



BSI Standards Publication

Code of practice for earthworks



...making excellence a habit."

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Contents

Foreword iii

Section 1: General 1

Introduction 1

- 1 Scope 3
- 2 Normative references 3
- **3** Terms and definitions *5*
- 4 The control of risk 10

Section 2: Design and management of earthworks 13

- 5 Planning of earthworks 13
- **6** Site conditions and investigations *17*
- 7 Design of earthworks 27
- 8 Specification of earthworks fill materials 70
- 9 Construction of earthworks 78
- 10 Adoption 88
- 11 Earthworks asset management 91
- 12 Decommissioning and disposal of earthworks assets 99

Section 3: Temporary excavations, trenches, pits and shafts 100

- **13** Temporary excavations *100*
- 14 Construction procedure 106
- 15 Trenches 107
- **16** Pits and shafts *110*

Annexes

Annex A (informative) Potential modes of failure of slopes 111

Bibliography 115

List of figures

Figure 1 – Flow diagram of lifecycle of an earthworks project 3

Figure 2 – The iterative feedback processes of a site investigation 23

Figure 3 – Example of possible surcharge combination on a slope 31 Figure 4 – General procedure for determining characteristic values

from measured values 33

Figure 5 – Variations of ϕ' with displacement 35

Figure 6 – Variation of ϕ' , ϕ'_r with I_p 36

Figure 7 – Short and long term stability of embankment and cutting slopes 38

Figure 8 – Design of earthworks drainage to capture significant flows 50

Figure 9 – Determination of acceptability limits for coarse soils using relationship testing data 61

Figure 10 – Determination of acceptability limits for fine soils using relationship testing data 61

Figure 11 – Example of relationship testing 62

List of tables

Table 1a) – Soil classification (after BS EN ISO 14688-1:2002) 7 Table 1b) – Grouping of soils for testing purposes (after BS 1377-1) 7 Table 1c) – Comparison of soil definitions in different earthworks circumstances 8

Table 2 – Indicative earthworks tests by test type and material type20Table 3 – Nominal load due to live surcharge31

Table 4 – Partial factors on actions or the effects of actions 41

Table 5 – Partial factors for soil parameters 42

Table 6 – Partial resistance factors for slopes and overall stability42Table 7 – Typical characteristics of foundation and embankmentfill materials54

Table 8 – Classification of earthworks materials in the UK by the Highways Agency 73

Table 9 – Example of classification and acceptability testing table 74

Table 10 – Classification and acceptability tests75

Table 11 – Relevant sections of CIRIA C591 and C592 92

Table A.1 – Definitions of potential modes of failure of slopes 111

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 120, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI and came into effect on 31 December 2009. It was prepared by Technical Committee B/526, *Geotechnics*. A list of organizations represented on this committee can be obtained on request to its secretary.

Information about this document

The start and finish of text introduced or altered by Corrigendum No. 1 is indicated in the text by tags C_1 $\langle C_1 \rangle$.

Supersession

This British Standards supersedes BS 6031:1981, which is obsolescent.

NOTE It was considered important to make the information on timber support and other largely historic advice available through the previous edition, which is still available from BSI.

Relationship with other publications

The standard has been completely re-written to bring it into line with both UK earthworks practice and the framework that is created by the Eurocodes. The aim was to reduce the size of the document and wherever possible include cross references to other existing documents.

This revision of BS 6031 reflects the widespread UK practice of using the Specification for Highway Works (SHW) 600 series [1] for the construction of earthworks. Within this standard, the SHW has been set as the default approach for earthworks specification that applies unless the designer details an alternative form of specification/earthworks management system.

Cross references are included within this standard to various other documents, to link into the existing information sources available. However, it remains the responsibility of the designer of the earthworks for a project to assess whether a reference is relevant to the particular project.

Use of this document

As a code of practice, this standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification and particular care should be taken to ensure that claims of compliance are not misleading.

Any user claiming compliance with this standard is expected to be able to justify any course of action that deviates from its recommendations.

It has been assumed in the preparation of this standard that the execution of its provisions will be entrusted to appropriately qualified and experienced people, for whose use it has been produced.

Presentational conventions

The provisions in this standard are presented in roman (i.e. upright) type. Its recommendations are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

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.

Section 1: General

Introduction

The structure for this document reflects the actual processes that might be followed on a typical project to deliver the earthworks. In practice earthworks design is an iterative process where design decisions are often taken by various parties (employer, consultant, main contractor, sub-contractors and construction validation team). To reflect this situation BS 6031:2009 includes some subjects in more than one clause.

This revision of BS 6031 reflects the widespread UK practice of using the Specification for Highway Works (SHW) 600 series [1] for the construction of earthworks. Within this standard, the SHW has been set as the default approach for earthworks specification that applies unless the designer details an alternative form of specification/earthworks management system. Guidance on the use of the SHW can be found in *Notes for Guidance to the Specification for Highway Works* [2].

Earthworks are commonly associated with transport infrastructure, but there are many other important applications:

- platforms for industrial, commercial and residential buildings;
- water engineering, flood defence and coastal protection works;
- other civil engineering projects.

BS 6031 is intended to be an all-encompassing code of practice; the document has been developed to enable it to cover all earthworks projects, with the exception of dams. In this regard it is relevant to note the following.

- a) Embankment dams are constructed either to retain water or for waste impoundments and, while some aspects of the design, construction and maintenance of such embankments are similar to those pertaining to infrastructure embankments, those features which relate specifically to their function as dams are not within the scope of this standard. Note that since 1930 reservoir safety in Great Britain has been regulated by Act of Parliament. A guide to the Reservoirs Act 1975¹⁾ [3] describes the application of current legislation and An engineering guide to the safety of embankment dams in the United Kingdom [4] provides some relevant information on earthworks.
- Substantial earthworks can take place for the purpose of providing a suitable landform for building development. Typically this can involve:
 - 1) backfilling old pits and quarries with engineered fill;
 - 2) cut and fill operations on natural slopes to provide terraces for building.

