

Hoist Inspection And Hoist Maintenance Personnel Manual

Prepared and Published by



HOIST MANUFACTURERS INSTITUTE®

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INTRODUCTION AND DISCLAIMER

The Hoist Manufacturers Institute (HMI) is an independent incorporated trade association affiliated with the Material Handling Industry of America Division of Material Handling Industry.

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MHI provides HMI with certain services and, in connection with this Hoist Inspection and Hoist Maintenance Personnel Manual, arranges for its production and distribution. Neither MHI, its officers, directors nor employees have any other participation in the development and preparation of the information contained in this Manual.

All inquiries concerning this Hoist Inspection and Hoist Maintenance Personnel Manual should be directed in writing to the Chairman of the HMI Engineering Committee, c/o Hoist Manufacturers Institute, 8720 Red Oak Boulevard, Suite 201, Charlotte, North Carolina 28217-3992.

HOIST INSPECTION AND MAINTENANCE PERSONNEL MANUAL

This Manual has been prepared by HMI and its Engineering Committee to provide information and suggestions for Hoist Inspection and Maintenance Personnel in their inspection and maintenance of overhead hoists. At times, hoist inspection and maintenance personnel may be required to operate an overhead hoist in the performance of their inspection and maintenance duties. Operation of an overhead hoist involves more than operating the controls of the hoist. The operator must consider and anticipate the motions and actions that will occur as a result of operating the controls. Therefore, it is important for Hoist Inspection and Maintenance Personnel to be instructed in the operation of overhead hoists and to understand the severe consequences from careless operation. Refer to the Hoist Operators Manual, latest edition, published by HMI.

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

It must be recognized that this is a Manual of recommendations for Hoist Inspection and Maintenance Personnel and its use is permissive not mandatory. It is the responsibility of the owner of the Hoist to make personnel aware of all federal, state and local rules, codes and plant safety rules and regulations and instructions and to make certain operators and inspection and maintenance personnel are properly trained.

INTRODUCTION AND DISCLAIMER

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INTRODUCTION AND DISCLAIMER

Taking precedence over any specific rule, however, is the most important rule of all:

“USE COMMON SENSE.”

It is a responsibility of the hoist owner/user to establish programs to:

1. train and designate hoist operators, and
2. train and designate hoist inspection and maintenance personnel.

The words **shall** and **should** are used throughout this manual in accordance with definitions in the ASME B30 standards as follows:

shall this word indicates that a rule is mandatory and must be followed.

should this word indicates that a rule is a recommendation, the advisability of which depends on the facts in each situation.

Hoist operator and hoist inspection and maintenance personnel training programs should be based on requirements in accordance with the latest edition of:

- ASME B30.16 Safety Standard for Overhead Hoists (Underhung)

Such training programs should also provide information for compliance with any Federal, State, or Local Code requirements, existing plant safety rules and regulations, and the instructions furnished by the manufacturer of the hoist.

If an overhead hoist is installed as part of an overhead crane or monorail system, training programs should also include requirements in accordance with the latest edition, as applicable, of:

- ASME B30.2 Safety Standard for Overhead and Gantry Cranes, Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist
- ASME B30.11 Safety Standard for Monorails and Underhung Cranes
- ASME B30.17 Safety Standard for Overhead and Gantry Cranes, Top Running Bridge, Single Girder, Underhung Hoist

Overhead hoists are often referred to by the basic type of construction of the hoist. Various types of overhead hoists are covered in the HOIST TYPES section of this manual. Definitions of the various terms used to identify hoist types or hoist components can be found in Appendix A.

INTRODUCTION AND DISCLAIMER

NOTICE

IT IS A RESPONSIBILITY OF THE OWNER/USER TO INSTALL, INSPECT, TEST, MAINTAIN, AND OPERATE A HOIST IN ACCORDANCE WITH THE ASME B30.16 SAFETY STANDARD, OSHA REGULATIONS, AND ANSI/NFPA 70, NATIONAL ELECTRICAL CODE. IF THE HOIST IS INSTALLED AS PART OF A TOTAL LIFTING SYSTEM, IT IS ALSO THE RESPONSIBILITY OF THE OWNER/USER TO COMPLY WITH THE APPLICABLE ASME B30 VOLUME THAT ADDRESSES OTHER TYPES OF EQUIPMENT USED IN THE SYSTEM.

FURTHER, IT IS THE RESPONSIBILITY OF THE OWNER/USER TO REQUIRE THAT ALL PERSONNEL THAT WILL INSTALL, INSPECT, TEST, MAINTAIN, AND OPERATE A HOIST READ THE CONTENTS OF THE INSTRUCTION MANUAL FURNISHED BY THE MANUFACTURER OF THE HOIST, ASME B30.16 SAFETY STANDARD FOR OVERHEAD HOISTS (UNDERHUNG), OSHA REGULATIONS, AND ANSI/NFPA 70, NATIONAL ELECTRICAL CODE. IF THE HOIST IS INSTALLED AS PART OF A TOTAL LIFTING SYSTEM, THE APPLICABLE ASME B30 VOLUME THAT ADDRESSES OTHER TYPES OF EQUIPMENT USED IN THE SYSTEM MUST ALSO BE READ BY ALL PERSONNEL.

WARNING

BEFORE INSTALLING, REMOVING, INSPECTING, OR PERFORMING ANY MAINTENANCE ON A HOIST, THE MAIN SWITCH SHALL BE DE-ENERGIZED. LOCK AND TAG THE MAIN SWITCH IN THE DE-ENERGIZED POSITION IN ACCORDANCE WITH ANSI Z244.1. FOLLOW OTHER MAINTENANCE PROCEDURES OUTLINED IN THE MANUAL FURNISHED BY THE MANUFACTURER OF THE HOIST AND ASME B30.16.

SAFETY ALERT SYMBOL

The Safety Alert Symbol is used in this manual to indicate hazards and to alert the reader to information that should be known, understood, and followed in order to avoid DEATH or SERIOUS INJURY.

Read and understand this manual before using, inspecting or maintaining the hoist.

Important issues to remember during operation are provided at the hoist control stations, at various locations on the hoist and in the manuals by **DANGER**, **WARNING**, or **CAUTION** instructions or placards, that alert personnel to potential hazards, proper operation, load limitations, and more.



DANGER:

Indicates an imminently hazardous situation which, if not avoided, will result in death or serious injury.



WARNING:

Indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury.

INTRODUCTION AND DISCLAIMER



CAUTION:

Indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. It may also be used to alert against unsafe practices.

WARNING

FAILURE TO READ AND COMPLY WITH ANY ONE OF THE LIMITATIONS NOTED IN THIS MANUAL AND THE INSTRUCTION MANUAL FURNISHED BY THE MANUFACTURER OF THE HOIST CAN RESULT IN SERIOUS BODILY INJURY OR DEATH, AND/OR PROPERTY DAMAGE.

Because the manufacturer of the hoist has no direct involvement or control over the hoist's operation, application, inspection, and maintenance, it is the responsibility of the hoist owner, user, and operating personnel to assure conformance to good safety practices.

Only those Authorized and Qualified Personnel who have shown that they have read and have understood this manual and the manufacturer's manual and that they understand the proper operation and maintenance of the hoist should be permitted to inspect, maintain or operate the hoist.

PLACARDS AND INSTRUCTIONS

READ and OBEY all Danger, Warning, Caution, and Operating Instructions on the hoist and in all manufacturers' manuals and this manual. Make sure that all placards are in place and legible.

Failure to comply with safety precautions in this manual, in the manufacturer's manual, and on the hoist is a safety violation that may result in serious injury, death, or property damage.

HOIST TYPES

Overhead hoists are defined in the ANSI/ASME standards as a machinery unit that is used for vertical lifting service involving material handling of freely suspended (unguided) loads. Overhead hoists are a basic and versatile piece of equipment used in manufacturing, warehousing, construction, and numerous other applications to aid workers in the handling and moving of loads.

Overhead hoists are available in various types of configurations and constructions. Overhead hoist types are usually referred to using terms that define a specific configuration and construction. Three areas that further define the hoist type are:

- **LIFTING MEDIUM:** Lifting medium defines the type of component used to transmit and cause vertical motion of the hoist load hook or hoist load block. Lifting mediums include wire rope or chain.
- **OPERATION:** Operation defines the type of power used to operate the hoisting motion. Operation types include manual power, electric power, or air power.
- **SUSPENSION:** Suspension defines the type of mounting or method used to mount or suspend the hoist. Common suspension types include hook mounted, clevis mounted, lug mounted, trolley mounted, deck mounted, base mounted, wall mounted, and ceiling mounted. Other types of suspension may be designed to meet specific application requirements.

