Perspectives on Material Handling Practice

Papers in the Perspectives series have appeared in conference proceedings of the Material Handling Institute between 1992 and the present. As such they provide a point of reference as to how the industry is changing as well as insight into accepted practice during this period. In many cases the authors credited have either changed jobs or are no longer in the industry. Some companies as well have been the subject of mergers or reorganization with a new corporate identity.

A GUIDE TO CODES AND STANDARDS

AN ENGINEER'S GUIDE TO CODES AND STANDARDS THAT IMPACT THE APPLICATION OF MATERIAL HANDLING AND STORAGE EQUIPMENT

PROMAT 99 FORUM
DONALD H. DURBIN
CONSULTING ASSOCIATE, MHIA
DR. MICHAEL K. OGLE
MATERIAL HANDLING INDUSTRY OF AMERICA

ABSTRACT

Material Handling equipment users, whether they are purchasing a single piece of equipment or an entire integrated system, need to know and understand applicable related codes, standards, and regulations. They should insist upon receiving specific evidence from their supplier, contractor, or integrator that the installation will meet these codes, standards, or regulations. The user of equipment has the ultimate responsibility for compliance although all parties involved are liable for the performance and safety of the equipment or systems with respect to the product or service they have provided and the interfaces of their product/service with the equipment provided by others.

This paper is concerned with awareness of building codes, available standards, and pertinent regulations related to material handling equipment. Published codes, standards and regulations cover many of the issues related to the installation and utilization of equipment. Where codes and standards do not exist, manufacturer's specifications and generally accepted best industrial practice address the issues. Strict compliance with the codes, standards, and regulations should protect employees from injury and minimize the company's exposure to liabilities.

1.0 INTRODUCTION

- Why should a Material Handling equipment purchaser be concerned about Codes, Standards, and Regulations that he has never heard of?

- What are the applicable Codes, Standards, and Regulations for my project and where do I go to find this information?

- How can I be certain that my Company is in compliance with appropriate Codes, Standards, and Regulations when my project is completed?

These and other questions are important in your planning. All too often, some of these issues are forgotten in the quest for appropriate technology and system selection.

Your physical facility most likely was built after securing a building permit. This permit indicated designer acceptance and compliance with a building code. In addition, there were probably inspections performed during construction and before a final acceptance and occupancy permit was issued. The process assured you of two things; construction proposals could be accepted with the expectation that they would be based upon a level playing field and the building would be built to code assuring the expected performance and safety levels based on the knowledge distilled into the building code.

Using this discussion of building construction as a comparison you can easily understand that you would want your material handling equipment to meet all appropriate Codes, Standards, and Regulations. You would also expect the installation and integration of this equipment to similarly comply. In fact, you clearly will insist upon a properly operating safe system. Compliance with Codes, Standards, and Regulations will help you to meet this goal.

The titles “Codes”, “Standards”, and “Regulations” are mentioned frequently in the foregoing text. Many individuals are somewhat puzzled about the meanings of these words and tend to use them interchangeably. Explanations of these terms are offered on the following pages.

2.0 CODES

The specific “Codes” we should be most concerned with are Building Codes. In addition, it is necessary to consider Electrical Codes, Fire Codes, Plumbing Codes, and Mechanical Codes. This latter list of Codes is usually part of the series of publications prepared by the Model Building Code organizations.

Two slightly different definitions of Codes follow:

- “A systematically arranged and comprehensive collection of laws”

- “A systematic collection of regulations and rules of procedure or conduct”

Building Codes embrace all aspects of building construction. They are developed and implemented for the safety and well being of a building and it’s occupants. There are also codes to support Public Policy such as energy preservation, reduction of barriers for the disadvantaged

and to prevent or mitigate natural hazard damage such as fire, flood, wind, seismic activity or other natural event.

Codes are REGULATORY and are typically enforced by government officials.

The following will illustrate the various Model Building Code organizations both present and future and their areas of influence. More substantial information on each organization will be provided as handouts and may be obtained from the Material Handling Industry organization.

2.1 Model Building Code Organizations:

Our discussion is based on the "Model" Building Codes, which are described in detail in a Material Handling Industry (MHI) document entitled "*Summary of Model Building Code Organizations and Publications"*[1]. These codes are extremely important because they are usually the basis for all of the local codes. Typically a political entity adopts one of the model codes verbatim or with some modified provisions by means of Council or other Legislative action. Once a city, county or state has adopted a code, it is enforceable as a law (Ordinance).

