



## **INTRODUCING HMI**

Founded in 1956, **The Hoist Manufacturers Institute (HMI)**, an affiliate of Material Handling Industry, is a trade association of manufacturers of overhead handling hoists. The products of its member companies include hand chain hoists, ratchet lever hoists, trolleys, air chain and air rope hoists, and electric chain and electric wire rope hoists.

HMI operates through committees with programs and policies reviewed and adopted by the membership with representation from each member company. Its many activities include an active engineering committee. HMI is represented on a number of standards developing committees and actively supports the development and certification of safety standards by the ANSI consensus method.

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### **Our Members**

HMI member companies are recognized as the leading authority and the principle resource in the Hoist Industry. The HMI members are concerned, conscientious manufacturers affiliated in an industry association to provide voluntary standards for the mechanical, structural and electrical design of hand chain hoists, ratchet lever hoists, trolleys, air chain and air rope hoists, and electric chain and electric wire rope hoists and to formulate guidelines for the proper use, operation and maintenance of that equipment.

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### **Our Association**

HMI is a member driven organization. To qualify for membership a company must manufacture or as a partial manufacturer of overhead hoists has engineered and designed its own overhead hoists and assembled continuously the major hoist components for at least a three-year period prior to its application for membership.

Member companies of HMI meet regularly to review, discuss and revise the standards for design, performance and proper operation. HMI member companies have committed to the development, maintenance and publishing of industry standard specifications.

Additionally, HMI has prepared, published and distributes Training, Inspection and Maintenance recommendations that are available to all hoist users, such as the Hoist Operators Manual, Hoist Inspection and Maintenance Personnel Manual, Manually Lever Operated Hoist Inspection and Hoist Maintenance Personnel Manual, and the Manually Lever Operated Hoist Operators Manual.

The Occupational Safety and Health Administration (OSHA) recently announced an alliance with the Monorail Manufacturers Association (MMA), the Crane Manufacturers Association of America (CMAA) and the Hoist Manufacturers Institute (HMI). The purpose of this alliance is to provide monorail systems, crane and hoists owners and operators with information, guidance, and access to education and training resources that will advance their workplace safety and health.

Member companies participate in a requisite number of regularly scheduled meetings which among other things further the ongoing process of revising and updating today's standards to meet the ever-changing demands of technology and the modern industrial environment.

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HOIST MANUFACTURERS INSTITUTE

## Members of the Hoist Manufacturers Institute, Inc.

### **Acco Chain & Lifting Products**

*Member Date 1966*  
P.O. Box 792  
76 Acco Drive  
York, PA 17405-0792  
(800) 967-7333  
[www.accolifting.com](http://www.accolifting.com)

### **Ace World Companies Inc.**

*Member Date 1993*  
10200 Jacksboro Highway  
Fort Worth, TX 76135  
(817) 237-7700  
[www.aceworldcompanies.com](http://www.aceworldcompanies.com)

### **Chester Hoist**

*Member Date 1970*  
P.O. Box 449  
7573 State Route 45, North  
Lisbon, OH 44432  
(330) 424-7248  
[www.cmworks.com](http://www.cmworks.com)

### **Coffing Hoists**

*Member Date 1957*  
P.O. Box 411245  
Charlotte, NC 28241-7010  
(704) 583-0095  
[www.cmworks.com](http://www.cmworks.com)

### **Columbus McKinnon Corporation**

*Member Date 1968*  
140 John James Audubon Parkway  
Amherst, NY 14228-1197  
(716) 689-5400  
[www.cmworks.com](http://www.cmworks.com)

### **Demag Cranes & Components Corp.**

*Member Date 1985*  
29201 Aurora Road  
Solon, OH 44139-1895  
(440) 248-2400  
[www.demag-us.com](http://www.demag-us.com)

### **Electrolift, Inc.**

*Member Date 1984*  
204 Sargeant Avenue  
Clifton, NJ 07013  
(973) 471-0204  
[www.electrolift.com](http://www.electrolift.com)

### **Harrington Hoists Inc.**

*Member Date 1976*  
401 West End Avenue  
Manheim, PA 17545  
(800) 233-3010  
[www.harringtonhoists.com](http://www.harringtonhoists.com)

### **Ingersoll-Rand Company**

*Member Date 1968*  
P.O. Box 970  
Annandale, NJ 08801  
(908) 238-7000  
[www.irco.com](http://www.irco.com)

### **J.D. Neuhaus L.P.**

*Member Date 2003*  
9 Loveton Circle  
Sparks, MD 21152  
(410) 472-0500  
[www.jdneuhaus.com](http://www.jdneuhaus.com)

