

**ASME NUM-1–2023**

(Revision of ASME NUM-1–2016)

# **Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type)**

---

**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

**ASME NUM-1-2023**  
(Revision of ASME NUM-1-2016)

# **Rules for Construction of Cranes, Monorails, and Hoists (With Bridge or Trolley or Hoist of the Underhung Type)**

---

AN AMERICAN NATIONAL STANDARD



**The American Society of  
Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

Date of Issuance: May 17, 2024

The next edition of this Standard is scheduled for publication in 2028.

This code or standard was developed under procedures accredited as meeting the criteria for American National Standards. The standards committee that approved the code or standard was balanced to ensure that individuals from competent and concerned interests had an opportunity to participate. The proposed code or standard was made available for public review and comment, which provided an opportunity for additional public input from industry, academia, regulatory agencies, and the public-at-large.

ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity. ASME does not take any position with respect to the validity of any patent rights asserted in connection with any items mentioned in this document, and does not undertake to insure anyone utilizing a standard against liability for infringement of any applicable letters patent, nor does ASME assume any such liability. Users of a code or standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, is entirely their own responsibility.

Participation by federal agency representatives or persons affiliated with industry is not to be interpreted as government or industry endorsement of this code or standard.

ASME accepts responsibility for only those interpretations of this document issued in accordance with the established ASME procedures and policies, which precludes the issuance of interpretations by individuals.

The endnotes and preamble in this document (if any) are part of this American National Standard.



ASME Collective Membership Mark

All rights reserved. “ASME” and the above ASME symbol are registered trademarks of The American Society of Mechanical Engineers. No part of this document may be copied, modified, distributed, published, displayed, or otherwise reproduced in any form or by any means, electronic, digital, or mechanical, now known or hereafter invented, without the express written permission of ASME. No works derived from this document or any content therein may be created without the express written permission of ASME. Using this document or any content therein to train, create, or improve any artificial intelligence and/or machine learning platform, system, application, model, or algorithm is strictly prohibited.

The American Society of Mechanical Engineers  
Two Park Avenue, New York, NY 10016-5990

Copyright © 2024 by  
THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

# CONTENTS

Foreword .....		xi
Committee Roster .....		xi
Correspondence With the CNF Committee .....		xii
Summary of Changes .....		xiv
<b>PART GR</b>	<b>GENERAL REQUIREMENTS</b> .....	<b>1</b>
<b>Section GR-1</b>	<b>Introduction</b> .....	<b>1</b>
GR-1.1	General .....	1
GR-1.2	Scope .....	1
GR-1.3	Applications .....	2
GR-1.4	Responsibility .....	2
<b>Section GR-2</b>	<b>Environmental Conditions of Service</b> .....	<b>3</b>
GR-2.1	General .....	3
GR-2.2	Radiation .....	3
GR-2.3	Temperature and Humidity .....	3
GR-2.4	Pressure .....	4
GR-2.5	Chemicals .....	4
GR-2.6	Wind .....	4
GR-2.7	Seismic Conditions .....	4
GR-2.8	Drainage .....	4
<b>Section GR-3</b>	<b>Performance Requirements</b> .....	<b>5</b>
GR-3.1	General .....	5
GR-3.2	Service Class .....	5
GR-3.3	Equipment Capacity .....	5
GR-3.4	Operational Characteristics .....	5
GR-3.5	Vertical Lift Considerations .....	5
<b>Section GR-4</b>	<b>Coatings and Finishes</b> .....	<b>8</b>
GR-4.1	Coating Service Levels .....	8
GR-4.2	Specific Requirements for Coating Service Levels .....	8
<b>Section GR-5</b>	<b>Quality Assurance</b> .....	<b>10</b>
GR-5.1	Requirements .....	10
GR-5.2	Documentation .....	10
<b>Section GR-6</b>	<b>Definitions</b> .....	<b>12</b>
GR-6.1	Definitions .....	12
GR-6.2	Figures of Cranes .....	16
<b>Section GR-7</b>	<b>Referenced Codes and Standards</b> .....	<b>36</b>
GR-7.1	General .....	36