2.2 The ICC and the IBC

The International Code Council (ICC) was formed as the result of efforts of the Board for the Coordination of Model Codes (BCMC). Members of BCMC include representatives of BOCA (National Building Code), SBCCI (Southern Building Code), ICBO (Uniform Building Code), and CABO (one and two family dwelling code). All of these organizations are working on the various tasks associated with writing appropriate code language. Ultimately, through the Challenge and Public Hearing process, the final language will be "hammered out" and adopted by the consensus process. The final product of this effort will be known as the International Building Code (IBC). It will be available for adoption by the users in the year 2000. Once the IBC is published the predecessor documents (National, Uniform, and Standard Building Codes) will no longer be published. The developing organizations will continue to work on the IBC as future editions are developed. It should be obvious to all that there are many benefits in having a code that is used nationally instead of the many documents that equipment suppliers, facility owners, architects and engineers, and many others have to understand and use.

3.0 STANDARDS

ISO Definition of "Standards":

> *"A technical specification or other document available to the public, drawn up with the cooperation and consensus or general approval of all parties affected by it, based upon the consolidated results of science, technology and experience, aimed at the promotion of optimum community benefits and approved by a standardization body."*

Other Definitions:

- An acknowledged and generally accepted method or practice.

- An acknowledged measure or comparison for quantitative or qualitative values.

What can utilization of standards do for you?

- Standards eliminate excess costs, boost productivity, satisfy customer needs, and protect the work force and the public.

- On the most basic level we must have assurance of at least a minimum acceptable level of quality and performance.

- The best industry practice is to follow standards to assure compliance to system performance requirements.

The American National Standards Institute (ANSI) is the registrar and clearinghouse for standards in the United States. ANSI also represents the US on the ISO committees. The American National Standards are NOT developed by ANSI. ANSI provides the procedures for standards development and reviews all actions taken during development of a standard to assure that all procedures were correctly followed by the Standards Developing Organization (SDO) and that due process was accorded to all interested parties and that consensus was achieved.

Some of the more well known SDO's are ACI, AISC, AISI, ASCE, ASME, ASTM, AWS, CEMA, HMI, CMAA, MHIA, NEMA, UL, etc.. There are many other SDO's that we have not listed that have equal importance and are also contributors to the approximately 13,000 existing ANSI Standards. There are also many standards under development at any given time and yet, there are many newer technologies in need of standardization.

Standards are VOLUNTARY unless your customer insists on or requests compliance or your company has a compliance policy.

Some widely known organizations do not use the ANSI process for their standards development but are cooperative standards developing organizations. Among these organizations is the Automotive Industry Action Group (AIAG). The AIAG has been very successful working with the major auto manufacturers and their vendors.

We, in the United States, are very used to the application of standards being voluntary. In most of the world this is not the case. European countries, for example, have "directives" which must be followed.

We suggest that you consider the necessity and benefits of involvement in and awareness of the standards development process either as a committee member or as a canvassee. If you aren't involved as an influence in the development process you will be left out and a standard could be to your disadvantage. It is suggested that the ANSI activities could be followed by means of a subscription to ANSI's *Standards Action,* a publication that reports on all standards activities on

a bi-weekly basis. You will find a selected list of material handling related ANSI specifications at the end of this paper.

4.0 REGULATIONS

Regulations are, typically, 'Rules of Law' as in the Code of Federal Regulations (CFR) or as in the ADA (Act for Disabled Americans). The *Code of Federal Regulation*s is one place where we find the rules set down by the federal government to cover many different issues.

An example of one of these regulations is covered by 29CFR-1910 and is commonly referred to as the OSHA regulation. This regulation is, of course, vigorously enforced. On a similar note the "Act for Disabled Americans Accessibility Guidelines "(ADAAG) was developed by HUD and is a Federal Regulation enforceable by law. This was HUD's effort to comply with the "Act for Disabled Americans". The ANSI Standard A-117 covers implementation of the guidelines and it was in place before the ADAAG rules came out. It appears that the rule to follow would be ADAAG since it is a regulation but, don't move too fast. In many cities and towns the A-117 has been adopted so it too has the force in those locations. The obvious question, since there is conflict on some items in the two documents that could be followed is "What should you do?" My thought is to follow a) the more rigorous of the two or b) go with the rules that are enforced more regularly and rigorously in the area in question.

Generally we can say:

- A Regulation is typically enforceable by law
- A Standard is voluntary and is not enforceable unless it is a requirement of a project specification, a code that requires compliance or a contractual issue

One other consideration is that ignoring a standard can sometimes be used against a defendant in a lawsuit.

5.0 MATERIAL HANDLING EQUIPMENT: COMPLYING WITH CODES, STANDARDS AND REGULATIONS

Who is responsible for compliance with codes and regulations?

You, the owner or senior executive, have primary responsibility as with everything else at your facility.

Who will enforce your compliance with codes and regulations?

