

TOPSOIL

The Sustainable
Choice

from British Sugar



Topsoil the essential guide

- Understanding topsoil
- British Standard (BS3882:2007)
- Development of green and brownfield sites
- Landscape20, Sports10, LandscapeCL

Guide produced in association with:



TIM O'HARE ASSOCIATES
SOIL & LANDSCAPE CONSULTANCY

www.bstopsoil.co.uk

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We have committed to
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Good topsoil is a mixture of mineral particles, water, nutrients, organic matter, air and living organisms.

Nutrients

Nitrogen

Required for the growth of leaves and stems, it's deficiency causes weak, stunted growth and yellowing of older leaves. However, excess nitrogen can also be detrimental causing such effects as disproportionate leaf growth at the expense of other parts of the plant (e.g. flowers).

Phosphorous

Principle nutrient for root growth and development, deficiencies may be seen through stunted root systems whilst the leaves on some plants may also exhibit a dull green or purple coloration.

Magnesium

A constituent of chlorophyll, the green pigment which enables plants to photosynthesise, magnesium deficiency may be noted by the interveinal yellowing of the plant's older leaves.

Organic Matter

Organic matter consists of living organisms and is very important to soil function and plant growth as it influences soil structure (and hence aeration, drainage and root growth), water-holding capacity and soil fertility. It binds mineral particles into granular or crumb structures and the proportion of water that is available for plant uptake. It is a major source of essential plant nutrients including nitrogen, phosphorus, potassium and sulphur; it is also the food for soil organisms, and without it, biochemical activity, which is essential for ecosystem functioning, would cease.

pH

pH is the measure of the acidity or alkalinity of a soil. It affects nearly all soil properties and is a major factor in determining where trees, shrubs and grasses will grow. It influences structural stability, plant nutrient availability, microbe activity and soil pollutant mobility.

Electrical Conductivity

General measure of the soluble salt content or salinity of a soil, a good quality topsoil should have an electrical conductivity value within the range of 100-1500uS/cm (soil : water extract).

Potentially Toxic Elements (PTEs)

Excessive concentrations may be hazardous to health and inhibit plant growth. Laboratory analysis is necessary to indicate the levels of PTEs.

Leaching

The removal of materials in solution from the soil, often as a result of excessive rainfall.

The British Standard for topsoil BS3882:2007 replaces the 1994 version and specifies the requirements for topsoil that is to be imported or traded, for example in landscaping or remediation projects.

Topsoil is an important aspect of many civil engineering, public and private landscaping projects where it provides support for the growth of vegetation. It should provide a good anchoring substrate, slowly release nutrients and oxygen, drain excess water whilst retaining enough moisture to sustain plant health during droughts.

In this revised standard *Manufactured Topsoil* has been given the same status as *Natural Topsoil*.

There are two grades:

Multipurpose grade:

This is a grade suited to most situations where topsoil is required.

Specific Purpose:

This grade comprises characteristics appropriate for specialist applications, e.g. low fertility, acidic or alkaline.

The Standard gives up-to-date advice on correct soil sampling, handling, analysis, spreading and drainage. In addition to ensuring soils are fit for use, safe and healthy for humans, vegetation and the broader environment, it advises on how to avoid soil erosion and weed establishment including consideration of the subsoil.

Chemical and physical composition, including levels of stone and sharps, are given acceptable limits.

The list of contaminants to be analysed for, and

the permissible level for each parameter, is based on the history of the topsoil source as well as the intended use of the topsoil. This is based upon current UK legislation including the 'Contaminated Land Exposure Assessment' (CLEA) model.

Topsoil suppliers are required to provide a Declaration of Analysis to include:

- Location of topsoil source
- Previous and current land use for Natural Soils
- Date of Sampling & Analysis
- BS3882:2007 compliant topsoil must be sampled every 5000 cubic metres (8000t) traded
- Test results including Contamination Parameters
- Written confirmation of compliance with BS3882:2007.

All purchasers and users of topsoil should ask their topsoil supplier for a copy of the following:

- BS3882:2007 Declaration of Analysis
- Analysis Certificate
- Sampling Protocol

Copies of **BS3882:2007** are available from:
BSI Customer Services Department
Tel: (0208 996 9001)

Further information is available at:
www.bstopsoil.co.uk

Topsoil - Terminology

What is a Soil Profile?

Soils develop over long periods of time and generally become deeper and develop distinct layers or horizons. A soil profile is made up of three layers: **topsoil**, **subsoil** and **parent material**.

Topsoil

This thin layer (usually less than 30cm) is normally the most fertile because of the organic matter that has accumulated from plant and biological activity.

In this layer, the majority of a plant's feeder roots are present which take up nutrients.

Subsoil

Usually lighter in colour as it does not contain as much organic matter as topsoil. This layer can be composed of varying proportions of clay, sand, silt and stones.