## Figures

GR-6.2.1-1	Underhung Single-Girder Crane . . . . .	17
GR-6.2.1-2	Underhung Double-Girder Crane With Underhung Trolley . . . . .	18
GR-6.2.1-3	Underhung Double-Girder Crane With Top-Running Trolley . . . . .	18
GR-6.2.1-4	Underhung Single-Girder Semi-Gantry Crane . . . . .	19
GR-6.2.2-1	Top-Running Single-Girder Crane . . . . .	19
GR-6.2.2-2	Top-Running Double-Girder Crane . . . . .	20
GR-6.2.2-3	Top-Running Single-Girder Semi-Gantry Crane . . . . .	20
GR-6.2.2-4	Top-Running Single-Girder Gantry Crane . . . . .	21
GR-6.2.3-1	Traveling Wall Crane With Single-Girder Boom . . . . .	22
GR-6.2.4-1	Wall-Mounted Jib Cranes . . . . .	23
GR-6.2.4-2	Free-Standing Pillar Jib Cranes . . . . .	24
GR-6.2.4-3	Mast-Type Jib Cranes . . . . .	25
GR-6.2.5-1	Basic Monorail System . . . . .	26
GR-6.2.5-2	Two-Way Switch Monorail System . . . . .	27
GR-6.2.5-3	Three-Way Switch Monorail System . . . . .	27
GR-6.2.5-4	Cross-Track Switch Monorail System . . . . .	28
GR-6.2.5-5	Interlocking-Mechanism Monorail System . . . . .	28
GR-6.2.5-6	Monorail System With Lift-Drop Sections . . . . .	29
GR-6.2.6-1	Hand-Chain-Operated Under-Running Trolley . . . . .	29
GR-6.2.7-1	Electric Wire Rope Hoist . . . . .	30
GR-6.2.7-2	Hand-Chain Hoist . . . . .	30
GR-6.2.7-3	Electric Chain Hoist . . . . .	30
GR-6.2.7-4	Air-Operated Wire Rope Hoist . . . . .	31
GR-6.2.7-5	Air-Operated Chain Hoist . . . . .	32
GR-6.2.7.1-1	Electric- and Air-Operated Wire Rope Hoist Suspension Types . . . . .	33
GR-6.2.7.1-2	Hand-Chain Hoist Suspension Types . . . . .	34
GR-6.2.7.1-3	Electric- and Air-Operated Chain Hoist Suspension Types . . . . .	35

## Tables

GR-1.2.1.1-1	Major Enhanced Safety Design Differences for Various Type IA and Type IB Hoist Configurations . . . . .	2
GR-3.2.1-1	Service Classes for Cranes and Monorails . . . . .	6
GR-3.2.2-1	Service Classes for Electrically Operated Hoists . . . . .	6
GR-3.2.3-1	Service Classes for Air-Operated Wire Rope and Chain Hoists . . . . .	6
GR-3.4.1-1	Recommended Electric Wire Rope Hoist Speeds . . . . .	7
GR-3.4.1-2	Recommended Air Hoist Speeds . . . . .	7
GR-3.4.1-3	Recommended Crane Bridge and Trolley Speeds . . . . .	7
GR-3.4.1-4	Recommended Electric Chain Hoist Speeds . . . . .	7
GR-3.4.1-5	Typical Hoist Hand-Chain Pull and Overhaul Characteristics . . . . .	7
<b>PART CM</b>	<b>CRANES AND MONORAILS . . . . .</b>	<b>38</b>
<b>Section CM-1</b>	<b>Introduction, Cranes and Monorails (Types I and II) . . . . .</b>	<b>38</b>
CM-1.1	General . . . . .	38

