

Catalog of MHI Standards and Specifications



<https://www.mhi.org/standards>

Updated: October 24, 2024

Catalog of MHI Standards and Specifications

Foreword

This catalog provides information for American National Standards developed by MHI (www.mhi.org), including the designation and title of the standard, the scope of the standard, the approval date, the industry group or standards committee responsible for drafting the standard, and ordering information. Also included is information on specifications prepared by the Crane Manufacturers Association of America (CMAA, www.mhi.org/cmaa).

The American National Standards Institute (ANSI, www.ansi.org) accredits standards developers such as MHI to create American National Standards under the auspices of ANSI's Governing Procedures. Approval of an American National Standard requires verification by the American National Standards Institute (ANSI) that the requirements for due process, consensus, and other criteria for approval have been met by the standards developer.

MHI creates American National Standards through its industry groups (<https://www.mhi.org/industrygroups>), who are comprised of the leading design or manufacturing companies in a particular industry sector. Industry groups involved in the development of American National Standards include:

- Automated Storage & Retrieval Systems;
- Automation, Controls, Electrification (formerly Electrification & Controls Manufacturers Association)
- Institute of Caster & Wheel Manufacturers
- Lift Manufacturers Product Section
- Monorail Manufacturers Association
- Protective Guarding Manufacturers Association
- Rack Manufacturers Institute
- Storage Manufacturers Association

Additionally, MHI supports two standards committees:

- MH1 Committee on Pallets, Slip Sheets, and Other Bases for Unit Loads
- MH10 Committee on Unit Loads and Transport Packages

MHI utilizes the Canvass Method for standards drafted by Industry Groups. A standards developer using the Canvass Method identifies, to the extent possible, those who are directly and materially affected by the standards, MHI develops a list of potential canvasees consisting representatives of different interest categories (users, manufacturers, associations, distributors, government, and general interest) to review and approve the standard. Materially affected individuals wishing to participate on a canvass committee can contact the MHI Director of Standards (standards@mhi.org) for more information.

The MH1 and MH10 committees have a standing consensus body and active subcommittees who meet periodically to draft, review, and approve new or revised American National Standards. Participation on the MH1 or MH10 committees or subcommittees is open to any materially affected individual. Contact the MHI Director of Standards (standards@mhi.org) regarding participation.

CMAA has developed its own procedures for the development of its crane specifications. Refer to the CMAA website for more information: <https://www.mhi.org/cmaa/specifications>.

Standards and specifications are updated periodically. Refer to <https://www.mhi.org/standards> for updates to standards, specifications, and this document.

MHI
8720 Red Oak Blvd., Suite 201, Charlotte, NC, 28217-3992
Telephone: (704) 676-1190 Fax: (704) 676-1199
www.mhi.org/standards
standards@mhi.org

Contents

Foreword	i
Rack Manufacturers Institute	1
ANSI MH16.1-2023, Design, Testing and Utilization of Industrial Steel Storage Racks	1
ANSI MH16.3-2016, Specification for the Design, Testing and Utilization of Industrial Steel Cantilevered Storage Racks	2
ANSI MH26.2-2023, Design, Fabrication, Testing, and Utilization of Welded-Wire Rack Decking.....	2
Automated Storage & Retrieval Systems	3
ANSI MH24.2-2023, Power-Operated Vertical Carousels and Vertical Lift Modules	3
Monorail Manufacturers Association	4
ANSI MH27.1-2016, Patented Track Underhung Cranes and Monorail Systems.....	4
ANSI MH27.2-2017, Enclosed Track Underhung Cranes & Monorail Systems	4
Storage Manufacturers Association	5
ANSI MH28.1-2024, Design, Testing, and Utilization of Industrial Steel Bin Shelving	5
ANSI MH28.2-2022, Design, Testing, and Utilization of Industrial Steel Boltless Shelving	5
ANSI MH28.3-2022, Design, Testing, and Utilization of Industrial Steel Work Platforms	6
ANSI MH28.4-2024, Testing and Evaluation of Retail/Consumer Boltless Steel Shelving	6
LIFT Manufacturers Product Section	7
ANSI MH29.1-2020, Safety Requirements for Industrial Scissors Lifts	7
ANSI MH29.2-2020, Safety Requirements for Industrial Tilters	7
Loading Dock Equipment Manufacturers Association	8
ANSI MH30.1-2022, Design, Testing, and Utilization of Dock Leveling Devices	8
ANSI MH30.2-2022, Design, Testing, and Utilization of Portable Dock Leveling Devices.....	9
ANSI MH30.3-2022, Design, Testing, and Utilization of Vehicle Restraining Devices	9
Protective Guarding Manufacturers Association	10
ANSI MH31.1-2019, Steel Mesh Containment Panels Used in Pallet Rack and Vertical Storage System Applications: Performance and Testing Requirements	10
ANSI MH31.2-2021, Test Method for Crash Testing Industrial Guardrail Barriers and Barrier Posts.....	10
Rack Manufacturers Institute and Storage Manufacturers Association	11
ANSI MH32.1-2018, Stairs, Ladders, and Open-Edge Guards for Use with Material Handling Structures	11
Institute of Caster & Wheel Manufacturers	12
ANSI ICWM-2018, Vocabulary, Performance and Testing Requirements for Casters and Wheels	12
Automation, Controls, Electrification	13
ANSI ECMA 15-2018, Cable-less Controls for Electric Overhead Traveling Cranes	13
ANSI ECMA 25-2018, AC Inverters for Use on Electric Overhead, Monorail, and Gantry Traveling Cranes	13
ANSI ECMA 35-2018, Electrification Systems for Electric Overhead Traveling Cranes	13
MH1 Standards Committee	14
ANSI MH1-2021, Pallets, Slip Sheets, and Other Bases for Unit Loads	14
MH10 Standards Committee	14
ANSI MH10.8.2-2021, Data Identifiers	14
ANSI MH10.8.6-2013, Bar Codes and Two-Dimensional (2D) Symbols for Product Packaging	14
ANSI MH10.8.12-2011(R2018), American National Standard for Material Handling - Component Marking	14
ANSI MH10.8.13-2016, Performance Requirements and Test Procedures for Labels Incorporating Linear Bar Code and Two-Dimensional (2D) Symbols — Part 1: Pressure-Sensitive Labels	15
ANSI MH10.8.17-2017, Item Unique Identification (IUID) Data Matrix Encoding Guideline	15

