1 ***Apparatus***

A.5.1.1 *Small hollow corer*, approximately 50 mm in diameter (see Figure A.3).

A.5.1.2 *Ruler*, graduated in millimetres.

A.5.2 ***Method of test***

Remove a core from the ground to a depth of approximately 50 mm (see Figure A.4) or through the complete depth of a piece of turf if less than 50 mm. One minute after removal (to allow the compressed thatch to return to its original state) use the ruler to measure the depth of thatch in millimetres at four points approximately equidistantly around its circumference. Calculate the mean value.

NOTE The upper limit of the thatch layer is the continuous horizontal surface immediately below any distinct and separate green leaves. The lower limit is where the layer of interconnected fibrous material gives way to distinct particles of growing medium. In doubtful cases a pin or knife can be used to probe the resistance in the core, and is then used as a marker aid measurement.

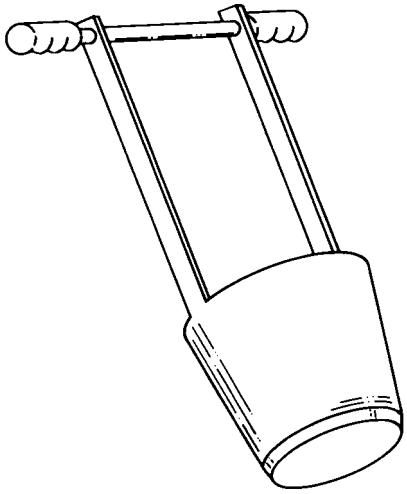


Figure A.3 — Hollow corer

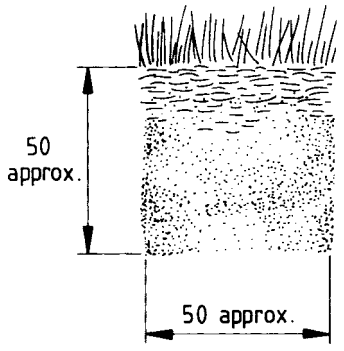
A.5.3 ***Number of cores***

On areas of continuous turf, take at least five cores from areas of less than 100 m^2, take five to 10 cores, as appropriate, from areas of 100 m^2 to 5 000 m^2, and take 10 cores from areas of 5 000 m^2 or greater. To ensure a representative distribution of cores, follow the procedure in **A.2**. When assessing pieces of turf, take one core from every piece of turf in the sample (see **A.2.2**), varying the position from turf to turf.

NOTE After measurement, cores should be returned to the turf.

A.6 Test results

Take the mean, (in millimetres), of all the thatch thickness values (which are the means of the four measurements round each core) to represent the thickness of thatch.



Dimensions in millimetres

Figure A.4 — Core of turf

Bibliography

[1] GREAT BRITAIN, *Turfgrass Seed*; Sports Turf Research Institute (STRI) published annually.

[2] LAYCOCK, R.W. and CANAWAY, P.M (1980). A new optical point quadrat frame for the estimation of cover in close mown turf. *Journal of Sports Turf Research Institute*, **56**, 91-92.

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