### **Morris Material Handling, LLC**

*Member Date 1970*  
315 West Forest Hill Avenue  
Oak Creek, WI 53154  
(414) 764-6200  
[www.morriscranes.com](http://www.morriscranes.com)

### **R&M Materials Handling, Inc.**

*Member Date 1947*  
4501 Gateway Boulevard  
Springfield, OH 45502-9339  
(937) 328-5100  
[www.rmhoist.com](http://www.rmhoist.com)

### **Ratcliff Hoist Company**

*Member Date 1973*  
1655 Old County Road  
San Carlos, CA 94070  
(650) 595-3840  
[www.beratcliff@yahoo.com](mailto:www.beratcliff@yahoo.com)

### **STAHL CraneSystems, Inc.**

*Member Date 2003*  
6420 Dorchester Road  
Charleston, SC 29418  
(843) 767-1951  
[www.stahlus.com](http://www.stahlus.com)

### **Yale Lift-Tech**

*Member Date 1970*  
P.O. Box 769  
Muskegon, MI 49443-0769  
(231) 733-0821  
[www.cmworks.com](http://www.cmworks.com)



## **HMI – HOISTS- BASICS AND STANDARDS**

### **COMPENDIUM OF BASIC INFORMATION AND STANDARDS FOR HOISTS**

#### **PURPOSE**

This HMI web page has been developed by member companies of the Hoist Manufacturers Institute (“HMI”), a trade association of Hoist Manufacturers, to familiarize potential hoist purchasers and users with the many different types of material handling hoists, hoist terminology, and hoist standards, as applicable in the United States, and in various countries and regions of the world. Standards may be mandatory by way of national or regional regulation, or voluntary as recommended by an engineering or manufacturers organization.

HMI believes that this overview may be helpful given the ever shrinking world wherein hoist products increasingly pass across international borders with resulting questions by the hoist purchaser and installer as to a hoist’s governing design and safety specifications from various regions and countries of the world.

The HMI involves itself in activities according to its Vision and Mission statement.

#### **MISSION**

To deliver exceptional value to our members, channel partners, consumers, end-users, and industry associates. HMI achieves this through:

- Educational Materials
- Marketing Information
- Standards Development
- Member Professional Development

## **VISION**

HMI is recognized as the leading authority and the principal resource in the hoist industry.

HMI is recognized as the leading advocate for the safe application and operation of hoisting equipment and related products.

HMI conducts business professionally with a spirit of enthusiasm, cooperation, honesty and integrity.

HMI's members are recognized as:

- The leaders in the marketplace
- Delivering superior value in their products and services
- Providing products and services that are safe and productive
- Providing high value solutions through knowledgeable and expert channel partners
- Providing an environment in which our customers can confidently purchase and derive superior value from our products

## **DISCLAIMER**

This Standards Overview for Overhead Hoists (“Overview”) is advisory only and has been promulgated by the Hoist Manufacturers Institute (“HMI”) with the sole intent of offering information for interested parties. HMI makes no warranties whatsoever in connection with this Comparison. HMI specifically disclaims all implied warranties of merchantability or of fitness for a particular purpose. Further HMI, its officers, agents and employees shall not be liable in tort, contract or otherwise – whether based on warranty, negligence, strict liability or any other theory of liability for any action or failure to act in connection with this Overview and this information, it being the user's intent and understanding to absolve and protect HMI, its successors and assigns, officers, agents and employees, from any and all liability in tort, contract or other liability

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Fax: 704-676-1199

## **Hoist Basics**

Some basic information about hoists is presented here. More in-depth information is available in the various manuals published by HMI [<http://www.mhiastore.org/category.cfm?Category=40>]

**AN OVERHEAD HOIST IS A MACHINE USED FOR VERTICAL LIFTING OF MATERIAL (NOT PEOPLE) THAT IS FREELY SUSPENDED (UNGUIDED).**

**A MANUALLY LEVER OPERATED HOIST IS A DEVICE USED TO LIFT, LOWER, OR PULL A LOAD (NOT PEOPLE), AND TO APPLY OR RELEASE TENSION TO ITEMS.**

Hoists can provide lifting and lowering motions in an overhead material handling system. When a hoist is mounted to a trolley on a fixed monorail, two directions of load motion are available: forward or reverse, up or down. When the hoist is mounted on a crane, three directions of load motion are available: right or left, forward or reverse, up or down. These systems can achieve straight-line moves, reduce material damage, reduce noise, minimize energy cost, reduce floor-based traffic, improve worker ergonomics, and accomplish other operational objectives.

Usually, a hoist is not a piece of stationary hardware. It is generally available for use whenever required and rarely requires a full time operator. Hoists can be integrated into a variety of automated handling systems.

In an overhead material handling system, hoists provide vertical movement of below-the-hook load supporting and positioning devices.