<b>Section CM-2</b>	<b>Structural Requirements, Cranes and Monorails (Types I and II)</b>	39
CM-2.1	General Requirements for All Cranes and Monorails	39
CM-2.2	Additional Requirements Specific to Underhung Cranes	59
CM-2.3	Additional Requirements Specific to Top-Running Bridge and Gantry Cranes	59
CM-2.4	Additional Requirements Specific to Traveling Wall Cranes	64
CM-2.5	Additional Requirements Specific to Jib Cranes	64
CM-2.6	Additional Requirements Specific to Monorail Systems	64
<b>Section CM-3</b>	<b>Mechanical Requirements, Cranes and Monorails (Type I)</b>	67
CM-3.1	General	67
CM-3.2	Additional Design Requirements Specific to Underhung Cranes	76
CM-3.3	Additional Requirements Specific to Top-Running Bridge and Gantry Cranes	76
CM-3.4	Additional Design Requirements Specific to Traveling Wall Cranes	80
CM-3.5	Additional Requirements Specific to Jib Cranes	80
CM-3.6	Additional Requirements Specific to Monorail Systems	80
<b>Section CM-4</b>	<b>Electrical Requirements, Cranes and Monorails (Type I)</b>	82
CM-4.1	General	82
CM-4.2	Additional Design Requirements Specific to Jib Cranes	94
CM-4.3	Additional Design Requirements Specific to Monorail Systems	94
<b>Section CM-5</b>	<b>Pneumatic Requirements, Cranes and Monorails (Type I)</b>	96
CM-5.1	General	96
CM-5.2	Air Supply	96
CM-5.3	Air Motors	96
CM-5.4	Additional Air Equipment	96
CM-5.5	Air Motor Controls	96
<b>Section CM-6</b>	<b>Marking, Cranes and Monorails (Types I and II)</b>	97
CM-6.1	Crane and Monorail Marking	97
<b>Section CM-7</b>	<b>Inspection and Testing, Cranes and Monorails (Types I and II)</b>	98
CM-7.1	General	98
CM-7.2	Additional Inspection and Testing Requirements Specific to Underhung Cranes	102
CM-7.3	Additional Inspection and Testing Requirements Specific to Top-Running Bridge and Gantry Cranes	102
CM-7.4	Additional Inspection and Testing Requirements Specific to Traveling Wall Cranes	102
CM-7.5	Additional Inspection and Testing Requirements Specific to Jib Cranes	102
CM-7.6	Additional Inspection and Testing Requirements Specific to Monorail Systems	102
<b>Figures</b>		
CM-2.1.1.2-1	Wheel-Skewing Forces	40
CM-2.1.3.4.1-1	Boundary Conditions for Wheel-to-Rail Interface	44
CM-2.1.4-1	Building Runway Alignment Tolerance for Patent Track	47
CM-2.1.4-2	Building Runway Alignment Tolerance	48
CM-2.1.6.2.3-1	Local Bending of Flanges due to Wheel Loads	55
CM-2.1.6.2.3-2	Local Loading on Tapered Flanges of a Standard S-Shaped Beam	55
CM-2.1.6.2.3-3	Local Loading on Parallel Flanges of a Wide Flange W-Shaped Beam	55
CM-2.1.6.2.3-4	Local Loading on Parallel Flanges of the Lower Chord of a Box Girder	55
CM-2.1.6.4.1-1	Joint Configuration	63

CM-3.1.4.4.1-1	Bridge Span . . . . .	74
CM-3.2.1-1	Arrangement of Crane Bridge Drives (A-2 Drive) . . . . .	77
CM-3.2.1-2	Arrangement of Crane Bridge Drives (A-4 Drive) . . . . .	78
CM-3.3.1.1-1	Arrangement of Crane Bridge Drives (A-1 Drive) . . . . .	79
CM-3.3.1.1-2	Arrangement of Crane Bridge Drives (A-2 Drive) . . . . .	79
CM-3.3.1.1-3	Arrangement of Crane Bridge Drives (A-4 Drive) . . . . .	79
CM-4.1.1.5.1-1	Arrangement of Pendant Push-Button Controllers . . . . .	89
CM-4.1.1.5.2-1	Arrangement of Cab Master-Switch Controllers . . . . .	90
CM-4.1.1.5.3-1	Arrangement of Radio-Transmitter Lever-Switch Controllers . . . . .	91
CM-4.1.1.7.2-1	Various Styles of Conductor System Types . . . . .	92
CM-4.2.2-1	Slew Drive Motor Size Selection . . . . .	95

