

BSI Standards Publication

Maritime structures

Part 8: Design of Ro-Ro linkspans, ramps and seaport passenger boarding bridges – Code of practice



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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 August 2026. 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This part of [BS 6349](#) supersedes [BS 6349-8:2007](#), which is withdrawn.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 the asset lifecycle*;
- 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: *Code of practice for the design of shipyards and sea locks*;
- Part 4: *Design of fendering and mooring systems – Code of practice*;
- Part 5: *Code of practice for dredging and land reclamation*;
- Part 6 (withdrawn): *Design of inshore moorings and floating structures¹⁾*;
- Part 7: *Guide to the design and construction of breakwaters*;
- Part 8: *Design of Ro-Ro linkspans, ramps and seaport passenger boarding bridges – Code of practice*.

This part of [BS 6349](#) follows the limit state principles set out in [BS EN 1990](#). It is intended to be read in conjunction with the [BS EN 1992](#) series (concrete bridges), the [BS EN 1993](#) series (steel bridges) or other applicable Eurocode design standards.

The first generation of Eurocodes was published between 2002 and 2007, with conflicting British Standards withdrawn in 2010. The second generation of Eurocodes was published between 2023 and 2026. These documents have been published as soon as they are available, to enable users to prepare for the transition from the first generation to second generation of Eurocodes. It is intended that UK adoptions of the first generation of Eurocodes will be withdrawn by BSI on 30 March 2028. Until that date, the first generation documents are the applicable standards for buildings and civil engineering works constructed in the UK, unless otherwise specified by the relevant authority or in the specification for a particular project.

Where reference is made to a Eurocode within this part of [BS 6349](#), this includes the relevant National Annex where applicable. The UK National Annexes for the second generation of Eurocodes will be published from 2026 until withdrawal of the first generation Eurocodes in 2028. The UK National Annexes for first generation Eurocodes are not applicable to second generation Eurocodes.

¹⁾ [BS 6349-6](#) was withdrawn in 2013 and a new, updated version is in preparation.

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can interpret the word “bridge” as “structure”. The various loads and load factors to be used when assessing the ultimate limit state (ULS) and serviceability limit state (SLS) are given in [Clause 6](#) of this part of [BS 6349](#).

An alternative approach to the design of Ro-Ro ramps, linkspans and seaport passenger boarding bridges (SPBBs) is given in the Lloyd’s Register *Rules and regulations for the classification of linkspans* [N1] (hereinafter referred to as “Lloyd’s Rules”). [BS EN 1992](#) and [BS EN 1993](#) are ULS codes and Lloyd’s Rules [N1] is a working stress design code, and the treatment of load factors and vehicle impact factors is markedly different between the two codes.

Both Lloyd’s Rules [N1] and [BS EN 1992](#) and [BS EN 1993](#) can be used as the basis of structural design of linkspans, but only Lloyd’s Rules [N1] gives guidance on the structural design of floating structures.

CIRIA Report C518 [1] provides an extensive discussion on the coverage and limitations of Lloyd’s Rules [N1].

Information about this document

This is a full revision of the document, and introduces the following principal changes.

- The references to standards and other publications have been updated to refer to the latest editions, including Eurocodes.
- The recommendations have been updated to take into account the introduction of the Eurocodes and changes to the Supply of Machinery (Safety) Regulations 2008 [2].²⁾
- Enhanced applicability of content generally, with reference to the whole asset life cycle of both the vehicle linkspan and SPBB infrastructure.
- The vehicle linkspan design recommendations have been separated from those of SPBBs, commencing at [Clause 7](#).
- Within the [Introduction](#), a new subclause highlights the need to incorporate all the elements of a complex machine within the design.
- The consequence class and execution class for structures are now defined in [Clause 4](#).
- The use of a basis of design (BoD) statement at the commencement of a new or refurbishment project has been added to [Clause 4](#).
- [Clause 5](#) now incorporates loads, movements and factors, including vehicle restraint barriers and pedestrian handrailing.
- [Clause 6](#) now includes specific design guidance on bearings, including the use of bearing materials.
- [Clause 7](#) to [Clause 9](#) have been broadened to cover a wider range of vehicle linkspan types, in particular in relation to pedestrian-only linkspans. The guidance on transitions has been revised and there is a new recommendation for the treatment of the deck surfacing at the vessel ramp interface.
- [Clause 10](#) to [Clause 12](#) are new clauses giving recommendations for the structure, geometry, gradients and construction materials for the different types of SPBBs.
- A new [Clause 13](#) provides guidance and recommendations for setting a new/refurbished vehicle linkspan or SPBB to work, including the independent design process and site load testing.
- [Clause 14](#) gives expanded recommendations on load testing.