In the former situation the major hazard to be guarded against is long-term settlement of the fill occurring subsequent to building development; in the latter situation slope instability can also be a significant hazard. While most of the technical background

¹⁾ Likely to be revised in 2010.

of highway earthworks (as captured within the SHW [1]) is also relevant to this type of application, two significant differences have to be recognized where structures are built on fill:

- settlement criteria can be much stricter than those normally acceptable for general earthworks; the designer has to consider whether the SHW [1] criteria are sufficient for the project; and
- ii) the engineering environment in which the earthworks are carried out does influence the approach that is applicable to earthworks; this is particularly relevant on comparatively small scale projects where the designer might need to modify the approach to earthworks.

This standard has been drafted to include sufficient flexibility to allow for these scenarios.

This standard is aligned with Eurocode BS EN 1997-1:2004. Advice on using BS EN 1997-1:2004 is provided in Thomas Telford *Designers' Guide to EN 1997-1 Eurocode 7: Geotechnical Design – General Rules* [5], local government guide *A designer's simple guide to BS EN 1997* [6], and CIRIA C641, *Eurocode 7: implications for UK practice* [7]. These publications help highlight differences between BS EN 1997-1:2004 and previous traditional practice.

The foreword to BS EN 1997-1:2004 states that "BS 6031 is to be withdrawn", which is an error; it has been agreed since the publication of BS EN 1997-1:2004 that BS 6031 will remain as part of the system of earthworks standards in UK.

The style adopted within BS 6031:2009 is to cross reference BS EN 1997-1:2004 (not repeat it), summarize the aspects of BS EN 1997-1:2004 that form the overall framework for undertaking an earthworks project, include an interpretation of certain key points that are relevant/important to earthworks (e.g. selection of partial factors to be used at design stage) and add additional information that is relevant to earthworks (i.e. add some commentary to the "dry rules" set out in BS EN 1997-1:2004). The overall aim is for BS 6031 to be non-conflicting complementary information (NCCI) to BS EN 1997-1:2004.

This edition of BS 6031 is set out in clauses to reflect the overall earthworks process: where earthworks are planned, designed, constructed, adopted/approved following construction, and then the earthworks moves into an asset management process. This cycle is only broken when the earthworks reach the end of their useful life and are decommissioned. This cycle is illustrated in Figure 1. This standard recognizes that construction of new earthworks and the remediation or repair of existing earthworks are activities that have similarities and significant differences. Wherever possible, clauses cover both construction and remediation activities, which need to be taken into consideration as appropriate.



Figure 1 Flow diagram of lifecycle of an earthworks project

1 Scope

This standard gives recommendations and guidance for unreinforced earthworks forming part of general civil engineering construction, with the exception of dams. This standard also gives recommendations and guidance for temporary excavations such as trenches and pits.

NOTE Reinforced earthworks are covered in BS 8006-1 and BS 8006-2.

This document applies to earthworks classified as Geotechnical Category 1, 2 and 3 structures as defined in BS EN 1997-1:2004.

2 Normative references

Standards publications

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

BS 812-109, Testing aggregates – Methods for determination of moisture content

BS 1377 (all parts), *Methods of test for soils for civil engineering* purposes²⁾

BS 1924-1, Stabilized materials for civil engineering purposes – Part 1: General requirements, sampling, sample preparation and tests on materials before stabilization

BS 1924-2, Stabilized materials for civil engineering purposes – Part 2: Methods of test for cement-stabilized and lime-stabilized materials

BS 5607, Code of practice for the safe use of explosives in the construction industry

BS 5930:1999+A1:2007, Code of practice for site investigations³⁾

BS 6164, Code of practice for safety in tunnelling in the construction industry

BS EN 474 (all parts), Earth-moving machinery – Safety

BS EN 500-4, Mobile road construction machinery – Safety – Part 4: Specific requirements for compaction machines

BS EN 791, Drill rigs – Safety

BS EN 1990:2002+A1:2005, Eurocode 0 – Basis of structural design

BS EN 1997-1:2004, Eurocode 7: Geotechnical design – Part 1: General rules⁴⁾

BS EN 1997-2:2007, Eurocode 7: Geotechnical design – Part 2: Ground investigation and testing⁵⁾

BS EN 1998-5, Eurocode 8: Design of structures for earthquake resistance – Part 5: Foundations, retaining structures and geotechnical aspects

BS EN 12111, Tunnelling machines – Road headers, continuous miners and impact rippers – Safety requirements

BS EN 13331-1, Trench lining systems – Part 1: Product specifications

BS EN ISO 14688-1:2002, Geotechnical investigation and testing – Identification and classification of soils – Part 1: Identification & description

BS EN ISO 14688-2:2004, Geotechnical investigation and testing – Identification and classification of soils – Part 2: Classification principles

BS EN ISO 14689-1, Geotechnical investigation and testing – Identification and classification of rock – Part 1: Identification and description

NA to BS EN 1990:2002+A1:2005, UK National Annex for Eurocode – Basis of structural design

²⁾ Under revision to act as NCCI to BS EN 1997-2:2007.

³⁾ Under revision with the intention that BS 5930 remains as the "first stop" for site investigations but also to act as NCCI to BS EN 1997-2:2007.

⁴⁾ Any general reference to BS EN 1997-1:2004 is also to be taken as a reference to NA to BS EN 1997-1:2004.

⁵⁾ Any general reference to BS EN 1997-2:2007 is also to be taken as a reference to NA to BS EN 1997-2:2007.