**Tables**

CM-2.1.2-1	Load Designations . . . . .	41
CM-2.1.3.4.6-1	Boundary Conditions for Wheel-to-Rail Interface . . . . .	45
CM-2.1.5.1-1	Acceptable Materials and Reference Properties for Structural Components . . . . .	49
CM-2.1.5.1-2	Required Inspection or Tests . . . . .	50
CM-2.1.6.1.1-1	Allowable Stresses (Members Not Controlled by Buckling) . . . . .	51
CM-2.1.6.1.2-1	Modifying Coefficient, $N$ . . . . .	52
CM-2.1.6.1.5-1	Bolt Allowable Stresses . . . . .	52
CM-2.1.6.2.4-1	Bolt Shear and Tension Factor, $R$ . . . . .	56
CM-2.1.6.3.2-1	Design Factor for Buckling, DFB . . . . .	56
CM-2.1.6.3.2-2	Value of the Buckling Coefficients, $K_{\sigma}$ and $K_{\tau}$ for Plates Supported at Their Four Edges	57
CM-2.1.6.3.3-1	Spacing Coefficient, $C$ . . . . .	58
CM-2.1.6.4.1-1	Allowable Stress Ranges . . . . .	59
CM-2.1.6.4.1-2	Fatigue Stress Provisions — Tension or Reversal Stresses . . . . .	60
CM-3.1.4.1.2-1	Crane Class Factors for Strength and Power Rating, $S_{fs}$ . . . . .	69
CM-3.1.4.1.2-2	Machinery Service Factor, $C_d$ . . . . .	69
CM-3.1.4.2-1	ABMA L10 Bearing Life . . . . .	69
CM-3.1.4.3.5-1	Crane Class Factor, $K_c$ . . . . .	71
CM-3.1.4.3.5-2	Surface Condition Factor, $K_{sc}$ . . . . .	71
CM-3.1.4.4.1-1	Maximum Permissible Bridge Wheel Loading . . . . .	73
CM-3.1.4.4.1-2	Bridge Load Factor, $K_{bw}$ . . . . .	74
CM-3.1.4.4.1-3	Speed Factor, $S_s$ . . . . .	74
CM-3.1.4.4.1-4	Wheel Service Factor, $S_m$ , and Minimum Service Factor, $K_{wl}$ . . . . .	75
CM-3.1.4.4.2-1	Maximum Wheel Loads for I Beams and Wide-Flange Beams . . . . .	75
CM-4.1.1.1.4-1	AC Contactor Ratings for AC Wound Rotor Motors . . . . .	83
CM-4.1.1.1.4-2	AC Contactor Ratings for AC Squirrel-Cage Motors . . . . .	83
CM-4.1.1.1.4-3	DC Contactor Ratings for DC Motors (230 V to 250 V DC) . . . . .	83
CM-4.1.1.1.4-4	AC Contactor Ratings for Mainline Service . . . . .	84
CM-4.1.1.1.4-5	DC Contactor Ratings for Mainline Service (230 V to 250 V DC) . . . . .	84
CM-4.1.1.1.5-1	NEMA Resistor Classification . . . . .	84
CM-4.1.1.2.2-1	Standard Rated Motor Voltages . . . . .	85
CM-4.1.1.2.4-1	Standard Maximum Acceleration Rate to Prevent Wheel Skidding . . . . .	86
CM-4.1.1.2.4-2	Standard Bridge Motion Acceleration Rates . . . . .	86

CM-4.1.1.2.4-3	Mechanical Efficiency, $E$ , of Drive Machinery .....	86
CM-4.1.1.2.4-4	Standard Values for Friction Factor, $f$ , for Bridges With Metallic Wheels and Antifriction Bearings .....	87
CM-4.1.1.2.4-5	Standard Values of Accelerating Torque Factor, $K_t$ .....	87
<b>PART HT</b>	<b>HOISTS AND TROLLEYS</b> .....	<b>10</b>
<b>Section HT-1</b>	<b>Introduction</b> .....	<b>104</b>
HT-1.1	General .....	104
<b>Section HT-2</b>	<b>Powered Wire Rope Hoists (Type IA)</b> .....	<b>105</b>
HT-2.1	General .....	105
HT-2.2	Equipment Configurations (Type IA) .....	105
HT-2.3	Mechanical Requirements (Type IA) .....	105
HT-2.4	Electrical Requirements (Type IA) .....	113
HT-2.5	Pneumatic Requirements (Type IA) .....	116
HT-2.6	Operator Control Station (Type IA) .....	116
HT-2.7	Seismic Requirements (Type IA) .....	117
HT-2.8	Hoist Marking (Type IA) .....	117
HT-2.9	Inspections and Tests for Powered Wire Rope Hoists (Type IA) .....	117
<b>Section HT-3</b>	<b>Powered Wire Rope Hoists (Type IB)</b> .....	<b>120</b>
HT-3.1	General .....	120
HT-3.2	Equipment Configurations (Type IB) .....	120
HT-3.3	Mechanical Requirements (Type IB) .....	120
HT-3.4	Electrical Requirements (Type IB) .....	123
HT-3.5	Pneumatic Requirements (Type IB) .....	124
HT-3.6	Seismic Requirements (Type IB) .....	124
HT-3.7	Hoist Marking (Type IB) .....	124
HT-3.8	Inspections and Tests (Type IB) .....	125
<b>Section HT-4</b>	<b>Powered Chain Hoists (Type IB)</b> .....	<b>127</b>
HT-4.1	General .....	127
HT-4.2	Equipment Configurations (Type IB) .....	127
HT-4.3	Mechanical Requirements (Type IB) .....	127
HT-4.4	Electrical Requirements (Type IB) .....	130
HT-4.5	Pneumatic Requirements (Type IB) .....	131
HT-4.6	Seismic Requirements (Type IB) .....	131
HT-4.7	Hoist Marking (Type IB) .....	131
HT-4.8	Inspections and Tests (Type IB) .....	131
<b>Section HT-5</b>	<b>Hand-Chain Hoists (Type IB)</b> .....	<b>134</b>
HT-5.1	General .....	134
HT-5.2	Equipment Configurations (Type IB) .....	134
HT-5.3	Mechanical Requirements (Type IB) .....	134
HT-5.4	Seismic Requirements (Type IB) .....	136
HT-5.5	Hoist Marking (Type IB) .....	136
HT-5.6	Inspections and Tests (Type IB) .....	136
<b>Section HT-6</b>	<b>Under-Running Trolleys (Type IB)</b> .....	<b>139</b>