The state and/or federal OSHA inspectors and local building officials will take care of the enforcement issue.

Is this good? Certainly it is. These things helped give you the assurance of the structural design integrity and other lifesaving features designed into your facility due to requirements of the building codes. You also get to realize the advantages you have achieved by doing the safety and

reliability planning encompassed in the various standards you asked your vendors to follow. Furthermore your demand for certification of compliance helped you to assure yourself that you received what you specified.

What about the material handling equipment and the installation of this equipment? ----- Are you addressing and complying with the appropriate standards? ----- Maybe you are. Who knows what the vendor is doing relative to this subject and just "maybe" you should be demanding compliance from your vendors and their subcontractors.

If this all sounds like a big pain, then believe me, it gets worse if you don't address the subject.

As system planners, how can you reassure yourself and your client now and in the future that the system installed will perform as planned? Standards implementation and an ongoing audit program are the only way.

Your warehouse or plant managers should educate themselves and their purchasing department personnel regarding the absolute need to specify certified compliance with all appropriate codes, standards, and regulations. When this approach is taken you can expect to receive equipment designed to meet your performance demands based upon design and testing to compliance with a standard. These steps will bring you a "right sized" system purchased at a competitive price that *will* do the job.

If you are unfortunate enough to have a failure or personal injury accident at your site and a forensic engineer hired by some lawyer comes calling you will be able to prove that your planners complied with the rules and did all possible to prevent that kind of an event.

Unfortunately, we occasionally encounter sales people and other employees of resale organizations who are not fully schooled and conversant with codes, standards, and regulations applicable to the equipment they sell and/or install. In addition, imported equipment may not comply with U.S. standards and the buyer, in many cases, becomes aware of this lack of compliance when it is too late. For these reasons we strongly recommend the insistence on certification of compliance with appropriate published documents.

Vendor Benefits that may be realized when appropriate Standards, Codes, and Regulations are observed:

- Perception of favorable comparison to competitive brands
- Reassurance of users
- Peer pressure if non-compliant
- Mitigate costs and awards associated with litigation
- Provide appropriate interfaces with associated technology
- Provide a smoothly operating, trouble free system

- Provide yourself with a happy client

6.0 WHAT'S NEXT?

New concepts in formatting and writing of codes and standards are rapidly appearing . I am referring to "Performance Based Specifications" as opposed to many of the current prescriptive documents, especially the Building Codes. The Model Code organizations are now moving toward performance specifications which will begin appearing in the second edition (2003) of the International Building Code.

Many other SDO's are moving rapidly to performance based standards in order to realize the potential for technological advancements and associated cost savings that may become available with performance based requirements. For example, The US Department of Defense has come a long way down this road with their suppliers and realized considerable savings simply by removing the "chains" known as MIL-SPECS that bound these suppliers in the past. There are articles available that discuss what performance specifications are and why they should be considered[2][3]. These articles are provided as handouts and may be obtained from Material Handling Industry. Also available is a recently completed Pallet Performance specification for use with mechanized/automated systems. Information on the three current Model Code organizations is also available in a booklet named *Codes Forum* and is published bi-monthly by the Forum that consists of three members; BOCA, ICBO, and SBCCI. This is the group that has been working together to write the single model building code to be used throughout the US and to be known as the International Building Code.

There is one other issue that you must also take under consideration. The NIOSH recommendations and formulas for Ergonomic issues have not yet been accepted and written into the OSHA specifications. However, this may not be too long in coming although it is a highly political matter. We have heard reports that some OSHA inspectors are already enforcing these recommendations using the General Duty clause as their justification. This should be watched closely because the recommendations will result in dramatic changes from previous practice. We are also aware of several other efforts at standardization on ergonomic issues. There is a proposed ANSI standard (developed by the ANSI Z365 committee) under development that is in the process of seeking consensus and expects to get approval and publish in 1999. There is also an effort underway at ASTM to be known as E34485. This is also expected in 1999. Finally we hear that CAL-OSHA is trying to get some ergonomic standards on the street. With all of this going on it would appear that everyone should keep their eyes and ears open.

7.0 ANSI, MHI, AND STANDARDS DEVELOPMENT METHODS

Those companies that choose to get involved in the standards process will be in a stronger competitive position. Those persons responsible for standards work at a company or organization should have some idea of how the ANSI standards process takes place. What follows is an overview of the standards development process and how Material Handling Industry (MHI) acts as a facilitator to help the member companies get involved in the standards setting process.

