

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

**BS 6349-1-3:2021**



**BSI Standards Publication**

## **Maritime works**

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

**bsi.**

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

**Publishing and copyright information**

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

© The British Standards Institution 2021

Published by BSI Standards Limited 2021

ISBN 978 0 539 06627 2

ICS 93.140; 47.020.01

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

Committee reference CB/502

Draft for comment 20/30403581 DC

**Amendments/corrigenda issued since publication**

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

---

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

<b>CONTENTS</b>	<b>Page</b>
<b>Foreword</b>	<b>iii</b>
<b>Section 1: General</b>	<b>1</b>
1 Scope	1
2 Normative references	1
3 Terms, definitions, symbols and abbreviations	2
<b>Section 2: Geotechnical investigation</b>	<b>4</b>
4 General	4
5 Planning of geotechnical investigations	4
5.1 Existing data sources	4
5.2 Site reconnaissance	5
5.3 Selection of investigation and sampling methods	6
5.4 Location and extent of geophysical surveys	6
5.5 Location of boreholes, CPTs and trial excavations	7
5.6 Depth of intrusive investigations	8
<i>Figure 1 — Location and depth of boreholes for piled wharf</i>	9
<i>Figure 2 — Depth of boreholes in relation to retained height of soil and width of quay wall</i>	10
5.7 Sealing of boreholes	10
5.8 Ground investigations over water	10
6 Groundwater investigations	12
7 Field tests in soil and rock	13
7.1 Planning	13
7.2 Normal field tests	13
7.3 Other field tests	13
7.4 Trial dredging	15
7.5 Sampling of soils, rock and groundwater	15
8 Laboratory tests on soil and rock	16
<b>Section 3: Geotechnical design</b>	<b>17</b>
9 General	17
9.1 Basis of geotechnical design	17
9.2 Geotechnical design report	17
9.3 Tides and water level variations	17
9.4 Earthquakes	18
10 Geotechnical data – Selection of parameters for working design	19
10.1 General considerations	19
10.2 Monitoring during and after construction	19
11 Water	19
11.1 Single-wall structures	19
<i>Figure 3 — Effects on hydrostatic and soil pressure distribution where seepage takes place beneath a retaining structure</i>	20
<i>Figure 4 — Hydrostatic pressure distribution on waterfront structures where soil is retained to full height of structure</i>	21
<i>Figure 5 — Hydrostatic pressure distribution on waterfront structure where the soil is embanked behind the structure</i>	23
11.2 Double-wall and cellular structures	22
12 Fill, dewatering, ground improvement and reinforcement	24
12.1 Fill materials	24
12.2 Ground improvement	25
12.3 Reinforcement	26

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

13.1	Earth pressures	26
	<i>Figure 6 — Distribution of earth pressure and earth resistance on cantilevered single-wall sheet pile structure</i>	27
	<i>Figure 7 — Distribution of earth pressure and earth resistance on anchored single-wall sheet pile structure</i>	28
	<i>Figure 8 — Double-wall sheet pile structures – Sheet piles driven into soil below seabed</i>	29
	<i>Figure 9 — Double-wall sheet pile structures – Sheet piles terminated on rock at seabed</i>	30
13.2	Sheet piles	31
13.3	Diaphragm walls and bored pile walls	33
13.4	Function and location of anchorages	34
14	Bearing piles	35
14.1	Selection of bearing piles	35
14.2	Steel bearing piles	36
14.3	Concrete bearing piles	36
14.4	Timber bearing piles	37
15	Slopes	37
15.1	Design considerations for slopes and embankments	37
15.2	Slope stability and protection – Environmental factors	38
15.3	Modes of failure	39
15.4	Safety and risks of failure	39
15.5	Slope profile	39
15.6	The effects of construction procedure	40
	<i>Figure 10 — Embankment built in stages with core material protected by dumped stone</i>	41
15.7	Drainage	42
15.8	Monitoring stability	42
15.9	Slope protection	43
15.10	Maintenance of earthworks	44
	<i>Figure 11 — Slope protection by rock or concrete armouring backed by filter layer</i>	45
15.11	Remedial works	44
16	Verification	46
	<b>Bibliography</b>	<b>47</b>

### 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.

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

## 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 April 2021. It was prepared by Technical Committee CB/502, *Maritime works*. A list of organizations represented on this committee can be obtained on request to the committee manager.

