BS 6349-3:2013

Maritime works –

Part 3: Code of practice for the design of shipyards and sea locks

Publishing and copyright information

Published by BSI Standards Limited 2013

ISBN 978 0 580 78084 4

ICS 47.020.99; 93.140

The following BSI references relate to the work on this document:
Committee reference CB/502
Draft for comment 13/30259247 DC

Publication history

First published August 1988
Second (present) edition, December 2013

Amendments issued since publication

Date	Text affected

Contents

List of figures

List of tables

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 126, 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 31 December 2013. 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

This part of BS 6349 supersedes BS 6349-3:1988, which is withdrawn.

Relationship with other publications

BS 6349 is published in the following parts [1)]:

- Part 1-1: *General – Code of practice for planning and design for operations*;
- Part 1-2: *General – Code of practice for assessment of actions*; [2)]
- 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: *Code of practice for the design of shipyards and sea locks*;
- 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*; [3)]
- 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*.

The recommendations in this part of BS 6349 are intended for use in all global locations, but taking into account local conditions. As a British Standard, this part of BS 6349 makes reference to other British Standards and to other publications commonly used in the UK, but it is recognized that in some locations there will be alternative local or international publications that are equally applicable. It is the responsibility of the designer to take steps to be fully cognisant of the prevailing codes and standards in any particular location.

Information about this document

This is a full revision of the standard. The principal change is to broaden the scope to include all principal maritime waterfront structures designed for shipyards and their interrelationship in the design of the whole shipyard. The general criteria for maritime works have been removed in this revision, as they are now collected together in the four subparts of BS 6349-1 [4)], which includes general planning and design for operations, actions, geotechnical conditions and materials. BS 6349-3 covers the criteria which are specific to works in shipyards and sea locks.

---

1) A new part 9, covering port surfacing, is in preparation.
2) In preparation.
3) Some of the recommendations in BS 6349-6:1989 have now been incorporated into Clause **9** of the present part of BS 6349, and brought up to date. It is anticipated that these recommendations will be removed from BS 6349-6.
4) At the time of publication of BS 6349-3, BS 6349-1-2 is still at drafting stage.

Shipyards incorporate industrial processes which determine the operational requirements of the facilities and hence their design. To assist the designer in the use of BS 6349-3, a common format has been adopted for each clause from Clause **4** onwards. This common format is as follows.

a) **Operational parameters**. The operational parameter is defined as the requirement of a system or element necessary to be incorporated or designed in, to undertake a defined function or facilitate operations either alone or in conjunction with other elements or systems, i.e. what is the facility for and why is it necessary?

b) **Siting**. The siting is defined as the location, routing and/or position of the respective element or system with respect to its requirements and other structures, services or elements necessary to be provided as part of the facility, i.e. where should the facility be located?

c) **Elements**. The element is defined as the important minimum individual items, components or elements that are necessary for a system, structure or unit serving the facility that need to be considered in the design, i.e. what are the key factors or items that need to be included and what are their specific design parameters?

d) **Equipment**. The equipment is defined as the individual key items of plant or equipment that are critical in that system, structure or service which it is necessary to incorporate, i.e. what equipment is needed to make the facility work?

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.

It has been assumed in the preparation of this British 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.

1 Scope

This part of BS 6349 gives recommendations and guidance on the design of shipyard waterfront layouts, dry docks, piers, quays, slipways, shipbuilding berths, shiplifts, floating docks, sea locks, hydrolifts, dock and lock gates, mechanical and electrical services distribution and control systems.

It focuses on shipyard-specific design considerations. It does not apply to general maritime works design or to the detailed planning and design of sea locks, as well as their hydraulic design, which are covered by other parts of BS 6349 and PIANC publications.

This part of BS 6349 is applicable to the design of both commercial and naval base facilities.

2 Normative references

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

BS 6349-1-3, *Maritime works – Part 1-3: General – Code of practice for geotechnical design*

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

BS 6349-4, *Maritime structures – Part 4: Code of practice for design of fendering and mooring systems*

BS EN 1991-1-4, *Eurocode 1 – Actions on structures – Part 4: General actions – Wind actions*

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

BS EN 1993 (all parts), *Eurocode 3 – Design of steel structures*

BS EN 1997 (all parts), *Eurocode 7 – Geotechnical design*

BS EN 13001 (all parts), *Cranes – General design*

3 Terms, definitions and abbreviations

3.1 Terms and definitions

For the purpose of this part of BS 6349, the following terms and definitions apply.

3.1.1 bilge block

ship support unit under the hull sides of a ship when it is drydocked

3.1.2 declivity

longitudinal inclination

3.1.3 dry berth

area of dry land to which ships can be moved for repairs

3.1.4 dry dock

fixed and gated structure with a floor below water level into which ships can be floated and subsequently be made dry

NOTE Dry docks are sometimes referred to as "graving docks".