Many of you recognize the American National Standards Institute (ANSI) as a source of U.S. standards. Keep in mind that ANSI does not develop standards. MHI does not develop standards. MHI acts as a facilitator to aid groups of member companies in the development of standards. Individuals within groups of MHI member companies develop standards through MHI, then ANSI determines whether a fair and proper process was followed in developing the standard. ANSI has sets of rules that guide the standards development process. The first set of rules helps determine whether an organization is accredited to develop standards. Shown below are the three categories of ANSI accreditation and the number of organizations or groups of organizations within each category (according to the ANSI document Accredited Standards Developers, dated March 12, 1998 and available on the web at http://web.ansi.org/public/ref-lib.html):

Accredited Sponsors Using the Canvass Method (90)
Accredited Standards Committees (102)
Accredited Organizations (53)

7.1 The Canvass Method

Most of the standards development effort within MHI's accreditation follows the first method: standards development using the canvass method. This method allows the sponsoring organization to conduct a canvas or mail poll of persons known to be directly or materially affected by the subject covered by the scope of the standard. Organizations using the canvass method include Underwriters Laboratories (as in the familiar UL listing), National Electrical Manufacturers Association (NEMA), MHI, and eighty-seven others. The canvass method allows member companies within a product section or affiliated trade association to form a committee (which can include and has included non-member companies) and develop a standard. The committee essentially has a life only for the duration of the standards setting process. MHI's ANSI approved scope of standard activities by the canvass method consists of the following:

> underhung cranes and monorails; industrial metal containers; overhead traveling cranes; storage racks; shelving; welded wire rack decking; demountable remountable/relocatable multiple use platforms; portable, dock face mounted and fixed loading dock levelers; industrial scissors lifts.

The process begins with submission of a Project Initiation Notification System (PINS) form to ANSI. This form registers the standards development effort with ANSI. ANSI then publishes this information in a publication called Standards Action (available in print or on the web at http://web.ansi.org/rooms/room_14/). PINS forms are submitted when a new standard is being developed and when an existing standard is being revised, reaffirmed, or withdrawn. A list of potential canvassees is developed. We generally call this the pre-canvass list. Nobody is voting at this time, they are just saying, "Yes, I am directly and materially affected by the subject matter in your standard". This list is submitted to ANSI for review and they will announce the call for canvassees in the Standards Action publication in order to solicit additional canvassees who may not have been contacted during the pre-canvass. Once the product section or affiliated trade association based committee has developed a proposed standard, it will be sent to the canvass list. The canvassees may then approve, object (with reasons), abstain (with comment), or not

participate in the canvass mail ballot. All objections are given proper consideration by the committee and canvassees, but approval only requires a majority of the canvass list and at least two-thirds of those voting, excluding abstentions. A public review period is also required to ensure that all interested parties have a chance to state any objections. Public review is announced in Standards Action, appropriate trade publications, and to appropriate U.S. Technical Advisory Groups. If objections result in substantive changes, canvassees will receive those changes and a new ballot must be circulated. Once all objections have been appropriately addressed, the proposed standard is submitted to ANSI. The Board of Standards Review (BSR) at ANSI is responsible for the final review of standards. Once the board provides its approval, you have a genuine ANSI standard. The process is not complex in theory, but takes much work and patience by individuals on the standards committee.

7.2 MH10: Developing Standards by the Accredited Committee Method

MHI is also involved in the standards development process using the second category of accreditation by serving as secretariat of the accredited standards committee ASC MH10 Unit-Loads and Transport-Packages. This committee is concerned with standards development in the areas of unit-loads and transport-packages. Committee activities include work on sizes, heights, testing, terminology, sacks and bags, and coding and labeling.

The scope of the committee effort is as follows:

> *To facilitate freight movement within transportation and distribution systems by providing standards for transport-packages and unit-loads, including their dimensions, definitions, terminology, coding, labeling, and performance criteria; and to represent the United States' interests within the scope of ISO/TC 122 - Packaging*

The information below from ANSI provides a good description of why the committee method is best to serve these interests:

> "The committee method is most often used when a standard affects a broad range of diverse interests or where multiple associations or societies with similar interests exist. The committee serves as a forum where many different interests, without a common membership in an organization or society, can be represented. Accredited standards committees are administered by a secretariat, an organization that takes the responsibility for providing administrative oversight of the committee's activities and ensuring compliance with the pertinent operating procedures."

The last sentence describes the MHI role in MH10, as the secretariat that oversees and coordinates the overall committee efforts.

The scope of MH10's efforts are currently divided into a set of subcommittees as shown below:

SBC-1 Unit-Load & Transport-Package Sizes
SBC-3 Package Testing Standards
SBC-4 Definitions and Terminology
SBC-6 Standardization of Unit-Load Heights
SBC-7 Sacks & Multi-Wall Bag Standards
SBC-8 Coding & Labeling of Unit-Loads

These subcommittees may be further divided into working groups (WG) to address specific issues or to work on specific standards.