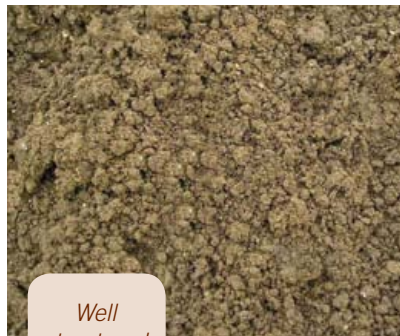
Parent Material

This is the original material from which the soil is developed. This layer has deposits of sand, gravel, pebbles, boulders and rock in various mixtures.

What is Soil Structure?

Soil structure is the aggregation of soil particles (sand, silt, clay and organic matter) into granules, crumbs or blocks. It is the shape that the soil takes based on its physical, chemical and biological properties; it is very important since (along with texture) it affects drainage and aeration capacity of the soil.

Without structure a soil collapses and compacts, resulting in a number of problems for landscaping and civil projects. It can be considered as the "framework" of a Soil Profile.



Well structured soil



Typical soil profile



Poorly-structured, cloddy soil

Why is Structure Important?

Virtually all soils need an open structure through the soil profile in order to function effectively as a growing medium. In particular, soil structure influences the main soil and plant root functions, aeration, drainage and root development.

Without structure, soils will suffer from anaerobism, waterlogging and nutrient lock-up and, ultimately, plants will die!



Trial pit showing anaerobism (grey colour)

What is Compaction?

Compaction destroys soil structure because it increases the density of the soil by packing the particles closer together; this causes a layer within the soil profile that is impregnable to plant roots, water and air. It can occur in the topsoil and the subsoil layers.

Topsoil is easier to restore than subsoil but the latter cannot be ignored as rooting alone will not break up or restructure a compacted subsoil.

Main causes of compaction

- Misuse of heavy equipment
- Trampling or trafficking over soils
- Handling soils when wet and plastic
- Stockpiling soils inappropriately

Danger signs of compaction

Anaerobism and waterlogging are the biggest soil-related causes of plant failures in landscaping projects but both can be avoided with the right ground preparation.

How you can detect compaction

- Ponding of water on the surface
- Resistance experienced when pushing a soil probe or spade into a soil
- Black, anaerobic layer with a sour odour in a turf-rooting layer
- Uneven plant growth
- Yellowing leaves
- Waterlogging
- Poor root development and shallow root systems
- Anaerobism

Development of Green and Brownfield Sites

Phase 1: Desk Study

- Determine past land use by consulting historical maps and other reference material
- Identify possible areas of contamination on site and on surrounding land
- Review the landscape design to understand the soil requirements



Phase 2: Site Investigation

Greenfield:

- Analyse in-situ soil samples to determine soil quality and its suitability for re-use on site
- If soil is not suitable for re-use, produce a specification for importing a suitable topsoil

Brownfield:

- Analyse in-situ soil samples to determine contaminants by using the information found from the desk study to determine a suitable suite of analysis
- If the soil on site is not suitable for end use, or if a capping layer needs applying above the contaminated layer, then new topsoil will need to be imported to the site

Useful contacts:

Local Authority Contaminated Land Officers
www.ciria.org
www.environment-agency.gov.uk

Phase 3: Soil Management & Remediation

- If soil can be reused, produce a soil management plan for handling, stripping and replacing the soils
- If contamination is found, design a remediation strategy to clean the site in line with its end use. For example, development of a car park will have different contamination thresholds to those for front and back gardens

Phase 4: Post Remediation

- Check all soils in landscape areas to confirm that they are suitable for plant growth; soil compaction is a common problem on construction sites
- If in-situ remediation has been carried out then validation of the on-site soil used must be carried out against the site specific specification
- If new topsoil needs to be imported it must be validated against the precise specification of the site
- Sign-off of areas following remediation or the application of new topsoil



TOPSOIL

Premium Products

The TOPSOIL range from British Sugar comprises of three premium products, Landscape20, Sports10 and LandscapeCL.

All products are produced to the stringent TOPSOIL quality standard and are available quickly and cost-effectively to anywhere in the UK.

Quality

Due to the stringent, fully-audited standards rigorously maintained throughout the TOPSOIL business, all its products have a dependable quality assured by regular independent analysis. Unlike 'muckaway', they are entirely free of contamination, glass or building material residue and are devoid of invasive weeds such as Japanese Knotweed. As natural products, none are sterilised.

Storage

All TOPSOIL products are delivered in their optimum condition and therefore to maintain the product's consistency and ensure easy application it is advisable to keep it covered if it is not being used immediately.



Sports10

The affordable solution for repair and maintenance of heavy-use winter sports pitches. Easily applied, fertile and of consistent quality, it is ideal for achieving rapid turf growth on high-wear areas and improving poor drainage.

It is not designed for use on sand rootzone pitches or those with sand slits.

Application

TOPSOIL Sports10 is a highly friable topsoil with a good level of nutrients and organic matter.

It is very easy to apply as it can be spread by hand or by suitable equipment such as a twin spinning disc spreader.



