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Specification for topsoil

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Contents

Annexes

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 26, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 April 2015. It was prepared by Technical Committee AW/20, *Topsoil, other growing media and turf*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 3882:2007, which is withdrawn.

Relationship with other publications

This British Standard is intended to complement BS 8601 which specifies subsoil.

Information about this document

This is a full revision of the standard to bring it up to date and to make it complementary to the new British Standard for subsoil, BS 8601.

Test laboratory accreditation. Users of this British Standard are advised to consider the desirability of selecting test laboratories that are accredited to BS EN ISO/IEC 17025 by a national or international accreditation body.

Use of this document

It has been assumed in the preparation of this British Standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Hazard warnings

WARNING. This British Standard calls for the use of substances and/or procedures that can be injurious to health if adequate precautions are not taken. It refers only to technical suitability and does not absolve the user from legal obligations relating to health and safety at any stage.

Presentational conventions

The provisions of this standard are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Requirements in this standard are drafted in accordance with *Rules for the structure and drafting of UK standards*, subclause **J.1.1**, which states, "Requirements should be expressed using wording such as: 'When tested as described in Annex A, the product shall ...'". This means that only those products that are capable of passing the specified test will be deemed to conform to this standard.

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.

Particular attention is drawn to:

- Schedule 9 of the Wildlife and Countryside Act 1981 [1]
- The Environmental Protection Act 1990 (EPA) [2]
- The National Planning Policy Framework (NPPF) [3]
- Contaminated Land Exposure Assessment (CLEA) model (EA/DEFRA:2009) Soil Guideline Values [4]
- Chartered Institute of Environmental Health (CIEH)/Land Quality Management (LQM) Generic assessment criteria for human health risk assessment (2nd Edition, 2009) [5]
- The Waste Management Licensing Regulations 1994 (as amended) [6]
- Definition of waste: Development industry code of practice (Guidance Bulletin GB 03, CL:AIRE, 2011) [7]

Introduction

Topsoil is an important component of most landscape projects [such as gardens, civil engineering, sustainable drainage systems (SuDS) and reclamation sites], where it provides the function of supporting the growth of vegetation. It does this by providing an anchorage for plant roots, by slowly releasing nutrients, by providing oxygen, by draining excess water whilst delaying/retarding runoff and by retaining moisture to sustain plant growth during dry periods. The underlying subsoil or other substrate can provide additional rooting depth, moisture storage and drainage.

Topsoil can be both naturally occurring and manufactured. Naturally occurring topsoil is the product of dynamic chemical, physical and biological processes acting on weathered mineral matter. Topsoil can also be manufactured by combining organic matter, mineral material with additional lime and/or fertilizer, as appropriate, to provide a medium that (with the same chemical, physical and biological processes) can develop properties similar to naturally-occurring topsoil.

During natural soil formation, organic matter (typically from decaying vegetation) becomes incorporated by biological activity into the surface layers to form a (characteristically) darkened topsoil over a lighter subsoil, the latter typically of lower organic content and fertility. In many places this process has become modified by human intervention through cultivation and/or by the addition of fertilizer and organic materials.

Topsoil is a dynamic and fragile material, which when managed appropriately, fulfils its function, but is easily damaged by mishandling. It is important that topsoil is lifted, transported, stored and spread carefully over a non-compact substrate. Damage during handling can result in a rapid deterioration in the functions topsoil provides.

NOTE 1 Transporting soil involves mechanical handling, i.e. excavation, loading, transport and distribution on site. Not all naturally occurring topsoils would survive such handling and retain the ability to develop into an acceptable soil in a reasonable time at the new site, even though in their undisturbed, naturally occurring condition they might be very productive and capable of sustaining plant growth over long periods of time. For example, clay textured soil could be very productive in situ but its structure might suffer damage during stripping (or other handling activities) that could only be reversed by years of careful management.

NOTE 2 In the context of soil profile construction, the subsoil is also an important medium for root growth, since it provides reserves of water and available plant nutrients and mechanical anchorage, and for SuDS.

1 Scope

This British Standard specifies requirements for the classification and composition of natural and manufactured topsoils that are moved or traded for creating soil profiles intended to support plant growth. The standard is not applicable to subsoil, or to topsoil that is to remain in situ, however, it is not intended to preclude the use of topsoil that is already on site and suitable for its intended purpose. This standard specifies requirements for multipurpose topsoil, which is fit for the majority of needs, and also specific purpose topsoils that have low fertility or are acidic or calcareous, for specialist use where low fertility or acidic or calcareous soil profiles are required. It also specifies requirements for sampling and analysis of topsoil.

NOTE Recommendations for the stripping, handling and trafficking of topsoil are given in Annex A.

2 Normative references

Standards publications

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 7755-3.7:1995, *Soil quality – Part 3: Chemical methods – Section 3.7: Determination of total nitrogen – Modified Kjeldahl method*

BS EN 12579:2013, *Soil improvers and growing media – Sampling*

BS EN ISO 3696:1995, *Water for analytical laboratory use – Specification and test methods*

BS ISO 10390:2005, *Soil quality – Determination of pH*

BS ISO 11277:2009, *Soil quality – Determination of particle size distribution in mineral soil material – Method by sieving and sedimentation*

BS ISO 16729:2013, *Soil quality – Determination of nitric acid soluble fractions of elements*

Other publications

[N1] DEPARTMENT FOR ENVIRONMENT, FOOD AND RURAL AFFAIRS. *Construction code of practice for the sustainable use of soils on construction sites*. London: DEFRA, 2009.

3 Terms and definitions

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

3.1 topsoil

top layer of soil, darker in colour and with more organic matter than the layer below (subsoil), or manufactured soil with similar properties

NOTE The thickness of a natural topsoil varies with land use and management.

3.2 subsoil

soil layer extending between the topsoil and the little weathered parent material below, or material that functions in the same way in a constructed soil profile and on to which topsoil can be spread

NOTE Usually subsoil has a lower concentration of organic matter and available plant nutrients than topsoil.

3.3 soil texture

proportion by mass of sand, silt and clay sized particles in the mineral fraction of the <2 mm fraction of soil

NOTE See Figure 1 (with equivalent spherical diameters as follows: sand: 2 mm to 0.063 mm; silt: 0.063 mm to 0.002 mm; clay <0.002 mm).

3.4 soil structure

arrangement formed by aggregation of primary soil particles (mineral and organic) into larger units

NOTE It is the spaces (pores) between these larger units (aggregates) that allow the flow of air and water, and root penetration.

3.5 soil organic matter

well decomposed remains of plants, animals, organic manures or other forms of decomposed organic matter

NOTE It does not include fossil and other unreactive organic matter such as coal.

3.6 soil pH value

measure of the acidity or alkalinity of soil

NOTE pH 7 is neutral, values less than 7 are acid, values greater than 7 are alkaline.

3.7 potentially phytotoxic element

element which, when present in excess, has the potential to inhibit plant growth or kill plants

3.8 visible contaminant

undesirable potentially injurious foreign object discernible by the naked eye

NOTE Examples include metal objects, plastics, treated wood, textiles and sharp fragments of ceramics and glass.