When the above various types of configurations or constructions are considered, some of the names used to refer to overhead hoists include: hook mounted manually operated hand chain hoists; electric chain hoists; air chain hoists; electric wire rope hoists; air wire rope hoists; trolley mounted wire rope hoists; etc. Manually lever operated hoists are not considered an overhead hoist and are not covered in this manual.

LIFTING MEDIUM TYPES

As previously stated, lifting medium defines the type of component used to transmit and cause vertical motion of the hoist load hook or hoist load block. Hoist lifting mediums include:

- Welded Link Load Chain
- Roller Load Chain
- Wire Rope

HOIST TYPES

WELDED LINK LOAD CHAIN

Welded link load chain consists of a series of interwoven formed and welded links. The links fit pockets of the hoist load sprocket that transmits motion to the load chain. The load sprocket may also be called load wheel, load sheave, pocket wheel, chain wheel, or lift wheel. Welded link load chain sizes are stated as the diameter of the wire used to form the link, i.e. 1/4 in., 5/16 in., etc. Welded link load chain is designed and manufactured to specific dimension and material strength requirements for a specific hoist. Welded link load chain is **not interchangeable** between different manufacturers' hoists; and is **not interchangeable** with welded link lifting chain used for other purposes such as chain slings and load securement. Only welded link load chain with specifications as originally stated by the hoist manufacturer should be used on any welded link load chain hoist.

ROLLER LOAD CHAIN

Roller load chain consists of a series of alternately assembled roller links and pin links where the pins articulate inside bushings and the rollers are free to turn on the bushings. Pins and bushings are press fit in their respective link plates. The links fit teeth of the hoist load sprocket that transmits motion to the load chain. The load sprocket may also be called load wheel, load sheave, pocket wheel, chain wheel, or lift wheel. Roller load chain sizes are stated as the pitch or spacing between pins, i.e. 5/8 in., 3/4 in., etc. Roller load chain for use on hoists is designed and manufactured to specific material strength requirements for hoist applications. Roller load chain for hoist applications has different manufacturing specifications than roller chain for power transmission applications. Therefore, hoist roller load chain is **not interchangeable** with power transmission roller chain. Only roller load chain with specifications as originally stated by the hoist manufacturer should be used on any roller load chain hoist.

WIRE ROPE

Wire rope consists of a core, strands, and wires that comprise a strand. The wire rope fits and wraps onto grooves on the circumference of the hoist drum that transmits motion to the wire rope. Wire rope sizes are stated as the diameter of a circle that would enclose the wire rope strands, i.e. 5/16 in., 3/8 in., etc. Each wire rope size is available in various rope constructions and materials. The construction and material strength requirements of the wire rope are selected by the hoist manufacturer in accordance with the design specification requirements of the hoist. Therefore, only wire rope with specifications as originally stated by the hoist manufacturer should be used on any wire rope hoist.

HOIST TYPES

OPERATION TYPES

As previously stated, operation defines the type of power used to operate the hoisting motion. Hoist operating types include:

- Hand Chain Manual Power
- Electric Power
- Air Power

HAND CHAIN MANUAL POWER

The hoisting motion of hand chain manually operated hoists is achieved by the operator grasping and pulling a continuous hand chain suspended from the hoist. Hand chain consists of a series of interwoven formed welded or un-welded links according to the design specifications of the hand chain. The hand chain links fit pockets of the hoist hand chain wheel or sprocket. As the operator pulls the hand chain, the hand chain wheel turns and transmits power through the hoist gearing to the hoist load chain sprocket. Pulling the hand chain in one direction will cause the hoist load hook to travel in one direction (LIFT or LOWER); and pulling the hand chain in the opposite direction will cause the hoist load hook to travel in the opposite direction (LIFT or LOWER).

Hand chain manually operated hoists are available with only welded link load chain or roller load chain as the lifting medium. Before the advent of electric powered hoists and air powered hoists, wire rope was used as a lifting medium. However, hand chain manually operated wire rope hoists are not available in today's market unless they are specifically designed to meet the requirements of a unique and special application, and are not addressed in this manual.

Higher capacity hand chain manually operated chain hoists may have multiple hand chains suspended from the hoist. Hoists that have multiple hand chains require multiple operators, each grasping and pulling one of the hand chains.

WARNING

THE HAND CHAIN OF A HOIST, OR EACH HAND CHAIN OF A HOIST HAVING MULTIPLE HAND CHAINS, SHOULD ONLY BE OPERATED (GRASPED AND PULLED) BY A SINGLE OPERATOR. IF ANY SINGLE HAND CHAIN IS OPERATED (GRASPED AND PULLED) BY MORE THAN ONE PERSON, THE HOIST COULD BE OVERLOADED WITH SUBSEQUENT DAMAGE AND/OR FAILURE OF HOIST COMPONENTS, RESULTING IN SERIOUS BODILY INJURY OR DEATH, AND/OR PROPERTY DAMAGE.

HOIST TYPES

ELECTRIC POWER

The hoisting motion (lifting or lowering) of electric powered hoists is achieved by the operator grasping and activating a control device. The control device has push buttons or levers that energize, through a series of contactors and other electrical components, an electric motor. The electric motor transmits power through the hoist gearing to the hoist load chain sprocket or hoist drum; thereby, lifting or lowering the hoist load hook. Lifting is accomplished by actuating the lifting control; and lowering is accomplished by actuating the lowering control. The controls could be marked: LIFT/LOWER; UP/DOWN; RAISE/LOWER; ↑/↓; or a combination of such markings. Hoist lifting and lowering controls are usually push buttons mounted in a pendant control enclosure suspended from the hoist; or levers or switches mounted in a remote radio-control transmitter. Pendant control enclosures, radio-control transmitters, or other control means could also be permanently mounted on the building structure or cab of an overhead crane depending on the application.

The control device used to lift and lower hoist motion may also contain controls for other motions or functions. Such controls include: trolley travel, overhead crane travel, power on/off, emergency stop, motions associated with below-the-hook lifting devices, and other special functions associated with a specific application. Examples of such control markings may include, but are not limited to: EAST/WEST; RIGHT/LEFT; OPEN/CLOSE; START/STOP; etc.

Before the advent of pendant controls, electric powered hoists were controlled by pull controls or rod controls. Pull control consists of two pull chains or two pull cords having handles marked for hoisting direction, and suspended from the hoist. Rod control consists of a rod handle suspended from the hoist and controls motion by linear or rotary movement of the rod handle or a combination of linear and rotary motion. While pull controls or rod controls are not normally used on electric powered hoists today, such controls may be found on older type hoists.

AIR POWER

The hoisting motion (lifting or lowering) of air powered hoists is achieved by the operator grasping and activating a control device. The control device has push buttons or levers that energize, through a series of valves and other air components, an air motor. The air motor transmits power through the hoist gearing to the hoist load chain sprocket or hoist drum; thereby, lifting or lowering the hoist load hook. Lifting is accomplished by actuating the lifting control; and lowering is accomplished by actuating the lowering control. The controls could be marked: LIFT/LOWER; UP/DOWN; RAISE/LOWER; ↑/↓; or a combination of such markings. Hoist lifting and lowering controls are usually push buttons or levers mounted in a pendant control enclosure suspended from the hoist; or pull controls or rod controls suspended from the hoist. Pendant control enclosures could also be permanently mounted on the building structure or cab of an overhead crane depending on the application.

HOIST TYPES

Pull control consists of two pull chains or two pull cords having handles marked for hoisting direction, and suspended from the hoist. Rod control consists of a rod handle suspended from the hoist and controls motion by linear or rotary movement of the rod handle or a combination of linear and rotary motion.

A control device of the type used to lift and lower hoisting motion of an air powered hoist may also be used for other motions or functions, such as trolley travel, overhead crane travel, etc. Examples of such control markings may include, but are not limited to: EAST/WEST; RIGHT/LEFT; OPEN/CLOSE; START/STOP; etc.

