Offshore Pedestal-mounted Cranes

API SPECIFICATION 2C
EIGHTH EDITION, OCTOBER 2020

API MONOGRAM PROGRAM EFFECTIVE DATE: MAY 1, 2021

ERRATA 1, JUNE 2021

REAFFIRMED, NOVEMBER 2025



Special Notes

API publications necessarily address problems of a general nature. With respect to particular circumstances, local, state, and federal laws and regulations should be reviewed. The use of API publications is voluntary. In some cases, third parties or authorities having jurisdiction may choose to incorporate API standards by reference and may mandate compliance.

Neither API nor any of API's employees, subcontractors, consultants, committees, or other assignees make any warranty or representation, either express or implied, with respect to the accuracy, completeness, or usefulness of the information contained herein, or assume any liability or responsibility for any use, or the results of such use, of any information or process disclosed in this publication. Neither API nor any of API's employees, subcontractors, consultants, or other assignees represent that use of this publication would not infringe upon privately owned rights.

API publications may be used by anyone desiring to do so. Every effort has been made by the Institute to assure the accuracy and reliability of the data contained in them; however, the Institute makes no representation, warranty, or guarantee in connection with this publication and hereby expressly disclaims any liability or responsibility for loss or damage resulting from its use or for the violation of any authorities having jurisdiction with which this publication may conflict.

API publications are published to facilitate the broad availability of proven, sound engineering and operating practices. These publications are not intended to obviate the need for applying sound engineering judgment regarding when and where these publications should be utilized. The formulation and publication of API publications is not intended in any way to inhibit anyone from using any other practices.

Any manufacturer marking equipment or materials in conformance with the marking requirements of an API standard is solely responsible for complying with all the applicable requirements of that standard. API does not represent, warrant, or guarantee that such products do in fact conform to the applicable API standard.

All rights reserved. No part of this work may be reproduced, translated, stored in a retrieval system, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher. Contact the Publisher, API Publishing Services, 200 Massachusetts Avenue, NW, Suite 1100, Washington, DC 20001.

Copyright © 2020 American Petroleum Institute

Foreword

Nothing contained in any API publication is to be construed as granting any right, by implication or otherwise, for the manufacture, sale, or use of any method, apparatus, or product covered by letters patent. Neither should anything contained in the publication be construed as insuring anyone against liability for infringement of letters patent.

The verbal forms used to express the provisions in this document are as follows.

Shall: As used in a standard, “shall” denotes a minimum requirement in order to conform to the standard.

Should: As used in a standard, “should” denotes a recommendation or that which is advised but not required in order to conform to the standard.

May: As used in a standard, “may” denotes a course of action permissible within the limits of a standard.

Can: As used in a standard, “can” denotes a statement of possibility or capability.

This document was produced under API standardization procedures that ensure appropriate notification and participation in the developmental process and is designated as an API standard. Questions concerning the interpretation of the content of this publication or comments and questions concerning the procedures under which this publication was developed should be directed in writing to the Director of Standards, American Petroleum Institute, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001. Requests for permission to reproduce or translate all or any part of the material published herein should also be addressed to the director.

Generally, API standards are reviewed and revised, reaffirmed, or withdrawn at least every five years. A one-time extension of up to two years may be added to this review cycle. Status of the publication can be ascertained from the API Standards Department, telephone (202) 682-8000. A catalog of API publications and materials is published annually by API, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001.

Suggested revisions are invited and should be submitted to the Standards Department, API, 200 Massachusetts Avenue, Suite 1100, Washington, DC 20001, standards@api.org.

Contents

Page

1 Scope . . . 1

2 Normative References . . . 1

3 Terms, Definitions, Acronyms, Abbreviations, Units, and Symbols . . . 3
3.1 Terms and Definitions . . . 3
3.2 Acronyms and Abbreviations . . . 16
3.3 Units and Symbols . . . 17

4 Documentation . . . 22
4.1 Manufacturer-supplied Documentation Upon Purchase . . . 22
4.2 Purchaser-supplied Information Prior to Purchase . . . 22
4.3 Record Retention . . . 23
4.4 References to Annexes . . . 23

5 Loads . . . 23
5.1 Safe Working Limits (SWLs) . . . 23
5.2 Critical Components . . . 24
5.3 Forces and Loadings . . . 24
5.4 In-service Loads . . . 24
5.5 Out-of-service Loads . . . 36
5.6 Wind, Ice, and Seismic Loads . . . 36