3.9 sharp

noun

sharp inorganic contaminant such as a glass fragment, nail or needle that can cause physical injury to the hands of a user of topsoil when handling it without protective gloves

3.10 coarse fragment

particle of greater than 2 mm diameter that is not a sharp or visible contaminant

3.11 soil source

location from which a topsoil is obtained

3.12 supplier

person or organization supplying topsoil from within or outside the site where it is to be used

3.13 incremental sample

quantity of material taken from one sampling point

[SOURCE: BS EN 12579:2013, **3.5**]

4 Topsoil classification and characteristics

NOTE If correctly handled, placed over a non-compact subsoil and managed appropriately (including attention to drainage), topsoil is capable of sustainably supporting grass, trees, shrubs, herbaceous plants and other plantings (see Annex A). However, irrespective of its classification, unless correctly handled and managed, a topsoil cannot be expected necessarily to perform these functions satisfactorily.

4.1 Classification

The topsoil shall be classified as:

a) multipurpose topsoil; or

b) specific purpose topsoil.

Specific purpose topsoil shall be further classified as follows:

1) acidic;

2) calcareous;
3) low fertility;
4) low fertility acidic;
5) low fertility calcareous.

NOTE 1 Multipurpose topsoil is the grade suited to most situations where topsoil is required; however, there can be situations where specific purpose topsoil is required [see Note 3]. Some natural topsoils, especially clayey and low organic matter silty topsoils, might not be able to survive the handling involved with trading topsoil.

NOTE 2 Specific purpose topsoils comprise topsoils with characteristics appropriate for specialist applications, e.g. supporting the growth of certain plants or plant communities.

NOTE 3 Specific purpose topsoils might not be appropriate for general landscaping projects.

NOTE 4 When specifying multipurpose or specific purpose topsoil, users, specifiers and suppliers of topsoil should take into account the intended use of the site at which the topsoil is to be deployed so that the particular properties are fit for that use.

NOTE 5 The specification of low fertility topsoils is complex because it depends on the intended planting. Specialist advice is recommended. General guidance on low fertility topsoils is given in Annex B.

4.2 Characteristics

The topsoil shall be sampled in accordance with Clause **5**. The samples shall be reduced and prepared in accordance with Annex C and tested in accordance with the methods listed in Table 1. The characteristics of the samples shall be as specified in Table 1 and Figure 1.

NOTE 1 Attention is drawn to the documents listed Table 1, Note 2 to Note 5.

NOTE 2 The methods given in Annex F, Annex G and Annex I are based on Reference Book 427 [8] as used and validated by the Agricultural Development and Advisory Service (ADAS).

Table 1 **Topsoil characteristics** *(1 of 2)*

NOTE 1 Attention is drawn to the documents listed Note 2 to Note 5 of this table.

Parameter	**Multipurpose topsoil**	**Specific purpose topsoil**					**Method of test**
		Acidic	**Calcareous**	**Low fertility** A)	**Low fertility acidic** A)	**Low fertility calcareous** A)	
Soil texture <2 mm fraction % m/m	See area of permitted soil textural classes in Figure 1						BS ISO 11277
Maximum coarse fragment content % m/m							BS ISO 11277
>2 mm	30	30	30	30	30	30	
>20 mm	10	10	10	10	10	10	
>50 mm	0	0	0	0	0	0	
Mass loss on ignition % B)							Annex D
Clay 5% to 20%	3 to 20	3 to 30	3 to 20	2 to 20	2 to 30	2 to 20	
Clay 20% to 35%	5 to 20	5 to 30	5 to 20	2 to 20	2 to 30	2 to 20	
Soil pH (measured in water)	5.5 to 8.5	3.5 to 5.5	7.5 to 9.0	3.5 to 9.0	3.5 to 5.5	7.5 to 9.0	BS ISO 10390
Carbonate % m/m	—	—	>1	—	—	>1	Annex E
Plant nutrient content							
Total nitrogen % m/m	>0.15	>0.15	>0.15	— C)	— C)	— C)	BS 7755-3.7
Extractable phosphate mg/L	16 to 140	16 to 140	16 to 140	≤20	≤20	≤20	Annex F and Annex I
Extractable potassium mg/L	121 to 1 500	121 to 1 500	121 to 1 500	—	—	—	Annex G and Annex I
Extractable magnesium mg/L	51 to 600	51 to 600	51 to 600	—	—	—	Annex G and Annex I
Carbon:nitrogen ratio D) E)	<20:1	<20:1	<20:1	<35:1	<35:1	<20:1	Annex D and BS 7755-3.7
Electrical conductivity μS·cm^{-1} F)	3 300						Annex H

Table 1 **Topsoil characteristics** *(2 of 2)*

Potentially phytotoxic elements (by soil pH) (mg/kg dry solids)	**Multipurpose and specific purpose topsoils**			BS ISO 16729
	Soil pH <6.0	**Soil pH 6.0 to 7.0**	**Soil pH >7.0**	
Zn (Nitric acid extractable)	<200	<200	<300	
Cu (Nitric acid extractable)	<100	<135	<200	
Ni (Nitric acid extractable)	<60	<75	<110	
Visible contaminants % m/m (air-dried soil)	<0.5			Annex J
…- of which plastics	<0.25			
Sharps, number (air dried soil)	zero in 1 kg air-dried soil			Annex J

NOTE 2 Attention is drawn to Schedule 9 of the Wildlife and Countryside Act 1981 [1] which lists plants that it is prohibited to release, allow to escape or cause to grow in the wild.

NOTE 3 Attention is drawn to the Environmental Protection Act 1990 [2] (EPA) and to the National Planning Policy Framework (NPPF) [3], under which there is a requirement for topsoil to contain no concentrations of chemical contaminants that would cause a significant risk to human health and the environment.

NOTE 4 Attention is drawn to the possibility that Site Specific Assessment Criteria (SSAC) or Generic Assessment Criteria (GAC) might have been set for the intended recipient site under the EPA or NPPF. Further guidance is given in Contaminated Land Exposure Assessment (CLEA) model (EA/DEFRA:2009) Soil Guideline Values *[4] and Chartered Institute of Environmental Health (CIEH)/Land Quality Management (LQM)* Generic assessment criteria for human health risk assessment *(2nd Edition, 2009) [5].*

NOTE 5 If the topsoil is classed as a waste under the Waste Management Licensing Regulations 1994 (as amended) [6] the supplier has a legal obligation to supply it in accordance with those Regulations and to inform the customer that the topsoil has been classified as waste under those Regulations. The Waste Management Licensing Regulations [6] also place legal obligations on the storage and use of such topsoil in most contexts. In addition, the Definition of waste: Development industry code of practice *(Guidance Bulletin GB 03, CL:AIRE, 2011) [7] gives guidance on assessing on a site-specific basis whether excavated soils are classified as waste or not and, if they are, when they can cease to be a waste when put to a particular use.*

[A] Information on low fertility topsoils is given in Annex B.

[B] Mass loss on ignition gives a measurement of the soil organic matter content (see **3.5**). For more demanding landscaping applications (e.g. ornamental shrub planting, rootballed trees), minimum soil organic matter contents 1% greater than the minima shown might be beneficial.

[C] The total nitrogen concentration in a low fertility topsoil is not critical; however, a concentration >0.15% can aid the initial establishment of plants.

[D] The carbon nitrogen ratio gives an indication of the potential for soil to release nitrogen for plant growth. The potential to release or immobilize nitrogen also depends on the bioavailability of the carbon and the nitrogen.

[E] Excluding very acidic soil (pH<5), the carbon:nitrogen ratios of temperate topsoils normally fall within the range from 10 to 14. A ratio of 12 is typical.

[F] The electrical conductivity is related to the concentration of soluble ionic constituents, particularly ammonium, calcium, chloride, magnesium, nitrate, phosphate, potassium, sodium and sulphate.

