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Guide to fatigue design and assessment of steel products

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Contents

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Summary of pages

This document comprises a front cover, an inside front cover, pages i to vi, pages 1 to 140, an inside back cover and a back cover.

Foreword

Publishing information

This British Standard is published by BSI Standards Limited, under licence from The British Standards Institution, and came into effect on 31 March 2014. It was prepared by Technical Committee WEE/37, *Acceptance levels for flaws in welds*. A list of organizations represented on this committee can be obtained on request to its secretary.

Supersession

This British Standard supersedes BS 7608:1993, which is withdrawn.

Information about this document

Guidance on general fatigue design philosophy is given in Annex A, which also contains a brief description of the method of using this British Standard. A more general method for assessing welded joints using the hot-spot stress, only included previously for assessing tubular joints, is also introduced.

The relevant application standard or specification for the particular product being assessed specifies the following:

a) the loading to be assumed for design purposes, including its magnitude and frequency;

b) the required life of the structure;

c) the environmental conditions;

d) the required nominal probability of failure.

This is a full revision of the standard, and introduces the following principal changes [1]:

- Introduction of the hot-spot stress method with guidance on finite element stress analysis (FEA).
- New correction for both plate thickness and applied bending with allowance for welded joint proportions.
- Additional weld details; some have been reclassified.
- Weld quality requirements based on fitness for purpose.
- Revised sea water corrosion fatigue data.
- New rules for bolts.
- Design data to resist shear fatigue failure.
- Guidance on stress calculation for combined loading.
- Revised cumulative damage rules.
- Comprehensive guidance on use of weld toe improvement methods.
- New guidance on acceptance fatigue testing and statistical analysis of results.

European standards containing fatigue rules for steel structures and pressure vessels have been published since the 1993 edition of this British Standard. It is therefore not applicable to product areas covered by them. It is applicable to a wide range of other steel product areas that do not have specific fatigue rules.

Use of this document

As a guide, this British Standard takes the form of guidance and recommendations. It should not be quoted as if it were a specification or a code of practice and claims of compliance cannot be made to it.

Presentational conventions

The guidance in this standard is presented in roman (i.e. upright) type. Any 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.

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1 Scope

1.1 General

This British Standard gives methods for assessing the fatigue life of parts of steel products that are subject to repeated fluctuations of stress. It is applicable to all areas of industrial application that are not covered by other British Standards containing fatigue assessment rules.

NOTE Some British Standards have specific product acceptance tests for fatigue life, but do not have assessment rules. In such cases the guidance in this British Standard might be applicable for product development purposes.

1.2 Applications not covered

This British Standard is not applicable to the following application areas:

a) lighting columns (see BS EN 40);

b) concrete building and civil engineering structures (see BS EN 1992);

c) steel building and civil engineering structures [see BS EN 1993 (all parts)];

d) composite steel and concrete building and civil engineering structures [see BS EN 1994 (all parts)];

e) unfired pressure vessels (see BS EN 13445); and

f) fixed offshore structures (see BS EN ISO 19902).

1.3 Materials

This British Standard covers:

a) wrought steel material products;

b) welds in fully machined areas of steel casting;

c) ferritic alloy and low alloy steels;

d) austenitic and duplex stainless steels;

e) unprotected weathering steels; and

f) threaded fasteners.

It is applicable to yield strengths in the range 200 N/mm^2 to 960 N/mm^2 and ultimate tensile strengths in the range 360 to 1 200 N/mm^2 for material thicknesses 3 mm and greater.

This British Standard is not applicable to the following:

1) proprietary fasteners;

2) steel castings;

3) cold drawn products;

4) wire ropes; and

5) steel for reinforcement in concrete.

1.4 Manufacturing processes

This British Standard is applicable to machined products with the following exceptions:

a) rough sawn surfaces;

b) surfaces requiring high quality surface finish (e.g. lapping, polishing, honing, fine grinding); and