When you look at a committee member list of an MHI sponsored standards development effort using the canvass method, you typically see a list of individual companies. Most, if not all, of these companies are members of MHIA and members of a product section of MHI. Representatives of those companies gather together, facilitate development of a standard, vote on internal approval of the proposed standard, then send the proposed standard out to a canvass list of materially affected organizations, companies, and consultants. At this point, the committee has only one vote, just like each of the external materially affected parties. Some of you have experienced this process through your work with an MHI product section.

When you look at the list of committee members for the MH10 accredited committee, you see a list of organizations rather than individual MHIA member companies. The organizations have individual contacts that are responsible for voting their organization's position on proposed standards. In contrast, a canvass list may contain a mixture of organizations, individual companies, and consultants. There is no canvass list for an accredited standards committee. The committee is assumed to already contain all of the materially affected organizations. Outside expertise may be solicited to provide additional information or reports, but all of the voting is internal.

The MH10 committee is also the US Technical Advisory Group (TAG) to ANSI for ISO/TC 122 – Packaging. The TC stands for Technical Committee. In this capacity, MH10 acts as the US voice to the international standards development community concerning packaging issues.

As part of its international activities, the United States, through MH10 convened a working group to develop the world's first bar coding standard for unit loads and transport packages. The document was recently approved as an international standard (the last designation was as a Draft International Standard (DIS) 15394).

The MH10 committee developed the standard ANSI MH10.8.M – 1993: Unit Loads and Transport Packages – Bar Code Symbols, to facilitate the movement of goods and information between trading partners. The standard provides guidance for the labeling and direct marking of unit loads and transport packages by providing requirements for printing, physical parameters, orientation, and placement of bar codes.

Other significant standards efforts by MH10 are itemized below:

MH10.1M	For Unit Loads and Transport Packages - Heights
MH10.6M	For Unit Loads and Transport Packages - Size
MH10.8	For Unit Loads and Transport Packages - Bar Codes
MH10.8.2	For Unit Loads and Transport Packages - Data/Application Identifiers
MH10.8.3	For Unit Loads and Transport Packages - Two Dimensional Labels

8.0 HOW CAN I OBTAIN ANSI AND/OR OTHER STANDARDS?

There is still no single source for ordering all standards, but it is getting much easier to find standards thanks to the internet and to the efforts of the American National Standards Institute (ANSI) and the International Standards Organization (ISO). You should place the following sites in a Standards bookmark folder for future reference:

www.ansi.org	American National Standards Institute
www.nssn.org	National Standards Systems Network (also an ANSI site)
www.iso.org	International Organization for Standardization
www.wssn.net	World Standards Services Network

8.1 American National Standards Institute

ANSI is well known as the national resource for standards information. Material Handling Industry has a policy that all standards created within the product sections will follow ANSI canvass procedures (as previously described). You can find information on standards development methods, ANSI's procedures, Standards Action, accredited developers and contacts, and all ANSI personnel and their areas of responsibility. If you want to get into the standards development process, you might also take a careful look at the training materials and courses that ANSI has available.

8.2 National Standards Systems Network

NSSN is a good central point to find standards from a variety of standards developing organizations. NSSN allows you to search for a specific standard, lets you track the status of standards work in progress, or aids in identifying contact persons to interpret standards. The national in the title is a bit of a misnomer because NSSN goes well beyond national standards. The site now contains standards information from more than 600 national, foreign, regional and international bodies.

8.3 International Organization for Standardization

The International Organization for Standardization (ISO) was established in 1947 and is a worldwide federation of national standards bodies from some 130 countries, one from each country. ANSI places our one vote in the international arena. ISO promotes the development of standards internationally in much the same way as ANSI promotes the development of standards nationally. ISO's work results in international agreements which are published as International Standards.

You very likely notice that the short form of the name, ISO, and the long form, International Organization for Standardization, do not seem to match. ISO states that the ISO is not an acronym, but is “derived from the Greek isos, meaning "equal"”

The ISO site contains much of the same procedural and organizational information as the ANSI site. A good introduction to ISO may be found at the following web address: http://www.iso.ch/infoe/intro.html

8.4 WORLD STANDARDS SERVICES NETWORK

The World Standards Services Network (WSSN) acts as a central resource for ISO in the same way the NSSN is a central resource for ANSI. It has links to publicly accessible World Wide Web servers of standards organizations around the world. Information on international, regional and national standardization and related activities and services is provided through member’s web servers.

9.0 REFERENCES

[1] Durbin, Don (1998). “Summary of Model Building Code Organizations and Publications”, Material Handling Industry

[2] Tubbs, Beth, Armstrong, Paul, and Bowman, David (1997). “Performance-based Codes – What are They Anyway?”, Building Standards, May-June 1997, pp. 4-6.