5 Sampling of topsoil

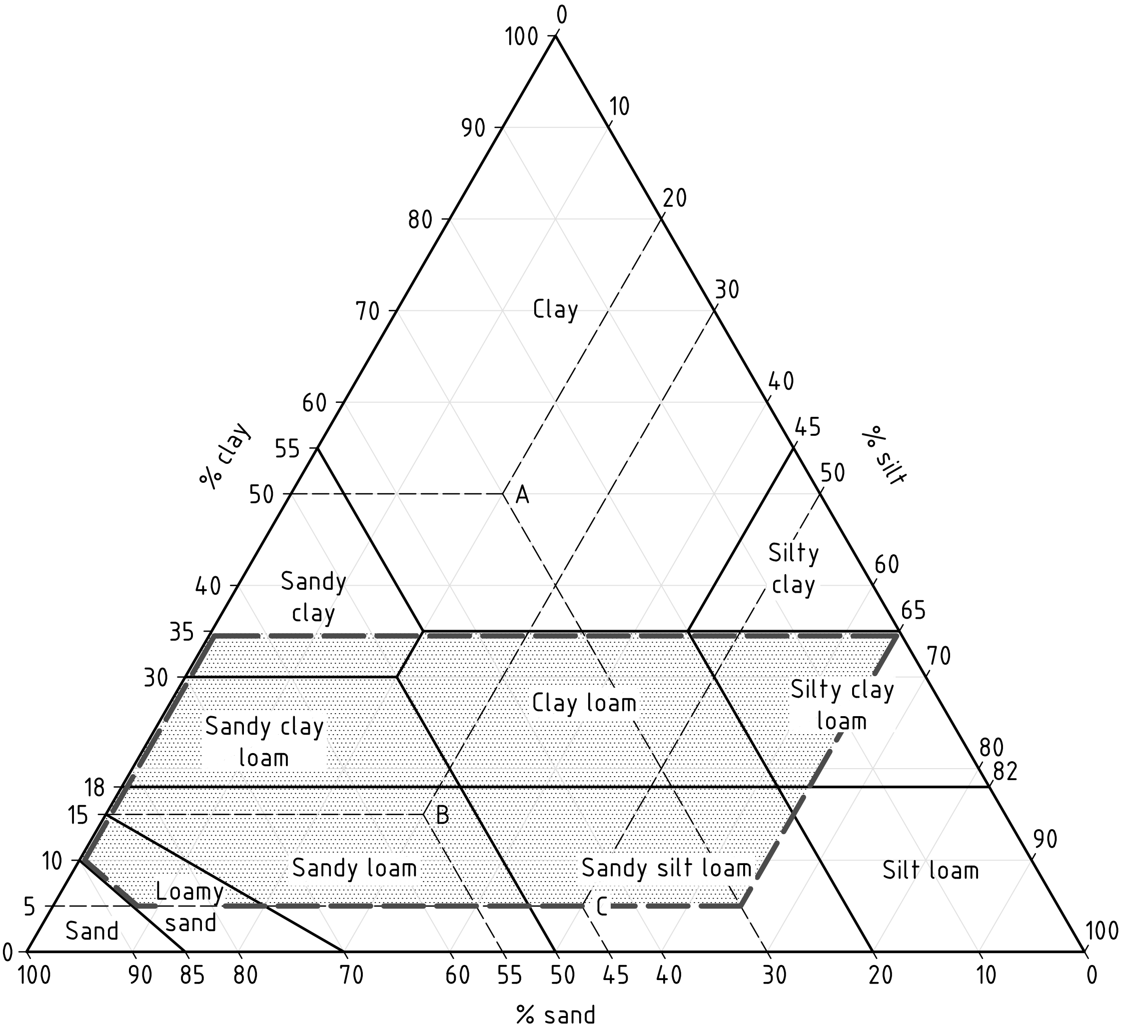
NOTE Any source of topsoil (including soils to be retained on site), whether natural or manufactured, should be investigated carefully with respect to its suitability for the intended use. The supplier should consult the customer regarding the intended use of the topsoil.

If natural topsoil is to be used without stockpiling, the topsoil shall be sampled before stripping to the full depth that is intended to be stripped. Before sampling, a soil resource survey shall be carried out in accordance with the DEFRA code of practice [N1]. A geotechnical or geo-environmental survey shall not be used for this purpose. A separate topsoil sample shall be taken from each of the different soil areas delineated by the survey and from any sub-areas of differing land use within them. Sampling patterns for each soil area shall be based on a rectilinear grid or a W-pattern. To ensure accurate representation of each soil area, a minimum of 10 incremental samples shall be taken across each soil area and these shall be mixed together to create one composite sample for each soil area (minimum 2 kg) for analysis.

From stockpiles, incremental samples shall be taken at regular intervals both from the surface 1 m and from the core in accordance with BS EN 12579 and mixed together to create a composite sample for analysis. One composite sample (minimum 2 kg) shall represent no more than 5 000 m^3 of topsoil.

The samples shall be reduced and prepared in accordance with Annex C.

Figure 1 **Textural classification (limiting percentages of sand, silt and clay sized particles for the mineral texture class) and the area of textures that are acceptable within BS 3882:2015**



Key

▨ Area within which the texture of topsoil is required to fall

NOTE Examples of textural classification are as follows.

- *Soil A with 30% sand, 20% silt and 50% clay is in the "clay" textural class.*
- *Soil B with 55% sand, 30% silt and 15% clay is in the "sandy loam" textural class.*
- *Soil C with 45% sand, 50% silt and 5% clay is in the "sandy silt loam" textural class.*

6 Information to be provided by the supplier to the purchaser

The supplier shall provide at least the following information to the purchaser of the topsoil prior to supply of the topsoil:

a) number and date of this British Standard, i.e. BS 3882:2015 [1];

b) soil source (see **3.11**):

   1) for natural topsoil: description of location including previous and current land use, and ordnance survey grid reference (minimum two letters, six figures);

   2) for manufactured topsoil: name of producer;

c) the designation of the topsoil, i.e. multipurpose or specific purpose (see Clause **4**);

d) the supplier's understanding of the intended use of the site where the topsoil will be used;

e) details of the laboratory that performed the topsoil analysis;

f) date the topsoil was sampled;

g) date the sample was received by the laboratory;

h) date the laboratory reported the results;

i) soil texture class (see **3.3**) presented on a three axis triangular diagram of the form shown in Figure 1, and the contents of sand, silt and clay;

j) content of coarse fragments (see **3.10**) classified as >2 mm, >20 mm and >50 mm;

k) mass loss on ignition;

l) pH of the topsoil (see **3.6**) measured in water;

m) for specific purpose calcareous topsoil, the carbonate content;

n) total nitrogen;

o) extractable phosphate, potassium and magnesium;

p) carbon:nitrogen ratio;

q) topsoil electrical conductivity;

r) content of potentially phytotoxic elements (see **3.7**), i.e. nitric acid extractable zinc, copper and nickel;

s) content of visible contaminants >2 mm (see **3.8**):

t) plastics;

u) sharps (see **3.9**).

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[1] Marking BS 3882:2015 on or in relation to a product represents a manufacturer's or supplier's declaration of conformity, i.e. a claim by or on behalf of the manufacturer or supplier that the product meets the requirements of the standard. The accuracy of the claim is solely the claimant's responsibility. Such a declaration is not to be confused with third-party certification of conformity.