Catalog of MHI Standards and Specifications


Crane Manufacturers Association of America 16

 CMAA 70-2020, Multiple Girder Cranes 16

 CMAA 74-2020, Single Girder Cranes..... 16

 CMAA 78, Professional Services 16

 CMAA 79, Crane Operators Manual 17

Rack Manufacturers Institute	Designation and Title	Price
	ANSI MH16.1-2023, Design, Testing and Utilization of Industrial Steel Storage Racks	\$150
	Industry Group: RMI Approval Date: March 28, 2023 Supersedes: ANSI MH16.1-2021	
<p>This standard applies to industrial steel storage racks, movable-shelf racks, rack-supported systems and automated storage and retrieval systems (stacker racks) made of cold-formed or hot-rolled steel structural members. Such rack types also include push-back rack, pallet-flow rack, case-flow rack, pick modules, and rack-supported platforms. This standard is intended to be applied to the design of the storage rack portion of any rack structure that acts as support for the exterior walls and roof, except as noted. It does not apply to other types of racks, such as drive-in or drive-through racks, cantilever racks, portable racks, or to racks made of material other than steel.</p>		
2021 Revision		
ANSI MH16.1-2021 is a revision of ANSI MH16.1-2012(R2019). A summary of the major revisions to this version include:		
<ul style="list-style-type: none"> • Reorganization of the document to align with guidance in <i>ISO/IEC Directives, Part 2</i>, specifically moving requirements previously in Section 1 elsewhere in the document, adding Normative References to Section Error! Reference source not found. (previously Section 10, “References to the Text”), and adding Terms and Definitions to Section Error! Reference source not found. (previously “Nomenclature” in the Foreword); • A requirement for post-installation inspection conducted by the owner has been added (see Error! Reference source not found.); • New stability design requirements similar to the requirements in ANSI/AISI S100 or ANSI/AISC 360 replace the effective length method for stability design outlined in previous editions; • Seismic provisions (see Error! Reference source not found.) were revised to align with ASCE/SEI 7-2016, including: <ul style="list-style-type: none"> ○ Revision of redundancy factors for multiple rows; ○ Revision of the F_a and F_v coefficients for the D-Default site class (reference section removed in 2022 revision); • New design procedure for perforated columns that includes a new definition of net section using reduced strips to represent the hole lines. Torsional properties are now to be calculated using rounded corners and a distortional buckling check is required for those sections subject to distortional buckling. The equation for Q effect on the column strength has changed; • New section on pallet support design; • New section on frame tie and cross-aisle tie design; • New provisions for base plate and anchor design where the seismic overstrength consideration is required; • Interpretation of the cyclic tests for connectors has been added; • The base fixity test (see Error! Reference source not found.) and frame bracing test have been added; • The portal test and the upright frame test in the 2012 revision were removed from the 2021 revision. 		
2023 Revision		
ANSI MH16.1-2023 is a revision of ANSI MH16.1-2021. The major revisions to this version include:		
<ul style="list-style-type: none"> • Seismic provisions were revised to align with ASCE/SEI 7-2022, including: <ul style="list-style-type: none"> ○ Use of software to obtain seismic data; ○ New methods to obtain the seismic response coefficients; 		

- Revisions to the cantilever testing provisions and to the cyclic beam-to-column testing provisions in this section. Either test can be used to determine beam design spring constants.



Rack Manufacturers Institute

This standard applies to free-standing and top-tied cantilevered storage racks made of cold-formed or hot-rolled structural steel members. This standard also covers cantilevered storage racks with accessories, such as decked shelves, shed roofs and canopies.

The scope limits the applicability of this standard to cantilevered storage racks made from either hot-rolled or cold-formed steel.

[ANSI MH16.3-2016, Specification for the Design, Testing and Utilization of Industrial Steel Cantilevered Storage Racks](#)

Industry Group: [RMI](#)

Approval Date: October 8, 2015

\$150



Rack Manufacturers Institute

This standard is established to provide a guideline for design, testing, fabrication, and utilization of industrial storage rack decking utilized as an accessory for industrial steel storage racks that conform to ANSI MH16.1, *Design, Testing, and Utilization of Industrial Steel Storage Racks*. Storage rack decking is placed on beams of industrial steel storage racks to create a surface on which to place materials that can be on pallets, in containers, or in some other form.

This standard applies to uniformly loaded storage rack decking applications, as well as various concentrated and partially distributed loading conditions common to storage rack applications. Storage rack decking can be fabricated from welded-wire mesh with permanently attached reinforcements, metal bar grating, composite engineered wood, corrugated metal, perforated sheet metal, or other materials that meet the performance requirements for use in storage racks.

This standard does not apply to:

- storage rack decking manufactured prior to date of adoption of this standard;
- storage rack decking that has been improperly installed, altered, damaged, or used in any manner other than that for which it was originally intended, designed, purchased, sold, or a combination thereof;
- lumber not graded or stamped by the Southern Pine Inspection Bureau (SPIB), West Coast Lumber Inspection Bureau (WCLIB), or equivalent grading agency; or
- storage rack decking that is intended to support any loads other than product loads (e.g., moving, or live, loads due to walking or stepping).

[ANSI MH26.2-2023, Design, Fabrication, Testing, and Utilization of Welded-Wire Rack Decking](#)

Industry Group: [RMI](#)

Approval Date: April 6, 2023

Supersedes: ANSI MH27.2-2017

\$50

Automated Storage & Retrieval Systems



Designation and Title

[ANSI MH24.2-2023, Power-Operated Vertical Carousels and Vertical Lift Modules](#)

Price

\$100

Industry Group: [AS/RS](#)

Approval Date: May 16, 2023

Supersedes: ANSI MH24.2-2019

Scope

This standard provides guidance for designers, manufacturers, sellers, installers, users, and governing bodies associated with power-operated vertical carousels and vertical lift modules.

