



Association of Geotechnical &
Geoenvironmental Specialists

DESCRIPTION OF ANTHROPOGENIC MATERIALS– A PRACTITIONERS’ GUIDE

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1. Introduction

BS:5930:2015 and BS EN ISO 14688-1 provided the basis for the description of soils in the UK; however, it provides limited guidance on the description of made ground and anthropogenic soils, which has led to an inconsistent approach in the description of these materials within the contaminated land industry. The accurate and consistent description of such soils is of vital importance to provide an indication of the geotechnical properties of these materials, as well to indicate their potential for contamination and to generate potentially hazardous ground gas.

This guide aims to provide a simple standardised approach to the description of anthropogenic materials in the form of a flow chart that can be widely adopted and laminated for use on site, as an aid memoir. The basis of the description follows the BS:5930 approach where possible, whilst broadening it to cover materials which may be encountered which fall beyond the scope of the grain sized based BS:5930 description.

1.1 Description Methodology

Once it has been established that the material is not of natural origin, the assessor should estimate the approximate proportions of the main constituents or the matrix and establish what class of material the made ground largely comprises. The adopted classes are tabulated below.

Material Classes					
Class No	Class 1	Class 2	Class 3	Class 4	Class 5
Name	Granular material	Cohesive material	Organic material	Non-cohesive fine grained anthropogenic material	Other identifiable materials
Description	Sand and gravel sized fragments of flint, sandstone, brick and concrete etc.	Silt and clay	Organic matter, decayed vegetation, decomposed waste of non-natural origin	Amorphous material such as chemical precipitates, crystalline material, chemical salts, pastes, sludges, powder i.e. Galligu or foul lime	Plastic sheeting, timbers, sawdust, large metal objects etc.

Class 1 and 2 materials are described in accordance with the BS:5930 methodology with the secondary constituents being described as slightly (sandy), sandy, or very (sandy) as appropriate. The proportions of the various inclusions should be noted whether in terms of their approximate percentage by volume being included in the description or by using the following descriptors;

- rare (<5%),
- occasional / scattered (5% to 20%),
- numerous / frequent (20% to 40%),
- abundant (>40%)

Note: the term scattered implies an infrequent but regular distribution

Class 3 Organic materials are NOT described as peat or peaty to avoid confusion with natural organic deposits, although they may, where appropriate, be described as being soft, firm, spongy or plastic in the same way as is used in BS:5930 for natural soils.

The Class 4, non-cohesive fine grained amorphous materials category is used to cover materials that do not comprise typical soil matrices, such as chemical wastes, chemical precipitates and salts, crystalline materials, powders and sludges. This class of materials would include the Galligu waste from the LeBlanc process, filter cake wastes, foul lime and the chemical salts which may build up in the ground below acid tanks at former electroplating or galvanising works.

Where the bulk of the ground comprises identifiable non-soil materials such as plastic, glass or timbers the Class 5 category is used.

Whichever class of material is adopted the main component of the made ground is described along with the proportion by volume of the various inclusions or tertiary constituents. The presence of individual items such as; railway sleeper or corroded unlabelled chemical drum are also recorded. Other details such as any staining or odours are also detailed together with any voids present within the material or any evidence of instability or groundwater seepages / inflows or any other information, such as the dates on newspapers, which could assist the readers understanding of the material, its origin and the potential risk posed by it.

Photographs of the material should be taken and presented with the logs where appropriate.

1.2 Ash, Clinker, Cinders, and Slag

Terms such as ash, clinker, cinders and slag are poorly defined across the industry. BS:5930 states that *'particular care should be taken when describing non-natural materials such as slags, clinker and ash. Unless they can be positively identified as such they should be described as, for example, slag-like, or the descriptors "probably" or "possibly" should be used.'*

Whilst, it is accepted that not all slags are expansive and could present a potential geotechnical hazard, it is considered that the use of the term slag is useful as it may indicate a likely source of elevated metallic or sulphurous contamination and thus it should be included even if a positive identification can not be made in the field.

For the purpose of this guidance the above terms are defined as tabulated below.

Material Classes					
Type	Ash*	Clinker	Slag	Cinders	Charcoal
Description	Silt and sand sized particles of the mineral residue from burning.	Gravel sized fragments of the residual inorganic minerals from the burning of coal.	Gravel to cobble sized fragments of inorganic minerals from the smelting or refining of ore.	Not Used Sand or gravel sized fragments of partly burnt coal or wood.	Gravel sized fragments of carbonised wood
Characteristics	Typically present as grey, black or reddish brown silty sand	Typically dark grey possibly 'silvery', angular, potentially vesicular in parts, but may also be fused	May be grey, black, blue, green, purple or brown, often either vesicular or glassy	Describe as medium gravel sized fragments of part burnt coal etc.	Black lightweight fragments often with visible 'wood grain'
Typical contaminants	May be rich in metallic compounds and PAH	Likely to be rich in metallic compounds particularly arsenic, lead, copper, nickel and zinc and PAH	Likely to be rich in a variety of metallic and sulphurous compounds, may contain free lime. Steel making slags may be expansive whilst blast furnace slags are likely to be stable.	Likely to be rich in PAH	Can adsorb organic compounds and hydrocarbons in the soil

- Includes pulverised fuel ash (PFA)

The term cinders is not used as it is considered more useful to describe the composition and size of such part burnt particles i.e. fine gravel of part burnt coal.

1.3 Colour

The colour of an anthropogenic material is a vital clue as to its contaminant potential and should be carefully noted via comparison to standard BS:5930 compatible colour charts where necessary. In general the orange-brown colouration of a soils derives from the ferric iron content, so where such soils become blueish or greenish grey it is often an indication that the iron in the soil has been reduced ferrous iron. The change in colour can thus give an indication of the presence of reducing conditions induced by the presence of organic or hydrocarbon contaminants which are being or have been actively degraded. Many metal salts are either white or brightly coloured, which may highlight their presence in the soil. Bright yellow or orange colouration may be indicative of the presence of hexavalent chromium at a significant concentration. Staining / discoloration of the soil is also a vital indication of the potential presence of contamination or of changes in the chemical environment so should be recorded in detail.

1.4 Odours

Table 19 of BS:5930 includes a limited list of odours, but many of these are unlikely to be encountered within the ground and using the single term 'hydrocarbon odour' is of little help in distinguishing between, for example fuel contamination and coal tar or chlorinated solvents. The following odour types are thus suggested along with their strength as detailed below.

- H₂S (rotten egg),
- rotten cabbage (Mercaptan),
- naphthalene (mothballs),
- solvent (acetone - nail varnish, xylene-thinners),
- chlorinated solvent ('Tippex' thinners, in the past)
- acetic (vinegar),
- fuel (petrol, diesel, paraffin),
- mineral oil (engine oil, lubricating oil),
- creosote/coal tar,
- putrid (decaying waste)

The strength of odour (from AS 4482.1-2005);

- Weak (just detectable at source, location difficult to determine),
- Distinct (detectable immediately adjacent to source, bearable at source),
- Strong (detectable 20m from source, bearable at source),
- Very strong (detectable >20m from source, pungent at source).

1.5 Further reading

The Environmental Protection Group Ltd, are shortly to publish additional guidance 'A practical framework for the logging of anthropogenic soils' in Ground Engineering Magazine, this publication will provide useful additional guidance and should be read in conjunction with this AGS guidance note, especially where landfill deposits are encountered and with regard to the gas generation potential of the material.

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AGS Field Description of Anthropogenic Materials

Based on visual evidence the material largely comprises