Annex A (informative) Recommendations for stripping, handling and preparing topsoil

A.1 General

Soils generally lose strength and become less resistant to damage as they become wetter; therefore, it is essential that they are stripped, handled and trafficked only in the appropriate conditions of weather and soil moisture, and with suitable machinery. If sustained heavy rainfall (e.g. >10 mm in 24 h) occurs during soil stripping operations, work should be suspended and not restarted until the ground has had at least one dry day or until a suitable moisture content has been reached. A soil can be considered to have a suitable moisture content for stripping and handling if the whole thickness of the topsoil layer being stripped and/or handled is at a moisture content below the plastic limit as determined in accordance with BS 1377-2.

Machinery should be selected and routed to minimize soil compaction.

Topsoil should not be stripped, handled or trafficked:

- in a waterlogged condition;
- when the ground is frozen or covered by snow; or
- when there are pools of water on the ground surface.

To minimize risks of damage to the soil structure, whenever possible, soil should be moved directly from where it is stripped or manufactured to the receptor land.

NOTE 1 Multiple handling of soil materials increases the risk of damage to the soil structure.

At the commencement of work on a site, topsoil should be stripped from all areas that are to be disturbed by construction activities or driven over by vehicles.

Stripping should be done by earthmoving plant that is appropriate to the size of the site, the volume of soil to be stripped and the haul distances.

NOTE 2 The selection of appropriate equipment and work practices is also important because mishandling topsoil can have an adverse effect on its properties, especially the permeability, which can result in waterlogging, reduce recharge of underlying aquifers, and increase the risk of flooding and off-site discharges which can breach water discharge consents.

The operation should follow a detailed stripping plan showing soil units to be stripped, haul routes and the phasing of vehicle movements. The topsoil units should be identified on the site with information to distinguish types and layers, and ranges of thickness.

NOTE 3 It is essential that the stripping is adequately supervised to ensure that the stripping plan is adhered to.

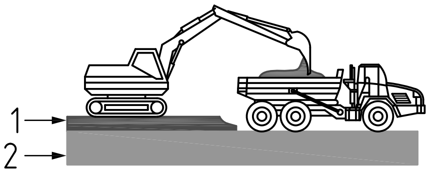
Topsoil and subsoil should be stripped separately and they should be kept separate. Topsoils of different quality should also be kept separate from each other.

NOTE 4 Figure A.1 shows the preferred method of soil stripping. Each topsoil unit is removed in sequential strips that can be up to 6 m wide (the reach of a 360° excavator). Using an excavator bucket with teeth is preferable to using one without. The soil transport vehicle runs on the layer beneath the topsoil, not on the topsoil.

NOTE 5 Alternative stripping methods that can be shown to afford the same degree of soil protection are acceptable.

NOTE 6 An archaeological watching brief might have to be accommodated during soil stripping.

Figure A.1 **Preferred method of stripping topsoil**



Key

1 Topsoil
2 Subsoil

A.2 Storage

The stockpiling of soils should be avoided whenever possible because topsoil loses its quality when stored.

Where stockpiling is unavoidable, heaps should be tipped loosely and the surface firmed and shaped to shed water.

Stockpiles should be sited so as to avoid any risk that muddy water runs off directly or indirectly into watercourses.

The site of a stockpile should be prepared thoroughly in advance by grading and removing rubbish. Topsoil should be stockpiled separately from subsoil and other excavated materials.

If soil has to be stored for more than six months, it is good practice for the stockpile to be sown with a deep rooting grass/legume seed mixture (or other vegetation appropriate to the specific nature of the topsoil) to maintain soil structure and aeration, to minimize weed colonization and to stabilize the stockpile. In such cases the stockpile should be managed to restrict self-seeding.

A.3 Preparation of the receiving area and spreading topsoil

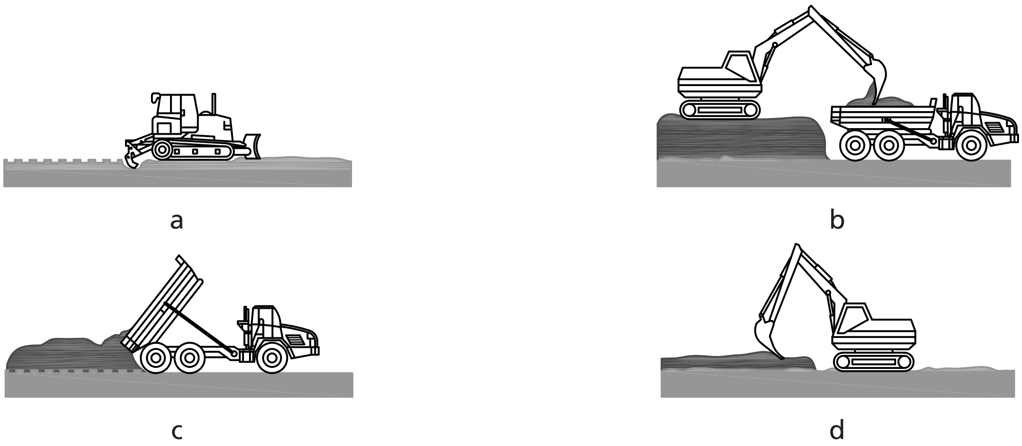
The depth of topsoil spread should not normally exceed 300 mm. Suitable (loosened) subsoil should provide the remainder of the minimum rooting depth. The minimum rooting depth should be normally 450 mm for grass, 600 mm for shrubs and 900 mm for trees.

Prior to spreading topsoil, the receiving area should be decompacted to increase permeability.

NOTE 1 The functioning of topsoil within a landscape depends not only on the quality of the topsoil but also on the care given to the preparation of the receiving area, which will often have been compacted by the passage of vehicles or storage of materials.

NOTE 2 It is particularly important that the topsoil is not over-compacted during spreading. Over-compaction prevents plant root growth and function, and reduces water attenuation and the ability of excess water to drain away. It is one of the most common reasons for plant failures in landscape schemes, and it increases the risk of erosion and runoff. Placement of soil by tracked hydraulic excavators working in strips from ground not yet loosened (the "loose-tipping" method) is a way to avoid this. This method is illustrated in Figure A.2.

Figure A.2 **The loose tipping method for placing topsoil, including subsoil loosening**



Key

a	Loosening the subsoil of the ground that is to receive the topsoil
b	Loading of topsoil from stockpile
c	Backtipping topsoil onto receiving ground
d	Levelling topsoil

If over-compaction of subsoils occurs they should be loosened using ripping equipment before receiving topsoil; ripping should only be done when the subsoil is sufficiently dry that it shatters. In small confined areas, such as in gardens and narrow landscaping strips, the use of a small tracked excavator with a “tine attachment”, or hand cultivation, should be used.

Care should be taken to avoid overworking soils, especially with inappropriate machinery, as this can damage soil structure and increases the risk of erosion and runoff.

All stones and other objects larger than 75 mm brought to the subsoil surface by ripping should be removed from the prepared surface.

NOTE 3 Further guidance on the management, preparation and handling of soils is provided in the Defra publication Construction code of practice for the sustainable use of soils on construction sites *[N.1].*

A.4 Stones

Stone size and shape can be important factors (see Table A.1) in relation to ultimate land use. For example, large stones, especially sharp stones, are of greater detriment in playing field soil than in planting areas.