A **vertical carousel** is an enclosed system equipped with a series of shelves that work on a Ferris wheel concept, rotating around a track to deliver stored items to personnel through one or more ergonomically designed pick windows.

A **vertical lift module** is an enclosed system that consists of one or two columns of tray storage with an inserter/extractor. For vertical lift modules with two columns of trays, the inserter/extractor is located between the tray storage. The vertical lift module inserter/extractor automatically locates and retrieves stored trays from the unit to deliver stored items to personnel through one or more ergonomically designed pick windows.

Both vertical carousels and vertical lift modules are designed to utilize floor-to-ceiling height in a facility to optimize storage density. Shelves or carriers in vertical carousels and vertical lift modules are configurable to maximize storage density in a minimal footprint.

The scope of this standard is to eliminate or minimize the hazards which can arise during installation, start up, operation, maintenance, testing, and dismantling of power-operated vertical carousels and vertical lift modules.

The scope presumes that the power-operated vertical carousels and vertical lift modules would be installed and operated indoors in an environment that does not contribute to hazards. When evaluating hazards, considerations for environmental or external factors should be considered, including, but not limited to:

- outdoor installations;
- hot or cold temperatures or temperature fluctuations;
- corrosive or explosive environments;
- magnetic fields;
- high concentrations of dust or airborne contaminants;
- radioactive conditions;
- hazardous materials storage;
- floods, earthquakes, or other natural disasters; or
- food contact.

Limitations

This standard applies to buildings and parts of buildings only insofar that the hazards and risks of interfaces with the power-operated vertical carousels and vertical lift modules are assessed.

Power-operated vertical carousels and vertical lift modules that use human labor or gravity as the power source are excluded from the scope of this standard.

Power-operated vertical carousels and vertical lift modules and their components are intended to handle and store goods or material. They are not designed as passenger lifts and are not intended for human occupancy or transport.

This standard does not consider hazards that arise from noisy environments or environments subject to electromagnetic interference as defined in IEEE C63.14-2014 and which are outside the range specified in IEC 61000-6-2:2016.

Catalog of MHI Standards and Specifications

Monorail Manufacturers Association



Designation and Title

[ANSI MH27.1-2016, Patented Track Underhung Cranes and Monorail Systems](#)

Industry Group: [MMA](#)

Approval Date: June 30, 2016

Supersedes: ANSI MH27.1-2003(R2009)

Price

\$25

This standard applies to underhung cranes whose end trucks operate on the lower flange of a patented-track runway section; and to carriers (trolleys) operating on single-track patented-track monorail systems, including all curves, switches, transfer devices, lift and drop sections, and associated equipment. Systems used for transporting personnel require special considerations and are not included in this standard. This standard does not apply to enclosed-track runway sections, enclosed-track monorail systems, structural-shape runway section, or structural-shape monorail systems. Refer to ANSI MH27.2 2017, *Enclosed Rack Underhung Cranes and Monorail Systems* for enclosed-track runway sections and enclosed-track monorail systems.

Hoist(s) or carrier(s) may be supplied by the crane manufacturer, crane distributor, crane installer, or by the user. In either case, the applicable portions of ASME/ANSI B30.16, *Overhead Hoists (Underhung)*; ASME B30.11, *Monorails and Underhung Cranes* and appropriate ASME HST Performance Standards apply to the hoist(s) and carrier(s). If the hoist(s) or carrier(s) are supplied by the user, the crane builder shall be provided with certified dimensional drawings with all required data including wiring diagrams, carrier collector locations and weights.

This standard includes considerations for cranes and monorail equipment only. It does not include considerations or specifications for the design of the building, the design of supporting structure, electrical power supply, or erection.

This standard applies to systems operating in normal ambient temperatures and atmospheric conditions; any other conditions require special consideration.



[ANSI MH27.2-2017, Enclosed Track Underhung Cranes & Monorail Systems](#)

Industry Group: [MMA](#)

Approval Date: June 30, 2016

Supersedes: ANSI MH27.2-2003(R2009)

\$25

This standard applies to underhung cranes whose end trucks operate on the internal flange of a runway using enclosed track section; and to trolleys (carriers) operating on single-track monorail systems, including all curves, switches, transfer devices, lift and drop sections, and associated equipment. Systems used for transporting personnel require special considerations and are not included in these specifications. This standard does not apply to underhung cranes whose end trucks operate on the lower flange of a patented-track runway section. Refer to ANSI MH27.1-2016, *Patented Track Underhung Cranes and Monorail Systems* for patented-track runway sections and patented-track monorail systems.

Hoist(s) or carrier(s) may be supplied by the crane manufacturer, crane distributor, crane installer, or by the user. In either case, the applicable portions of ASME/ANSI B30.16, *Overhead Hoists (Underhung)*; ASME B30.17, *Cranes and Monorails (With Underhung Trolley or Bridge)* and appropriate ASME HST Performance Standards apply to the hoist(s) or carrier(s). If the hoist(s) or carrier(s) are supplied by the user, the crane builder shall be provided with certified dimensional drawings with all required data including wiring diagrams, carrier collector locations and weights.

This standard includes considerations for cranes and monorail equipment only. It does not include considerations or specifications for the design of the building, the design of supporting structure, electrical power supply, or erection.

This standard applies to systems operating in normal ambient temperatures and atmospheric conditions; any other conditions require special consideration.

Catalog of MHI Standards and Specifications

Storage Manufacturers Association



Storage Manufacturers Association

powered by  MHI

Designation and Title

[ANSI MH28.1-2024, Design, Testing, and Utilization of Industrial Steel Bin Shelving](#)

Industry Group: [SMA](#)

Approval Date: April 24, 2024

Price

\$0

This standard applies to industrial steel bin shelving; bin shelving placed on mobile carriages; multi-level bin shelving systems such as pick modules, catwalks, and deck overs; and for bin shelving used in conjunction with an automated storage and retrieval system (AS/RS). The structural framing components for these systems are made of cold-formed or hot-rolled steel structural members.