SUSPENSION TYPES

As previously stated, suspension defines the type of mounting or method used to mount or suspend the hoist. Hoist suspension types include:

- Hook Mounted
- Clevis Mounted
- Lug Mounted
- Trolley Mounted
- Deck Mounted
- Base Mounted
- Wall Mounted
- Ceiling Mounted

HOOK MOUNTED

Hook mounted hoists have a top hook on the hoist frame or body that can be used to suspend the hoist from the clevis or suspension pin of a trolley; or a fixed suspension device, that will accept the hook, mounted on a beam or the structural framework of a building. Hook mounted hoists normally have only welded link load chain or roller load chain as the lifting medium, because the load chain lifting medium is always in line with the top hook. Hook mounted hoists include: hand chain manually operated chain hoists, electric chain hoists, and air chain hoists. Wire rope hoists are not normally hook mounted because the loading position on the drum moves as the wire rope is wound or unwound on the drum, and therefore not in line with a top hook. Hook mounted wire rope hoists can be furnished; however, they may require multiple top hooks, and special design considerations by the hoist manufacturer.

HOIST TYPES

CLEVIS MOUNTED

Clevis mounted hoists are the same as hook mounted hoists except that a clevis is used in place of the top hook. A clevis is a closed hook having an eye opening to accept a suspension pin.

LUG MOUNTED

Lug mounted hoists have a lug mounting attached to the top of the hoist frame, or a lug mounting attached as an integral part of the hoist frame. Lug mounted hoists are available in all hoist types. Lug mountings are used to suspend the hoist from a trolley, or a fixed suspension device mounted on a beam or the structural framework of a building. Lug mounted hoists are suspended from a trolley, beam, or structural framework by the use of suspension pin(s) or stud(s).

TROLLEY MOUNTED

Trolley mounted hoists are hook mounted, clevis mounted, or lug mounted hoists suspended from a trolley or trolleys; or a hoist having an integral trolley as part of the hoist frame, that allows travel motion on the lower flange of a monorail beam, or the lower flange of the bridge beam of an overhead crane.

DECK MOUNTED

Deck mounted hoists have a mounting arrangement on the lower portion of the hoist frame that permits the hoist to be mounted on a horizontal flat or deck surface. Deck mounted hoists are normally mounted on the deck of a top running trolley for use on a double girder crane, or permanently mounted on a building structure or an overhead crane.

BASE MOUNTED

Base mounted hoists are similar to deck mounted hoists with the exception that instead of the lifting medium hanging down from the hoist, the lifting medium may pay or feed off of the hoist drum or load sprocket at some other point, such as horizontal, vertically upward, or some other angle with either the horizontal or vertical centerline of the hoist. In this arrangement, the hoist unit functions like a winch and is used in applications where the hoist unit cannot be suspended above where the load is to be hoisted.

WALL MOUNTED

Wall mounted hoists have a mounting arrangement that permits the hoist to be mounted on a wall or vertical surface.

HOIST TYPES

CEILING MOUNTED

Ceiling mounted hoists have a mounting arrangement that permits the hoist to be mounted on a ceiling or horizontal surface above the hoist.

TROLLEYS

Trolleys allow traverse motion of the hoist unit, and load being handled, by traveling: on the lower flange of a monorail beam; on the lower flange of a bridge beam of an overhead crane; or on top of the bridge beams of an overhead crane. Hoist trolleys are available in several types, depending on the method used to obtain travel motion. Trolley types include:

- Plain
- Hand Chain Operated
- Electric powered or Air powered

PLAIN TROLLEYS

The travel motion of plain type trolleys is obtained by pulling or pushing the load or by some other means, such as the strain relief of a pendant control, suspended from the trolley or hoist. Plain type trolleys are recommended where trolley motion is infrequent or relatively short. Because of the force required to manually operate this type of trolley, it is recommended that the use of plain trolleys be limited to a maximum capacity load of 3 tons or 3000 kg, and that the elevation of the beam where the trolley is suspended be not more than 20 feet or 6 m above the operating floor level.

HAND CHAIN OPERATED TROLLEYS

The travel motion of hand chain manually operated trolleys is achieved by the operator grasping and pulling a continuous hand chain suspended from the trolley. Hand chain consists of a series of interwoven formed welded or un-welded links according to the design specifications of the hand chain. The hand chain links fit pockets of the trolley hand chain wheel, or sprocket. As the operator pulls the hand chain, the hand chain wheel turns and transmits power through gearing to the trolley wheels. Pulling the hand chain in one direction will cause the trolley to travel in one direction; and pulling the hand chain in the opposite direction will cause the trolley to travel in the opposite direction. Hand chain manually operated trolleys provide excellent load spotting ability.

HOIST COMPONENTS

ELECTRIC POWERED OR AIR POWERED TROLLEYS

The travel motion of electric powered or air powered trolleys is achieved by the operator grasping and activating a control device in the same manner as described under electric powered or air powered hoists. The control device used to lift and lower hoist motion may also contain controls for trolley travel. Recommendations for use of electric powered or air powered trolleys are based on frequency of operation, distance of travel, capacity of load, height of beam, and type or size of load being handled.

Hoist inspection and maintenance personnel should be familiar with the parts of a hoist and have a thorough knowledge of hoist control device functions and movements. The principal parts of a hand chain hoist are identified and shown in Figure 1 below. The principal parts of an electric chain hoist are identified and shown in Figure 2, page 15. The principal parts of an electric wire rope hoist are identified and shown in Figure 3, page 15. The types of and principal parts of a trolley are identified and shown in Figures 4, 5, and 6, page 16.

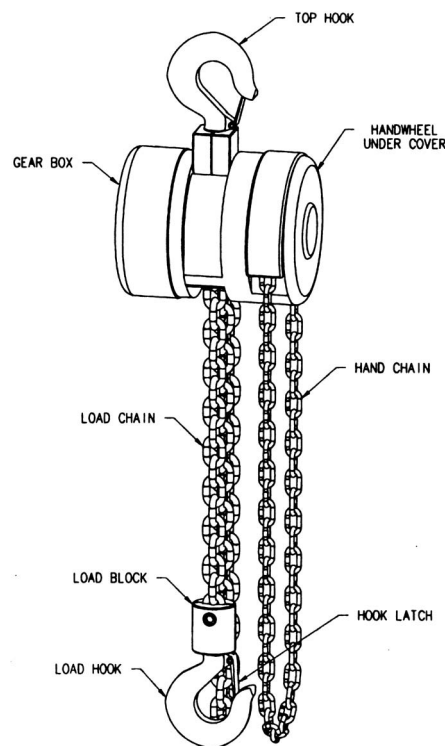


FIGURE 1
Principal Parts of a Hand Chain Hoist

HOIST COMPONENTS

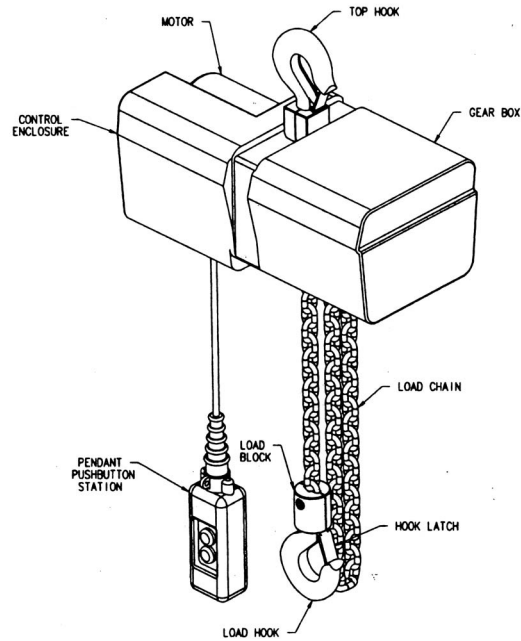


FIGURE 2
Principal Parts of an Electric-Powered or Air-Powered Chain Hoist
(Power supply not shown for clarity.)

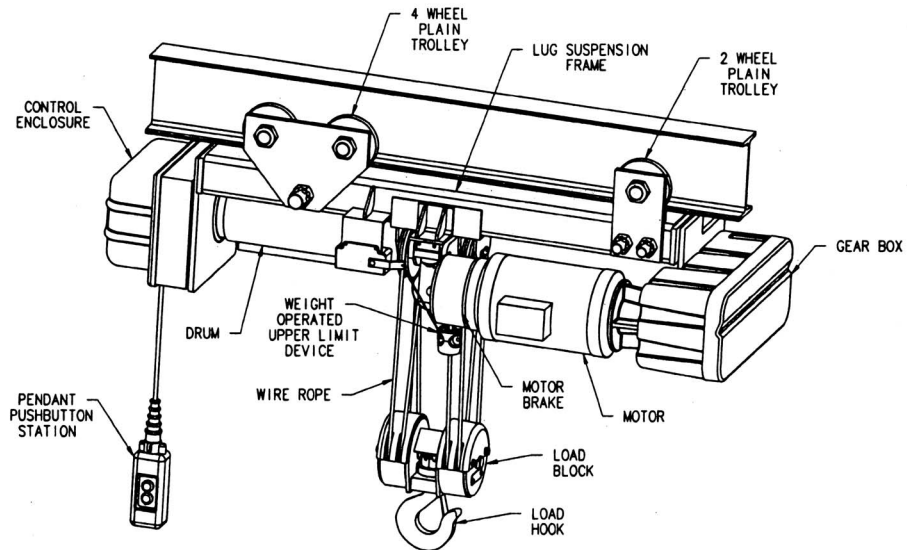


FIGURE 3
Principal Parts of an Electric Wire Rope Hoist
(Power supply not shown for clarity.)