6 Structure . . . 38
6.1 General . . . 38
6.2 Design Methods . . . 38
6.3 Critical Connections . . . 39
6.4 Pedestal, Kingpost, and Crane-supporting Foundation . . . 39
6.5 Exceptions to Use of AISC . . . 40
6.6 Structural Fatigue . . . 40

7 Mechanical . . . 40
7.1 Machinery and Wire Rope Duty Cycles . . . 40
7.2 Critical Rigging Components . . . 45
7.3 Hoisting, Boom Luffing, Telescoping, and Folding . . . 53
7.4 Swing Mechanism . . . 58
7.5 Power Plant . . . 63

8 Ratings . . . 64
8.1 General . . . 64
8.2 Load Rating and Information Charts . . . 66

9 Gross Overload Conditions . . . 68
9.1 General . . . 68
9.2 Failure-mode Calculations . . . 68
9.3 Calculation Methods . . . 69
9.4 Failure Mode Charts . . . 69
9.5 Gross Overload Protection System (GOPS) . . . 69

10 Human Factors-Health, Safety, and Environment . . . 70
10.1 Controls . . . 70
10.2 Cabs and Enclosures . . . 74
10.3 Miscellaneous Requirements and Equipment . . . 76

Contents

Page

11 Manufacturing Requirements. 80
11.1 Material Requirements of Critical Components 80
11.2 Welding of Critically Stressed Components. 84
11.3 Nondestructive Examination of Critical Components 85

12 Design Validation by Testing 87
12.1 Design Validation 87
12.2 Certification 88
12.3 Operational Tests 88

13 Temporary Installation Cranes (TICs) 88

14 Marking 88

Annex A (informative) Additional Purchaser Supplied Information 90

Annex B (informative) Commentary. 92

Annex C (informative) Example List of Critical Components 112

Annex D (normative) Subsea Rating 113

Annex E (normative) Cylinder Calculation Methods 118

Annex F (informative) Example Calculations 119

Bibliography 133

Figures

1 Crane Illustrations. x

2 Offboard Loadings 26

3 Onboard Loadings 27

4 Out-of-service Loadings 28

5 Some Methods of Securing Dead End of Rope when using Conventional Wedge Sockets 47

6 Sheave Dimensions 48

7 Hoist Drum 55

8 Plots of Rated Loads for Various Operating Conditions. 67

9 Basic Four-lever Crane Control Diagram 71

10 Basic Two-Lever Crane Control Diagram (Option 1) 73

11 Basic Two-Lever Crane Control Diagram (Option 2) 74

12 Example Nameplate 89

B.1 Variable Pedestal Factor 100

D.1 SAMPLE Subsea Lift Plan Data Chart 115

E.1 Cylinder Configuration 117

F.1 Swing Bearing Ultimate Strengths 131

Contents

Page

Tables

1 Description of Symbols 18
2 Summary of Design Parameter 25
3 Vertical Velocity for Dynamic Coefficient Calculations 30
4 Crane Vertical Acceleration 31
5 Crane Base Inclinations and Accelerations 31
6 Recommended Shape Coefficients 37
7 Load Factors 39
8 Classification of Offshore Crane Applications 41
9 Auxiliary Hoist—5-year TBO 42
10 Main Hoist—5-year TBO 42
11 Boom Hoist—5-year TBO 42
12 Slew Mechanism—5-year TBO 42
13 Prime Mover and Pump Drive—5-year TBO 43
14 Wire Rope TBR by Typical Offshore Crane Classification 43
15 Auxiliary Wire Rope 44
16 Main Wire Rope 44
17 Boom Wire Rope 44
18 Sheave Groove Radius, Metallic Rim 50
19 Sheave Groove Radius, Cast Nylon Rim 51
20 Four-lever Crane Control Function 72
21 Two-Lever Crane Control Function (Option 1) 73
22 Two-Lever Crane Control Function (Option 2) 74
23 Indicators, Alarms, and Limits 76
24 Boom and Load Indicators 78
25 Level 1 Fracture Toughness 81
26 Casting Acceptance Criteria Based on ASTM Radiographic Standards 82
27 Level 2 Fracture Toughness 82
28 Bearing Ring Steel Cleanliness Limits 83
29 Workmanship Standard Examples 86
B.1 EXAMPLE of LRFD Information for Crane Foundation Support Structure Design 92
B.2 Type of Lift Scenarios 94
B.3 General Method-Vessel Information 95
B.4 General Method Sample Design Value Calculations TLP and Spar 96
B.5 Minimum Required Hook Speeds at Supply Boat Deck vs. Significant Wave Height 98
B.6 Crane Structures 102
B.7 Auxiliary Hoist—5-year TBO 102
B.8 Main Hoist—5-year TBO 102
B.9 Boom Hoist—5-year TBO 102
B.10 Slew Mechanism—5-year TBO 103
B.11 Prime Mover and Pump Drive—5-year TBO 103
B.12 Calculated Noise Exposures 106