Bin shelving) is typically a hand-loaded, prefabricated, free-standing, building-like non-building structure that utilizes a designed framing system, which is generally located within an industrial or warehouse environment. Personnel working within the confines of the bin shelving structure are presumed to be properly trained, physically able, and appropriately attired to work in the intended working environment.

This standard is intended to be applied to the design, testing, and utilization of industrial steel bin shelving systems. When a bin shelving system is designed for use in a seismically active area, the designer is cautioned to obtain more detailed information, amendments, and changes to adopted codes, including applicable design ground motions to use in the design, by contacting the local jurisdiction where the shelving units are to be installed.

This standard applies to industrial steel bin shelving systems installed within a building and subjected to seismic (earthquake) loads. Loads from environmental exposure, such as snow, wind, or rain loads, are not addressed in this standard. This standard does not cover any design requirements that need to be addressed for supported equipment that would subject a shelving system to significant dynamic loading and/or harmonic vibration that has the potential to cause structural damage or metal fatigue. For environmental exposure or applications beyond the scope of this standard, an evaluation by a qualified design professional is required.



Storage Manufacturers Association

powered by  MHI

[ANSI MH28.2-2022, Design, Testing, and Utilization of Industrial Steel Boltless Shelving](#)

Industry Group: [SMA](#)

Approval Date: February 4, 2022

Supersedes: ANSI MH28.2-2018

\$0

This standard applies to industrial steel boltless shelving; boltless shelving placed on mobile carriages; multi-level boltless shelving systems such as pick modules, catwalks, and deck-overs; and for boltless shelving used in conjunction with an automated storage and retrieval system (AS/RS). The structural framing components for these systems are made of cold-formed or hot-rolled steel structural members. This standard does not apply to the following: industrial steel pallet racks (addressed by ANSI MH16.1), industrial cantilever racks (addressed by ANSI MH16.3), boltless shelving structures not fabricated from steel, industrial steel bin shelving, or shelving systems built with slotted metal angles.

Industrial steel boltless shelving (hereinafter referred to as boltless shelving) is typically a hand-loaded, prefabricated, free-standing, building-like non-building structure that utilizes a designed framing system. It is generally located within an industrial or warehouse environment that is restricted from the general public. Personnel working within the confines of the boltless shelving structure are presumed to be properly trained, physically able, and appropriately attired for the intended working environment.

This standard is intended to be applied to the design, testing and utilization of such structures.

This standard applies to boltless shelving structures installed within a building and subjected to seismic (earthquake) loads. Loads from environmental exposure, such as snow, wind, or rain loads, are not addressed in this standard. This standard does not cover any design requirements that need to be addressed for supported equipment that would subject a shelving system to significant dynamic loading and/or harmonic vibration that has the potential to cause structural damage or metal fatigue. For environmental exposure or applications beyond the scope of this standard, an evaluation by a qualified design professional is required.



[ANSI MH28.3-2022, Design, Testing, and Utilization of Industrial Steel Work Platforms](#)

\$0

Industry Group: [SMA](#)

Approval Date: February 1, 2022

Supersedes: ANSI MH28.3-2018

This standard applies to industrial steel work platforms.

An industrial steel work platform is typically a prefabricated free-standing non-building structure similar to a building with an elevated surface that utilizes a pre-designed framing system and is located within an industrial or similarly restricted environment. Flooring may include other structural or non-structural elements such as, but not limited to, concrete, steel, and engineered wood-products. This standard is intended to be applied to the design, testing and utilization of such structures. Industrial steel work platforms are hereinafter referred to as just “work platforms” or “platforms”. This standard does not apply to platforms whose structural framing components are not made from steel.

This standard is written based on the work platform being restricted from the general public and that those working on the work platform are properly trained, appropriately dressed, and physically able to work on such platforms in an industrial or warehouse environment. For applications beyond the scope of this standard, consult a qualified design professional.

This standard is written around the preponderance of work platform installations and is not intended to limit the extent of possible designs nor the auxiliary materials that may be used in conjunction with a boltless shelving installation. Special designs, e.g., systems installed outdoors subject to wind, snow and rain, or the use of material not specifically cover in the standard require the approval of a qualified design professional.

Even though the cyclic testing in this standard is focused on the three common moment frames—ordinary, intermediate, and special—this standard does not preclude the use of other recognized lateral bracing systems.

This standard does not prohibit the direct connection of a work platform to the building framework. See commentary for further remarks.

Structural design and analysis of concrete slab-on-grade or foundation is not part of this standard.



[ANSI MH28.4-2024, Testing and Evaluation of Retail/Consumer Boltless Steel Shelving](#)

\$0

Industry Group: [SMA](#)

Approval Date: April 24, 2024

This standard applies to retail/consumer boltless steel shelving. The framing components for these systems are made of steel members. This standard does not apply to the following: industrial steel storage racks (addressed by ANSI MH16.1), industrial steel cantilevered racks (addressed by ANSI MH16.3), industrial boltless steel shelving (addressed by ANSI MH28.2), products greater than 96 in. (2.4 m) in height, boltless shelving structures not fabricated from steel, industrial steel bin shelving (addressed by ANSI MH28.1), or shelving systems built with slotted metal angles.

Retail/consumer shelving is a hand loaded, prefabricated, freestanding, building-like non-building structure that utilizes a designed framing system. It is primarily designed and intended to be used in residential or commercial applications (as opposed to applications requiring larger-scale industrial product storage in accordance with ANSI MH28.2) and generally located indoors within a home, shop, or garage environment not designed to withstand wind or earthquake loading.

Retail/consumer steel boltless shelving systems are designed to be purchased by non professional consumers at retail stores and assembled without the need for technical guidance or training.

This standard does not provide guidance for design requirements that need to be addressed for supported equipment that would subject a shelving system to significant dynamic loading or harmonic vibration that has the potential to cause damage or metal fatigue.