HOIST COMPONENTS

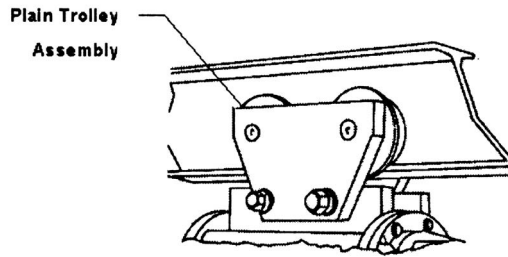


FIGURE 4
Plain Trolley

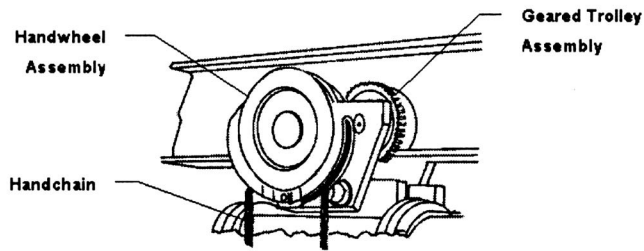


FIGURE 5
Hand Chain Trolley

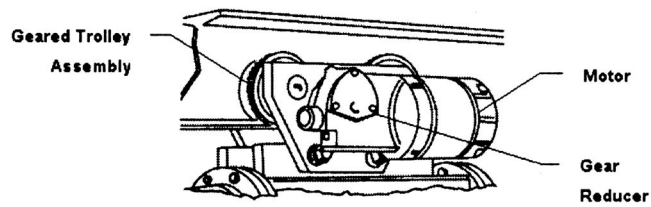


FIGURE 6
Electric-Powered or Air-Powered Trolley

HOIST, TROLLEY AND BRIDGE MOTIONS

Overhead hoists have one axis of directional travel. This is:

- **THE HOISTING OR VERTICAL TRAVEL DIRECTION OF THE LOAD HOOK**

When overhead hoists are trolley suspended, the trolley hoist unit has two axes of directional travel. These include:

- **THE HOISTING OR VERTICAL TRAVEL DIRECTION OF THE LOAD HOOK**
- **THE TRAVERSE TRAVEL DIRECTION OF THE TROLLEY (INCLUDING THE HOIST UNIT)**

When trolley suspended overhead hoists are used on an overhead crane, the crane, including the trolley hoist unit has three axes of directional travel. These include:

- **THE HOISTING OR VERTICAL TRAVEL DIRECTION OF THE LOAD HOOK**
- **THE TRAVERSE TRAVEL DIRECTION OF THE TROLLEY (INCLUDING THE HOIST UNIT)**
- **THE TRAVERSE TRAVEL DIRECTION OF THE BRIDGE (INCLUDING THE TROLLEY AND HOIST UNIT)**

Some hoists or cranes may have power-operated rotating hooks, power-operated below-the-hook lifting devices, or other power-operated accessories that result in additional axes of directional travel.

Hoist operators and hoist inspection and maintenance personnel should be familiar with the hoist (or crane) controls and understand what type of motion will occur when any one of the control devices is activated. The controls shall be marked, and all markings shall be legible. The daily inspection that is required to be performed by the operator at the start of each shift or at the time the hoist is first used during each shift, should include a check that all travel motions agree with control device markings.

HOIST, TROLLEY AND BRIDGE MOTIONS

If more than one hoist or trolley hoist unit is used on an overhead crane, each hoist or trolley hoist shall have an identification marking on it or its load block, and these markings shall also appear on the controllers used by the operator. For example, if a crane has two trolley hoist units, one trolley hoist unit shall be marked “1” (or some other designation) on the trolley hoist or load block, and the other trolley hoist unit shall be marked “2” (or some other designation) on the trolley hoist or load block. The markings on the trolley hoists are to be visible to the operator and any signal person used in rigging the load. The controllers for trolley hoist 1 must be marked “1” (or other designation used on the trolley hoist), and the controllers for trolley hoist 2 must be marked “2” (or other designation used on the trolley hoist).

All motions of multi-speed powered hoists should be started in the slowest speed available for that motion, and then the speed should be increased until the desired speed is obtained. Upon hoisting motion, the load should be lifted only a few inches and stopped to check the holding brake before continuing with the lift.

The hoist should be brought directly over the load before rigging the load to the hoist load hook. Failure to center the hoist over the load could cause the load to swing when it is lifted, or could cause side pulls or other forces to be transferred into the crane. Slack should be taken out of the hoisting ropes or chains, and slings, if used, before attempting to lift the load.

HOIST MOTION

Hoist motion is the vertical travel motion direction of the hoist load hook. Control device markings for this motion should be as stated in the HOIST TYPES section of this manual. Regardless of the marking designation used, the operator should be fully aware of the direction of hook motion that will occur when the control device is activated.

TO LIFT OR RAISE A LOAD:

- Bring the hoist directly over the load.
- Lower the load hook so it can be attached to the load or the slings or other device used to rig the load. The load, sling(s), or other lifting device should be fully seated in the saddle or bowl of the hook. If the load hook is equipped with a hook latch, verify that the hook latch is operational and closes the throat opening of the hook. Make sure that the hook latch is not supporting any part of the load or the slings or device used to attach the load to the hook. Verify that the weight of the load to be lifted does not exceed the rated load capacity of the hoist.

HOIST, TROLLEY AND BRIDGE MOTIONS

- Slack should be taken out of the hoisting ropes or chains, and slings, if used, before attempting to lift the load.
- The load should be lifted only a few inches and stopped to check:
 - that the load is properly balanced;
 - that slings, if used, are properly positioned;
 - that load or sling is seated in the saddle, base, or bowl of the load hook; and
 - that the hoist holding brake stops and holds the load before continuing with the lift.

If an electric powered or air powered hoist has multiple travel speeds, always start motion with the slowest speed and then increase speed until the desired speed is obtained. Some multiple-speed hoists may have other features that affect the lifting motion and the operator should become familiar with the operation of such features. Refer to the manual furnished by the manufacturer of the hoist.

Anyone who operates a hoist must verify that all personnel are clear of the load and the path of the load, and that the load will clear all obstacles before lowering or landing. When lowering the load, if a powered hoist has multiple travel speeds, the lowering speed should be decreased to the slowest travel speed before stopping or landing the load. Block loads before landing if slings or other lifting devices must be removed from under the landed load.

A load should never be left suspended and unattended unless specific precautions to prevent the load from inadvertent lowering have been instituted and are in place, and guards or barriers are utilized on the floor to prevent people from entering the area affected by the suspended load. When the hoist is not in use, the empty load hook should be raised and positioned above head level for storage. Seven feet or greater above floor level is recommended.

TROLLEY MOTION

When trolleys are used with a hoist, trolley motion is the traverse travel motion direction of the trolley hoist unit. Control device markings for this motion should be as stated in the HOIST TYPES section of this manual. Regardless of the marking designation used, the operator should be fully aware of the direction of trolley motion that will occur when the control device is activated.

If a load is to be lifted with the hoist hook before moving the trolley, refer to the HOIST MOTION section of this manual. If a powered trolley has multiple travel speeds, always start motion with the slowest speed and then increase speed until the desired speed is obtained. Both single-speed trolleys and multiple-speed trolleys may have electronic devices that provide controlled acceleration of the motor that offers a soft or controlled start.

HOIST, TROLLEY AND BRIDGE MOTIONS

When bringing the trolley to a stop, if a powered trolley has multiple travel speeds, it is recommended that the travel speed be decreased to the slowest travel speed before stopping the trolley to minimize load swing.

HOIST LIMIT DEVICES

Powered hoists must be equipped with an upper limit device that will prevent the hoist load block from exceeding the upper limit of travel. Depending on the shape or size of the load being lifted, it may be possible for some part of the load to come into contact with some part of the hoist, trolley, crane, or building structure before the load block reaches the upper limit of travel. The operator must consider this possibility when it is required to lift the load to a level of close proximity to the hoist.