HT-6.1	General	139
HT-6.2	Trolley Configurations (Type IB)	139
HT-6.3	Trolley Design Criteria (Type IB)	140
HT-6.4	Seismic Requirements (Type IB)	141
HT-6.5	Trolley Marking (Type IB)	141
HT-6.6	Inspections and Tests (Type IB)	141
<b>Section HT-7</b>	<b>Common NDE Criteria for Hoists and Trolleys</b>	<b>144</b>
HT-7.1	General	144
HT-7.2	Surface MT or PT Criteria	144
HT-7.3	NDE Weld Criteria	144
HT-7.4	Charpy-V or Drop-Weight Impact Testing Criteria	144
HT-7.5	UT Volumetric Testing Criteria	144
 <b>Figures</b>		
HT-2.2-1	Type IA Wire Rope Dual Hoist Drive Unit With Single Drum	106
HT-2.2-2	Type IA Wire Rope Single Hoist Drive Unit With Drum Brake	106
HT-2.2-3	Type IA Wire Rope Dual Hoist Drive Unit With Dual Drum	106
HT-2.3.1-1	Type IA Redundant Reeving With Single Drum (With Upper Equalizer Sheaves)	107
HT-2.3.1-2	Type IA Redundant Reeving With Single Drum (With Equalizer Bar)	108
HT-2.3.1-3	Type IA Redundant Reeving With Dual Drum	109
HT-2.3.3-1	Drum Fleet Angle	110
HT-2.3.3-2	Sheave Fleet Angle	110
HT-3.2-1	Type IB Wire Rope Hoist Unit With Dual Holding Brakes	121
HT-3.2-2	Type IB Wire Rope Hoist With One Holding Brake and Mechanical Load Brake	121
HT-3.3.1-1	Single-Reeved Hoist	122
HT-3.3.1-2	Double-Reeved Hoist	122
HT-4.2-1	Type IB Powered Chain Hoist With Dual Braking System	128
HT-4.2-2	Type IB Powered Chain Hoist With Single Holding Brake and Secondary (Motor/Drivetrain) Braking Means	128
HT-4.3.1-1	Powered Chain Hoist With Two-Part Reeving	129
HT-4.3.1-2	Powered Chain Hoist With Single-Part Reeving	129
HT-5.2-1	Type IB Hand Chain Hoist Major Drive Components	134
HT-5.3.1-1	Hand-Chain Hoist With Single-Part Reeving	135
HT-5.3.1-2	Hand-Chain Hoist With Two-Part Reeving	135
HT-6.2-1	Typical Independent Trolley Unit	139
HT-6.2-2	Typical Integral Trolley Unit	140
 <b>Tables</b>		
HT-2.3.4-1	Minimum Pitch Diameter of Running Sheaves	111
HT-2.3.5-1	Minimum Pitch Diameter of Drums	111
HT-2.3.6-1-1	Bearing Life Expectancy	111
HT-2.3.7-1	Machinery Service Factor, $C_d$	112
HT-2.3.7-2	Hoist Duty Class Factor (Strength), $S_{fs}$	112
HT-2.4.3.2-1	Standard Rated Motor Voltages	114
HT-2.9.1-1	Required Hoist Component Inspections or Tests (Type IA Powered Wire Rope Hoists)	119