LIFT Manufacturers Product Section



Designation and Title

Price

[ANSI MH29.1-2020, Safety Requirements for Industrial Scissors Lifts](#)

\$30

Industry Group: [LIFT](#)
Approval Date: May 19, 2020
Supersedes: ANSI MH29.1-2012

This standard applies to industrial scissors lifts that are raised and lowered by means of hydraulic, pneumatic, or mechanical actuation. These industrial scissors lifts are intended for commercial applications on firm and level surfaces and may be either stationary or mobile and used to position, feed, transfer, load, or unload materials or personnel. Some of these combinations are not covered by this standard. Industrial scissors lifts are available in a range of capacities, sizes, and travels and include dock lifts, work access lifts and lift tables which are categorized by function.

[ANSI MH29.2-2020, Safety Requirements for Industrial Tilters](#)

\$30

Industry Group: [LIFT](#)
Approval Date: April 3, 2020

This standard applies to industrial tilters that are rotated about a horizontal axis by means of hydraulic, pneumatic, mechanical, or electro/mechanical actuation. Industrial tilters can be stationary or movable and are generally used to position, feed, transfer, load, or unload materials only.

This standard does not apply to:

- a) dumpers or upenders where angular travel exceeds 110 degrees;
- b) invertors and rotators;
- c) refuse dumpers;
- d) self-dumping hoppers; or
- e) truck mounted dump bodies.

[ANSI MH29.3-2023, Safety Requirements for Industrial Turntables](#)

\$30

Industry Group: [LIFT](#)
Approval Date: March 28, 2023

This standard applies to industrial turntables designed to rotate in the horizontal plane that are activated manually, or by hydraulic, pneumatic, mechanical, or electro-mechanical means. Industrial turntables can be stationary or movable, and manual or powered. They are used to rotate, position, feed, transfer, load, or unload materials only. Industrial turntables are not intended to move personnel. Industrial turntables are available in a range of capacities, sizes, and degrees of rotation.

This standard does not apply to:

- a) pallet rotators and/or inverters;
- b) rotating cranes meeting the requirements set forth by ANSI B30;
- c) building structures, or other architectural features, which may rotate but are not related to the handling or transference of material;
- d) vanes, mills, and other equipment designed primarily for generation or transmission of energy;
- e) amusement rides;
- f) locomotive roundhouses;
- g) machine tools which utilize rotating tables, tool changers, or other devices as an integral component of a drilling, milling, grinding, or other machining process; or
- h) medical or pharmaceutical type turntables.

Loading Dock Equipment Manufacturers Association



LOADING DOCK EQUIPMENT MANUFACTURERS

powered by  MHI

Designation and Title

[ANSI MH30.1-2022, Design, Testing, and Utilization of Dock Leveling Devices](#)

Industry Group: [LODEM](#)

Approval Date: November 28, 2022

Supersedes: ANSI MH30.1-2015

Price

\$60

Purpose

The purpose of this standard is to serve as the guide for designers, manufacturers, sellers, installers, owners, users, and governing bodies of dock levelers and to achieve the following objectives:

- to provide guidelines for the design and testing of dock leveling devices;
- to promote the understanding of the respective responsibilities of manufacturers, sellers, installers, owners, users, and governing bodies associated with dock leveling devices; and
- to provide a uniform means of comparison for dock leveling devices.

Equipment Covered

A dock leveling device is a manufactured structure designed to span and compensate for space and height differentials between a loading dock and a transport vehicle to facilitate freight transfers in an effective and efficient manner. The three types of dock leveling devices within the scope of this standard are described in the following paragraphs.

- a) **dock-face mounted type:** A dock-face mounted dock leveling device is permanently affixed to the face of a dock. Also known as edge of dock (EOD) levelers.
- b) **fixed type:** A fixed dock leveling device is affixed to the dock structure and usually incorporates a mechanism to aid in positioning the leveling device with respect to a transport vehicle. Fixed types include both horizontal and vertical storing levelers.
- c) **rail dock leveling device:** A rail dock leveling device is a manufactured structure designed to span and compensate for space and height differences between a rail car loading dock and a rail car to facilitate effective and efficient freight transfer or passage.
 - i. **fixed type:** a structure designed for stationary mounting to the dock, located at either the dock face or recessed into a pit. Placement of the bridging structure into a working or stored position will usually be aided by a mechanism incorporated into the design.
 - ii. **sliding type:** a structure designed to be permanently mounted to a dock face with a mounting assembly that allows for lateral movement of the bridging structure parallel to the dock face. Placement of the bridging structure, either laterally along the dock or into the stored or working position, may be manual or with a mechanism designed to aid in such positioning.

Performance and testing requirements for portable dock leveling devices are provided in ANSI MH30.2.

Loading Dock Equipment Manufacturers Association



LOADING DOCK EQUIPMENT MANUFACTURERS

powered by  MHI

Designation and Title

[ANSI MH30.2-2022, Design, Testing, and Utilization of Portable Dock Leveling Devices](#)

Industry Group: [LODEM](#)

Approval Date: November 28, 2022

Supersedes: ANSI MH30.2-2015

Price

\$60

This standard defines performance and testing requirements for the design, use, and maintenance of portable dock leveling devices. The purpose of this standard is to provide a uniform means of comparison, improve user confidence and knowledge and to define product requirements for portable dock leveling devices.

A **dock leveling device** is a manufactured structure designed to span and compensate for height differentials between a stationary loading dock and a movable transport vehicle to facilitate effective and efficient freight transfers. Dock leveling devices may be either built-in or portable.

A **portable type dock leveling device** is not permanently affixed to either the transport vehicle or the dock structure, and is capable of being moved from one location to another by manual effort or by independently powered equipment. Portable dock leveling devices are commonly referred to as **dockboards** or **dockplates**.

Performance and testing requirements for built-in dock leveling devices are provided in ANSI MH30.1.