In any material handling system, the hoist is used to accurately position a load.

The majority of hoists used in the United States are classified as Standard or “packaged hoists”, typically defined as largely self-contained units, prepared to be installed on existing structures. They are selected and installed into an application, often as part of a system. These systems vary greatly from simple, manually controlled systems to complex integrated and automated systems involving sophisticated components and controls. Hoists can be powered manually, with air, hydraulics, or electricity. Trolley selection is dictated by system requirements.

This publication does not specifically address “Built-up Hoists”, which may be covered by other standards, more crane related.

## **Types of Overhead Hoists**

These hoists are defined by:

- Mounting Type – There are eight suspension/mounting methods for overhead hoists: Hook Mounted, Clevis Mounted, Lug Mounted, Trolley Mounted, Deck Mounted, Base Mounted, Wall Mounted, and Ceiling Mounted.
- Lifting Medium – Four types of lifting medium for overhead hoists: Welded Link Chain, Roller Load Chain, and Wire Rope, synthetic web or rope material.
- Power Application – Three methods of applying power for overhead hoists: Manually by Hand Chain, Electric Power, and Air Power.

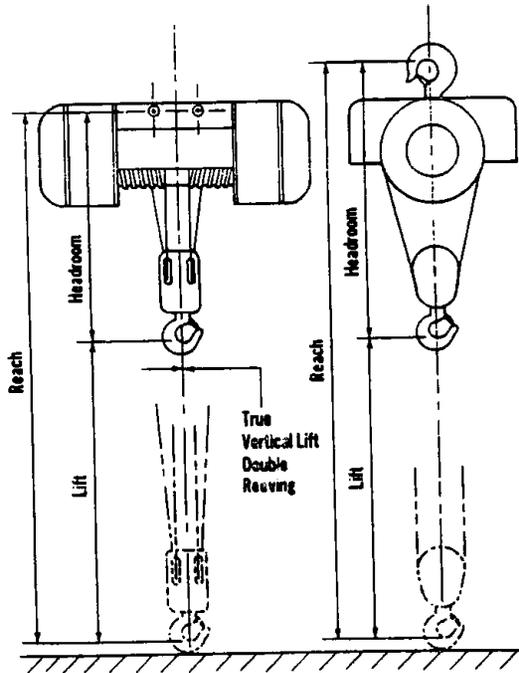
# Overhead Hoist Mounting Types

Hoist mounting selection depends upon the requirements of the application and must be considered in conjunction with other lifting considerations.