HT-3.8.1-1	Required Hoist Component Inspections or Tests (Type IB Powered Wire Rope Hoists)	125
HT-4.8.1-1	Required Hoist Component Inspections or Tests (Type IB Powered Chain Hoists) . . . .	132
HT-5.6.1-1	Required Hoist Component Inspections or Tests (Type IB Hand-Chain Hoists) . . . . .	137
HT-6.3.1-1	Under-Running Type IB Design Factors for Independent Trolleys . . . . .	140
HT-6.3.1-2	Under-Running Type IB Design Factors for Integral Trolleys . . . . .	141
HT-6.6.1-1	Required Under-Running Trolley Component Inspections or Tests (Type IB Independent or Integral Trolleys) . . . . .	145
 <b>Mandatory Appendix</b>		
I	SI Conversion Factors . . . . .	146
 <b>Tables</b>		
I-1-1	SI Conversion Factors . . . . .	147
I-1-2	Conversion Factors for Weight, ton . . . . .	148
 <b>Nonmandatory Appendix</b>		
A	Examples . . . . .	149
 <b>Figure</b>		
A-2-1	Lower Flange Bending . . . . .	151

# FOREWORD

The Committee on Cranes for Nuclear Power Plants was first established in 1976. In 1980, the scope of the committee was revised, and its name was changed to the Committee on Cranes for Nuclear Facilities. In 1983, the Nuclear Underhung and Monorail (NUM) Subcommittee was established to develop a standard to cover the design, fabrication, installation, and testing of underhung and monorail equipment used in nuclear facilities. ASME NUM-1 is the result of the subcommittee's work.

The first edition of ASME NUM-1 was approved by the American National Standards Institute (ANSI) on October 28, 1996. The second edition of ASME NUM-1 was approved by ANSI on May 3, 2000. The third edition of ASME NUM-1 was approved by ANSI on August 17, 2004. The fourth edition of ASME NUM-1 was approved by ANSI on December 22, 2009. The fifth edition of ASME NUM-1 was approved by ANSI on June 16, 2016.

This Standard, or portions thereof, can be applied to cranes, monorails, and hoists at facilities other than nuclear where enhanced equipment safety may be required and can be provided by means of single failure-proof features, additional safety features, increased design factors, or a seismic design.

ASME NUM-1-2023 has been reformatted and updated. The Standard comprises the following three Parts, which cover the topics and equipment listed below:

Part GR, General Requirements (applicable to all equipment)

- Environmental Conditions of Service
- Performance Requirements
- Coatings and Finishes
- Quality Assurance
- Definitions
- Referenced Codes and Standards

Part CM, Cranes and Monorails

- Structural Requirements, Cranes and Monorails (Types I and II)
- Mechanical Requirements, Cranes and Monorails (Type I)
- Electrical Requirements, Cranes and Monorails (Type I)
- Pneumatic Requirements, Cranes and Monorails (Type I)
- Marking, Cranes and Monorails (Types I and II)
- Inspection and Tests, Cranes and Monorails (Types I and II)

Part HT, Hoists and Trolleys

- Powered Wire Rope Hoists (Type IA)
- Powered Wire Rope Hoists (Type IB)
- Powered Chain Hoists (Type IB)
- Hand-Chain Hoists (Type IB)
- Under-Running Trolleys (Type IB)
- Common NDE Criteria for Hoists and Trolleys

The Standard now applies only to the enhanced safety and seismic Type I cranes and monorails, seismic Type II cranes and monorails, and enhanced safety Type I hoist and trolley units. Hoists having single failure-proof features are identified as Type IA, with those having additional safety features and increased design factors identified as Type IB. This Standard now separately and more clearly addresses the criteria for powered wire rope hoists (Type IA), powered wire rope hoists (Type IB), powered chain hoists (Type IB), manual chain hoists (Type IB), and under-running trolleys (Type IB). Type III standard equipment, which is not used for handling critical loads and is not required to withstand a seismic event, is no longer addressed in this Standard since such equipment is covered by other industry standards.

The 2023 edition of ASME NUM-1 was approved by ANSI on December 4, 2023.

# ASME CNF COMMITTEE

## Cranes for Nuclear Facilities

(The following is the roster of the committee at the time of approval of this Standard.)