Powered hoists may have additional travel limit devices depending on the specific purchase specifications of the hoist. However, in such cases, the upper limit device that is activated to stop the upper limit of travel is considered the primary upper limit device.

Operation of the primary upper limit device, on powered hoists, is one of the items the hoist operator must check during the daily inspection to be performed at the start of each shift, or at the time the hoist is first used during each shift.

CAUTION

THE PRIMARY LIMIT DEVICE THAT CONTROLS THE UPPER LIMIT OF TRAVEL IS AN EMERGENCY DEVICE ONLY. IT SHALL NOT BE USED AS AN OPERATIONAL MEANS TO STOP TRAVEL DURING NORMAL OPERATIONS.

HOIST INSPECTION AND MAINTENANCE PROCEDURES

Overhead hoist inspection, maintenance, and repair can be performed in various ways depending on the conditions, policies, and practices of a particular owner/user. Maintenance policies and practices are determined by the size of the operation and number of employees, the availability of trained and experienced in-house maintenance persons, and the type of hoists and extent of sophisticated performance characteristics.

Regardless of the manner used to perform hoist inspections, maintenance, and repairs, each function should be performed only by trained, experienced, and qualified hoist inspection, maintenance, and repair personnel. For information on hoist inspection, maintenance, and repair, always refer to the manual furnished by the manufacturer of the hoist.

NOTICE

THE HOIST OPERATOR SHOULD NOT PERFORM FREQUENT AND PERIODIC INSPECTIONS, MAINTENANCE, OR REPAIR ON A HOIST, UNLESS THE OPERATOR HAS BEEN TRAINED TO PERFORM SUCH INSPECTIONS, MAINTENANCE, OR REPAIR ON A HOIST, AND IS DESIGNATED BY THE HOIST OWNER/USER TO PERFORM SUCH INSPECTIONS, MAINTENANCE, AND REPAIR.

MAINTENANCE AND INSPECTION PROCEDURES

Hoists shall be maintained, inspected, and tested in accordance with the manual furnished by the manufacturer of the hoist and in accordance with the intervals and requirements of ASME B30.16.

Before maintenance or inspections are performed on a hoist, (or trolley, crane, crane runway, crane runway support, or crane runway conductors, as applicable), precautions shall be taken, which include those listed below. While the hoist operator should not perform inspection, maintenance, or repair on a hoist, unless trained, qualified, and authorized to do so, the operator may be involved in performing these precautions before maintenance or inspections are performed by others.

1. The hoist, if on a trolley or crane, shall be run to a location where it will cause the least interference with other hoists, cranes, and operations in the area. If the hoist is suspended from a fixed location, maintenance and inspections can be performed in place, or the hoist can be removed to a repair area, as required.
2. If a load is attached to the hoist, it shall be landed. On wire rope hoists, the load block should be lowered onto a surface that allows the rope to be slack, and measures should be taken to prevent the drum from turning.

HOIST INSPECTION AND MAINTENANCE PROCEDURES

3. All electric and air controllers shall be placed in the off position.
4. If a trolley hoist is installed on a monorail or crane, the trolley shall be blocked to prevent trolley movement.
5. If the hoist is mounted on a crane, the crane shall be blocked to prevent crane movement. Refer also to item 9.
6. The main switch (disconnect) of an electric hoist, crane or lifting system shall be de-energized. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1.

DANGER

ON ELECTRIC POWERED HOISTS, HAZARDOUS VOLTAGES ARE PRESENT IN THE CONTROL BOX, OTHER ELECTRICAL COMPONENTS, AND CONNECTIONS BETWEEN THESE COMPONENTS.

7. The main air supply of an air hoist, crane or lifting system shall be disconnected and vented. Lock and tag the main switch in the de-energized position in accordance with ANSI Z244.1.
8. Warning signs and barriers shall be utilized on the floor beneath the hoist, crane, or lifting system where overhead maintenance, repair, or inspection work creates a hazardous area on the floor beneath the hoist crane, or lifting system.
9. If a trolley hoist is installed on a crane, and the crane runway remains energized because other cranes on the same runway are in operation, rail stops or a signal person(s), located full-time at a visual vantage point for observing the approach of an active crane(s), shall be provided to prohibit contact by the active crane(s) with the idle crane.
10. If a trolley hoist is installed on a crane, a guard or barrier shall be installed between adjacent runways for the length of the established work area to prevent contact between persons performing maintenance, repair, or inspection and a crane on the adjacent runway.
11. Safe access to the hoist, trolley, crane, or lifting system, such as scaffolding, work platforms, etc., shall be provided for personnel that will perform maintenance, repair, or inspection. If personnel are required to work above floor or ground level, a fall prevention policy and procedure shall be developed, documented, and implemented by the owner/user.

HOIST INSPECTION AND MAINTENANCE PROCEDURES

12. After maintenance, repair, or inspection work is completed, and before the hoist, crane, or lifting system is returned to normal operation:
 - Any guards and covers on the hoist, trolley, crane, or lifting system that were removed to perform maintenance, repair, or inspection work shall be reinstalled.
 - Any safety devices on the hoist, trolley, crane, runway, or lifting system that were deactivated to perform maintenance, repair, or inspection work shall be reactivated.
 - Any parts that were replaced and other loose material shall be removed.
 - All equipment used in the maintenance, repair, or inspection work shall be removed.
13. Warning signs, barriers, and guards shall be removed only by authorized personnel.
14. Locks and tags on the main switch (disconnect) or main air supply of the hoist, crane, or lifting system shall be removed only by the person that locked and tagged the main switch or main air supply originally, or an authorized person in accordance with ANSI Z244.1.
15. If the extent of the maintenance or repair work requires any testing as outlined in ASME B30.16 or any other applicable ASME B30 volume; such tests shall be conducted before the hoist, crane, or lifting system is returned to normal operation.

HOIST INSPECTION AND MAINTENANCE PERSONNEL RESPONSIBILITIES AND REQUIREMENTS

It is recommended that

HOIST INSPECTION AND MAINTENANCE PERSONNEL SHALL:

- Be required to read the operation, inspection, and maintenance sections of the manual furnished with the hoist.
- Be required to read the warnings in the manual furnished with the hoist.
- Be required to read the instructions and warning labels on the hoist.
- Be required to read the operation, inspection, and maintenance sections of ASME B30.16.
- Be required to be familiar with the hoist controls before being authorized to operate the hoist.

HOIST INSPECTION AND MAINTENANCE PROCEDURES

It is recommended that

HOIST INSPECTION AND MAINTENANCE PERSONNEL SHOULD:

- Have normal depth perception, field of vision, reaction time, manual dexterity, and coordination for the work to be performed.
- **NOT** be subject to seizures, loss of physical control, physical defects, or emotional instability that could result in actions of the operator being a hazard to the operator or others.
- **NOT** operate a hoist when under the influence of alcohol or drugs.
- **NOT** operate a hoist when under the influence of medication that could result in actions of the operator being a hazard to the operator or others.

NOTICE

HOISTS ARE INTENDED ONLY FOR VERTICAL LIFTING SERVICE OF FREELY SUSPENDED UNGUIDED LOADS. DO NOT USE A HOIST TO LIFT LOADS THAT ARE NOT LIFTED VERTICALLY, LOADS THAT ARE NOT FREELY-SUSPENDED, OR LOADS THAT ARE GUIDED. IF SUCH CONDITIONS EXIST, THE OPERATOR SHOULD CONTACT THE SUPERVISOR FOR INSTRUCTIONS.

⚠ WARNING

DO NOT LIFT PERSONNEL.
DO NOT LIFT LOADS OVER PEOPLE.

DAILY OR PRESTART HOIST INSPECTIONS

In accordance with the requirements of ASME B30.16, the hoist operator should perform daily (prestart) inspections at the start of each shift, or at the time the hoist is first used during each shift. The daily inspection is a visual and audible examination of the hoist. Records of the daily inspection are not required except as required by the hoist owner/user. Daily inspection items that should be performed by the operator at the start of each shift, or at the time the hoist is first used during each shift, include the items outlined in Table 1 below for hand chain manually operated hoists, and in Table 2, page 27, for electric powered or air powered hoists. Also, refer to the manual furnished by the manufacturer of the hoist for additional information on daily inspections.

