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Taking soil samples for determination of volatile organic compounds (VOCs) — Specification

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Summary of pages

This document comprises a front cover, and inside front cover, pages i to iv, pages 1 to 48, an inside back cover and a back cover.

Foreword

Publishing information

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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.

Where words have alternative spellings, the preferred spelling of the Shorter Oxford English Dictionary is used (e.g. "organization" rather than "organisation").

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Introduction

BS 10175:2011+A2:2017, **8.3.2**, recommends that, when collecting samples for the determination of volatile compounds, a sampling technique is employed that minimizes the loss of volatiles. The primary purpose of BS 10176 is to set out procedures that can be followed in the field to minimize loss of volatile organic compounds (VOCs) during sampling, and thus assist in the collection of representative samples so that subsequent analytical results provide a reliable basis for estimation of potential risks. These procedures are presented as requirements which need to be strictly adhered to in order to provide reliable and repeatable results.

The specified procedures amplify those in BS EN ISO 15009, BS EN ISO 16558-1, BS ISO 18512 and BS EN ISO 22155 for the application of the methanol immersion method and introduces procedures for application of the sodium hydrogen sulfate (sodium bisulfate) solution immersion method, and for immersion in de-ionized water.

VOCs are flammable and typically toxic, carcinogenic, narcotic or otherwise harmful to humans and other biota and terrestrial and aquatic ecosystems, and can cause degradation of certain man-made materials, including plastics. Human exposure can be through inhalation, ingestion (direct and indirect) and dermal contact.

An understanding of how VOCs might be present in soil, their distribution between soil phases, and how they can behave in soil is important to understanding how reliably measurements of concentrations in soil are likely to provide a realistic picture of potential risks in any particular situation.

Research has shown that if soil samples for the determination of VOCs are taken and handled incorrectly in the field and laboratory most, if not all, of the volatiles present can be lost. Even under ideal laboratory conditions, there can be substantial losses [1-3] (see Annex A for a summary of the research in references [2] and [3]).

The procedures in this British Standard require careful consideration when planning a ground investigation, taking account of the conceptual model, the objectives of the investigation, the subsequent risk management approach for the site, and the practical implications. It might be necessary to take into account that the immersion methods described in this standard can require considerable time, resources, competent oversight and quality control. They introduce potential health risks due to the chemicals required during transport, site work and in the laboratory. In addition, certain operational sites might not permit the use of the procedures due to the nature of the chemicals required to be used on site.

1 Scope

This British Standard specifies methods for taking soil samples for the determination of volatile organic compounds (VOCs) to minimize the possible loss of VOCs to atmosphere during and after sample collection.

Two principal ways of taking samples for VOC determination are specified:

a) an intact core sealed to prevent loss of VOCs is taken and sent to the laboratory; and

b) a small portion of material taken with a coring device is immediately placed in water or a preservative (e.g. methanol or sodium hydrogen sulfate) in a subsequently sealed vial to be sent to the laboratory.

The methanol immersion method described amplifies the guidance in BS EN ISO 5667-15, BS EN ISO 16558-1, BS ISO 18512 and BS EN ISO 22155 about this method and is intended to be followed in preference to the briefer descriptions in these four standards.

*NOTE 1 This standard uses the term "soil" to refer to "soil and soil materials" as defined BS EN ISO 11074:2015, **7.4.16**, although the procedures specified might not be applicable to certain coarse soils and rocks (see **4.1.2**, Figure 1 and **6.3**).*

NOTE 2 The methods described can be applied at the sampling location, in an on-site facility or at an off-site facility. In all three cases, the sample is then sent to the analytical laboratory. It is assumed that the overall site investigation is carried out in accordance with BS 10175 and that the sampling strategy is developed in accordance with BS 10175 and BS ISO 18400-104.

NOTE 3 Analytical procedures are outside the scope of this standard. Laboratories should adopt procedures that will yield accurate results for the sample as presented to the laboratory. The sampling methods described are suitable for use in connection with, amongst others, the analytical methods described in:

- *BS EN ISO 15009, Gas chromatographic determination of the content of volatile aromatic hydrocarbons, naphthalene and volatile halogenated hydrocarbons – Purge-and-trap method with thermal desorption;*
- *BS EN ISO 16558-1, Risk-based petroleum hydrocarbons – Determination of aliphatic and aromatic fractions of volatile petroleum hydrocarbons using gas chromatography (static headspace method);*
- *BS EN ISO 22155, Gas chromatographic determination of volatile aromatic and halogenated hydrocarbons and selected ethers – Static headspace method.*

Observations and recommendations regarding analytical procedures in commentaries and notes are provided for information only.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes provisions of this document[1]. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 5930, *Code of practice for ground investigations*[2]

BS 8576, *Guidance on investigations for ground gas – Permanent gases and Volatile Organic Compounds (VOCs)*[3]

BS 10175:2011+A2:2017, *Investigation of potentially contaminated sites – Code of practice*

[1] Documents that are referred to solely in an informative manner are listed in the Bibliography.
[2] This standard also gives an informative reference to BS 5930:2015.
[3] This standard also gives informative references to BS 8576:2013.