LOADING DOCK EQUIPMENT MANUFACTURERS

powered by  MHI

[ANSI MH30.3-2022, Design, Testing, and Utilization of Vehicle Restraining Devices](#)

Industry Group: [LODEM](#)

Approval Date: November 28, 2022

Supersedes: ANSI MH30.3-2015

\$60

This standard defines performance and testing requirements with regard to design, use, and maintenance of vehicle restraining devices. The purposes of this standard are to provide a uniform means of comparison, to improve user confidence and knowledge, and to define requirements for vehicle restraining devices.

Equipment Covered

A vehicle restraining device is a manufactured structure designed to interface between a loading dock and a transport vehicle. It is intended to facilitate effective and efficient freight transfers by limiting vehicle creep and preventing unscheduled departure. Vehicle restraining devices commonly incorporate a communication light system between the dock worker on the inside of the building and the truck driver on the outside. The two types of vehicle restraining devices within the scope of this Standard are include.

- a) **rear impact guard (RIG) type:** this is the most common type of vehicle restraint. It is a vehicle restraint that engages the RIG of a transport vehicle, inhibiting uncontrolled separation of the vehicle from the dock face; and

NOTE – these are also known as “ICC bar restraints.”

- b) **wheel dependent type:** A vehicle restraint that engages one or more wheels of a transport vehicle, inhibiting uncontrolled separation of the vehicle from the dock face.

Vehicle restraining devices are further classified according to manual vs. powered operations:

- c) **manually operated:** a vehicle restraining device that is both engaged and released manually;
- d) **power operated:** a vehicle restraining device that is both engaged and released through a powered means, either with a push-button or automatic operation.

Protective Guarding Manufacturers Association



Designation and Title

[ANSI MH31.1-2019, Steel Mesh Containment Panels Used in Pallet Rack and Vertical Storage System Applications: Performance and Testing Requirements](#)

Industry Group: [ProGMA](#)

Approval Date: December 19, 2019

Price

\$25/\$50

This standard provides performance and testing requirements for vertically-mounted steel mesh containment panels used in pallet rack and vertical storage system applications to contain and minimize the potential for falling items, protecting personnel, product, and property.

The purpose of this standard is to serve as the guide for designers, manufacturers, sellers, installers, owners, users, and governing bodies of steel mesh containment panels used in pallet rack and vertical storage system applications and to achieve the following objectives:

- to provide guidelines for the design and testing of steel mesh containment panels used in pallet rack and vertical storage system applications;
- to promote the understanding of the respective responsibilities of manufacturers, sellers, installers, owners, users, and governing bodies associated with steel mesh containment panels used in pallet rack and vertical storage system applications; and
- to provide a uniform means of testing steel mesh containment panels used in pallet rack and vertical storage system applications.



[ANSI MH31.2-2021, Test Method for Crash Testing Industrial Guardrail Barriers and Barrier Posts](#)

Industry Group: [ProGMA](#)

Approval Date: July 17, 2024

Supersedes: March 24, 2021

\$25/\$50

This standard provides a test method of evaluating performance characteristics for industrial guardrail barriers and barrier posts. Industrial guardrail barriers and barrier posts are commonly utilized within industrial and warehouse environments to safeguard against unwanted interactions with, or provide added protection against potential impacts from, passing industrial vehicle traffic. These devices are typically mounted directly to the ground-level concrete floor slab at a safe distance away from pedestrian aiseways, vital equipment, or critical infrastructure.

Prior to the adaptation of this standard, no standardized test method had been established to assess the crash performance of these devices. Over the years, many manufacturers and suppliers of these products have performed independent testing based on a wide range of non-standardized parameters. The findings from these personalized tests have been published in marketing literature or data sheets aimed at assisting consumers with the selection process prior to purchase. It is important to note that ratings achieved in accordance with this procedure are based strictly on the criteria outlined herein. Performance under conditions other than those specifically tested may vary significantly.

In 2014, ASTM published standard F3016 *Standard Test Method for Surrogate Testing of Vehicle Impact Protective Devices at Low Speeds*. ASTM F3016 outlines a range of impact conditions, designations, and penetration performance levels for automobile impacts. Surrogate test vehicle weight is limited to 22,250 N (5,000 lbf) with three options for impact velocity; 20, 35, and 50 km/h, (10, 20, and 30 mph). Velocity is pre-selected, and a penetration rating category is assigned based on the maximum penetration of the device or surrogate vehicle during testing.

The test method outlined herein draws a distinct parallel to the ASTM F3016 test methods due to the functional similarities and desired measure of performance. For the purposes of this standard, the surrogate test vehicle mass and impact velocities are revised to represent powered industrial truck impacts consistent with material handling operation conditions.

This standard, which was originally published in 2021 and updated in 2024, outlines a testing methodology that can be used to substantiate performance claims for industrial guardrail barriers and barrier posts. The 2024 update modifies some test methods and tolerances in the 2021 standard that were impracticable for testing laboratories to achieve.

Rack Manufacturers Institute and Storage Manufacturers Association



Designation and Title

[ANSI MH32.1-2018, Stairs, Ladders, and Open-Edge Guards for Use with Material Handling Structures](#)

Industry Groups: [RMI](#) and [SMA](#)

Approval Date: November 30, 2018

This standard applies to fixed stairways and ladders along with guarding for elevated platforms used in material handling structures. The stairways and ladders are attached to structures such as industrial racking pick modules, decked-over platforms, industrial shelving pick modules and decked-over platforms, and free-standing work platforms. These structures are described in the ANSI MH 16.X and ANSI MH28.X series of standards.

This standard is intended to serve as a reference document for other material handling equipment standards or specifications.

All loads presented in this standard are unfactored.

Limitations

This standard is intended for structures within an industrial or warehouse environment where access is limited to trained employees who are trained, physically capable, wearing appropriate personal protective equipment, and are familiar with the configuration and use of this equipment.

This standard is not intended to apply to stairs or ladders used to:

- a) access a building roof or any other surface with an overhead latch or closed access;
- b) cross over other material handling equipment, such as conveyors; or
- c) ladders or stairs attached to automated equipment, such as automated storage and retrieval systems (AS/RS).