TABLE 1 HAND CHAIN MANUALLY OPERATED HOISTS DAILY INSPECTION (REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

<u>INSPECTION ITEM</u>	<u>DESCRIPTION OF INSPECTION CHECK POINTS</u>
Tagged Hoist	Check that hoist is not tagged with an out-of-order sign.
Hand Chain Control	Check that all travel direction motions agree with hand chain pull.
Hook	Check for damage, cracks, nicks, gouges, deformation of the throat opening, wear on saddle or load bearing point, and twist.
Hook Latch	Check that the hook latch, if provided, is not missing and that it operates properly.
Load Chain	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for lubrication of load chain.
Hand Chain	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for open links or open connecting links.
Reeving	Check that load chain is properly reeved and that load chain is not kinked or twisted, and that load chain parts are not twisted about each other.
Brakes	Check that hoist motion does not have excessive drift and that stopping distance is normal.
Oil or Grease Leakage	Check for any sign of oil or grease leakage on the hoist and on the floor area beneath the hoist.
Unusual Sounds	Check for any unusual sounds from the hoist and hoist mechanism while operating the hoist.
Capacity, Warning and	Check that capacity, warning and other safety labels are not missing and Safety Labels that they are legible.

DAILY OR PRESTART HOIST INSPECTIONS

**TABLE 2
ELECTRIC POWERED AND AIR POWERED HOISTS
DAILY INSPECTION
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)**

<u>INSPECTION ITEM</u>	<u>DESCRIPTION OF INSPECTION CHECK POINTS</u>
Tagged Hoist	Check that hoist is not tagged with an out-of-order sign.
Control Devices	Check that all travel motions agree with control device markings. When checking hoist travel motion, always use the lifting or up control first.
Brakes	Check that all travel motions do not have excessive drift and that stopping distances are normal.
Hook	Check for damage, cracks, nicks, gouges, deformation of the throat opening, wear on saddle or load bearing point, and twist.
Hook Latch	Check that hook latch, if provided, is not missing and that it operates properly.
Load Chain (If applicable)	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for lubrication of load chain.
Wire Rope (If applicable)	Check for broken wires, broken strands, kinks, and any deformation or damage to the rope structure.
Reeving	Check that load chain or wire rope is properly reeved, that load chain is not kinked or twisted, and that load chain or wire rope parts are not twisted about each other.
Limit Devices	<p>Check that the primary upper limit device stops lifting motion of the hoist load block at the upper limit of travel.</p> <p>If furnished, check that the lower limit device stops lowering motion of the hoist load block at the lower limit of travel. Note: On wire rope hoists, two wraps of wire rope must remain at each anchorage on the drum. One wrap of wire rope at each anchorage on the hoist drum is permitted if a lower limit device is present.</p>
Oil or Grease Leakage	Check for any sign of oil or grease leakage on the hoist and on the floor area beneath the hoist.
Unusual Sounds	Check for any unusual sounds from the hoist and hoist mechanism while operating the hoist.
Capacity, Warning and	Check that capacity, warning and other safety labels are not missing and Safety Labels that they are legible.

DAILY OR PRESTART HOIST INSPECTIONS

⚠ WARNING

IF ANY DAMAGE OR MALFUNCTIONS ARE NOTED BY THE DAILY INSPECTION ITEMS, THE OPERATOR SHALL NOT OPERATE THE HOIST, AND SHALL IMMEDIATELY ADVISE THE SUPERVISOR SO CORRECTIVE ACTION CAN BE TAKEN. IF THE HOIST IS TAGGED WITH AN OUT-OF-ORDER SIGN, THE OPERATOR SHALL NOT OPERATE THE HOIST.

HOIST OPERATORS SHOULD BE AWARE OF MALFUNCTIONS OF THE EQUIPMENT THAT COULD OCCUR DURING OPERATION, AND SHOULD IMMEDIATELY STOP OPERATION IF SUCH MALFUNCTIONS OCCUR, AND SHOULD IMMEDIATELY ADVISE THE SUPERVISOR SO CORRECTIVE ACTION CAN BE TAKEN.

IF CORRECTIVE ACTION HAS NOT BEEN COMPLETED BY THE END OF THE SHIFT, THE OPERATOR SHALL ADVISE THE OPERATOR OR OPERATORS ON THE NEXT SHIFT THAT CORRECTIVE ACTION IS REQUIRED ON THE HOIST AND VERIFY THAT THE HOIST IS TAGGED WITH AN OUT-OF-ORDER SIGN.

FREQUENT AND PERIODIC HOIST INSPECTIONS

Frequent and periodic inspections of the hoist in accordance with the requirements of the ASME B30.16 standard and as outlined in the manual furnished by the hoist manufacturer are required.

Frequent and periodic inspections are to be performed by trained, experienced, and qualified hoist inspection and hoist maintenance personnel.

Refer to the HOIST INSPECTION AND MAINTENANCE PROCEDURES section of this manual before performing frequent or periodic hoist inspections. Refer to the FREQUENT AND PERIODIC HOIST INSPECTIONS section of this manual for information on frequent or periodic hoist inspections.

NOTICE

THE HOIST OPERATOR SHALL NOT PERFORM FREQUENT OR PERIODIC INSPECTIONS, OR PERFORM MAINTENANCE ON A HOIST UNLESS THE OPERATOR HAS BEEN TRAINED TO PERFORM SUCH INSPECTIONS OR MAINTENANCE, AND IS DESIGNATED BY THE HOIST OWNER/USER TO PERFORM SUCH INSPECTIONS OR MAINTENANCE.

FREQUENT AND PERIODIC HOIST INSPECTIONS

Inspection procedure for hoists in regular service is divided into two general classifications as outlined in ASME B30.16. Inspection procedure for trolleys in regular service is also divided into two general classifications as outlined in ASME B30.11 or ASME B30.17. These two general classifications are based upon the intervals at which inspections should be performed. The intervals are also dependent upon the nature of the critical components of the equipment, and the degree of exposure of equipment components and parts to wear and deterioration. The degree of exposure is dependent upon hoist activity, severity of hoist service, and the environment of hoist location. These two general classifications of inspection are designated as *frequent* and *periodic*.

FREQUENT INSPECTION: Frequent inspections are visual and audio external inspections and examinations by the operator or other designated personnel with no records required. Usual or minimum inspection intervals are as follows:

- Normal service** - monthly
- Heavy service** - weekly to monthly
- Severe service** - daily to weekly

PERIODIC INSPECTION: Periodic inspections are visual, hands-on, and audio external inspections and examinations by designated personnel making written records of external conditions to provide the basis for a continuing evaluation of the hoist and components. If the external inspection indicates the need, disassembly may be required to make a more detailed inspection and examination. Usual or minimum inspection intervals are as follows:

- Normal service** - annually
- Heavy service** - semiannually
- Severe service** - quarterly

WARNING

THE INSPECTION INTERVALS LISTED ABOVE ARE THE USUAL OR MINIMUM RECOMMENDATIONS AND ARE FOR REFERENCE PURPOSES ONLY. THEY ARE BASED ON SINGLE SHIFT OPERATION UNDER NORMAL OPERATING CONDITIONS AND NORMAL ENVIRONMENTAL CONDITIONS. ACTUAL OPERATING AND ENVIRONMENTAL CONDITIONS SHOULD BE REVIEWED BY A QUALIFIED PERSON AND APPROPRIATE INSPECTION INTERVALS ESTABLISHED ON THE RECOMMENDATIONS OF THE QUALIFIED PERSON.

FREQUENT AND PERIODIC HOIST INSPECTIONS

Definitions of service taken from ASME B30.16 for hoists and from ASME B30.11 and B30.17 for trolleys are as follows:

Normal service involves operation of the equipment with randomly distributed loads within the rated load limit, or uniform loads less than 65% of rated load, for not more than 15% of the time of a single work shift for manually-operated equipment and not more than 25% of the time of a single work shift for electric-powered equipment.

Heavy service involves operation of the equipment within the rated load limit that exceeds normal service.

Severe service involves operation of the equipment in normal service or heavy service with abnormal operating conditions.

The ASME standards state: A hoist or crane that is not in regular service, that has been idle for a period of one month or more, but less than one year, shall be inspected in accordance with the requirements for frequent inspection before being placed into service.

The ASME standards state: A hoist or crane that is not in regular service, that has been idle for a period of one year or more, shall be inspected in accordance with the requirements for periodic inspection before being placed into service.

Recommended items to be checked for deficiencies or damage during *frequent* and *periodic* inspections are outlined in Table 3 for hand chain manually operated hoists; and in Table 4 for electric powered or air powered hoists. Also, refer to the manual furnished by the manufacturer of the hoist for additional information on frequent and periodic inspections.