Hook  
Lug  
Clevis

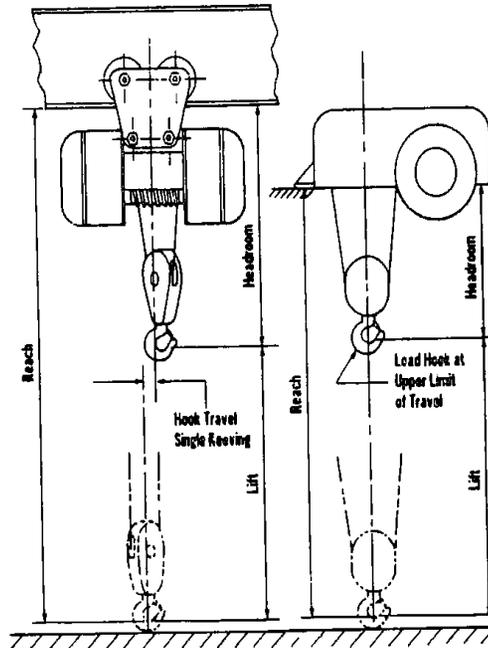
Trolley  
Deck  
Wall  
Base  
Ceiling

**Trolley Types:**  
Plain  
Hand Chain Geared  
Motor Driven



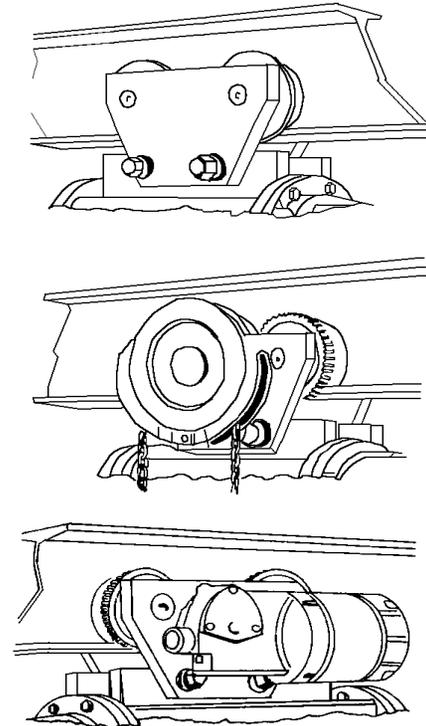
(a) Lug Suspended

(b) Hook Suspended



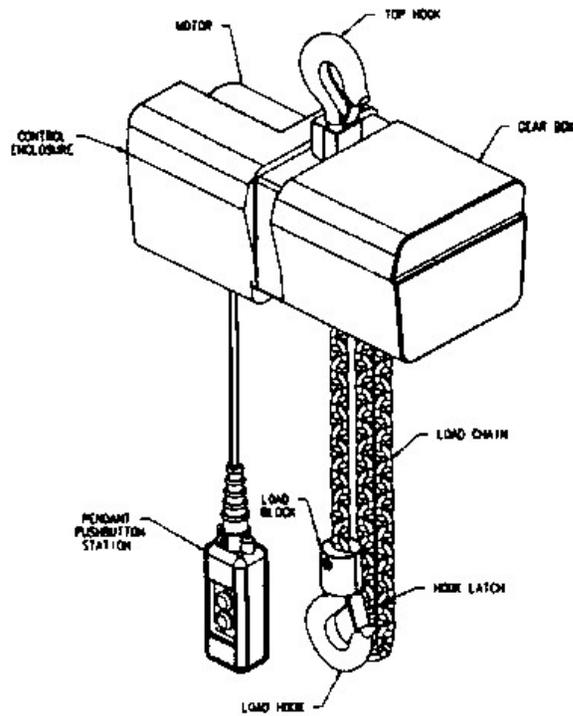
(c) Trolley Suspended

(d) Base or Deck Mount

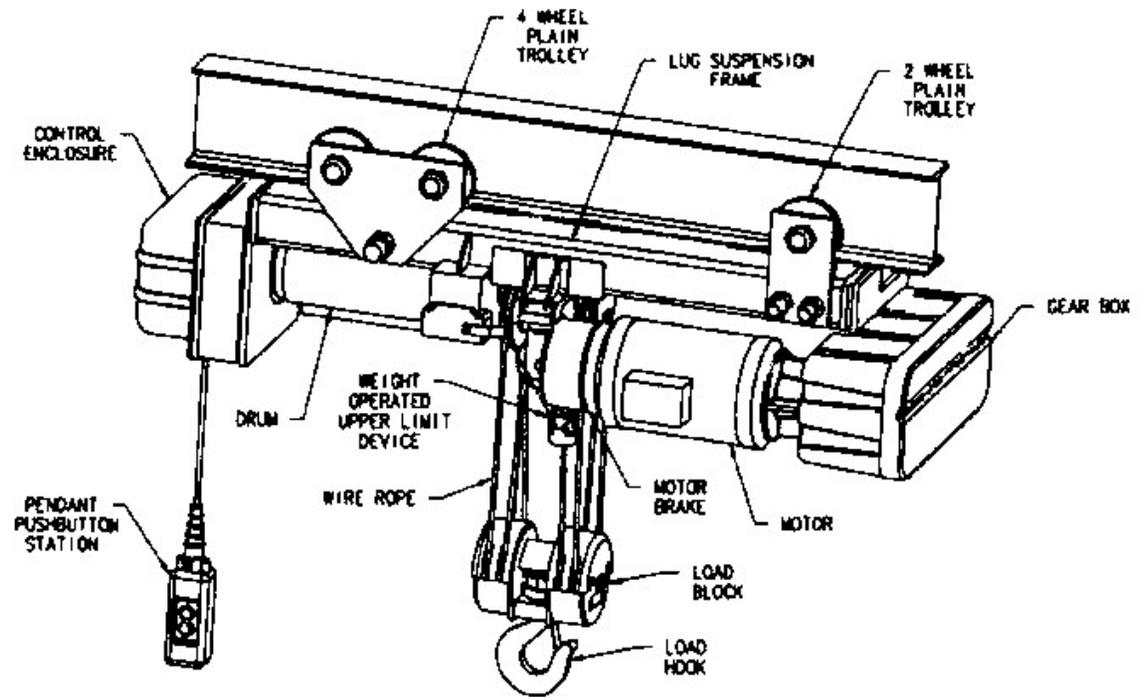


## Overhead Hoist Lifting Media

Welded Link Chain (Roller Load Chain not shown)

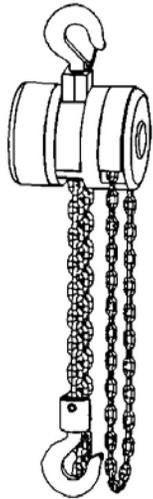


## Wire Rope



## Overhead Hoist Power Application

### Manual, by Hand Chain



### Electric

Electric is the most common power source

### Pneumatic

Pneumatic power is often required in applications of high speed, higher duty cycle involving rapid, repetitive tasks or hazardous areas where electric power is inadvisable.