Introduction

The API crane standards provide the design basis and construction, operations and maintenance, and training guidelines and requirements for pedestal-mounted cranes intended for use in offshore oil and gas applications on fixed and floating structures or vessels. They are intended to be used together, as appropriate, in order to better serve the product manufacturers and users—these include:

— Specification 2C, *Offshore Pedestal-Mounted Cranes*

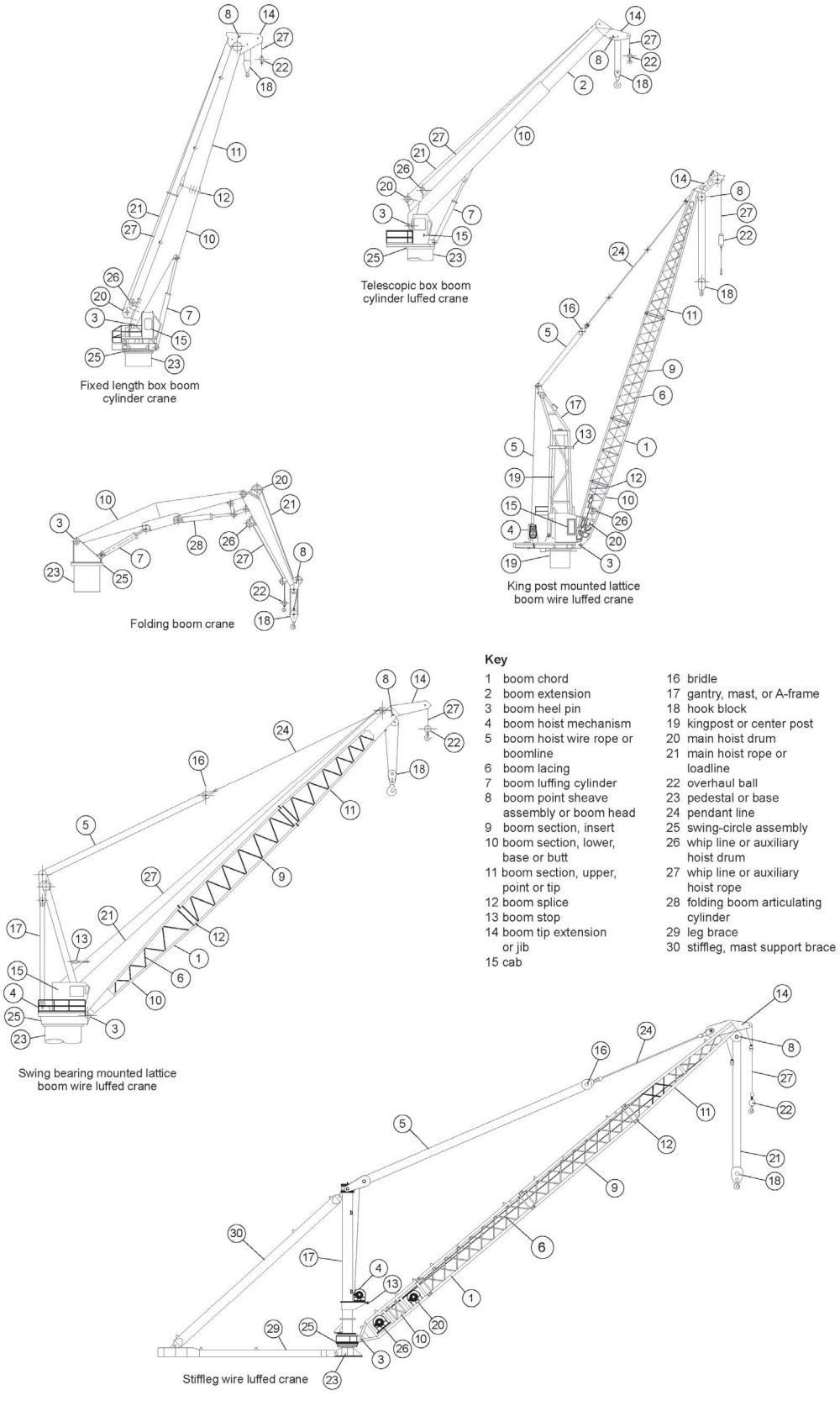
— Recommended Practice 2D, *Operation and Maintenance of Offshore Cranes*