Detailed inspection procedures for some items should be found in specific sections of the manual furnished by the manufacturer with the equipment. Inspections may be performed with the hoist in its normal location and do not require that the hoist be disassembled. Covers and other items normally supplied to allow inspection of components should be opened or removed for these inspections. Any deficiencies or damage such as those listed in Tables 3, page 31, or 4, page 33, shall be examined by a designated person to determine whether they constitute a hazard, or whether any disassembly is necessary for a more detailed inspection. The hoist operator should make observations during regular operation for any deficiencies or damage that might appear between inspections.

FREQUENT AND PERIODIC HOIST INSPECTIONS

TABLE 3
HAND CHAIN MANUALLY OPERATED HOISTS
FREQUENT AND PERIODIC INSPECTIONS
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

INSPECTION ITEM	INSPECTION		DESCRIPTION OF RECOMMENDED INSPECTION CHECK POINTS
	FREQUENT	PERIODIC	
All Functional Operating Mechanisms	•	•	Check for maladjustment or damage that interferes with proper operation, and unusual sounds.
Unusual Sounds	•	•	Check for any unusual sounds from the hoist and hoist mechanism while operating the hoist.
Brake System	•	•	Check for proper operation and that the hoist motion does not have excessive drift and that stopping distance is normal.
Oil or Grease Leakage	•	•	Check for any sign of oil or grease leakage on the hoist and on the floor area beneath the hoist.
Hook	•	•	Check for damage, cracks, nicks, gouges, deformation of the throat opening, wear on saddle or load bearing point, and twist.
Hook Latch	•	•	Check that hook latch, if provided, is not missing and that it operates properly.
Load Chain	•	•	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for lubrication of the load chain.
Hand Chain	•	•	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for open links or open connecting links.
Reeving	•	•	Check that load chain is properly reeved and that load chain is not kinked or twisted and that load chain parts are not twisted about each other.
Lubricant Levels (For detailed inspection procedures, refer to manual furnished by the hoist manufacturer.)	•	•	Check whether lubricant must be added or replaced.
Fastening Devices (bolts, nuts, pins, etc.)		•	Check for items not properly secured (tightened), damaged, or missing (Torque bolts per hoist manufacturers recommended values.)

FREQUENT AND PERIODIC HOIST INSPECTIONS

TABLE 3 (CONTINUED)
HAND CHAIN MANUALLY OPERATED HOISTS
FREQUENT AND PERIODIC INSPECTIONS
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

INSPECTION ITEM	INSPECTION		DESCRIPTION OF RECOMMENDED INSPECTION CHECK POINTS
	FREQUENT	PERIODIC	
Load Sprockets, Hand Chain Sprockets, and Chain Guides		•	Check for cracks, damage to grooves, and excessive wear.
Load block, Suspension, and Frame		•	Check for cracks, damage, and distortion.
Chain Attachments, Clevises, Yokes, Suspension Bolts, Shafts, Gears, Bearings, Pins, Rollers, and Locking and Clamping Devices		•	Check for wear, corrosion, damage and distortion.
Supporting Structure, and Trolley		•	Check for cracks, damage, and distortion.
Trolley Wheels		•	Check for flat spots, damage, and excessive wear.
Hook Retaining Devices		•	Check for damage to hook retaining nuts, collars, pins, welds, rivets, etc. used to secure hooks.
Brake Mechanism		•	Check for worn, glazed, or oil-contaminated friction discs; worn pawls, cams or ratchet; corroded, stretched, or broken pawl springs.
Load Chain End Connection		•	Check for looseness, cracks, damage, and distortion.
Capacity Warning and Safety Labels		•	Check that capacity, warning and other safety labels are not missing and that they are legible.

FREQUENT AND PERIODIC HOIST INSPECTIONS

TABLE 4
ELECTRIC POWERED AND AIR POWERED HOISTS
FREQUENT AND PERIODIC INSPECTIONS
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

INSPECTION ITEM	INSPECTION		DESCRIPTION OF RECOMMENDED INSPECTION CHECK POINTS
	FREQUENT	PERIODIC	
All Functional Operating Mechanisms	•	•	Check for maladjustment or damage that interferes with proper operation and unusual sounds.
Unusual Sounds	•	•	Check for any unusual sounds from the hoist and hoist mechanism while operating the hoist.
Control Devices	•	•	Check for improper operation.
All Limit Switch Devices	•	•	Check for maladjustment or malfunction.
Brake System	•	•	Check for proper operation and that the hoist motion does not have excessive drift and that stopping distance is normal. Check for worn, glazed, or contaminated friction discs; worn pawls, cams or ratchets; corroded, stretched, or broken springs.
Oil or Grease Leakage	•	•	Check for any sign of oil or grease leakage on the hoist and on the floor area beneath the hoist.
Air Lines, Valves, Etc.	•	•	Check for leakage.
Hook	•	•	Check for damage, cracks, nicks, gouges, deformation of the throat opening, wear on saddle or load bearing point, and twist.
Hook Latch	•	•	Check that hook latch, if provided, is not missing and that it operates properly.
Load Chain	•	•	Check for nicks, gouges, and any type of deformation or damage to the chain. Check for lubrication of load chain.
Wire Rope	•	•	Check for broken wires, broken strands, wear, twist, kinks, distortion of rope structure, end connections, rope clamps, deposits of foreign material, head damage, and inadequate lubrication.
Reeving	•	•	Check that wire rope or load chain is properly reeved, that wire rope or load chain is not kinked or twisted, and that wire rope or load chain parts are not twisted about each other.

FREQUENT AND PERIODIC HOIST INSPECTIONS

TABLE 4 (CONTINUED)
ELECTRIC POWERED AND AIR POWERED HOISTS
FREQUENT AND PERIODIC INSPECTIONS
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

INSPECTION ITEM	INSPECTION		DESCRIPTION OF RECOMMENDED INSPECTION CHECK POINTS
	FREQUENT	PERIODIC	
Lubrican Levels (For detailed inspection pro- cedures, refer to manual fur- nished by the hoist manufac- turer.)		•	Check whether lubricant must be added or re- placed.
Fastening Devices (bolts, nuts, pins, etc.)		•	Check for items not properly secured (tightened), damaged, or missing. (Torque bolts per hoist manufacturer’s recommended values.)
Load Sprockets, Chain Guides, Drums, and Sheaves		•	Check for cracks, damage to grooves, and ex- cessive wear.
Load block, Suspension, and Frame		•	Check for cracks, damage, and distortion.
Chain or Rope Attachments, Clevises, Yokes, Suspension Bolts, Shafts, Gears, Bear- ings, Pins, Rollers, and Lock- ing and Clamping Devices		•	Check for wear, corrosion, damage and distor- tion.
Supporting Structure, and Trolley		•	Check for cracks, damage, and distortion.
Trolley Wheels		•	Check for flat spots, damage, and excessive wear.
Hook Retaining Devices		•	Check for damage to hook retaining nuts, col- lars, pins, welds, rivets, etc. used to secure hooks.
Load Chain or Wire Rope End Connection		•	Check for looseness, cracks, damage, and dis- tortion.
Electrical Apparatus		•	Check for pitting, deterioration, and wear.
Contactors		•	Check for pitting, deterioration, wear, and im- proper operation.
Wiring and Fittings		•	Check for loose connections, and abraded, cut , or nicked insulation.

FREQUENT AND PERIODIC HOIST INSPECTIONS

TABLE 4 (CONTINUED)
ELECTRIC POWERED AND AIR POWERED HOISTS
FREQUENT AND PERIODIC INSPECTIONS
(REFER ALSO TO THE MANUAL FURNISHED BY THE HOIST MANUFACTURER)

INSPECTION ITEM	INSPECTION		DESCRIPTION OF RECOMMENDED INSPECTION CHECK POINTS
	FREQUENT	PERIODIC	
Capacity, Warning and Safety Labels		•	Check that capacity, warning and other safety labels are not missing and that they are legible.
Control Device Markings		•	Check that function labels are not missing or illegible.

 WARNING

IF ANY DAMAGE OR MALFUNCTIONS ARE NOTED BY THE FREQUENT OR PERIODIC INSPECTION ITEMS OF TABLES 3 OR 4, THE HOIST SHALL BE TAGGED WITH AN OUT-OF-ORDER SIGN AND SHALL NOT BE RETURNED TO REGULAR OPERATION UNTIL MAINTENANCE AND REPAIR OF THE DAMAGE OR DEFICIENCIES FOUND DURING THE INSPECTION HAVE BEEN CORRECTED.

Records of the condition of critical components such as wire rope, load chain, hooks, and brakes observed during frequent and periodic inspections should be established. This record should also record replacement, maintenance, and repair information. Use of this recorded information should be a basis for the establishment of a preventative maintenance program for replacement of wearing components on a regular basis, thereby eliminating or reducing unscheduled downtime situations.