### Supply Equipment Options

Power supply and control cords, cord reels, hoses, electrification systems, and flexible festooning systems provide means for supplying power to hoists. Such systems must be properly sized and meet all prevailing codes or regulations

### Control Options

A wide range of pendant and remote controls are available to provide suitable and convenient positioning for the operator.

## Operational Considerations

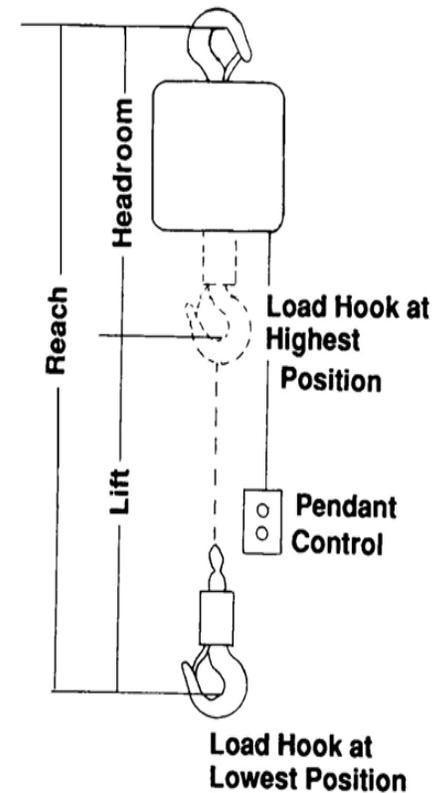
Hoist operators should be trained in the proper use of all hoisting equipment. Many accidents occur because operators simply do not know that they are doing something dangerous. Refer to the manufacturer's parts, maintenance and operating documents.

ASME B30.16 deals with equipment and the workplace safety issues, which apply to all overhead hoists that lift freely suspended unguided loads.

## Lifting Considerations

To select the proper hoist, consider:

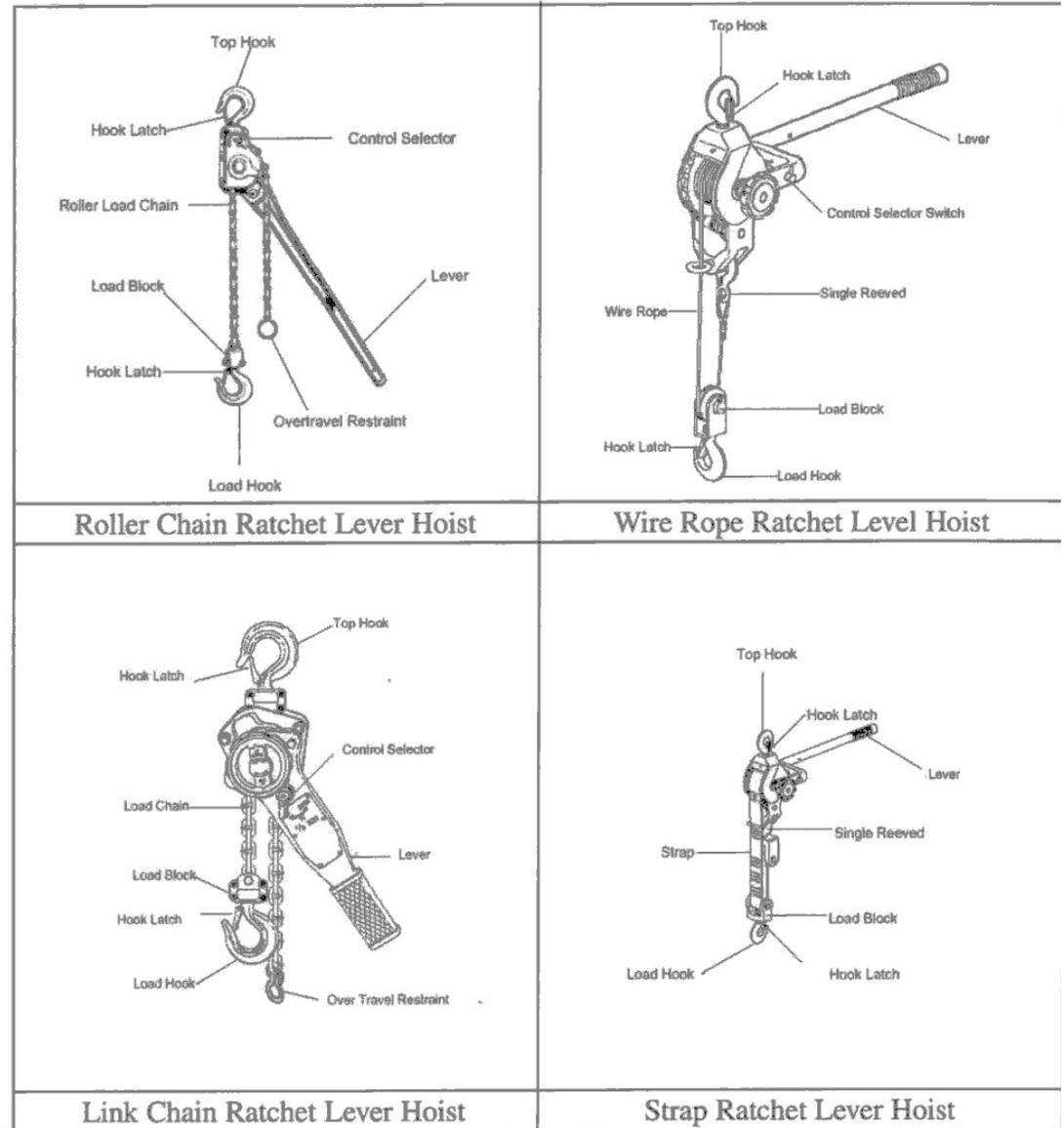
- A. The weight of the load to be lifted including below-the-hook lifting, load supporting, and positioning devices.
- B. Physical size of the load.
  1. Holding and orienting devices.
  2. Design for center of gravity (control & stability).
- C. Lift – the vertical distance the load can be moved.
- D. Clearance Considerations.
  1. Headroom
  2. Obstacles to be cleared during the load transfer.
  3. Design for vertical lift required including holding device height.
- E. Lifting Speed Considerations.
  1. Distance the load is to be raised and lowered
  2. Frequency of usage
  3. Required positioning accuracy
  4. Nature of the load being lifted
- F. Hoist duty Cycle Considerations based on:
  1. Number of lifts per hour
  2. Total number of lifts per shift
  3. Maximum number of starts and stops per hour
  4. Number of shifts per day
  5. Average distance load is raised and lowered
  6. Average weight to be lifted
  7. Maximum weight to be lifted
  8. Frequency of lifts with maximum weight.



