

Revised Code of Practice for Site Investigations

The British Standards Institute (BSI) is the official UK body for the drafting and production of standards. It is an independent, Royal Charter company formed by subscribing and committee members. Through engagement and collaboration, it develops British national standards to meet the needs of business and society. BSI's principal function is to prepare voluntary standards by consensus among all the significant interests concerned, and to promote their adoption.

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The BSI itself consists of a core secretariat and standards production staff. The technical content of standards is determined by approximately 4,600 volunteers who form the technical committees, many of whom represent interested or learned bodies, and who give their time and advice free of charge. Technical Committee EH/4 deals with soil quality issues, principally those relating to contaminated land and its identification and remediation. The committee is made up of members from academia, consultancy, industry, and regulatory bodies.

In March 2011 a substantially revised 'Code of Practice for the investigation of Contaminated Land' was issued, generally known as BS 10175:2011. This British Standard gives recommendations for, and guidance on, the investigation of land potentially affected by contamination and land with naturally elevated concentrations of potentially harmful substances, to determine or manage any risks. It covers:-

- Setting objectives
- Developing a strategy for investigation
- Designing the different phases of investigation
- Sampling and field testing
- Laboratory analysis and testing
- Reporting

BS 10175 is a code of practice, and is therefore not a legally binding standard such as those that cover electrical apparatus for example. It recommends good practice, but this is not necessarily best practice. The document is worded to use "should" rather than the binding "shall". Those involved in site investigations are not obliged to follow it unless required by Contract or Planning Condition etc. but failure to do so could be used as evidence of negligence. It does not absolve the user from their duty to make their own sound professional judgements, and if the standard is not followed those users who do so should be willing to defend their decision, in court if necessary.

BS 10175 is an 'umbrella' document and needs to be used in conjunction with other standards, particularly BS ISO 10381-1, BS ISO 10381-2, BS ISO 10381-3 and BS ISO 10381-6 which deal with various aspects of investigation and sampling of soil and soil materials to determine quality, not only on land potentially affected by contamination, but also agricultural, natural and near-natural sites. This series of international standards is currently being revised. There are also a plethora of standards which cover laboratory methods for the determination of the amounts of contaminants present. These are also subject to a process of revision to bring about common techniques for analysis of soil at national, European, and international levels through cooperation between BSI, CEN (European Committee for Standardisation) and ISO (International Organisation for Standardisation), and it is hoped that the new BS 10175 will be influential in upgrading the standards for contaminated land investigation at these levels.

The management of land potentially affected by contamination

involves identifying risks arising from the presence of contaminants in order that appropriate action can be taken. The risk assessment of a potentially contaminated site requires a variety of information, including:

- Details of the historical uses of the site and surrounding area and the potential for the presence of contaminants (the potential sources);
- Identification of who or what could be affected by the contaminants (i.e. receptors);
- Information on the pathways by which contaminants could migrate or come into contact with receptors (including details of any physical characteristics of the site that will affect contaminant movement).

This information is gathered by a process of site investigation in order to construct a conceptual model of the site, and it is this model that guides the methodology of investigations and any remedial actions.

The conceptual model is a description and/or representation of the site, incorporating what is known about the ground and groundwater conditions; the actual and potential contamination; the physical conditions and environmental setting; the receptors and potential pathway linkages between sources and receptors. Depending on the objectives of the investigation, it could be relevant to consider new future receptors associated with the construction and completion of a new development.

The conceptual model leads to the formulation of contamination-related hypotheses, which the investigation process examines through the collection of relevant data. The investigation should lead to reduced uncertainty in the conceptual model, but may also lead to revision and refinement of the model as more information becomes available.

A site investigation should usually be carried out in a series of phases, with each phase designed to achieve specific objectives. The phases will typically comprise preliminary, exploratory, main and supplementary investigations. A preliminary investigation will always be required. However, the requirement for subsequent exploratory, main and supplementary field investigations will depend on the objectives and the results of the antecedent investigations. Each phase of subsequent field investigations should be split into a number of stages, when necessary, in order to obtain sufficient relevant data to characterise potential source/pathway/receptor scenarios.

A preliminary Investigation would normally include a documentary search, and investigation of the site history and usage. The study should include looking at the geology, geochemistry, hydrology and hydrogeology of the site, or any other means by which contaminants could move within, onto and off the site.

