

BS 8601:2013



BSI Standards Publication

Specification for subsoil and requirements for use

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Published by BSI Standards Limited 2013

ISBN 978 0 580 69112 6

ICS 13.080.01

The following BSI references relate to the work on this document:

Committee reference AW/20

Draft for comment 13/30209661 DC

Publication history

First published December 2013

Amendments issued since publication

Date	Text affected
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Summary of pages

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Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 December 2013. 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.

Relationship with other publications

This British Standard is intended to complement BS 3882 which specifies topsoil.

Information about this document

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 the *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.

In particular, attention is drawn to the Environmental Protection Act 1990 [1].

Introduction

The subsoil is an essential component of most soil profiles. Only soil that is shallow over rock lacks a subsoil layer. Subsoil provides storage of moisture, transmits rainfall to deeper layers or watercourses and enables deep rooting by trees, shrubs, grasses and other plants. It controls the waterlogging of surface layers, helps vegetation and crops to withstand summer droughts and provides anchorage for trees.

Subsoil plays an important role in reducing the amount and speed of surface water runoff, reduces the risk of erosion and flooding and consequently is an integral part of sustainable drainage systems.

Subsoil can be both naturally-occurring and manufactured. Naturally-occurring subsoil is the product of dynamic chemical, physical and (to a lesser extent) biological processes acting on weathered mineral matter. Subsoil can be manufactured by combining mineral ingredients to provide a medium that can develop properties similar to naturally-occurring subsoil.

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

NOTE 1 Transporting soil involves mechanical handling, i.e. excavation, loading, transport and distribution on site. Not all naturally-occurring soils 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.

1 Scope

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

2 Normative references

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 7755-5.6:1999 (ISO 11272:1998), *Soil quality – Part 5: Physical methods – Section 5.6: Determination of dry bulk density*

BS EN 12579:2000, *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 – Digestion of nitric acid soluble fractions of elements*

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

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, see Figure 1 (sand: 2 mm to 0.063 mm; silt: 0.063 mm to 0.002 mm; clay <0.002 mm equivalent spherical diameter particles)

NOTE Modified from BS 3882:2007, 3.5.

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.

[BS 3882:2007, 3.6]

3.5 soil pH value

measure of the acidity or alkalinity of soil

[BS 3882:2007, 3.8]

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

3.6 potentially phytotoxic element

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

3.7 other contaminant

undesirable, potentially injurious foreign object discernible by the naked eye

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

3.8 sharp

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

[BS 3882:2007, 3.14]

NOTE At some future date, subsoil might be brought to the surface, for example when planting holes are dug or when a pipeline is routed through a site.

3.9 coarse fragment

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

3.10 soil source

location from which a subsoil is obtained

3.11 supplier

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

3.12 incremental sample

quantity of material taken from one sampling point

[BS EN 12579:2000, 3.5]

4 Subsoil classification and characteristics

4.1 Classification

The subsoil shall be classified as multipurpose subsoil or specific purpose subsoil. Specific purpose subsoil shall be further classified as acidic or calcareous.

NOTE 1 If correctly handled, and managed appropriately (including attention to drainage), subsoil is capable of providing adequate rooting, drainage, aeration and runoff attenuation (see Clause 6). Some natural subsoils, especially clayey and silty subsoils, might not be able to survive the handling involved with trading subsoil.

NOTE 2 Multipurpose subsoil is natural subsoil or manufactured subsoil. This is the grade suited to most situations where subsoil is required; however, there can be situations where specific purpose subsoil is required (see NOTE 3).

NOTE 3 Specific purpose subsoil is natural or manufactured subsoil. It comprises subsoils with characteristics appropriate for specialist applications, e.g. supporting the growth of certain plants or plant communities where acidic or calcareous soils are required.

NOTE 4 Specific purpose subsoils might not be appropriate for general landscaping projects.

NOTE 5 When specifying multipurpose or specific purpose subsoil, suppliers, specifiers and users of subsoil should take into account the intended use of the site at which the subsoil is to be deployed so that the particular properties are fit for the intended planting.

4.2 Characteristics

The subsoil shall be sampled in accordance with Clause 5. The samples shall be reduced and prepared in accordance with Annex A 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 Schedule 9 of the Wildlife and Countryside Act 1981 [2] which lists plants that it is prohibited to release, allow to escape or cause to grow in the wild.

NOTE 2 Attention is drawn to the Environmental Protection Act 1990 [1] (EPA) and to the National Planning Policy Framework (NPPF) [3], under which there is a requirement for subsoil to contain no concentrations of chemical contaminants that would cause a significant risk to human health and the environment.

NOTE 3 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 4 If the subsoil 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 subsoil 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 subsoil 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.

Table 1 Subsoil characteristics

Parameter	Multipurpose subsoil	Specific purpose subsoil		Method of test
		Acidic	Calcareous	
Soil texture <2 mm fraction % <i>m/m</i>	See area of permitted soil textural classes in Figure 1			BS ISO 11277:2009
Mass loss on ignition				Annex B
Maximum coarse fragment content % <i>m/m</i> (see 3.9)		Maximum 2%		BS ISO 11277:2009
>2 mm		40		1 kg sample minimum
>20 mm		20		
>75 mm		0		
Soil pH (measured in water)	5.5 to 8.5	3.5 to 5.5	7.5 to 8.5	BS ISO 10390:2005
Carbonate % <i>m/m</i>	—	—	>1	Annex C
Exchangeable sodium percentage (ESP) %		<15		Annex D, Annex E and Annex F
Need not measure if soil electrical conductivity <2 800 $\mu\text{S}\cdot\text{cm}^{-1}$				
Electrical conductivity ^{A), B)}	Value to be measured and recorded (see ESP)			Annex F
Potentially phytotoxic elements (by soil pH) (mg/kg dry solids)	Multipurpose and specific purpose subsoils			BS ISO 16729:2013
	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	
Other contaminants % <i>m/m</i> (air-dried soil)				Annex G
>2 mm of which plastics sharps	<0.5 <0.25 zero in 1 kg air-dried soil			

^{A)} The electrical conductivity is related to the concentration of soluble ionic constituents, particularly ammonium, calcium, chloride, magnesium, nitrate, phosphate, potassium, sodium and sulfate. A discussion of the importance of soil electrical conductivity, soil salinity and ESP is given in Annex H.

^{B)} A high soil electrical conductivity might indicate a detrimentally high level of salinity.