## Types of Manually Lever Operated Hoists

These manually lever operated hoists are defined by four types of lifting media:

- Roller Load Chain
- Welded Link Chain
- Wire Rope
- Web Strap.



## Balancers

These overhead devices provide and perform functions different from overhead hoist in that they can lift, lower and float a load. The balancer configurations and suspensions are similar to a hoist.

The balancer functions differently from a hoist. The functional difference is indicated in the name: balancer. A balancer balances the load in a near weightless condition during the lifting operation. This feature allows the operator to maneuver the load easily.

Balancers are often used for awkward and / or rapid load movements. Balancers can also be used to suspend equipment, which is used in repetitive operation.

A variety of control options are available.

A very broad range of load handling devices (end effectors) can expand this product's versatility.

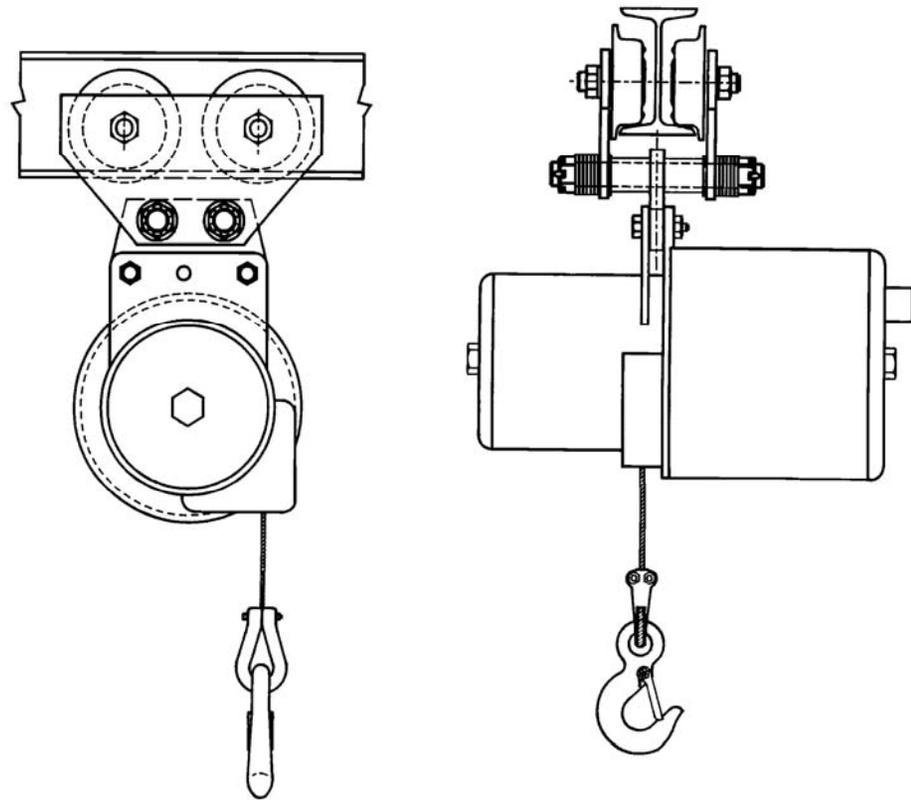
Balancers are typically supported on small jibs, light monorail systems, or enclosed track monorail systems.