[3] Evans, Douglas (1997). “Changing Mindsets Is Key to Performance-based Codes”, Building Standards, May-June 1997, pp. 7-8.

SELECTED LIST OF RELATED ANSI SPECIFICATIONS

Revised 10-12-98
American National Standards 1997 Catalog

SPECIFICATION	AFFECTED PRODUCT GROUPS
ANSI A10.5-1992 Material Hoists, Safety Requirements for	HMI, CMAA
ANSI A10.13-1989 Steel Erection, Safety Requirements for	AMM, SMA, RMI, AS/RS, CMAA
ANSI A10.18-1983 Floor and Wall Openings, Flat Roofs, Stairs, Railings and Toeboards, Construction Safety Requirements for Temporary	AMM, SMA, RMI
ANSI/CABO A117.1-1992 Accessible and Usable Buildings and Facilities	ALL
ANSI C2-1993 AEM,MMA,LODEM National Electrical Safety Code	HMI,CMAA, AS/RS, AGV, CONVEYOR
ANSI MH2-1991 **Steel Drums and Pails, Universal**	
ANSI MH5.1.5-1990 Road/Rail Closed Dry Van Containers	
ANSI MH5.1.3M-1982 Tank Containers for Liquids and Gases, Requirements for	
ANSI MH5.1.9 Freight Containers, Automatic Identification	
ANSI MH5.3M-1982 Identification and Marking Cargo Containers, Specifications for	
ANSI MH5.6-1990 Basic Interface Requirements for Cargo Container Chassis	
ANSI MH10.1M-1980 Unit-Load and Transport Package Sizes (includes supplement ANSI MH10.1Ma)	RMI, AS/RS,CONVEYOR,AGV
ANSI MH10.1Ma-1983 Unit-Load and Transport Package Sizes (supplement to ANSI MH10.1M-1980)	RMI, AS/RS, CONVEYOR,AGV
ANSI MH10.6M-1990 Surface Vehicles - Unit-Load Heights for Palletized Loads	RMI, AS/RS, CONVEYOR,AGV

ANSI MH10.8M-1993 Bar Code Symbols on Transport Packages and Unit Loads, Specifications for	RMI, AS/RS,CONVEYOR,AGV
ANSI MH10.8.2-1995 Data application identifier standard	
ANSI MH10.8.3M-1996 Material Handling Unit Loads and Transport Packages Two Dimensional Symbols	
ANSI MH16.2-1984(r 1996) Industrial and Commercial Steel Storage Racks, Safety Practices for the Use of	RMI
ANSI MH26.1-1991 Industrial Metal Containers(in process)	IMC
ANSI MH26.2-1997 Wire Rack Decking (in process)	RMI,SMA,IMC
ANSI MH27.1-1981 Cranes and Monorail Systems, Specifications for Underhung	CMAA,AEM,MMA
ANSI MH28.1-1982(in process) Industrial Grade Steel Shelving, Specification for the Design, Testing, Utilization, and Application of MHI Standard revised version waiting for printing	SMA
ANSI MH29.1-1994 Safety Requirements for Industrial Scissor Lifts (in process)	LIFT
ANSI MH30.1-1993 Safety, Performance and Testing of Dock Leveling Devices(in process) MHI Standard undergoing revision.	LODEM
ANSI Z94.0-1989 Industrial Engineering Terminology	ALL
ANSI Z244.1-1982(R1993) Lock Out/Tag Out of Energy Sources, Safety Requirements for the	AS/RS,MMA,AEM,CMAA
ANSI Z535.1-1991 Safety Color Code On hand	ALL
ANSI Z535.2-1991 Environmental and Facility Safety Signs On hand	ALL
ANSI Z535.3-1991 Criteria for Safety Symbols On hand	ALL
ANSI Z535.4-1991 Product Safety Signs and Labels On hand	ALL
ANSI Z535.5-1991 Accident Prevention Tags On hand	ALL

