

BS 6349-1-3:2012



BSI Standards Publication

Maritime works

Part 1-3: General – Code of practice
for geotechnical design

bsi.

This is a preview. [Click here to purchase the full publication.](#)

Publishing and copyright information

The BSI copyright notice displayed in this document indicates when the document was last issued.

© The British Standards Institution 2012

Published by BSI Standards Limited 2012

ISBN 978 0 580 76230 7

ICS 47.020.01; 93.140

The following BSI references relate to the work on this standard:

Committee reference CB/502

Draft for comment 12/30250709 DC

Publication history

First published as BS 6349-1, April 1984

Second edition as BS 6349-1, July 2000

Third (present) edition, September 2012

Amendments issued since publication

Date	Text affected
------	---------------

Contents

Foreword *iv*

Section 1: General 1

- 1 Scope 1
- 2 Normative references 1
- 3 Terms, definitions, symbols and abbreviations 1

Section 2: Site investigation 4

- 4 General 4
- 5 Planning of ground investigations 5
 - 5.1 Existing data sources 5
 - 5.2 Site reconnaissance 5
 - 5.3 Selection of sampling methods 6
 - 5.4 Layout of boreholes and trial excavations 6
 - 5.5 Depth of boreholes 8
 - 5.6 Sealing of boreholes 9
 - 5.7 Ground investigations over water 9
- 6 Groundwater investigations 11
- 7 Field tests in soil and rock 12
 - 7.1 Planning 12
 - 7.2 Normal field tests 12
 - 7.3 Other field tests 12
- 7.5 Sampling of soils, rock and groundwater 14
- 8 Laboratory tests on soil and rock 15
- 9 Geotechnical design report 15

Section 3: Geotechnical design 16

- 10 General 16
 - 10.1 Soil pressures 16
 - 10.2 Tides and water level variations 16
 - 10.3 Earthquakes 17
- 11 Basis of geotechnical design 18
- 12 Geotechnical data – Selection of parameters for working design 18
 - 12.1 General considerations 18
 - 12.2 Sands and gravels 18
 - 12.3 Silts and fine silty sands 20
 - 12.4 Normally- and lightly over-consolidated clays 20
 - 12.5 Over-consolidated clays 21
 - 12.6 Rocks 22
- 13 Water 24
 - 13.1 Single-wall structures 24
 - 13.2 Double-wall and cellular structures 29
- 14 Fill, dewatering, ground improvement and reinforcement 29
 - 14.1 Fill materials 29
 - 14.2 Ground improvement 30
 - 14.3 Reinforcement 30
- 15 Function and location of anchorages 30
- 16 Retaining structures 31
 - 16.1 Flexible structures 31
 - 16.2 Diaphragm walls 41
- 17 Slopes 43
 - 17.1 Design considerations for slopes and embankments 43
 - 17.2 Slope stability and protection – Environmental factors 43
 - 17.3 Modes of failure 44
 - 17.4 Safety and risks of failure 45
 - 17.5 Slope profile 45
 - 17.6 The effects of construction procedure 46
 - 17.7 Drainage 48
 - 17.8 Monitoring stability 48

17.9	Slope protection	49
17.10	Maintenance of earthworks	50
17.11	Remedial works	52
18	Verification	52

Annexes

Annex A (informative)	Sampling and investigation procedures	53
Annex B (informative)	In-situ and laboratory testing procedures for soil and rock	56
Annex C (informative)	Properties of the ground – Physical characteristics of soil and rock	62