3.1.5 drydocking
putting a ship in a dry condition for repair

3.1.6 floating dock
structure with variable buoyancy than can be submerged for a ship to enter and then be raised to lift the ship into a dry condition

NOTE Floating docks are called "dry docks" in some countries.

3.1.7 hydrolift
fixed and gated structure which uses water to lift or lower ships to or from the level of dry land

3.1.8 keel block
ship support unit along the line of a ship's keel when it is drydocked

3.1.9 operation
activity required to undertake ship repair or shipbuilding

3.1.10 pumphouse
location of pumping equipment

3.1.11 shipbuilding
industrial process of building a new ship

3.1.12 shipbuilding berth
berth dedicated to shipbuilding

3.1.13 shiplift system
method of lifting or lowering ships to/from the level of dry land

3.1.14 ship repair
industrial process of repairing a ship

3.1.15 sill
fixed structure forming the bottom of a gated entrance through which ships pass

NOTE This is sometimes spelled "cill".

3.1.16 slipping
inclined retrieval or launching of ships

3.1.17 slipway
inclined system for retrieval and launching of ships extending from dry land to below water level

3.1.18 sue point
ship contact with a support unit at one location along its length before the full keel length is in contact

NOTE This is sometimes spelled "sew".

3.1.19 under-drained floor
floor which has the natural ground water pressure beneath it reduced

3.2 Abbreviations

For the purpose of this part of BS 6349, the following abbreviations apply.

DCS	distributed control systems
EHWL	extreme high water level
HAT	highest astronomical tide
HAZID	hazard identification
HAZOP	hazard and operability
LAT	lowest astronomical tide
LBP	length between perpendiculars
MDL	maximum distributed load
MHWN	mean high water neaps
MHWS	mean high water springs
MLWS	mean low water springs
PLC	programmable logic controllers
SCADA	supervisory control and data acquisition

4 Shipyard layout

4.1 Operational parameters of shipyards

4.1.1 Shipyard life cycle

The life cycle of a shipyard starts at the early concept stage and follows through to the decommissioning stage, and includes each and every stage in between. The design of the shipyard should be developed with a holistic approach, such that the consequences of decisions made at a particular stage are taken into account for all subsequent stages of the life cycle.

4.1.2 Consultation

Throughout the life cycle of a shipyard, timely coordination should take place with all identified stakeholders. The stakeholders should include, but are not limited to, the following:

- shipyard owner;
- shipyard operator (management, procurement, engineering and maintenance);
- port authority;
- fire authority (authority having jurisdiction);
- host country governing departments;
- local business, people and representative bodies;
- country utility providers (power supply, water supply, phone, sewage disposal and data services);
- insurance companies.

4.1.3 Input to shipyard layout design

The shipyard layout should be able to achieve a set of facilities which provides an operationally efficient shipyard. In order to achieve this, the input to the design should include the following principal parameters and constraints:

- intended shipyard types of business (see **4.1.4**);
- throughput mix of ships, including offshore work where applicable, which the shipyard is intended to accommodate (see **4.1.4**);
- potential shipyard physical site data;
- local construction capability constraints;
- stakeholder constraints and opportunities.

The final layout should be the result of a progressive iterative optimization of all of the input information and applied to each of the individual facilities. The designer should have a good understanding of the operational purpose of each facility and of the following constraints:

a) operational parameters of the facility;

b) siting of the facility;

c) structural elements of the facility;

d) equipment of the facility.

4.1.4 Target throughput

The basis of design for the shipyard should be defined clearly in terms of the type of business it is intended to undertake, such as shipbuilding, ship repair, ship conversion, ship recycling or a mix of these, together with the target throughput mix of ships to be accommodated subdivided into ship size, ship types and numbers.

For commercial shipyards, the target throughput should be derived from a market study which has identified the potential revenue, which should be taken into account as a budgetary parameter for the scale and affordability of the shipyard facilities.

For naval bases, the current and planned fleets usually provide the target throughput parameters with an associated support facilities budget.

4.1.5 Landside and waterfront

The shipyard layout should be planned to optimize the overall capacity of both the landside and waterfront facilities, taking into account the combined operations and construction. The designer of the waterfront marine works should be aware of and contribute to the operational layout planning.

4.2 Siting of shipyards

4.2.1 Site selection

For the design of a new greenfield site shipyard, the site selection process should take account of the full range of parameters which encompass both the physical site constraints and operational needs. There should be an informed balance for the physical site needs of landside and waterfront facilities. A simplified shipyard footprint area of the waterfront and land requirements should be derived from the target throughput mix of ships (see **4.1.4**), as a basis for the scale of the site needed (an example is given in Figure 1).

For the upgrading of existing shipyards or for predefined locations, the optimum layout should be determined from the combined opportunities and constraints for both the landside and waterfront facilities.