ANSI/ACI 301-84 Structural Concrete for Buildings, Specifications for	RMI,SMA,AS/RS,AMM
ANSI/ACI 318-89 Building Code Requirements for Reinforced Concrete and Commentary	RMI,SMA,AS/RS,AMM
ANSI/ACI 318M-83 Building Code Requirements for Reinforced Concrete	RMI,SMA,AS/RS,AMM
ANSI/ACI 318.1-83 Structural Plain Concrete, Building Code Requirements for	RMI,SMA,AS/RS,AMM
ANSI/ACI 318.1M-83 Building Code Requirements for Structural Plain Concrete	RMI,SMA,AS/RS,AMM
ANSI/ASCE 7-95 Minimum Design Loads for Buildings and Other Structures On hand	RMI,SMA,AS/RS,AMM
ANSI/ASME B20.1-1993 Conveyors and Related Equipment, Safety Standards for (includes revision service)	CONVEYOR
ANSI/ASME B29.24M-1995 Roller Load Chains for Overhead Hoists	HMI
ANSI/ASME B30.2-1996 Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist) (includes revision service)	CMAA
ANSI/ASME B30.9-1996 Slings, (includes revision service)	CMAA,HMI,AEM,MMA
ANSI/ASME B30.10-1993 Hooks, (includes revision service)	CMAA,HMI,AEM,MMA
ANSI/ASME B30.11-1993 Monorails and Underhung Cranes (includes revision service)	CMAA,HMI,AEM,MMA
ANSI/ASME B30.13-1996 Storage/Retrieval (S/R) Machines and Associated Equipment (includes revision service)	AS/RS
ANSI/ASME B30.14-1996 Side Boom Tractors (includes revision service)	ITA
ANSI/ASME B30.16-1993 Overhead Hoists (Underhung) (includes revision service)	HMI,CMAA
ANSI/ASME B30.17-1992 Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist) (includes revision service)	CMAA

ANSI/ASME B30.18-1993 Stacker Cranes (Top or Under Running Bridge, Multiple Girder with Top or Under Running Trolley Hoist) (includes revision service)	CMAA
ANSI/ASME B30.20-1993 Below the Hook Lifting Devices (includes revision service)	OCM
ANSI/ASME B56.1-1993 Low Lift and High Lift Trucks (includes revision service)	ITA
ANSI/ASME B56.5-1993 Guided Industrial Vehicles (includes revision service)	AGV
ANSI/ASME B56.6-1992 Rough Terrain Forklift Trucks (includes revision service)	ITA
ANSI/ASME B56.7-1987 (R 1992) **Industrial Crane Trucks (includes revision service)**	**ITA**
ANSI/ASME B56.8-1993 Personnel and Burden Carriers (includes revision service)	ITA
ANSI/ASME B56.9-1992 Operator Controlled Industrial Tow Tractors (includes revision service)	ITA
ANSI/ASME B56.11.1-1992 Double Race or Bi-Level Swivel and Rigid Industrial Casters (includes revision service)	
ANSI/ASME B56.11.3-1992 Load Handling Symbols for Powered Industrial Trucks (includes revision service)	ITA
ANSI/ASME B56.11.4-1992 Forks and Fork Carriers for Powered Industrial Fork Lift Trucks, Hook Type (includes revision service)	ITA
ANSI/ASME HST-1M-1989 (R 1995) Hoists, Performance Standard for Electric Chain	HMI,CMAA
ANSI/ASME HST-2M-1989 (R 1995) Hand Chain Manually Operated Chain Hoists, Performance Standard for	HMI
ANSI/ASME HST-3M-1991 (R 1996) Chain Hoists, Performance Standard for Manually Lever Operated	HMI
ANSI/ASME HST-4M-1991 (R 1996) Overhead Electric Wire Rope Hoists, Performance Standard for	HMI,CMAA
ANSI/ASME HST-5M-1991 (R 1996) Air Chain Hoists, Performance Standard for	HMI,CMAA

ANSI/ASME HST-6M-1986 (R 1995) Performance Standard for Air Wire Rope Hoists	HMI,CMAA
ANSI/ASME MH1.1.2-1989 (1996) Pallet Definitions and Terminology	RMI,AS/RS,RPCPA
ANSI/ASME MH1.2.2M-1989 (1996) Pallet Sizes	RMI,AS/RS,RPCPA
ANSI/ASME MH1.4.1M-1989 (1996) Testing Pallets, Procedures for	RMI,AS/RS,RPCPA
ANSI/ASME 1.5M-1993 Slip Sheets	RMI,AS/RS,RPCPA
ANSI/ASME MH1.6-1996 Standard Procedures for Determination of Durability of Wooden Pallets and Related Structures (includes revision service)	
ANSI/ASME MH1.7M-1996 N/A Driven Fasteners for Assembly of Pallets and Related Structures	
ANSI/ASME 1.8M-1996 Wood Pallets	
ANSI/ASME MH1.9-1993 Export Pallets	
ANSI/ASME NOG-1-1989 Cranes, Overhead and Gantry (Top Running Bridge, Multiple Girder), Rules for Construction of (includes revision service) **ANSI/ASME PALD-11-1993** Wheel Dollies (includes revision service)	CMAA
ANSI/AWS D1.1-1996 Structural Welding Code - Steel	
ANSI/AWS D14.1-85 (R 1991) Cranes and Other Material Handling Equipment, Specification for Welding of Industrial and Mill	RMI,SMA,AS/RS,CMAA
ANSI/CEMA 102-1994 Terms and Conveyor Definitions	CONVEYOR
ANSI/CEMA 300-1988 **Screw Conveyors, Dimensional Standards**	CONVEYOR
ANSI/CEMA 350-1988 Screw Conveyors	CONVEYOR
ANSI/CEMA 401-1994 Unit Handling Conveyors - Roller Conveyor - Non-Powered	CONVEYOR
ANSI/CEMA 402-1992 Unit Handling Conveyors - Belt Conveyors	CONVEYOR