Bibliography	63
--------------	----

List of figures

Figure 1	– Location and depth of boreholes for piled wharf	7
Figure 2	– Depth of boreholes in relation to retained height of soil and width of quay wall	8
Figure 3	– Plain strain shear diagram for sand	19
Figure 4	– Plain strain shear diagram for normally consolidated clay	22
Figure 5	– Slab slide in rock	23
Figure 6	– Wedge failure in rock	23
Figure 7	– Toppling failure in rock	24
Figure 8	– Hydrostatic pressure distribution on waterfront structures where soil is retained to full height of structure	25
Figure 9	– Hydrostatic pressure distribution on waterfront structure where the soil is embanked behind the structure	27
Figure 10	– Effects on hydrostatic and soil pressure distribution where seepage takes place beneath retaining structure	28
Figure 11	– Cantilevered single-wall sheet pile structure	32
Figure 12	– Anchored single-wall sheet pile structure	33
Figure 13	– Distribution of earth pressure and earth resistance on cantilevered single-wall sheet pile structure	34
Figure 14	– Distribution of earth pressure and earth resistance on anchored single-wall sheet pile structure	34
Figure 15	– Double wall sheet pile structures – Sheet piles driven into soil below seabed	35
Figure 16	– Double wall sheet pile structures – Sheet piles terminated on rock at seabed	36
Figure 17	– Active pressure distribution on anchored single-wall structure where filling is placed before dredging	37
Figure 18	– Active pressure distribution on anchored single-wall structure where filling is placed after dredging	38
Figure 19	– Distribution of active pressure and passive resistance for total stress conditions in normally and lightly over-consolidated clay	39
Figure 20	– Embankment built in stages with core material protected by dumped stone	47
Figure 21	– Slope protection by rock or concrete armouring backed by filter layer	51

List of tables

Table 1	– Typical side slopes for various soil types: underwater slopes	46
Table A.1	– Sampling and investigation procedures	54
Table B.1	– In-situ and laboratory testing procedures for soils	56
Table B.2	– Density of sands and gravels	57
Table B.3	– In-situ and laboratory testing procedures for rocks	59

Table B.4 – Strength of rock material 61

Table C.1 – Physical characteristics of soils and rocks 62

Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 64, an inside back cover and a back cover.

Foreword

Publishing information

This part of BS 6349 is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 30 September 2012. It was prepared by Technical Committee CB/502, *Maritime works*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

Together with BS 6349-1-1, BS 6349-1-2 and BS 6349-1-4, this part of BS 6349 supersedes BS 6349-1:2000, which will be withdrawn when all four of the new subparts have been published.

Relationship with other publications

BS 6349 is published in the following parts:

- Part 1-1: *General – Code of practice for planning and design for operations*; ¹⁾
- Part 1-2: *General – Code of practice for assessment of actions*; ¹⁾
- Part 1-3: *General – Code of practice for geotechnical design*;
- Part 1-4: *General – Code of practice for materials*; ¹⁾
- Part 2: *Code of practice for the design of quay walls, jetties and dolphins*;
- Part 3: *Design of dry docks, locks, slipways and shipbuilding berths, shiplifts and dock and lock gates*;
- Part 4: *Code of practice for design of fendering and mooring systems*;
- Part 5: *Code of practice for dredging and land reclamation*;
- Part 6: *Design of inshore moorings and floating structures*;
- Part 7: *Guide to the design and construction of breakwaters*;
- Part 8: *Code of practice for the design of Ro-Ro ramps, linkspans and walkways*.

This part of BS 6349 is intended to be read in conjunction with BS EN 1997-1 and BS EN 1997-2.

Information about this document

A full revision of BS 6349-1:2000 has been undertaken and the principal change is to split the document into four smaller parts:

- BS 6349-1-1: *Code of practice for planning and design for operations*;
- BS 6349-1-2: *Code of practice for assessment of actions*;
- BS 6349-1-3: *Code of practice for geotechnical design*;
- BS 6349-1-4: *Code of practice for materials*.

The principal change in respect of the geotechnical content is that the document has been edited to be compatible with relevant Eurocodes.

The new BS 6349-1-3 is split into two main sections covering site investigation and geotechnical design, with annexes containing informative text regarding site investigation and testing procedures and typical ground properties.

¹⁾ In preparation.

Use of this document

As a code of practice, this part of BS 6349 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 British Standard is expected to be able to justify any course of action that deviates from its recommendations.

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.