Landscape20

A general-purpose, high quality topsoil, compliant to BS3882:2007, ideal for landscaping and amenity projects. Continually developed over the past decade, this sandy loam has become the most successful product of its type in the UK.

Application

Landscape20 is a highly friable topsoil with a good level of nutrients and organic matter.

It is easy to work on-site using conventional equipment or by hand.



LandscapeCL

A specialised clay loam topsoil, developed specifically for non-demanding planting environments such as embankments, hedgerows and landscape schemes that require moisture-retentive soils.

Application

It is important that the physical condition of the soil is maintained and as such, all soil handling operations should be carried out when the soil is dry and non-plastic (friable) in consistency.

Because of its textural classification, clay loam will inherently hold moisture and consequently may become stickier during wetter times of the year.

Analysis – your guarantee of quality

In order to avoid unsuitable soil for your project, we strongly advise you obtain a comprehensive analysis of the topsoil from your chosen supplier. It is also vital that this analysis conforms to the recently revised British Standard for topsoil BS3882:2007.

All British Sugar's TOPSOIL products are analysed by an independent laboratory, the accredited Tim O'Hare Associates based in Oxfordshire (see back cover).

The initial visual examination describes the product (colour, moisture level, friability, etc) and covers whether stones, weeds, roots or rhizomes of pernicious weeds are present.

The sample is then submitted to a UKAS- and MCERTS-accredited laboratory for a range of physical and chemical tests to confirm the composition and fertility of the soil, and the absence of potential contaminants.

The following parameters are determined:

- particle size analysis and stone content
- pH value
- electrical conductivity values (CaSO₄ and water extracts)
- major plant nutrients (N, P, K, Mg)
- organic matter content
- heavy metals (As, Ba, Br, Cd, Cr, Cu, Pb, Hg, Ni, Se, V, Zn, B)
- soluble sulphate, elemental sulphur, acid volatile sulphide
- total cyanide and total (mono) phenols
- total petroleum hydrocarbons (C10-C40)
- speciated PAHs (US EPA16 suite)

Finally, the results are presented on a Certificate of Analysis along with an interpretation of the results.



Client:	British Sugar plc Co-Products		
Client Ref:	Wissington		
Date:	October 2008		
Job Ref No:	TOHA/08/3312/CS		
Sample Reference			
Clay (<0.002mm)	% U	18	✓
Silt (0.002-0.063mm)	% U	26	✓
Sand (0.063-2.0mm)	% U	58	✓
Texture Class (UK Classification)	% U	SL	✓
Stones (2-20mm)	% DW G	2	✓
Stones (20-50mm)	% DW G	0	✓
Stones (>50mm)	% DW G	0	✓
pH Value (1:2.5 water extract)	units G	7.7	✓
Electrical Conductivity (1:2.5 water extract)	uS/cm U	1670	-
* Exchangeable Sodium Percentage (ESP)	% U	2647	-
Moisture Content	% U	4	✓
Organic Matter (WB)	% U	22	✓
Total Nitrogen (Dumas)	% U	6.1	✓
Total Carbon	% U	0.18	✓
C:N Ratio	% U	3.6	✓
Extractable Phosphorus	mg/l U	20	✓
Extractable Potassium	mg/l U	56	✓
Extractable Magnesium	mg/l U	856	✓
Total Arsenic (As)	mg/kg M	112	✓
Total Barium (Ba)	mg/kg M	8	✓
Total Beryllium (Be)	mg/kg M		

Signed
Andy Spetch
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Planning your order

Order only what you need

Use the following as a guide for ordering the correct amount of topsoil:

1. Calculate the volume (cubic metres) needed for the site:

Multiply the width x length x depth

2. Use the following formula to estimate the tonnage required:

Cubic metre = 1.5 tonne of topsoil

Take account of any site restrictions

When you talk to your supplier/contractor make sure you cover details such as site access as this could affect what size of vehicle can be used; deliveries tend to be made by articulated trucks carrying 29 tonnes or rigid vehicles carrying 20 tonnes. Also consider any effect on local residents and any possible delivery time restrictions.

The dimensions below are based on the truck approaching the entrance in a straight line, **if the approach access is at an angle then more space will be required.**

Articulated Truck

Gross weight: 44 tonne
Net weight: 29 tonne
Width: 3.2 metres
Length: 12.8 metres
Height: 4 metres



Deliveries tend to be made by 29 tonne articulated, or 20 tonne rigid trucks

Rigid Truck

Gross weight: 32 tonne
Net weight: 20 tonne
Width: 3.2 metres
Length: 11.5 metres
Height: 3.7 metres



TOPSOIL

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British Sugar's LimeX
business supplies products
for the maintenance of soil
acidity and brownfield
restoration



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Tim O'Hare Associates LLP is an independent soil and landscape science practice. The firm provides soil survey, laboratory analysis, technical design, site supervision and consultancy services to the commercial landscape, sports amenity and construction sectors.

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