### STANDARDS COMMITTEE OFFICERS

**L. C. Fraser**, *Chair*  
**S. Parkhurst**, *Vice Chair*  
**G. M. Ray**, *Vice Chair*  
**J. Oh**, *Secretary*

### STANDARDS COMMITTEE PERSONNEL

<b>B. B. Bacon</b> , Tennessee Valley Authority	<b>G. M. Ray</b> , Tennessee Valley Authority
<b>S. W. Butler</b> , U.S. Air Force	<b>A. Reisner</b> , Lockheed Martin Space
<b>L. C. Fraser</b> , Newport News Shipbuilding	<b>G. A. Townes</b> , BE, Inc.
<b>L. S. Gibbs</b> , Southern Nuclear	<b>D. Weber</b> , American Crane & Equipment Corp.
<b>D. Gupta</b> , Sarens Nuclear & Industrial Services, LLC	<b>M. K. Albergo</b> , <i>Alternate</i> , Virginia Tech College of Engineering
<b>S. R. Jones</b> , U.S. Nuclear Regulatory Commission	<b>J. Edmundson</b> , <i>Alternate</i> , Konecranes Nuclear Equipment & Services, LLC
<b>J. Konop</b> , Par Systems, LLC	<b>R. Hernandez</b> , <i>Alternate</i> , U.S. Nuclear Regulatory Commission
<b>A. Kureck</b> , Ace World Companies	<b>P. Kanakasabai</b> , <i>Alternate</i> , Konecranes Nuclear Equipment & Services, LLC
<b>S. M. Lawrence</b> , Konecranes Nuclear Equipment & Services, LLC	<b>J. F. Knight</b> , <i>Alternate</i> , Naval Nuclear Laboratory
<b>R. Lindberg</b> , Sargent & Lundy, LLC	<b>J. S. Schulz</b> , <i>Alternate</i> , PAR Systems, LLC
<b>B. P. Lytle</b> , Eureka! Engineering, LLC	<b>N. Sirinakis</b> , <i>Alternate</i> , Newport News Shipbuilding
<b>A. Moore</b> , NuScale Power, LLC	<b>J. R. Wiest</b> , <i>Alternate</i> , American Crane & Equipment Corp.
<b>S. T. Nguyen</b> , Navy Crane Center	<b>T. Finnegan</b> , <i>Contributing Member</i> , Lockheed Martin Space
<b>C. Nichol</b> , Merrick & Co	<b>J. N. Fowler</b> , <i>Contributing Member</i> , Consultant
<b>J. Oh</b> , The American Society of Mechanical Engineers	<b>W. A. Horwath</b> , <i>Contributing Member</i> , Consultant
<b>S. Parkhurst</b> , Material Handling Equipment, Inc.	<b>T. V. Vine</b> , <i>Contributing Member</i> , Berry Lake Consulting, LLC
<b>L. E. Patrick</b> , National Aeronautics and Space Administration	
<b>B. Pence</b> , Naval Nuclear Laboratory	

### SUBCOMMITTEE ON OPERATION AND MAINTENANCE FOR CRANES

<b>G. M. Ray</b> , <i>Chair</i> , Tennessee Valley Authority	<b>S. Parkhurst</b> , Material Handling Equipment, Inc.
<b>B. B. Bacon</b> , Tennessee Valley Authority	<b>L. E. Patrick</b> , National Aeronautics and Space Administration
<b>L. C. Fraser</b> , Newport News Shipbuilding	<b>B. Pence</b> , Naval Nuclear Laboratory
<b>L. S. Gibbs</b> , Southern Nuclear	<b>A. Reisner</b> , Lockheed Martin Space
<b>R. Lindberg</b> , Sargent & Lundy, LLC	<b>T. V. Vine</b> , Berry Lake Consulting, LLC
<b>S. T. Nguyen</b> , Navy Crane Center	<b>D. Weber</b> , American Crane & Equipment Corp.

### CNF ENGINEERING SUPPORT SUBCOMMITTEE

<b>D. Gupta</b> , Sarens Nuclear & Industrial Services, LLC	<b>B. Pence</b> , Naval Nuclear Laboratory
<b>S. Huffard</b> , WECTEC, LLC	<b>D. T. Tang</b> , U.S. Nuclear Regulatory Commission
<b>G. Jenich</b> , PAR Systems, LLC	<b>P. A. Vallejos</b> , Hanford Mission Integration Solutions
<b>P. Kanakasabai</b> , Konecranes Nuclear Equipment & Services, LLC	

# CORRESPONDENCE WITH THE CNF COMMITTEE

**General.** ASME codes and standards are developed and maintained by committees with the intent to represent the consensus of concerned interests. Users of ASME codes and standards may correspond with the committees to propose revisions or cases, report errata, or request interpretations. Correspondence for this Standard should be sent to the staff secretary noted on the committee's web page, accessible at <https://go.asme.org/CNFcommittee>.

**Revisions and Errata.** The committee processes revisions to this Standard on a continuous basis to incorporate changes that appear necessary or desirable as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. Such proposals should be as specific as possible, citing the paragraph number, the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent background information and supporting documentation.

## Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

(b) Users are cautioned that not all jurisdictions or owners automatically accept cases. Cases are not to be considered as approving, recommending, certifying, or endorsing any proprietary or specific design, or as limiting in any way the freedom of manufacturers, constructors, or owners to choose any method of design or any form of construction that conforms to the Standard.

(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number

(4) the editions of the Standard to which the proposed case applies

(d) A case is effective for use when the public review process has been completed and it is approved by the cognizant supervisory board. Approved cases are posted on the committee web page.

**Interpretations.** Upon request, the committee will issue an interpretation of any requirement of this Standard. An interpretation can be issued only in response to a request submitted through the online Inquiry Submittal Form at <https://go.asme.org/InterpretationRequest>. Upon submitting the form, the inquirer will receive an automatic e-mail confirming receipt.

ASME does not act as a consultant for specific engineering problems or for the general application or understanding of the Standard requirements. If, based on the information submitted, it is the opinion of the committee that the inquirer should seek assistance, the request will be returned with the recommendation that such assistance be obtained. Inquirers can track the status of their requests at <https://go.asme.org/Interpretations>.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME committee or subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Interpretations are published in the ASME Interpretations Database at <https://go.asme.org/Interpretations> as they are issued.

**Committee Meetings.** The CNF Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the secretary of the committee. Information on future committee meetings can be found on the committee web page at <https://go.asme.org/CNFcommittee>.

# **ASME NUM-1-2023 SUMMARY OF CHANGES**

Following approval by the ASME CNF Standards Committee and ASME, and after public review, ASME NUM-1-2023 was approved by the American National Standards Institute on December 4, 2023.

ASME NUM-1-2023 has been revised in its entirety.

# PART GR

## GENERAL REQUIREMENTS

### Section GR-1

#### Introduction

#### GR-1.1 GENERAL

Design of equipment covered by this Standard shall be in accordance with the Standard's requirements but not necessarily with its recommendations. The word *shall* is used to denote a requirement; the word *should* is used to denote a recommendation; and the word *may* is used to denote permission, which is neither a requirement nor a recommendation.

This Standard is comprised of three major parts:

(a) **Part GR:** general requirements applicable to all equipment

(b) **Part CM:** requirements applicable to cranes and monorails

(c) **Part HT:** requirements applicable to hoists and trolleys

**Part CM** provides criteria for the crane and monorail structures and is used in conjunction with **Part HT**, which provides criteria for the hoist and trolley units. Both parts require inclusion of the general criteria of **Part GR** for the specified crane, monorail, hoist, and trolley configurations.

#### GR-1.2 SCOPE

This Standard covers the following lifting and handling equipment configurations used in nuclear facilities that require enhanced safety features or seismic design features, or both:

- (a) underhung cranes
- (b) top-running bridge and gantry cranes with underhung trolleys
- (c) traveling wall cranes
- (d) jib cranes
- (e) monorail systems
- (f) overhead hoists
- (g) hoists with integral trolleys
- (h) separate underhung trolleys

**Subsection GR-6.2** provides graphical depictions of the various crane, monorail, hoist, and trolley configurations addressed in this Standard.

The above cranes, whether single or multiple girder, are covered by this Standard. For multiple-girder cranes with both top-running bridge and top-running trolley, see ASME NOG-1.

#### GR-1.2.1 Equipment Types Covered

The handling equipment used in a nuclear facility is categorized as Type I, Type II, or Type III. This Standard addresses Type I and Type II cranes and monorails and Type I hoists and trolleys. Type II hoists and trolleys shall meet the requirements of general industry standards and the additional requirements noted in **para. GR-1.2.1.2**. Type III cranes, hoists, monorails, and trolleys shall meet the requirements of general industry standards. **Paragraphs GR-1.2.1.1 through GR-1.2.1.3** define the three categories of equipment.

**GR-1.2.1.1 Type I Equipment.** Type I equipment is a crane, monorail, hoist, or trolley with enhanced safety designs and features for handling a critical load. Design and construction of Type I equipment shall be such that it will remain in place and support the critical load during and after a safe shutdown earthquake (SSE) event; however, Type I equipment does not have to be operational after this event.

There are two subtypes of Type I equipment.

(a) Type IA equipment shall incorporate single-failure-proof designs and features. The design shall be such that any credible failure of a single component will not result in the loss of capability to stop and hold a critical load.

(b) Type 1B equipment shall incorporate enhanced safety designs and features. This includes increased design factors and redundant components that minimize the potential for failure that would result in the loss of capability to stop and hold a critical load.