ANSI/CEMA 403-1985 Unit Handling Conveyors - Belt Driven Live Roller Conveyors	CONVEYOR
ANSI/CEMA 404-1985 Unit Handling Conveyors - Chain Driven Live Roller Conveyors	CONVEYOR
ANSI/CEMA 405-1985 Package Handling Conveyors - Slat Conveyors	CONVEYOR
ANSI/CEMA 501.1-1988 Welded Steel Wing Pulleys, Specifications for	CONVEYOR
ANSI/CEMA B105.1-1992 Specification for Welded Steel Conveyor Pulleys	CONVEYOR
ANSI/NAAMM MBG 531-93 Metal Bar Grading Manual	AMM,RMI,SMA
ANSI/NAAMM MBG 532-1994 Heavy-Duty Metal Bar Grating Manual	AMM,RMI,SMA
ANSI/NFPA 70-1996 National Electrical Code	AGV,AEM,CMAA,MMA
ANSI/NFPA 70B-1994 Electrical Equipment Maintenance	
ANSI/NFPA 70E-1995 Employee Work Places, Electrical Safety Requirements for	
ANSI/NFPA 70 Handbook - 1996 National Electrical Code Handbook (includes ANSI/NFPA 70-1990) (NOT AN AMERICAN NATIONAL STANDARD)	
ANSI/NFPA 203-1995 Roof Coverings and Floor Deck Construction	AMM,RMI,SMA
ANSI/NFPA 231C-1995 Rack Storage of Materials	RMI,SMA,AS/RS
ANSI/NFPA 232-1995 Protection of Records	RMI,SMA
ANSI/NFPA 232A-1995 Archives and Record Centers	RMI,SMA
ANSI/NFPA 505-1992 Powered Industrial Trucks, Including Type Designations, Areas of Use, Maintenance, and Operation	ITA
ANSI/RIA R15.06-1992 Industrial Robots and Industrial Robot Systems, Safety Standard for	
ANSI/SAE AMS 2825A (R 1993) Material Safety Data Sheets	ALL
ANSI/SAE ARP 1372A Minimum Requirements for Air Cargo Unit Load Device Ground Handling and Transport Systems	

ANSI/SAE ARP 1395 (R 1989) Wide-Body Aircraft Cargo Systems and Compartments (Intermodal), Minimum Requirements for Future	
ANSI/SAE ARP 1554A Auto Transport Unit Load Devices	
ANSI/SAE J96-MAR86 Lamp for Industrial Equipment, Flashing Warning	ITA,AGV
ANSI/SAE J180-MAY87 Electrical Charging Systems for Construction and Industrial Machinery	ITA,AGV
ANSI/SAE J297-Aug. 94 Operator Controls on Industrial Equipment	ITA,CMAA,HMI
ANSI/SAE J699-NOV85 Average Vehicle Dimensions for Use In Designing Docking Facilities for Motor Vehicles	LODEM
ANSI/SAE J721-FEB93 Operating Requirements for Tractors and Power Take-Off Driven Implements	ITA
ANSI/SAE J959-MAY91 Lifting Crane, Wire-Rope Strength Factors	HMI,CMAA
ANSI/SAE J999-OCT80 Crane Boom Hoist Disengaging Device	HMI,CMAA
ANSI/SAE J1042-JUN93 Operator Protection for General Purpose Industrial Machines	ITA
ANSI/SAE J1092-JUNE86 Nomenclature - Industrial Tractors (Wheel)	ITA
ANSI/UL 508-1988 Industrial Control Equipment	AGV,ISC
ANSI/UL 558-1991 Internal-Combustion-Engine-Powered Industrial Trucks	ITA
ANSI/UL 583-1991 Electric-Battery-Powered Industrial Trucks	ITA,AGV

This listing of standards is not necessarily all inclusive. Standards for plastics or other specific materials as well as those covering electrical or electronic issues are not referenced. The listing was developed as an effort to list the more common and frequently referenced standards applying to material handling equipment and devices.