Price

\$0

Institute of Caster & Wheel Manufacturers



Designation and Title

[ANSI ICWM-2018, Vocabulary, Performance and Testing Requirements for Casters and Wheels](#)

Industry Group: [ICWM](#)

Approval Date: June 11, 2018

Supersedes: ANSI ICWM-2012

Price

\$0

This standard provides manufacturers, specifiers, and users with a common basis for evaluating the safety, durability, structural adequacy, and technical requirements for group-specific casters and wheels. The standard defines industry terms, specific tests, equipment/methods that can be used, the conditions of tests, and minimum acceptance levels to be used in evaluating these products.

Equipment covered

This standard addresses the total range or market for casters and wheels for these categories:

- a) furniture chair casters;
- b) industrial casters (at or under 2.5 mph and over 2.5 mph);
- c) institutional and medical equipment casters; and
- d) business machine and shopping cart casters.

This standard includes a glossary of caster and wheel terms, definitions, symbols and dimensions. Additionally, appropriate caster and wheel test equipment, procedures and methods are delineated and incorporated into this standard.

Automation, Controls, Electrification



Designation and Title

[ANSI ECMA 15-2018, Cable-less Controls for Electric Overhead Traveling Cranes](#)

Industry Group: [ECMA](#)

Approval Date: June 11, 2018

Price

\$15/\$25

This standard provides the minimum requirements and guidelines for cable-less controls of electric overhead traveling cranes. A cable-less control device as referenced in this standard uses radio frequency signals to control the movements and actions of said cranes for applications such as material handling.

This standard is referenced in CMAA Specification #70, *Specifications for Top Running & Gantry Type Multiple Girder Electric Overhead Traveling Cranes*, and CMAA Specification #74, *Specifications for Top Running & Under Running Single Girder Electric Traveling Cranes Utilizing Under Running Trolley Hoist*. These specifications contain information and references specific to electric overhead traveling (EOT) cranes.

This document assumes that the reader understands the general language and terms used for electric overhead traveling cranes.

In the United States, use of radio devices must comply with federal regulations outlined in CFR Title 47, Chapter 1, Subchapter A, Part 90, *Private Land Mobile Radio Services* and CFR Title 47, Chapter 1, Subchapter A, Part 15, *Radio Frequency Devices*.



[ANSI ECMA 25-2018, AC Inverters for Use on Electric Overhead, Monorail, and Gantry Traveling Cranes](#)

Industry Group: [ECMA](#)

Approval Date: July 29, 2019

\$15/\$25

This standard applies to AC Inverters for use on electric overhead, monorail, and gantry traveling cranes. AC Inverters are also referred to as variable frequency drives, adjustable frequency drives, or variable speed drives. The guidance in this standard is general in nature. Other and more detailed requirements may be agreed upon between the purchaser and the manufacturer to suit each specific installation.



[ANSI ECMA 35-2018, Electrification Systems for Electric Overhead Traveling Cranes](#)

Industry Group: [ECMA](#)

Approval Date: July 11, 2018

\$15/\$25

This standard provides minimum requirements and guidelines for alternating current (AC) and direct current (DC) electrification systems for electric overhead, monorail, and gantry traveling cranes.

Electrification systems include:

- conductor bars;
- festoon systems;
- cable chains;
- spring driven reels; and
- motor driven reels.

Catalog of MHI Standards and Specifications

MH1 Standards Committee



Designation and Title

[ANSI MH1-2021, Pallets, Slip Sheets, and Other Bases for Unit Loads](#)

Drafting Committee: MH1 Standards Committee

Approval Date: May 7, 2021

Supersedes: ANSI MH1-2016

Price

\$0

The purpose of this standard is to serve as the guide for designers, manufacturers, sellers, installers, owners, users, and governing bodies in the design, manufacturing, and use of pallets, slip sheets, and other bases for unit loads.

A pallet is a portable, horizontal, rigid, composite platform used as a base for assembling, storing, stacking, handling, and transporting goods as a unit load; often equipped with superstructure; described by providing the following information in the sequence listed: class, use, type, style, bottom deck, size, and design.

MH10 Standards Committee



Designation and Title

[ANSI MH10.8.2-2021, Data Identifiers](#)

Drafting Committee: MH10 Subcommittee 8

Approval Date: February 11, 2021

Price

\$0

This document provides a comprehensive dictionary of data identifiers (DIs), and provides for the assignment of new DIs, when required.

A DI is a specified character or string of characters that defines the general category or intended use of the data that follows. DIs can be used in automatic identification and data capture (AIDC), Internet of Things (IoT), Blockchain, or other similar applications. DIs described in this document consist of a capital letter (A through Z), optionally preceded by one-, two-, or three digits (0 through 9). DIs are succeeded by a string of letters, numbers, and/or symbols of a length and composition that can vary from DI to DI, which encode specific information pertinent to the item being encoded.

Apply for a new data identifier or data identifier interpretation: [Apply for New Data Identifier](#)



[ANSI MH10.8.6-2013, Bar Codes and Two-Dimensional \(2D\) Symbols for Product Packaging](#)

Drafting Committee: MH10 Subcommittee 8

Original Approval Date: October 4, 2013

Supersedes: ANSI MH10.8.6-2003

\$15

This standard is an application standard for the marking of product packages with linear bar code and two-dimensional symbols. It defines minimum requirements for identifying product packages that are distributed outside the originating location. It specifies label data content and requirements, including data element requirements; data representation; rules for encoding of mandatory and optional elements in machine-readable symbols; and human readable information.

MH10 Standards Committee



Designation and Title

[ANSI MH10.8.12-2011\(R2018\), American National Standard for Material Handling - Component Marking](#)

Drafting Committee: MH10 Subcommittee 8

Original Approval Date: September 6, 2018

Supersedes: CEA/EIA-706

Price

\$15

This standard specifies a transfer structure, syntax, and coding of messages and data formats when using high capacity automatic data capture media between trading partners, specifically between suppliers and recipients, and where applicable, in support of carrier applications, such as bills of lading and carrier sortation and tracking.