### Equipment Characteristics

Vertical lift only

Max. Lifting Capacity: 500 pounds, approx.

Weight: 100 pounds, approx.



Balancers may or may not have been historically designed with hoist standards applied. Work is presently under way by the ASME B30 committee to prepare a safety standard for balancers. When available this standard will be released at B30.28

## Hoist Standards

There are many standards produced by many different standards-writing bodies. In an ever-shrinking world, hoist products increasingly pass across international borders. The list of standards referenced below is by no means complete, yet, in HMI's opinion, represents the standards that are applicable in different regions of the world. Since some of those standards may differ from the country to country, it is important for purchasers, installers, and users to know which ones apply for a particular situation.

### USA

In the USA, the American Society of Mechanical Engineers (ASME; website [www.asme.org](http://www.asme.org)) publishes standards for hoists. Three are safety standards and six are performance standards. All carry the American National Standards Institute (ANSI) designator for a consensus American National Standard (ANS):

ASME-HST-1	Performance Standard for Electric Chain Hoists
ASME-HST-2	Performance Standard for Hand Chain Manually Operated Chain Hoists
ASME-HST-3	Performance Standard for Manually Lever Operated Chain Hoists
ASME-HST-4	Performance Standard for Overhead Electric Wire Rope Hoists
ASME-HST-5	Performance Standard for Air Chain Hoists
ASME-HST-6	Performance Standard for Air Wire Rope Hoists
ASME-B30.7	Safety Standard for Base Mounted Drum Hoists
ASME-B30.16	Safety Standard for Overhead Hoists (Underhung)
ASME-B30.21	Safety Standard Manually Lever-Operated Hoists

OSHA (Parts 1910 and 1926) adopts or invokes the American Society of Mechanical Engineers (ASME) HST Performance and B30 Safety Standards for hoists and related equipment.

Generally, for hoist installations in the US the standards published by the American Society of Mechanical Engineers apply.

## **INTERNATIONAL NON-EUROPEAN**

Outside North America, ISO (International Organization for Standardization) is sometimes referenced. For certain areas of the Asian markets the Japanese JIS standards may apply. Following is a selection of ISO and JIS standards applicable to hoists directly or through association with lifting machinery such as cranes:

### **ISO STANDARDS**

The International Organization for Standardization (ISO; website [www.iso.ch](http://www.iso.ch)) publishes many standards for numerous types of lifting machinery, many specifically for application, design, operation and maintenance of cranes. Below is a brief selection applicable to hoists and hoist components:

ISO 1837	Lifting Hooks - Nomenclature
ISO 2374	Lifting Appliances - Range Of Maximum Capabilities for Basic Models
ISO 2408	Steel Wire Rope for General Purposes

### **JIS STANDARDS**

The Japanese Industrial Standards Committee (JIS; website [www.jisc.go.jp](http://www.jisc.go.jp)) publishes standards for hoists. Some of the primary ones are:

JIS B 8802	Manually Operated Chain Hoists
JIS B 8815	Electric Chain Hoists
JIS B 8819	Manually Operated Chain Lever Hoists
JIS C 9620	Electric Wire Rope Hoists

## **EUROPEAN**

Traditionally, European countries have maintained national standards in reference to a large number of industrial products, e.g. DIN (Germany), BSI (United Kingdom). In addition the FEM (Federation Europeenne de la Manutention) has published standards specifically for material handling and lifting equipment.

With the creation of the European Union, organizations for standardization were established at different levels of regulatory authority covering numerous product areas.

The highest regulatory level is a European Standards Commission. Its regulations are absolute and regulatory, focusing primarily on worker safety and protection from occupational hazards.