Table A.1 **Recommended maximum stone size for different land uses**

Land use	**Maximum stone size** (mm)
Planting areas	50
Tree planting	50
Informal recreation	20
Formal recreation	20
Native habitats	50
Agriculture	50

NOTE 4 Further guidance on the specific quality of topsoil for formal recreation is provided in the SAPCA publication The SAPCA Code of practice for the design, construction and improvement of natural sports turf *[10].*

Annex B (informative) Information and guidance on low fertility topsoils

Many biodiverse habitats (e.g. species-rich wildflower grassland, heathland) are commonly, but not exclusively, associated with soils with low extractable phosphorus concentrations.

Low phosphorus concentrations are considered to be a limiting factor in reducing competition from aggressive broad-leaved species or the dominance of grasses, where levels of other plant nutrients, including total nitrogen, are elevated.

Where the intention is to achieve establishment of such a habitat, specialist advice is recommended.

Annex C (normative) Method of sample reduction and preparation

C.1 Sample reduction and identification

The sample shall be mixed thoroughly and subdivided by quartering, riffling or another suitable method to produce a reduced sample of not less than 1 kg. The reduced sample shall be labelled clearly.

C.2 Sample preparation

The reduced sample shall be transferred to a suitable tray to form a layer approximately 20 mm deep. If necessary, any clods shall be broken between the fingers into pieces not exceeding 25 mm in any direction. The sample shall be dried by placing the tray in a current of air at a temperature of (30 ±2) °C. The process shall be continued until the sample feels dry.

The air-dried sample shall be weighed and shall then be sieved through a 2 mm aperture sieve.

The material retained on the sieve shall be used for analysis of coarse fragment content, visible contaminants and sharps.

The material passing through the sieve shall be used for the determination of sharps, soil texture and for chemical analysis.

NOTE It is recommended that a portion of air-dried sample be retained for at least 12 months.

Annex D (normative) Determination of mass loss on ignition

D.1 General

This annex describes the determination of the mass loss on ignition of soil over a specified temperature range. It is a measure of the content of soil organic matter. None of the soil organic matter methods is definitive; mass loss on ignition over the temperature range 125 °C to 440 °C is deemed adequate for the purposes of this standard.

D.2 Principle

Air-dried soil is dehydrated at (125 ±5) °C then ashed at (440 ±10) °C. The mass loss on ignition is expressed as a percentage of the mass of the dehydrated sample.

NOTE The drying temperature of 125 °C has been chosen to allow for the relatively large loss of mass that results because of the loss of "bound" water which occurs between the more common drying temperature of 105 °C and 125 °C. Combustion of soil organic matter can be expected to occur in the range 125 °C to 440 °C. A temperature of 440 °C has been chosen to avoid mass loss due to decarboxylation of carbonates, combustion of fossil carbon or water loss from the crystal structures of minerals.

D.3 Apparatus

D.3.1 *Drying oven*, capable of maintaining a temperature of (125 ±5) °C.

D.3.2 *Electric muffle furnace*, capable of maintaining temperatures of (440 ±10) °C and (550 ±10) °C.

D.3.3 *Basin*, made from fused silica or quartz, of shallow form with a flat bottom, capable of holding a 5 g sample.

NOTE Typical dimensions are 70 mm width and 20 mm height.

D.3.4 *Desiccator*, containing a suitable desiccant.

D.4 Procedure

D.4.1 Preparation of the basin

Heat the basin (**D.3.3**) for 16 h in the muffle furnace (**D.3.2**) at (550 ±10) °C. Cool in the desiccator (**D.3.4**). After cooling, weigh to the nearest 0.001 g. Note the mass of the basin, M_0.

D.4.2 Determination

Spread evenly over the surface of the basin (**D.3.3**) approximately 5 g of the test sample prepared in accordance with **C.2** and dry in the oven (**D.3.1**) at a temperature of (125 ±5) °C for 16 h. Allow the basin and contents to cool to room temperature in the desiccator (**D.3.4**) and weigh to the nearest 0.001 g. Note the mass of the basin and dehydrated sample, M_1. Place the basin and contents into the cool muffle furnace (**D.3.2**) and raise the temperature to (440 ±10) °C. Maintain this temperature for 4 h. Allow the basin and contents to cool to room temperature in the desiccator (**D.3.4**) and weigh to the nearest 0.001 g. Place the basin and contents into the muffle furnace maintained at (440 ±10) °C for a further 1 h. Allow the basin and contents to cool to room temperature in the desiccator (**D.3.4**) and weigh to the nearest 0.001 g. Repeat the operations of heating, cooling and weighing until the difference between two successive weighings is less than 0.01 g. Note the mass of the basin and sample after ignition, M_2.

D.5 Calculation and expression of results

D.5.1 Calculate the mass loss on ignition (LOI), expressed as a percentage by mass of the dehydrated sample [after drying at (125 ±5) °C for 16 h], using the following equation:

$$\text{LOI} = [(M_1 - M_2)/(M_1 - M_0)] \times 100$$

where:

M_0 is the mass of the basin, in grams (g);

M_1 is the mass of the basin and dehydrated sample, in grams (g);

M_2 is the mass of the basin and sample after ignition, in grams (g).

D.5.2 Calculate the carbon content of the soil, C, expressed as a percentage by mass of the dehydrated sample, from the mass loss on ignition (LOI) using the following equation:

$$C = LOI/1.7$$

D.6 Test report

The test report shall include the following:

a) a complete identification of the sample;

b) a reference to this British Standard, i.e. BS 3882:2015;

c) the results expressed in accordance with **D.5**;

d) any unusual features noted during the determination;

e) any operation not included in this method or regarded as optional.

Annex E (normative) Determination of mineral carbonate content of soil (as calcium carbonate)

E.1 General

This annex gives a method for the determination of the mineral carbonate content of soil (expressed as calcium carbonate). It is applicable to all soils that have not had free lime applied within the previous 3 months.

E.2 Principle

A weighed portion of soil is allowed to react with an excess of standardized hydrochloric acid. After clarification, the excess acid is back-titrated with standard alkali.

E.3 Reagents

Only reagents of recognized analytical grade and water conforming to grade 3 of BS EN ISO 3696:1995 shall be used.

NOTE All reagents listed below can be purchased commercially.

E.3.1 *Sodium carbonate solution,* 2.0 mol/L. Dry solid sodium carbonate at 260 °C for 30 min; allow to cool to room temperature in a desiccator. Dissolve 13.25 g of the dried sodium carbonate in water and dilute to 250 mL in a standard volumetric flask.

E.3.2 *Indicator solution, methyl orange-indigo carmine*. Dissolve 1 g of methyl orange and 2.5 g of pure indigo carmine in 1 L of water. Filter the solution and store in a dark bottle.

E.3.3 *Hydrochloric acid, approximately* 1 mol/L. Dilute 90 ml of 36% (m/m) (1.18 g/L) HCl to 1 L. Standardize with 2.0 mol/L sodium carbonate solution (**E.3.1**) using the methyl orange-indigo carmine indicator (**E.3.2**) (end point neutral grey). Calculate the concentration factor, f_1.

E.3.4 *Hydrochloric acid, approximately* 4 mol/L. Dilute 360 ml of 36% (m/m) (1.18 g/L) HCl to 1 L. Standardize with 2.0 mol/L sodium carbonate solution (**D.3.1**) using the methyl orange-indigo carmine indicator (**E.3.2**) (end point neutral grey). Calculate the concentration factor, f_2.