²⁾ Legislation might become out of date during the lifespan of this document. No reliance can be placed on this document as being a definite statement of a user’s legal responsibilities or potential liabilities under legislation.

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system assessment and registration against the appropriate standard in the [BS EN ISO 9000](#) series by an accredited third-party certification body.

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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.

Use of this document

As a code of practice, this part of [BS 6349](#) 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 part of [BS 6349](#) with practices of equivalent or better outcome. Any user claiming compliance with this part of [BS 6349](#) 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 part of [BS 6349](#) 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.

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

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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.

In particular, attention is drawn to the following specific regulations³⁾:

- Supply of Machinery (Safety) Regulations 2008 [2];
- Management of Health and Safety at Work Regulations 1992 [3]; and
- Provision and Use of Work Equipment Regulations 1998 (PUWER) [4].

³⁾ Legislation might become out of date during the lifespan of this document. No reliance can be placed on this document as being a definite statement of a user’s legal responsibilities or potential liabilities under legislation.

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0 Introduction

0.1 Design traditions

BS 6349-8 was first issued in 2007 and provided vehicle linkspan and seaport passenger boarding bridge (SPBB) designers with a specific design standard for the first time. Before this date, designers would use either the [BS 5400](#) series (now withdrawn) or Lloyd's Rules [[N1](#)], or a combination of both, supported by CIRIA Report C518 [[1](#)].

This part of [BS 6349](#) includes recommendations for several issues that are not covered by either the Eurocodes, which have superseded the [BS 5400](#) series, or Lloyd's Rules [[N1](#)]. In particular, [BS EN 1990](#), the [BS EN 1991](#) series, the [BS EN 1993](#) series, etc. do not cover:

- a) pontoons or floating structures;
- b) overall hydrostatic stability; or
- c) wave, current and vessel-induced loadings.

Lloyd's Rules [[N1](#)] does not cover:

- 1) upstanding plate girders with U-frame action;
- 2) members in which lateral torsional buckling is likely; or
- 3) overall hydrostatic stability.

The 2007 version of BS 6349-8 has universally become the cornerstone of linkspan and SPBB design but has fallen behind in several key areas, particularly regarding loading criteria and the need to integrate the mechanical and electrical aspects into overall design, testing and safety of what is now classified as a complex machine, i.e. a vehicle linkspan and SPBB.

NOTE Complementary design advice is given in PIANC Report WG167 [[5](#)].

0.2 Design of complex machinery

The integration of mechanical and electrical elements and control systems is crucial for the success of the overall design of Ro-Ro ramps, linkspans and SPBBs.

A design is expected to take into account the whole life cycle from manufacture through to decommissioning, with the machinery elements requiring careful planning in order to:

- a) achieve safe operation;
- b) provide a design life for all components as agreed with the owner; and
- c) facilitate efficient maintenance and replacement of elements.

Safe and effective operation of the facility is another fundamental aspect that needs to be taken into account in the design.

Risk management is at the heart of the design process, with designers taking responsibility for the minimizing of risk through design. A holistic approach is paramount for the success of the design, with integration of the multiple disciplines being fundamental.

Reliability of machinery is an important design factor; in many port facilities the consequence of failure can have significant repercussions. In these installations, design for high reliability is essential; a robust and systematic assessment is necessary to optimize the design, and to enable owners to understand the higher risk areas of their installations.