### Supersession

This part of BS 6349 supersedes [BS 6349-1-3:2012](#), which is withdrawn.

### 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;*
- Part 1-2: *General – Code of practice for assessment of actions;*
- Part 1-3: *General – Code of practice for geotechnical design;*
- Part 1-4: *General – Code of practice for materials;*
- 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 1997-1:2004 and BS EN 1997-2:2007.

### Information about this document

This is a full revision of the standard, and introduces the following principal changes:

- general restructuring;
- inclusion of clause on bearing piles, previously in [BS 6349-1-4](#);
- enhanced reference to and alignment with BS EN 1997-1:2004 and BS EN 1997-2:2007;
- removal of general geotechnical guidance, which was more akin to a design manual.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at [bsigroup.com/standards](https://bsigroup.com/standards), or by contacting the Customer Services team.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

As a code of practice, this British Standard takes the form of recommendations and guidance. It is not to be quoted as if it were a specification. Users are expected to ensure that claims of compliance are not misleading.

Users may substitute any of the recommendations in this British Standard with practices of equivalent or better outcome. 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.*

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

### **Contractual and legal considerations**

This publication has been prepared in good faith, however no representation, warranty, assurance or undertaking (express or implied) is or will be made, and no responsibility or liability is or will be accepted by BSI in relation to the adequacy, accuracy, completeness or reasonableness of this publication. All and any such responsibility and liability is expressly disclaimed to the full extent permitted by the law.

This publication is provided as is, and is to be used at the recipient's own risk.

The recipient is advised to consider seeking professional guidance with respect to its use of this publication.

This publication is not intended to constitute a contract. Users are responsible for its correct application.

**Compliance with a British Standard cannot confer immunity from legal obligations.**

This is a preview of "BS 6349-1-3:2021". [Click here to purchase the full version from the ANSI store.](#)

## Section 1: General

---

### 1 Scope

This part of BS 6349 gives recommendations for geotechnical activities associated with the design and implementation of maritime works. It covers ground investigation and geotechnical design, and gives additional guidance on testing procedures.

---

### 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<sup>1)</sup>. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

[BS 6031](#), *Code of practice for earthworks*

[BS 6349-1-2](#), *Maritime works – Part 1-2: General – Code of practice for assessment of actions*

[BS 6349-1-4](#), *Maritime works – Part 1-4: General – Code of practice for materials*

[BS 6349-2](#), *Maritime works – Part 2: Code of practice for the design of quay walls, jetties and dolphins*

[BS 8006-1](#), *Code of practice for strengthened/reinforced soils and other fills*

[BS 8081](#), *Code of practice for ground anchorages*

BS EN 1536, *Execution of special geotechnical work – Bored piles*

BS EN 1538, *Execution of special geotechnical works – Diaphragm walls*

BS EN 1992 (all parts), *Eurocode 2 – Design of concrete structures*

[BS EN 1995](#), *Eurocode 5: Design of timber structures*

BS EN 1993-5:2007, *Eurocode 3 – Design of steel structures – Part 5: Piling*

BS EN 1997-1:2004, *Eurocode 7 – Geotechnical design – Part 1: General rules*

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

BS EN 1998 (all parts), *Eurocode 8 – Design of structures for earthquake resistance*

BS EN 12063:1999, *Execution of special geotechnical work – Sheet pile walls*

BS EN 14731, *Execution of special geotechnical works – Ground treatment by deep vibration*

BS EN ISO 22475-1, *Geotechnical investigation and testing – Sampling methods and groundwater measurements – Part 1: Technical principles for execution*

NA to BS EN 1997-1: 2004, *UK National Annex to Eurocode 7 – Geotechnical design – Part 1: General rules*

---

<sup>1)</sup> Documents that are referred to solely in an informative manner are listed in the Bibliography.