ICS 53.020.20
CCS J 80

NATIONAL STANDARD OF THE PEOPLE'S REPUBLIC OF CHINA

GB/T 41676-2022

Cranes - General design - Limit states and proof of competence of forged steel hooks

Issued on: October 12, 2022 **Implemented on: May 1, 2023**

Issued by: State Administration for Market Regulation, China National Standardization Administration

Table of Contents

Preface
1 Scope 1
2 Normative references 1
3 Terms and definitions, symbols 2
3.1 Terms and Definitions 2
3.2 Symbol 2
4 General requirements 5
4.1 Materials 5
4.2 Process 6
4.3 Manufacturing tolerances 6
4.4 Heat treatment 7
4.5 Load verification 7
4.6 Shaft geometry 8
4.7 Hook Shank Processing 8
4.8 Nut 9
4.9 Hook suspension form 10
5 static strength 10
5.1 General requirements 10
5.2 Design force in vertical direction 10
5.3 Horizontal Design Force 11
5.4 Hook Shank Bending Moment 11
5.5 Hook body design stress 14
5.6 Design stress of hook shank 15
5.7 Static Strength Verification of Hook 15
6 fatigue strength 16
6.1 General requirements 16
6.2 Vertical fatigue design force 17
6.3 Horizontal direction fatigue design force 17
6.4 Fatigue design bending moment of hook shank 17
6.5 Verification of fatigue strength of hook body 18
6.6 Verification of fatigue strength of hook shank 22
6.7 Fatigue design of series production hook shanks 27

7 Compliance Verification 28
7.1 General 28
7.2 Manufacturing verification 28
7.3 Load verification 28
7.4 Non-destructive testing (NDT) 28
7.5 Test sampling 29
8 Usage information 29
8.1 Maintenance and inspection 29
8.2 Flags 29
8.3 Safe use 29
Appendix A (informative) Technical differences between this document and ISO 17440.2014 and their reasons 30
Appendix B (informative) Appendix E and Appendix F Static Strength Ultimate Design Force of Hook Shaft 33
Appendix C (Normative) Bending of Curved Beams 36
Appendix D (informative) Calculation example of fatigue strength of verified hook (applied verification load) 38
Appendix E (Informative) Example of Single Hook Series 42
Appendix F (informative) Double hook series example 48
Appendix G (Informative) Examples of Hook Shank and Thread Series 50
Appendix H (Normative) Calculation of Tilting Resistance for Hinged or Rope-wrapped Hook Suspension Forms 55
Appendix I (Normative) Hook Body Calculation and Specific Spectral Ratio Coefficient 59
Appendix J (Informative) Appendix E and Appendix F Fatigue Strength Ultimate Design Force of Hook Shaft 62
Appendix K (Informative) Guidelines for Selecting Hook Sizes Using Appendix B, Appendix I and Appendix J 64
Appendix L (Normative) Information provided by the hook manufacturer 66
Reference 67

foreword

This document is in accordance with the provisions of GB/T 1.1-2020 "Guidelines for Standardization Work Part 1.Structure and Drafting Rules for Standardization Documents" drafting.

This document is modified to adopt ISO 17440.2014 "General Rules for Design of Cranes - Limit State and Capability Verification of Forged Steel Hooks".

Compared with ISO 17440.2014, this document has made the following structural adjustments.

--- Added informative appendix A;

---Appendix B corresponds to Appendix C in ISO 17440.2014;

---Appendix C corresponds to Appendix H in ISO 17440.2014;

---Appendix D corresponds to Appendix F in ISO 17440.2014;

---Appendix E corresponds to Appendix A in ISO 17440.2014;

---Appendix F corresponds to Appendix B in ISO 17440.2014;

---Appendix G corresponds to Appendix G in ISO 17440.2014;

---Appendix H corresponds to Appendix I in ISO 17440.2014;

---Appendix I corresponds to Appendix E in ISO 17440.2014;

---Appendix J corresponds to Appendix D in ISO 17440.2014;

---Appendix K corresponds to Appendix J in ISO 17440.2014;

---Appendix L corresponds to Appendix K in ISO 17440.2014.

Compared with ISO 17440.2014, this document has more technical differences, and vertical

A single line (?) is indicated. See Appendix A for a list of these technical differences and their causes.

Please note that some contents of this document may refer to patents. The issuing agency of this document assumes no responsibility for identifying patents.

1 Scope

This document specifies the general requirements, static strength, fatigue strength, compliance verification and usage information for forged steel hooks of cranes.

This document applies to the following hook components and hook types.

---Any type of forged steel hook body;

---Thread/nut structure type machined hook shank.

Note 1.In principle, this document also applies to hooks of other shank types and the determination and use of relevant stress concentration factors for hook shank structures. This document does not

Suitable for laminated hooks consisting of one or more rolled steel plates.

This document applies to hooks whose ultimate tensile strength of the material does not exceed 800N/mm2 and the ultimate yield strength does not exceed 620N/mm2.

The following are major hazardous situations and hazardous events that may cause harm to personnel during normal use and foreseeable misuse, Chapter 4 ~ Chapter 4

Chapter 8 specifies the relevant requirements to reduce or eliminate the risks associated with it.

--- beyond the strength limit (yield, tensile and fatigue);

--- Exceeding the temperature limit of the material;

--- Accidentally remove the load from the hook.

Note 2.This document is only applicable to the limit state design method in accordance with GB/T 22437.1.

2 Normative references

The contents of the following documents constitute the essential provisions of this document through normative references in the text. Among them, dated references

For documents, only the version corresponding to the date is applicable to this document; for undated reference documents, the latest version (including all amendments) is applicable to

this document.

GB/T 197 Common thread tolerances (GB/T 197-2018, ISO 965-1.2013, MOD)

GB/T 228.1 Tensile tests on metallic materials - Part 1.Test methods at room temperature (GB/T 228.1-2021, ISO 6892-1.

2019, MOD)

GB/T 228.3 Tensile tests on metallic materials - Part 3.Low temperature test methods (GB/T 228.3-2019, ISO 6892-3.

2015, MOD)

GB/T 229 Charpy pendulum impact test method for metallic materials (GB/T 229-2020, ISO 148-1.2016, MOD)

GB/T 3505 Product Geometric Specifications (GPS) Surface Structure Profiling Terms, Definitions and Surface Structure Parameters

(GB/T 3505-2009, ISO 4287.1997, IDT)

Inspection of GB/T 3808 pendulum impact testing machine (GB/T 3808-2018, ISO 148-2.2008, MOD)