The preliminary investigation should determine whether the site (or its immediate environs) has been designated as an area of ecological or archaeological significance. The preliminary investigation should also determine whether there are species (e.g. bats, nesting birds and water voles) or habitats of importance subject to legal protection.

The presence of invasive plant species, such as Japanese Knotweed and Giant Hogweed, should also be determined. Subsequent



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ground investigations should be designed to avoid any spread of these species.

This preliminary study should be followed by consultations and site reconnaissance. The visit should be made by a suitably qualified, trained and experienced person. If during the site reconnaissance anything is seen that is considered likely to pose an immediate threat to human health and safety or the environment, this should be reported immediately.

Regarding main site investigations BS 10175:2011 updates and revises many aspects of fieldwork and sample analysis. The methods of all the non-intrusive and intrusive techniques have been updated, and now includes Sonic/Rota-Sonic drilling and dynamic sampling using window or windowless sampling tubes.

There is an updated definition of "Spot", "Cluster" and "Spatial composite" samples. However, note that there are major updates in the pipeline in the guidance of soil sampling. These are to include the latest developments on statistical analysis of sampling results so as to contain site and laboratory variability, and to include variability introduced by sub-sampling of soils in the laboratory. These new standards should hopefully appear over the next two to five years, but are currently subject to much discussion.

The updated BS 10175 now states that surface water sampling should be carried out in accordance with BS EN ISO 5667-1, BS EN ISO 5667-3, BS ISO 5667-5 or BS ISO 5667-6. Collection of groundwater samples should be carried out in accordance with BS ISO 5667-11, and this brings the UK water sampling methodology into alignment with international standards.

Regarding off-site (i.e. laboratory) analysis, there has been considerable revision to the text of BS 10175. Methods of analysis should be validated for all relevant matrices and MCERTS

accreditation should be in place where possible. There are references to new standard test methods including links to ISO websites rather than just lists of standards.

There are now descriptions of both sub-sampling uncertainty and analytical uncertainty. Sub sampling uncertainty should be addressed quantitatively if suspected of being a significant cause of overall sampling uncertainty.

There are expanded requirements for information to be provided on laboratory reports including date of sampling, date of analysis completion, unique reference number, whether the analysis was carried out on natural or air dried samples etc. Laboratory samples should be prepared in accordance with BS ISO 11464 or BS ISO 14507, as appropriate, unless there are method specific requirements (e.g. because otherwise the chemical form might change or volatiles be lost). Any deviation from the agreed method should be recorded and explained in the analytical report.

The laboratory report should include a description of, and the percentages of, material removed from the sample submitted to the laboratory, and whether this material has undergone separate analysis.

With regards to reporting of the main findings, reference should be made to specific regulatory requirements and the report should include copies of correspondence with regulators. Data is to be presented "in as clear and easily assimilated way as possible".

The revised BS 10175 also has considerable revisions to the technical appendices, mostly beyond the scope of this article. However a couple of noteworthy points are:-

Annex D: Assessment and control of sampling uncertainty. This replaces the previous very short Annex on 'collection of a

representative sample by means of the 9-point sample method'. It has a description of the issues arising from sample variability and guidance and references for duplicate sampling to reduce uncertainty.

Annex F: Rapid field measurement methods. This contains an up-to-date description of the use of presently available methods for soil, water and gas/vapour analysis in the field. Reference is made to the detailed guidance in the Environment Agency's RMT Science report (2009) and ISO 12404. However, note that there are a number of methods for rapid soil screening techniques, many of which are suitable for use in the field, which are currently working their way through the standards process.

Annex G: Laboratory analysis. This provides guidance on the selection of laboratory analyses, quality assurance, MCERTS accreditation, common laboratory analyses methods for contaminated land investigation and advice on biological, physical and oral bio-accessibility testing.

Overall it is considered that the revised BS10175 is a great improvement over the previous document. However, standards are always in a state of flux and there is a continuous cycle of revision and improvement with most standards being updated on a four to five year calendar. This revision process is, to some degree, an open one, and BSI and other national and international standards bodies are always open to suggestions for improvements to published standards. If there is a standard which you use on a regular basis with which you have a technical issue, or which you think could be clearer or include references to new methods, please get in touch. Standards are set by those who use them and constructive input from users is always welcome.

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