E.3.5 *Sodium hydroxide*, 1 mol/L. Quickly weigh out 20 g NaOH and dilute to 500 mL with water. Store in an air-tight plastics bottle. Standardize against 1 mol/L hydrochloric acid (**D.3.3**). Calculate the concentration factor, f_3.

E.3.6 *Indicator solution*, screened methyl orange.

E.4 Apparatus

E.4.1 *Conical flasks*, of capacity 150 mL.

E.4.2 *Filter paper*, 120 mm diameter.

NOTE Whatman™ filter paper GF/A has been found to be suitable. [2]

E.4.3 *Volumetric flasks*, marked at 100 mL.

E.5 Preparation of test sample

Prepare the test sample in accordance with **C.2**.

E.6 Procedure

Weigh to the nearest 0.1 g, approximately 25 g of the test sample (see **E.5**) and transfer into a conical flask (**E.4.1**). Pipette 20 ml of approximately 1 mol/L hydrochloric acid (**E.3.3**) into the flask. If a vigorous reaction is observed, add (cautiously) by pipette a further 20 mL of approximately 4 mol/L hydrochloric acid (**E.3.4**) to the flask. Allow to stand, swirling occasionally until there is no further visible effervescence and then for a further 10 min.

Filter through a 120 mm filter paper (**E.4.2**) and wash with water until at least 70 mL of filtrate has been collected. Dilute to 100 mL in a volumetric flask (**E.4.3**) (see Note). Pipette 50 mL of the clear filtrate into a clean 150 mL conical flask (**E.4.1**). Add a few drops of screened methyl orange indicator solution (**E.3.6**) to the filtrate and titrate with sodium hydroxide solution 1 mol/L (**E.3.5**) (colour change is from violet to green). If the titre is less than 5 mL or greater than 50 mL repeat the determination using more suitable volumes of hydrochloric acid.

NOTE In some cases it might be necessary to centrifuge the suspension in order to obtain a clear solution. If filtration is slow, repeat the test with less soil or by diluting the acid digest with water to 100 mL and centrifuging without the filtration step. If the solution is highly coloured and it is impossible to see the end point, titrate to pH 7.0 ±0.2 using a calibrated pH meter and electrode.

E.7 Calculation of result

Calculate the mineral carbonate content, expressed as a percentage by mass of calcium carbonate in air-dried soil using the following equation:

$$\mathrm{CaCO_3} = \{[(V_1f_1 + 4V_2f_2 - V_3f_3)\ (a/b)\ 0.05]/w\} \times 100$$

where:

V_1	is the volume of 1 mol/L HCl;
f_1	is the concentration factor for 1 mol/L HCl;
V_2	is the volume of 4 mol/L HCl;
f_2	is the concentration factor for 4 mol/L HCl;
V_3	is the volume of 1 mol/L sodium hydroxide;
f_3	is the concentration factor for 1 mol/L sodium hydroxide;
a	is the total volume of filtered extract;
b	is the volume taken for titration;

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[2] Whatman™ is a trade mark owned by GE Healthcare Companies and is an example of a suitable product available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of this product. Equivalent products may be used if they can be shown to lead to the same results.

0.05 is the mass equivalent in grams (g) of calcium carbonate per 1 mL of 1 mol/L HCl;

w is the mass of the test sample in grams (g).

Annex F (normative) Determination of the extractable phosphate content of soil

F.1 General

This annex describes a method for the determination of the extractable (which approximates to plant-available) phosphate content of soil.

F.2 Principle

Phosphate is extracted from soil at (20 ±1) °C with a sodium hydrogen carbonate solution of pH 8.5. The concentration of the blue complex produced by the reduction, with L-ascorbic acid, of the molybdophosphate formed when acidic ammonium molybdate reacts with phosphate is measured spectrometrically at a wavelength of 880 nm.

F.3 Reagents

Only reagents of recognized analytical grade and water conforming to grade 3 of BS EN ISO 3696:1995 shall be used.

F.3.1 *Polyacrylamide solution*, 0.5 g/L, comprising 0.5 g of polyacrylamide dissolved in approximately 660 mL of water by stirring for several hours and diluted to 1 L when the polymer has dissolved.

F.3.2 *Sodium hydrogen carbonate reagent*, made up from 420 g of sodium hydrogen carbonate ($NaHCO_3$) dissolved in approximately 7 L of water with 50 mL of the polyacrylamide solution (**F.3.1**) added and the solution diluted to 10 L. The sodium hydroxide solution (**F.3.9**) shall then be added dropwise, very carefully, until the pH is 8.50 ±0.05 at 20 °C.

NOTE 1 The pH of the reagent should be checked on the day of use and adjusted if necessary.

NOTE 2 This reagent should be retained for use for not more than one week.

F.3.3 *Ammonium molybdate stock reagent,* 12 g/L, made up from 60 g of powdered ammonium molybdate [$(NH_4)_6Mo_7O_{24}.4H_2O$] and 1.5 g of antimony potassium tartrate trihydrate ($K_2Sb_2C_8H_4O_{12}.3H_2O$) dissolved in 3 L of water. 740 mL of sulfuric acid approximately 98% (m/m) H_2SO_4 shall be slowly and carefully added, with stirring, and the solution diluted to 5 L and stored in a low actinic glass bottle in a cool place.

NOTE 1 This reagent should be discarded if it turns blue or goes turbid during preparation.

NOTE 2 This reagent should be retained for use for not more than 3 months.

F.3.4 *Ammonium molybdate reagent*, 1.5 g/L, made up from one volume of the ammonium molybdate stock reagent (**F.3.3**) diluted to eight volumes with water and stored in a low actinic glass bottle in a cool place.

F.3.5 *L-ascorbic acid solution*, 15 g/L, prepared on the day of use.

F.3.6 *Phosphate stock standard volumetric solution*, 1 g P/L, made up from potassium dihydrogen orthophosphate (KH_2PO_4) dried at (102 ±1) °C for at least 2 h and cooled in a desiccator. 0.879 g of the dried salt shall be dissolved in water in a 200 mL one-mark volumetric flask. 1 mL of hydrochloric acid solution, approximately 36% (m/m) HCl and one drop of toluene shall be added and the solution diluted to the mark.

F.3.7 *Phosphate working standard volumetric solutions*, 0 mg P/L to 7 mg P/L, prepared on the day of use from the phosphate stock standard volumetric solution (**F.3.6**). Solutions shall be prepared containing 0, 1, 2, 3, 4, 5, 6 and 7 mg P/L in the sodium hydrogen carbonate reagent (**F.3.2**).

F.3.8 *Sulfuric acid solution* (H_2SO_4), approximately 1.5 mol/L, made up from 80 mL of sulfuric acid containing approximately 98% *(*m/m*)* H_2SO_4 slowly added to water and diluted to 1 L.

F.3.9 *Sodium hydroxide solution (12.5 M)*, 500 g/L.

WARNING. This solution is highly corrosive and it is essential that suitable eye protection is worn.

F.4 Apparatus

F.4.1 *Bottles*, (200 ±25) ml capacity, wide mouth with closure.

F.4.2 *Filter paper*.

*NOTE 1 Whatman™ No. 2 filter paper 125 mm diameter has been found to be suitable for use in the procedure given in **F.6.1**.* [3]

*NOTE 2 Whatman™ GF/A filter paper 90 mm diameter has been found to be suitable for use in the procedure given in **F.6.4**.*[3]

F.4.3 *Shaking machine*, reciprocating, approximately 275 strokes/min and length of travel 25 mm.

F.4.4 *Spectrometer*, capable of measuring at a wavelength of 880 nm.

