



JAPANESE  
INDUSTRIAL  
STANDARD

Translated and Published by  
Japanese Standards Association

---

JIS B 8821 : 2023

(JCA/JSA)

**Calculation standards for steel structures  
of cranes**

---

ICS 53.020.20

Reference number: JIS B 8821 : 2023 (E)

PROTECTED BY COPYRIGHT

53 S

B 8821 : 2023

Date of Establishment: 1976-05-01

Date of Revision: 2023-09-25

Date of Public Notice in Official Gazette: 2023-09-25

Investigated by: Japanese Industrial Standards Committee  
Standards Board for ISO area

---

JIS B 8821 : 2023, First English edition published in 2024-12

Translated and published by: Japanese Standards Association  
Mita Avanti, 3-11-28, Mita, Minato-ku, Tokyo, 108-0073 JAPAN

---

In the event of any doubts arising as to the contents,  
the original JIS is to be the final authority.

© JSA 2024

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from the publisher.

Printed in Japan

HN

PROTECTED BY COPYRIGHT

## Contents

	Page
1 Scope .....	1
2 Normative references .....	1
3 Terms and definitions .....	2
4 Materials .....	2
5 Determination of grades and classification .....	3
6 Loads and load combination .....	3
7 Allowable stress .....	3
7.1 Basic allowable stress .....	3
7.2 Allowable stress for structural members and welded parts .....	4
7.3 Allowable stress for welded parts .....	4
7.4 Radiographic examination .....	5
7.5 Bolts and pins .....	5
7.6 Fatigue allowable stress .....	6
8 Strength design .....	6
8.1 Symbols .....	6
8.2 Calculation for tensile members .....	7
8.3 Calculation for compressive members .....	8
8.4 Calculation for members under compressive axial force with bending .....	8
8.5 Calculation for box girders subjected to bending and torsion .....	8
8.6 Calculation for welded part directly subjected to wheel load .....	10
8.7 Calculation for web joint of girder subjected to bending .....	10
9 Weld design .....	12
9.1 Calculation for welded joint .....	12
9.2 Design details of welded structure .....	14
10 Fatigue design .....	16
10.1 Definitions .....	16
10.2 Application .....	18
10.3 Range of check of fatigue design .....	18
10.4 Stress used for fatigue design .....	18
10.5 Fatigue design curve .....	18
10.6 Mean stress correction factor .....	21
10.7 Plate thickness correction factor .....	21
10.8 Total design repetition number .....	23
10.9 Equivalent stress range .....	23
10.10 Design stress range .....	24

10.11	Fatigue allowable stress range .....	24
10.12	Fatigue check method .....	24
10.13	Fatigue check procedure and flowchart .....	25
11	Buckling calculation .....	39
11.1	General .....	39
11.2	Design of truss and lattice jib .....	50
11.3	Calculation of local buckling of plates .....	58
Annex A (normative)	Equivalent stress range when repetition number exceeds $5 \times 10^6$ times .....	63
Annex B (informative)	Calculation example of fatigue .....	64
Annex C (informative)	Calculation of pillars buckling .....	77
Annex D (informative)	Basis for calculation of buckling factor $\omega$ .....	94

## Foreword

This Japanese Industrial Standard has been revised by the Minister of Health, Labour and Welfare and the Minister of Economy, Trade and Industry through deliberations at the Japanese Industrial Standards Committee as the result of proposal for revision of Japanese Industrial Standard submitted by Japan Crane Association (JCA)/Japanese Standards Association (JSA) with a draft being attached, based on the provision of Article 12, paragraph (1) of the Industrial Standardization Act applied mutatis mutandis pursuant to the provision of Article 16 of the said Act. This edition replaces the previous edition (**JIS B 8821** : 2013), which has been technically revised.

This **JIS** document is protected by the Copyright Act.

Attention is drawn to the possibility that some parts of this Standard may conflict with patent rights, published patent application or utility model rights. The relevant Ministers and the Japanese Industrial Standards Committee are not responsible for identifying any of such patent rights, published patent application or utility model rights.

Blank

## Calculation standards for steel structures of cranes

### 1 Scope

This Japanese Industrial Standard specifies the calculation standards based on the allowable stress method for steel structures of cranes and mobile cranes specified in **JIS B 0146-1**. However, the formulae and numerical values specified in this Standard need not necessarily be used if verification is possible with valid theory or experiment.

NOTE The calculation standards based on limit state method are provided in **JIS B 8829**.

### 2 Normative references

Part or all of the provisions of the following standards, through reference in this text, constitute provisions of this Standard. The most recent editions of the standards (including amendments) indicated below shall be applied.

JIS B 0146-1 *Cranes — Vocabulary — Part 1 : General*

JIS B 0146-2 *Cranes — Vocabulary — Part 2 : Mobile cranes*

JIS B 0146-3 *Cranes — Vocabulary — Part 3 : Tower cranes*

JIS B 0146-5 *Cranes — Vocabulary — Part 5 : Bridge and gantry cranes*

JIS B 1186 *Sets of high strength hexagon bolt, hexagon nut and plain washers for friction grip joints*

JIS B 8822-1 *Cranes — Classification — Part 1 : General*

JIS B 8822-2 *Cranes and lifting appliances — Classification — Part 2 : Mobile cranes*

JIS B 8822-3 *Cranes and lifting appliances — Classification — Part 3 : Tower cranes*

JIS B 8822-4 *Cranes and lifting appliances — Classification — Part 4 : Jib cranes*

JIS B 8822-5 *Cranes and lifting appliances — Classification — Part 5 : Overhead travelling and portal bridge cranes*

JIS B 8831 *Cranes — Design principles for loads and load combinations*

JIS G 3101 *Rolled steels for general structure*

JIS G 3106 *Rolled steels for welded structure*

JIS G 3114 *Hot-rolled atmospheric corrosion resisting steels for welded structure*

JIS G 3128 *High yield strength steel plates for welded structure*

JIS G 3136 *Rolled steels for building structure*

JIS G 3444 *Carbon steel tubes for general structure*