There are three main regulations:

- Machinery Regulation (including Lifting and Material Handling Equipment)
- Low Voltage Electricity Regulation
- EMV – Electro-magnetic Compatibility Regulation

At the next level are CEN (mechanical) and CENELEC (electrical) Standards. They are more detailed and product oriented than the regulations. Per definition, the publications of CEN and CENELEC are “Standards”, non-regulatory guidelines, reflecting state of the art design and construction practices. They are based on the highest level of probability that equipment, designed to these standards will be safe and functional. They do not preclude deviations or “product improvement based on technological progress”.

The goal of the CEN & CENELEC Committees is to harmonize the new, European norms with existing country-specific norms. The committees responsible for generating new standards include workgroups and sub-committees, which are comprised of representatives of related industries, academia and engineering research, as well as legal counsel. When a new CEN/CENELEC standard is introduced and “HARMONIZED” (language, legal, etc.) national norms (DIN (Germany), BS (England), AFNOR (France), AENOR (Spain), etc) lose validity.

CEN/CENELEC and ISO maintain communication between their committees working on related subjects.

FEM is an Industry Association of Material Handling Manufacturers, similar in nature and function to MHIA Product Councils (HMI, CMAA, MMA, etc.). FEM specifications are not regulatory, yet they are widely accepted in the international arena, and usually referred to in the absence of national standards.

Following is a listing of European standards and specifications for hoists and related equipment:

### **BSI STANDARDS**

Selection of primary standards published by British Standards (BSI website [www.bsi-global.com](http://www.bsi-global.com)) for hoists and related material handling equipment. (BS EN indicates harmonized standard):

BS EN 292	Safety of Machinery
BS EN 14492-2	Cranes – Power Driven Hoists
BS EN 60034-1	Rotating Electrical Machines: Rating and performance
BS EN 60034-5	Types of Enclosures for Rotating Electrical Machines
BS EN 60204-32	Safety of Machinery - Electrical Equipment of Machines - Part 32: Requirements for Hoisting Machines

### **DIN STANDARDS**

Selection of primary standards published by the Deutsches Institut für Normung (DIN; website [www.din.de](http://www.din.de)) for application, design, maintenance and safety aspects of hoist and related equipment. (DIN EN indicates harmonized standard):

DIN EN 14492-2	Cranes – Power Driven Hoists
DIN EN 60204-32	Safety of Machinery; Electrical Equipment of Machines; Requirements for Hoisting Machines.
DIN 3051-Sections 1–4	Lifting Ropes; Steel Wires
DIN 15017	Cranes & Hoists; Principles of Motor and Gear Sizing
DIN 15020- Sections 1–2	Hoists; Principles of Rope Reeving
DIN 15061- Sections 1–2	Cranes & Hoists; Grooves for Rope Sheaves & Drums
DIN 15100	Serial Lifting Equipment; Nomenclature
DIN 15400 through DIN 15414	Detailed Aspects of Load Hooks and Bottom Block Construction

## FEM STANDARDS

The Federation Europeenne de la Manutention (FEM; website [www.fem-eur.com](http://www.fem-eur.com)) publishes many standards for hoists and related material handling equipment. Some of the primary ones are:

FEM 1.002	Illustrated Terminology of Heavy Lifting Equipment
FEM 9.811	Rope and Chain Hoists – General Specifications
FEM 9.511	Rules for the Design of Series Lifting Equipment - Classification of Mechanisms
FEM 9.661	Rules for the design of Series Lifting Equipment - Dimensions and Design of Rope Reeving Components
FEM 9.683	Selection of Hoist and Travel Motors
FEM 9.852	Power Driven Series Hoist Mechanisms, Standardized Test Procedure for Verification of the Classification
FEM 9.755	Measures for Achieving Safe Working Periods for Motorized Serial Hoist Units (S.W.P.)
FEM 9.751	Power Driven Series Hoist Mechanisms, Safety
FEM 9.901	Rules for the Design of Series Lifting Equipment and Cranes Equipped with Series Lifting Equipment

## CEN STANDARDS

Selection of primary standards published by the European Committee for Standardization (CEN; website [www.cenorm.be](http://www.cenorm.be)) for hoists and related material handling equipment:

EN 341	Cranes – Bridge and Gantry Cranes
EN 13135-1	Cranes – Equipment – Part 1:Electrical Equipment
EN 13135-2	Cranes – Equipment – Part 2:Non-electrical Equipment
EN 13157	Cranes – Safety – Hand Powered Cranes
EN 13155	Cranes – Safety – Non-fixed Load Lifting Attachments
EN 13557	Cranes – Controls and Control Stations
EN 14492-1	Cranes – Power Driven Winches and Hoists – Part 1: Power Driven Winches
EN 14492-2	Cranes – Power Driven Winches and Hoists – Part 2: Power Driven Hoists
EN 60204-32	Safety of Machinery; Electrical Equipment of Machines; Requirements for Hoisting Machines.