— Recommended Practice 2D-2, *Training for Offshore Pedestal-Mounted Crane Riggers, Operators, and Inspectors*

The requirements, procedures and guidance provided are based on internationally recognized industry standards and global best practices, as well as the collective knowledge and experiences of those that participated in developing these standards. As such, the material in these standards represent the contribution from industry representatives of crane users, crane manufacturers, wire rope manufacturers, and ancillary crane device or component manufacturers. Conformance to the intent of the practices herein is intended to result in cranes that operate safely and efficiently between inspection periods and in accordance with a company's safety and environmental management system (see API 75).

It should be understood that the crane operating, and maintenance practices cover a wide range of crane types and configurations. Not all practices are applicable to all cranes. When applying this standard, care should be taken to review each item as stated and use those items specifically applicable to the crane's type, usage, and duty-cycle. It may be necessary to modify a procedure due to a particular crane requirement. This modification would be wholly acceptable as long as the original intent of the practice or procedure is met.

See Figure 1 below for general illustrations of the various types of cranes.



NOTE Stiffleg designs differ depending on application. All components shown are not required for all designs.

Figure 1—General Crane Illustrations

Offshore Pedestal-mounted Cranes

1 Scope

This standard provides requirements for design, construction, and testing of new offshore pedestal-mounted cranes. For the purposes of this standard, offshore cranes are defined as pedestal-mounted elevating and rotating lift devices for transfer of materials and personnel to or from marine vessels, barges, and structures or for transfer of materials to or from the sea or the seabed.

Typical applications can include:

a) offshore oil exploration and production applications; these cranes are typically mounted on a fixed (bottom-supported) structure, floating structure, or vessel used in drilling and production operations;

b) shipboard applications; these cranes are mounted on surface-type vessels and are used to move cargo, containers, and other materials while the crane is within a harbor or sheltered area; and

c) crane vessel applications; these cranes are typically mounted on ship-shaped vessels, semi-submersibles, barge, or self-elevating type marine vessels specialized in lifting heavy and/or unique loads for construction, pipe lay, renewable energy, salvage, and subsea applications in both harbor and offshore waters.

Figure 1 illustrates some (but not all) of the types of cranes covered under this standard (see Introduction). While there are many configurations of pedestal-mounted cranes covered in the scope of this standard, it is not intended to be used for the design, fabrication, and testing of davits or emergency escape devices. This standard does not cover the use of cranes for life-saving applications or for the launch and recovery of manned underwater units such as diving bells or submersibles.

2 Normative References

The following referenced documents are indispensable for the application of this standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any addenda) applies.

API Recommended Practice 2A-WSD, *Planning, Designing, and Constructing Fixed Offshore Platforms—Working Stress Design*

API Recommended Practice 2D, *Operation and Maintenance of Offshore Cranes*

API Specification 2H, *Carbon Manganese Steel Plate for Offshore Structures*

API Recommended Practice 2X, *Ultrasonic and Magnetic Examination of Offshore Structural Fabrication and Guidelines for Qualification of Technicians*

API Specification 9A, *Wire Rope*

API Recommended Practice 500, *Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Division 1 and Division 2*

API Recommended Practice 505, *Classification of Locations for Electrical Installations at Petroleum Facilities Classified as Class I, Zone 0, Zone 1, and Zone 2*

API Specification Q1, *Quality Management System Requirements for Manufacturing Organizations for the Petroleum and Natural Gas Industry*