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safe design of the installation. Effective collaboration between the relevant designers with regard to mechanical loading is therefore of great importance. The range of loadings upon Ro-Ro ramps, linkspans and walkways varies significantly, and the upper bound magnitudes of loading, and load combinations, need to be taken into account for all foreseeable eventualities. Of particular importance is assessment of the large inertial forces that can be generated in large moving structures, particularly when accelerating or decelerating large masses. Machinery needs to be designed to permit quick response by operators to potentially hazardous situations, and to prevent foreseeable mechanical, electrical or control and instrumentation failures resulting in gross failure of the system. Different drive mechanisms respond in greatly different ways, with the potential for large amplifications of loads from the dynamic response.

Additionally, the geometric compatibility of mechanical elements with the associated structural elements is a key factor in the design. Mechanical elements with their moving parts often require tight installation tolerances for correct functioning; it is therefore of vital importance that the interface with structural elements facilitate this, with provision for adjustment often being essential. From the outset of the design process, structures need to be designed such as to enable maintenance activities to be safely achieved.

In summary, the design of complex machinery relies on careful integration of mechanical, structural, control and instrumentation, and electrical elements, with operation, maintenance and reliability aspects all being taken into account. The potential for significant loss of life associated with these structures further compounds the importance of the highest standard of interdisciplinary integration and risk reduction throughout the design, with a holistic overview being always taken.

NOTE Attention is drawn to the Supply of Machinery (Safety) Regulations 2008 [2], particularly in respect of the definition of “complex machinery”, and the Management of Health and Safety at Work Regulations 1992 [3].

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1 Scope

This part of [BS 6349](#) gives recommendations for the design of Ro-Ro linkspans, ramps and seaport passenger boarding bridges (SPBBs) used for the transfer of vehicles and foot passengers between shoreside facilities and a vessel.

This part of [BS 6349](#) applies to the structural elements and integration of the mechanical systems only and does not cover the detailed design of any operational equipment, traffic control, mechanical or electrical, heating, lighting, lifesaving or rescue equipment. Geometrical aspects of fixed shore ramps are covered in this part of [BS 6349](#).

This part of [BS 6349](#) does not apply to rail-enabled linkspans used for loading and unloading rail carriages and wagons, as it does not give recommendations for railway loading and associated ramp gradients, etc. However, some recommendations are applicable to such facilities and can be used in the absence of other guidance.

NOTE This part of [BS 6349](#) is generally intended to cover facilities constructed in the UK. Although most of the contents are directly applicable elsewhere, local conditions might necessitate modifications, e.g. environmental effects and vehicle loading.

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, or limits the application, of this document.⁴⁾ For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

Standards publications

[BS 6349-1-1:2025](#), *Maritime works – Part 1-1: General – Code of practice for planning and design for the asset lifecycle*

[BS 6349-1-2](#), *Maritime works – Part 1-2: General – Code of practice for assessment of actions*⁵⁾

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

[BS 6349-4](#), *Maritime structures – Part 4: Design of fendering and mooring systems – Code of practice*

[BS 6701](#), *Telecommunications equipment and telecommunications cabling – Specification for installation, operation and maintenance*

[BS 7818:1995](#), *Specification for pedestrian restraint systems in metal*

[BS 8002](#), *Code of practice for earth retaining structures*

[BS 8004](#), *Code of practice for foundations*

[BS EN 1317](#) (all parts), *Road restraint systems*⁶⁾

[BS EN 1990](#), *Eurocode – Basis of structural and geotechnical design*

[BS EN 1991](#) (all parts), *Eurocode 1 – Actions on structures*⁷⁾

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

⁴⁾ Documents that are referred to solely in an informative manner are listed in the Bibliography.

⁵⁾ This part of [BS 6349](#) also gives informative references to [BS 6349-1-2:2016+A1:2017](#).

⁶⁾ This part of [BS 6349](#) also gives specific normative references to [BS EN 1317-1](#) and [BS EN 1317-2](#).

⁷⁾ This part of [BS 6349](#) also gives specific normative references to [BS EN 1991-1-4](#), [BS EN 1991-1-5](#), [BS EN 1991-1-6](#), [BS EN 1991-1-7](#) and [BS EN 1991-2](#).