F.5 Preparation of test sample

Prepare the test sample in accordance with **C.2**.

F.6 Procedure

F.6.1 Preparation of extract from test sample

Determine the laboratory density of the test sample (see **F.5**) using the method given in Annex I. Transfer a weighed amount of the test sample, weighed to the nearest 0.001 g, calculated using the result from Annex I to be equivalent to 5 ml, into a bottle (**F.4.1**). Add 100 mL of the sodium hydrogen carbonate reagent (**F.3.2**). Cap the bottle and shake on the shaking machine (**F.4.3**) for 30 min at 20 °C.

Immediately filter a portion through a filter paper (**F.4.2**, Note 1) and retain the filtrate for the determination of phosphate content.

F.6.2 Blank extraction

Carry out a blank extraction, in parallel with the extraction in accordance with **F.6.1**, omitting the test sample.

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[3] Whatman™ is a trade mark owned by GE Healthcare Companies and is an example of a suitable product available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of this product. Equivalent products may be used if they can be shown to lead to the same results.

F.6.3 Preparation of standard graph

Pipette 5 mL of each phosphate working standard volumetric solution (**F.3.7**) into one of a series of 100 ml conical flasks. Pipette into each flask 1 mL of the sulfuric acid solution (**F.3.8**) and agitate the solutions to assist the release of carbon dioxide. Pipette 20 mL of the ammonium molybdate reagent (**F.3.4**) and 5 mL of the L-ascorbic acid solution (**F.3.5**) into each flask, mix and allow to stand for 30 min for complete colour development. Using the spectrometer (**F.4.4**), measure the absorbance in a cell of 10 mm optical path length at a wavelength of 880 nm.

If greater sensitivity is required, measure the absorbances in cells of 20 mm or 40 mm optical path length and use correspondingly more dilute phosphate working standard volumetric solutions.

Construct a graph relating absorbance to the concentration of phosphate present.

NOTE The colour is stable for several hours.

F.6.4 Determination

F.6.4.1 Pipette 5 mL of the extract from the test sample (**F.6.1**) or the blank solution (**F.6.2**) into a 100 mL conical flask. Pipette into the flask 1 mL of sulfuric acid solution (**F.3.8**) and agitate the solution to assist the release of carbon dioxide.

F.6.4.2 Pipette 20 mL of the ammonium molybdate reagent (**F.3.4**) and 5 ml of the L-ascorbic acid solution (**F.3.5**) into the flask, mix and allow to stand for 30 min for complete colour development.

F.6.4.3 Using the spectrometer (**F.4.4**), measure the absorbance in a cell of 10 mm optical path length at a wavelength of 880 nm.

F.6.4.4 If the solution is turbid after colour development, repeat the determination as follows. Take 10 mL of the extract from the test sample (**F.6.1**) and add 2 mL of approximately 2.5 mol/L sulfuric acid. When frothing has ceased, filter the extract through a filter paper (**F.4.2**, Note 2). Pipette 6 mL of the resulting filtrate into a 100 mL conical flask, and complete the procedure in accordance with **F.6.4.2** and **F.6.4.3**.

F.6.4.5 If the filtrate after acidification is highly coloured, repeat the determination as follows. Take 10 mL of the extract from the test sample (**F.6.1**) and add 2 mL of approximately 2.5 mol/L sulfuric acid. When the frothing has ceased, filter through a filter paper (**F.4.2** Note 2). Pipette 6 mL of the resulting filtrate into a 100 mL conical flask. Add 20 mL of the ammonium molybdate reagent (**F.3.4**) and 5 mL of water to the flask, mix and allow to stand for 30 min. Using the spectrometer (**F.4.4**), measure the absorbance in a cell of 10 mm optical path length at a wavelength of 880 nm. Deduct the concentration of phosphate equivalent to the absorbance of this solution from that of the solution in which ascorbic acid is present.

F.7 Calculation and expression of results

Calculate the extractable phosphate content of the sample, expressed in milligrams per litre of air-dried soil, from the standard graph (**F.6.3**) using the sample and blank determinations, and multiplying the result by the extraction and dilution ratios. Incorporate the dilution factor into the calculation if the original sample extract has been diluted with the extracting solution prior to examination.

F.8 Test report

The test report shall include the following:

a) a complete identification of the sample;

b) a reference to this British Standard, i.e. BS 3882:2015;

c) the results expressed in accordance with **F.7**;

d) any unusual features noticed during the determination;

e) any operation not included in this method or regarded as optional.

Annex G (normative) Extraction of exchangeable cations in soil

G.1 General

This annex describes a method for extracting exchangeable (which approximates to plant-available) cations from the cation exchange sites in soil. It is applicable to the determination of extractable potassium, magnesium, calcium and sodium content of soil, and of the exchangeable sodium percentage.

G.2 Principle

The cations are extracted from soil by exchanging them with ammonium ions from an ammonium nitrate solution.

G.3 Reagents

Only reagents of recognized analytical grade and water conforming to grade 3 of BS EN ISO 3696:1995 shall be used.

G.3.1 *Ammonium nitrate solution*, 80 g/L.

G.4 Apparatus

G.4.1 *Bottles*, (200 ±25) mL, wide mouth with closure.

G.4.2 *Filter paper*.

NOTE Whatman™ No. 2 filter paper 125 mm diameter has been found to be suitable. [4]

G.4.3 *Shaking machine*, reciprocating, approximately 275 strokes/min and length of travel 25 mm.

G.5 Preparation of test sample

Prepare the test sample in accordance with **C.2**.

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[4] Whatman™ is a trade mark owned by GE Healthcare Companies and is an example of a suitable product available commercially. This information is given for the convenience of users of this standard and does not constitute an endorsement by BSI of this product. Equivalent products may be used if they can be shown to lead to the same results.

G.6 Procedure

G.6.1 Preparation of extract from test sample

Determine the laboratory density of the test sample (see **G.5**) using the method given in Annex I. Transfer a weighed amount of the test sample, weighed to the nearest 0.001 g, calculated using the result from Annex I to be equivalent to 10 mL, into a bottle (**G.4.1**) and add 50 mL of the ammonium nitrate solution (**G.3.1**). Cap the bottle and shake on the shaking machine (**G.4.3**) for 30 min. Immediately filter through a filter paper (**G.4.2**) and retain the filtered extract for the determination of cations.

NOTE 1 The extract can be stored for up to 24 h in cool conditions. A refrigerator maintained at a temperature of (4 ±2) °C has been found to be suitable for this purpose.

NOTE 2 The extract can be used for the determination of potassium, calcium or magnesium, and also of sodium if the determination is carried out immediately or the sample extract is stored in a sodium-free bottle.

G.6.2 Blank extraction

Carry out a blank extraction, in parallel with the extraction in accordance with **G.6.1**, omitting the test sample.

G.7 Measurement and expression of results

Measure the concentrations of cations in the filtered extract (**F.6.1**). Calculate the exchangeable cation content of the soil sample, expressed in milligrams per litre of air-dried soil, from the machine calibration graph using the sample and blank determinations and multiplying the result by the extraction and dilution ratios. Incorporate the dilution factor into the calculation if the original sample extract has been diluted with the extracting solution prior to examination.

G.8 Test report

The test report shall include the following information:

a) a complete identification of the sample;

b) a reference to this British Standard, i.e. BS 3882:2015;

c) the results expressed in accordance with **G.7**;

d) any unusual features noticed during the determination;

e) any operation not included in this method or regarded as optional.

