BRITISH STANDARD

BS 7608:1993

Incorporating Amendment No. 1

Code of practice for

Fatigue design and assessment of steel structures

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Welding Standards Policy Committee (WEE/-) to Technical Committee WEE/44, upon which the following bodies were represented:

AEA Technology
Association of Consulting Engineers
British Constructional Steelwork Association Ltd.
British Railways Board
Department of Transport
Department of Transport (Transport Research Laboratory)
ESDU International Ltd.
Electricity Association
Federation of Manufacturers of Construction Equipment and Cranes
Institution of Civil Engineers
Institution of Structural Engineers
Ministry of Defence
Process Plant Association
Railway Industry Association of Great Britain
Society of British Aerospace Companies Limited
United Kingdom Offshore Operators Association
Welding Institute

This British Standard, having been prepared under the direction of the Welding Standards Policy Committee, was published under the authority of the Standards Board and came into effect on 15 April 1993

The following BSI references relate to the work on this standard:
Committee reference WEE/44
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Amendments issued since publication

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8337	February 1995	Indicated by a sideline in the margin

Contents

Foreword

This British Standard has been prepared under the direction of the Welding Standards Policy Committee.

It has been produced with the objective of covering the general aspects of fatigue design of fabricated steel elements within the subject area regardless of the type of structure in which they are situated. It is anticipated that application standards for particular types of structure will in due course be modified to omit their own fatigue design rules and to cross refer to this code of practice, thereby achieving a co-ordinated approach to the subject. Such application standards will, however, still include fatigue loading and safety requirements for the structures to which they relate.

This code is based directly upon the recommendations of existing codes and other reference documents, such as the Department of Energy Publication *Offshore installations: Guidance on design, construction and certification*. At this stage no attempt has been made to update existing recommendations except in cases where they were found to be in need of clarification. Background notes on the sources of the data given in this code are provided in Annex G.

As a code of practice, this British Standard 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.

It has been assumed in the drafting of this British Standard that the execution of its provisions is entrusted to appropriately qualified and experienced people.

NOTE The numbers in square brackets used throughout the text of this British Standard relate to the bibliographic references given in Annex H.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, pages 1 to 80, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Section 1. General

1.1 Scope

This British Standard gives recommendations for methods for the fatigue design and assessment of parts of steel structures which are subject to repeated fluctuations of stress. It is concerned with wrought structural steel with a specified minimum yield strength of up to 700 N/mm^2 operating in the sub-creep regime.

This British Standard is applicable to the following:

a) parent material remote from joints;

b) welded joints (in air or sea water) in such material[1)];

c) bolted or rivetted joints in such material;

d) shear connectors between concrete slabs and steel girders acting compositely in flexure.

Guidance on general fatigue design philosophy is given in Annex A, which also contains a brief description of the method of using this document.

The relevant application standard or other specification for the particular structure under consideration should specify the following:

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

2) the required life of the structure;

3) the environmental conditions;

4) the required nominal probability of failure (see **4.2**).

This British Standard takes no account of the possible onset of unstable fracture from a fatigue crack. This possibility should be considered and guarded against by appropriate material selection.

This British Standard does not apply to the following:

— orthotropic decks;

— wire ropes;

— bonded connections;

— steel reinforcement in concrete;

— out of plane joints between hot rolled rectangular or square hollow sections;

— pressure vessels;

— castings;

— peening.

1.2 References

1.2.1 Normative references

This British Standard incorporates, by reference, provisions from specific editions of other publications. These normative references are cited at the appropriate points in the text and the publications are listed on the inside back cover. Subsequent amendments to, or revisions of any of these publications apply to this British Standard only when incorporated in it by updating or revision.

1.2.2 Informative references

This British Standard refers to other publications that provide information or guidance. Editions of these publications current at the time of issue of this standard are listed on the inside back cover, but reference should be made to the latest editions.

1.3 Definitions

For the purposes of this British Standard the following definitions apply.

1.3.1
fatigue

the damage of a structural part by the initiation and gradual propagation of a crack or cracks caused by repeated applications of stress

1.3.2
stress cycle

a pattern of variation of stress at a point defined by the cycle counting method and consisting of a change in stress between defined minimum (trough) and maximum (peak) values and back again

NOTE 1 Also known as cycle of stress.
NOTE 2 One loading event may produce one or more stress cycles at any particular point.

1.3.3
stress range S_r

the algebraic difference between the two extremes (reversals) of a stress cycle

NOTE 1 Also known as range of stress.
NOTE 2 See **3.2** and **3.3** for parent metal and weld metal respectively.

1.3.4
initial non-propagating stress range S_o

the constant amplitude stress range below which (in the absence of any previous loading) a crack is assumed not to propagate

NOTE Its magnitude depends on the joint class and, for joints in air or adequately protected against corrosion, it is assumed to be the stress corresponding to a life of 10^7 cycles on the design *S-N* curve. For unprotected joints in a corrosive environment it should be assumed that $S_o = 0$.

[1)] For welded joints fatigue strength is same for all steels.