[ANSI MH10.8.13-2016, Performance Requirements and Test Procedures for Labels Incorporating Linear Bar Code and Two-Dimensional \(2D\) Symbols — Part 1: Pressure-Sensitive Labels](#)

\$15

Drafting Committee: MH10 Subcommittee 10
Original Approval Date: May 12, 2016

This American National standard:

- Provides detailed test procedures and performance requirements for optically readable pressure sensitive labels used to identify products;
- Provides detailed test procedures and performance requirements for optically readable pressure sensitive labels used on product packages and shipping containers;
- Is intended for applications which include, but are not limited to, support of systems that automate the control of items during the processes of:
 - production,
 - inventory,
 - distribution,
 - field service,
 - point of sale and
 - repair
- Is intended to include, but it is not limited to, multiple industries including:
 - automotive,
 - aerospace,
 - chemical,
 - consumer items,
 - electronics,
 - health care,
 - marine,
 - rail, and
 - telecommunications



[ANSI MH10.8.17-2017, Item Unique Identification \(IUID\) Data Matrix Encoding Guideline](#)

\$0

Drafting Committee: MH10 Subcommittee 8
Original Approval Date: February 14, 2017

This standard has been developed as a guideline to address two related objectives:

- a) to provide a conceptual understanding of the various standards and how they interrelate to form requirements of Item Unique Identification (IUID). The specific facet of IUID this guideline focuses on is how to encode data into the proper machine-readable symbol (like a barcode) the proper way; and
- b) to provide a troubleshooting guide for checking markers and readers of IUID Data Matrix symbols.

**Crane Manufacturers
Association of America**



Designation and Title

[CMAA 70-2020, Multiple Girder Cranes](#)

Drafting Committee: CMAA

Approval Date: 2020

Price

\$20/\$105

The Specifications and information contained in this publication apply to top running bridge and gantry type multiple girder electric overhead traveling cranes. It should be understood that the Specifications are general in nature and other Specifications may be agreed upon between the purchaser and the manufacturer to suit each specific installation. These Specifications do not cover equipment used to lift, lower, or transport personnel suspended from the hoist rope system.

This Specification outlines six different classes of crane service as a guide for determining the service requirements of the individual application. In many cases there is no clear category of service in which a particular crane operation may fall, and the proper selection of a crane can be made only through a discussion of service requirements and crane details with the crane manufacturer or other qualified persons.

Service conditions have an important influence on the life of the wearing parts of a crane, such as wheels, gears, bearings, wire rope, and electrical equipment, and must be considered in specifying a crane to assure maximum life and minimum maintenance.

In selecting overhead crane equipment, it is important that not only present, but future operations be considered, which may increase loading and service requirements and that equipment be selected which will satisfy future increased service conditions, thereby minimizing the possibility of overloading or placing in a duty classification higher than intended.



[CMAA 74-2020, Single Girder Cranes](#)

Drafting Committee: CMAA

Approval Date: 2020

\$20/\$105

The Specifications and information contained in this publication apply to top running and under running single girder electric overhead traveling cranes utilizing under running trolley hoist except patented track. It should be understood that the Specifications are general in nature and other Specifications may be agreed upon between the purchaser and the manufacturer to suit each specific installation. These Specifications do not cover equipment used to lift, lower or transport personnel suspended from the hoist rope system.

These Specifications outline four different classes of crane service as a guide for determining the service requirements of the individual application. In many cases, there is no clear category of service in which a particular crane operation may fall, and the proper selection of a crane can be made only through a discussion of service requirements and the crane details with the crane manufacturer or other qualified persons.

Service conditions have an important influence on the life of the wearing parts of a crane such as wheels, gears, bearings, and electrical equipment, and must be considered in specifying a crane to assure maximum life and minimum maintenance.

In selecting overhead crane equipment, it is important that not only present but future operations be considered which may increase loading and service requirements and that equipment be selected which will satisfy future increased service conditions, thereby minimizing the possibility of overloading or placing in a duty classification higher than intended.



[CMAA 78, Professional Services](#)

Drafting Committee: CMAA

Approval Date: 2015

\$12/\$30

The information contained in this Specification applies to overhead traveling single or double girder top running, under running, gantry cranes, monorails and associated hoisting equipment. This Specification is general in nature and other specifications may be agreed upon between the purchaser and the service provider to suit each specific application.

It outlines six different classes of crane service as a guide for determining the service requirements of the individual application. In many cases there is no clear category of service in which a particular crane operation may fall. The proper selection of a crane services can be made only through discussion of service requirements and crane design with the OEM or other qualified service providers.

Catalog of MHI Standards and Specifications

Proper operator training, regular maintenance and inspections by qualified individuals have an important influence on the operating life of the crane components. These factors must be given careful consideration to assure maximum equipment operating life and minimize equipment failures.

Death, personal injury, and/or serious property damage, may occur if cranes are not operated properly, regularly inspected, serviced and maintained.



[CMAA 79, Crane Operators Manual](#)

\$5/\$10

Drafting Committee: CMAA

Approval Date: 2012

This booklet has been prepared to provide information and suggestions for Crane Operators in their operation of cranes. Overhead cranes generally handle materials in proximity to working areas where there are personnel. Therefore, it is important for the Crane Operator to be instructed in the use of the crane and to understand the severe consequences from careless operation.

It is not intended that the recommendations in this booklet take precedence over existing plant safety rules and regulations, OSHA regulations, or instructions issued by the Crane Manufacturer. However, a thorough study of the following information should provide a better understanding of safe operation and afford a greater margin of safety for people and machinery on the plant floor.

It must be recognized that this is a booklet of recommendations for the Crane Operator and its use is permissive not mandatory. It is the responsibility of the owner of the crane to make personnel aware of all federal, state and local rules, codes, plant safety rules, regulations and instructions, and to ensure that operators are properly trained.

This document is available in English and Spanish. See <https://www.mhi.org/cmaa/specifications> for details.