Annex H (normative) Determination of the specific electrical conductivity of a calcium sulfate extract of soil

H.1 General

This annex gives the method for the determination of the specific electrical conductivity of a calcium sulfate extract of soil.

H.2 Principle

Air-dried soil is extracted with saturated calcium sulfate solution at (20 ±1) °C [extraction ratio 2:5 (m/m)]; the specific conductivity of the filtered extract is measured.

H.3 Reagents

Only reagents of recognized analytical grade and water conforming to grade 2 of BS EN ISO 3696:1995 shall be used.

H.3.1 *Potassium chloride stock standard volumetric solution*, c(KCl) = 0.02 mol/L. Dissolve 1.492 g of potassium chloride, previously dried at (102 ±1) °C for at least 2 h, in water in a 1 000 mL one-mark volumetric flask and dilute to the mark. The specific conductivity of this solution at 20 °C is 2 501 $\mu S \cdot cm^{-1}$.

H.3.2 *Calcium sulfate solution.* Shake 7 g of calcium sulfate ($CaSO_4.2H_2O$) with 2 L of water at 20 °C for 2 h. Check that the temperature of the suspension is 20 °C and filter through a filter paper (**H.4.3**). Check that the specific conductivity of the filtrate does not exceed 1 990 $\mu S \cdot cm^{-1}$ at 20 °C. If it does, discard the solution and prepare a fresh one and recheck. Store the solution at 20 °C.

H.4 Apparatus

H.4.1 *Conductivity bridge and cell*, capable of measuring specific conductivity in the range 1 000 $\mu S \cdot cm^{-1}$ to 6 000 $\mu S \cdot cm^{-1}$.

H.4.2 *Constant temperature bath*, capable of maintaining a temperature of (20 ±0.5) °C.

H.4.3 *Filter paper*.

NOTE Whatman No. 2 filter paper 125 mm diameter has been found to be suitable [5]*.*

H.4.4 *Shaking machine*, reciprocating, approximately 275 strokes/min and length of travel 25 mm.

H.5 Test sample

Weigh 20 g of air-dried sample prepared in accordance with **C.2** to the nearest 0.001 g, transfer to a bottle and add 50 ml of the calcium sulfate solution (**H.3.2**). Cap the bottle and shake on the shaking machine (**H.4.4**) at 20 °C for 30 min. Filter through a filter paper (**H.4.3**) into a bottle and retain the filtrate for the determination of soil electrical conductivity.

H.6 Procedure

H.6.1 Determination of cell constant

Measure the conductivity of the potassium chloride solution (**H.3.1**) using the conductivity bridge (**H.4.1**) according to the manufacturer's instructions. Transfer approximately 50 mL of the potassium chloride solution into a bottle. Cap the bottle and, using the constant temperature bath (**H.4.2**), bring its temperature to, and maintain it at, (20 ±0.5) °C. Place the conductivity cell into the solution and record the conductivity of the solution, in $\mu S \cdot cm^{-1}$. Calculate the cell constant, *J,* using the following equation:

$$J = S/C_{KCl}$$

where:

S is the standard specific conductivity (in $\mu S \cdot cm^{-1}$);

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C_{KCl} is the conductivity of the potassium chloride solution (**H.3.1**) at 20 °C (in $\mu S \cdot cm^{-1}$).

NOTE 1 The measured values can be influenced by poisoning of the electrodes. Poisoning is difficult to recognize except as an influence on the cell constant. Variation of the cell constant should be investigated.

NOTE 2 It is important to check that the temperature setting of the conductivity bridge is 20 °C as some instruments are factory set to different temperatures.

H.6.2 Determination of conductivity

Cap the bottle containing the filtered extract (**H.5**) and, using the constant temperature bath (**H.4.2**), bring its temperature to, and maintain it at, (20 ±0.5) °C. Place the conductivity cell into the solution and record the conductivity of the filtered extract, c, in $\mu S \cdot cm^{-1}$.

H.7 Calculation and expression of results

Calculate the specific conductivity of the soil extract C, in $\mu S \cdot cm^{-1}$, using the following equation:

$$C = c \times J$$

where:

c is the conductivity of the filtered extract (from **H.6.2**) at 20 °C (in $\mu S \cdot cm^{-1}$);

J is the cell constant determined in accordance with **H.6.1**.

H.8 Test report

The test report shall include the following:

a) a complete identification of the sample;

b) a reference to this British Standard, i.e. BS 3882:2015;

c) the results calculated in accordance with **H.7**;

d) any unusual features noted during the determination;

e) any operation not included in this method or regarded as optional.

Annex I (normative) Determination of laboratory density of soil

I.1 General

This annex describes a method for determining the laboratory density of air-dried sieved soil.

I.2 Principle

The mass of a known volume of soil is measured and the density calculated.

I.3 Apparatus

I.3.1 *Test cylinder,* of capacity (100 ±5) cm^3, made of rigid material, of internal height 4.5 to 5.5 times the internal diameter.

I.3.2 *Striking plate*, made from a transparent sheet of rigid flat material (normally glass) that is large enough to cover the top of the test cylinder (**I.3.1**) easily.

I.4 Determination of the approximate volume of the test cylinder

Determine the approximate volume of the test cylinder as follows. Determine the mass of the test cylinder (**I.3.1**) empty together with the striking plate (**I.3.2**) to the nearest 0.1 g (m_1). Fill the test cylinder with water, using the striking plate to overcome meniscus errors. Determine the mass (with the striking plate) to the nearest 0.1 g (m_2). The approximate volume, v, of the test cylinder in cubic centimetres (cm^3) is given by (m_2 - m_1).

I.5 Procedure

Fill the test cylinder (**I.3.1**) (without tapping or compression) with the air-dried sieved test sample prepared in accordance with **C.2**. Strike off the soil level with the top of the cylinder using a straight edge, taking care not to cause compaction. Weigh the test cylinder and contents, with the striking plate to the nearest 0.1 g (m_3).

I.6 Calculation

Calculate the laboratory density, d, of the soil sample in grams per cubic centimetre (g/cm^3) from the following equation:

$$d = (m_3 - m_1)/v$$

where:

m_1	is the mass of the cylinder empty, with the striking plate, in grams (g);
m_3	is the mass of the cylinder with the soil sample, with the striking plate, in grams (g);
v	is the volume of the cylinder determined in **I.4** in cubic centimetres (cm^3).

Annex J (normative) Method for determining visible contaminants and sharps

J.1 Test samples

Samples retained on the sieves after measurement of the coarse fragment content (see Table 1) shall be used. For determination of sharps, the portion that has passed the 2 mm aperture sieve shall also be used.

J.2 Procedure

From the material retained on sieves with apertures 2 mm or larger, pick over and remove “visible contaminants” (**3.8**) for weighing. Weigh and record the mass of visible contaminants.

Pick over the visible contaminants (**3.8**) and remove plastics for weighing. Weigh and record the mass of plastics.

Pick over the visible contaminants, and the portion that has passed the 2 mm aperture sieve, for sharps (**3.9**). Count and record the number of sharps.

J.3 Test report

The test report shall include the following:

a) a reference to this British Standard, i.e. BS 3882:2015;

b) a complete identification of the original sample;

c) mass of the original sample
d) the % (m/m) of visible contaminants in the sample;
e) the % (m/m) of plastics in the sample;
f) the mass of sharps in 1 kg of the sample;
g) any operation not included in this method or regarded as optional.

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