HOIST INSPECTION REPORTS

Written reports are not required by the ASME B30.16 volume for daily inspections or frequent inspections. Some companies use a daily inspection report form to serve as a notice that the equipment needs or may soon need service. It is a means to convey such information to the maintenance department that repairs are or may be required and that the equipment may be required to be taken out of service. Some companies have also established procedures requiring a written inspection report for frequent inspections.

Written reports, however, are required by the ASME B30.16 volume for periodic inspections. This can be accomplished by the use of pre-printed forms for use by the inspector. The inspection forms can be prepared specifically for use to meet the needs of an individual company. Some software programs are available with forms established. An example of inspection report forms is presented below with sample forms shown in Appendix C. The sample forms of Appendix C are used with the permission of FKI Industries Inc. These sample forms can be used as guides by companies that need to develop an inspection program.

This sample form program uses one cover sheet for the inspection report form and seven different inspection report forms, each covering a specific type of equipment or component, as follows:

APPENDIX

AND

FORM NO.

EQUIPMENT COVERED

C1	Inspection Report Form (1 sheet) (this is a cover sheet for the inspection report)
C2	Hand Hoist Inspection Report Form (2 sheets)
C3	Electric Chain Hoist Inspection Report Form (3 sheets)
C4	Electric Wire Rope Hoist Inspection Report Form (3 sheets)
C5	Trolley Inspection Report Form (2 sheets)
C6	Wire Rope Inspection Report Form (2 sheets)
C7	Load Chain Inspection Report Form (1 sheet)
C8	Hook Inspection Report Form (1 sheet)

An inspection report sheet should always be used along with the applicable form or forms for the equipment being inspected. The report sheet shows by check marks the form or forms used and attached. The report sheet also shows by check mark the action determined as a result of the inspection to be required.

HOOK INSPECTION

Load hooks on hoists in regular service should be visually inspected daily by the operator. If the hoist is used in multiple-shift operations, load hooks should be visually inspected by the operator at the start of each shift. When visual inspection indicates that a more detailed inspection is required, the following are some recommended inspection procedures in addition to what is stated in the manual furnished by the manufacturer with the hoist. These procedures also would apply to scheduled frequent and periodic inspections.

1. Measure hook throat opening from metal to metal of the hook as shown by dimension E in Figure 7 below. DO NOT measure from latch to metal. Hook must be replaced when throat opening measurement has increased 15% over the original throat opening dimension of a new hook. The manual furnished with some hoists will include original dimensions and replacement dimensions for throat openings of standard hooks specified for the hoist line. Some hook manufacturers provide gauge marks on hooks. To aid in measuring the throat opening, it is recommended the hoist owner/user make a gauge of the dimensions shown in the manual. This will allow quick measurement of the throat opening and immediate indication that hook replacement is required.

If hook throat opening dimensions are not covered in the manual furnished with the hoist, the hook throat opening should be measured by the owner/user prior to installing the hoist. This will establish a reference point to use in future inspections for determination when the throat opening dimension has increased 15% requiring hook replacement. A gauge similar to the one discussed above is recommended. The gauge should have the throat opening dimension measured prior to installation, and a dimension 15% greater than the throat opening dimension measured prior to installation.

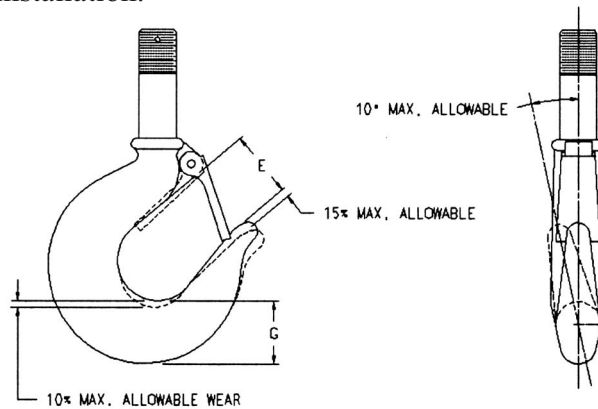


FIGURE 7

2. Measure hook depth at load bearing point (base, bowl, or saddle) of the hook as shown by dimension G in Figure 7 above. Hook must be replaced when wear at load bearing point is 10% of the original depth of the hook load bearing point. The manual furnished by the manufacturer with the hoist may include original dimensions and replacement dimensions for depth at load bearing point of standard hooks specified for the hoist line.

HOOK INSPECTION

If hook depth at load bearing point dimensions are not covered in the manual furnished with the hoist, the hook depth at load bearing point should be measured by the owner/user prior to installing the hoist. This will establish a reference point to use in future inspections for determination when wear at the load bearing point has reached 10% requiring hook replacement.

3. A bend or twist of the hook exceeding 10° from the plane of the unbent hook requires replacement of the hook. Refer to Figure 7, page 36.
4. A hook latch, when required on the hoist, that is missing shall be replaced.
5. A hook latch, when required on the hoist, that is inoperative shall be repaired or replaced.
6. A hook with a hook latch that does not close the throat opening of the hook, and the hook opening does not exceed the requirements of item 1 on page 36, shall be removed from service or moused until the latch is replaced or repaired.
7. Hooks having damage from chemicals, corrosion, or deformation shall be repaired or replaced. Damage in the form of cracks, nicks, and gouges may be repaired by a designated person by grinding longitudinally, following the contour of the hook, provided no dimension of the hook is reduced by more than 10% of the original dimension of a new hook. If the repair reduces the dimension of the hook by more than 10% of the original dimension of a new hook, the hook shall be replaced.

NOTICE

A HOOK THAT REQUIRES REPLACEMENT BECAUSE OF EXCESSIVE BENDS, TWISTS, OR THROAT OPENING INDICATES ABUSE OR OVERLOADING OF THAT HOIST. THEREFORE, OTHER LOAD SUPPORTING COMPONENTS OF THAT HOIST SHOULD BE INSPECTED FOR POSSIBLE DAMAGE WHEN SUCH CONDITIONS ARE FOUND.

⚠ CAUTION

NEVER REPAIR HOOKS BY WELDING OR RESHAPING. HEAT APPLIED TO THE HOOK WILL ALTER THE ORIGINAL HEAT TREATMENT OF THE HOOK MATERIAL AND CHANGE THE STRENGTH OF THE HOOK.

NEVER WELD HANDLES OR OTHER ATTACHMENTS TO THE HOOK. HEAT APPLIED TO THE HOOK WILL ALTER THE ORIGINAL HEAT TREATMENT OF THE HOOK MATERIAL AND CHANGE THE STRENGTH OF THE HOOK. IF HANDLES OR OTHER ATTACHMENTS ARE REQUIRED ON THE HOOK, CONTACT THE MANUFACTURER OF THE HOIST.

WIRE ROPE INSPECTION

Wire rope on hoists in regular service should be visually inspected daily by the operator. If the hoist is used in multiple-shift operations, wire rope should be visually inspected by the operator at the start of each shift. The daily inspection by the operator is for visual damage to the wire rope. Such damage includes excessive broken wires and wear, broken strands, kinks, birdcaging, or damage resulting in deformation of the wire rope structure. When visual damage is present, the operator shall report such damage to the supervisor, and shall not operate the hoist until a more detailed inspection is performed to determine that the wire rope can be used, or the wire rope is replaced. Detailed inspection procedures are outlined below. These procedures also apply to scheduled frequent and periodic inspections.

⚠ WARNING

DO NOT OPERATE A HOIST WITH WIRE ROPE THAT SHOWS ANY SIGN OF DAMAGE, DEFORMATION, OR EXCESSIVE WEAR.

Wire rope consists of a core, strands, and wires that comprise a strand as shown in Figure 8 below. The diameter of the wire rope is the diameter of a circle that would enclose the wire-rope strands. Correct and incorrect methods of measuring wire-rope diameter are shown in Figure 9 below. The term *one rope lay* refers to the length of wire rope assembly wherein one strand completely wraps 360° around the wire-rope assembly.

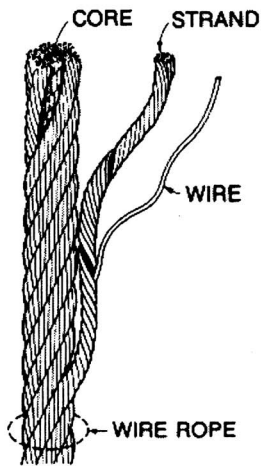


FIGURE 8

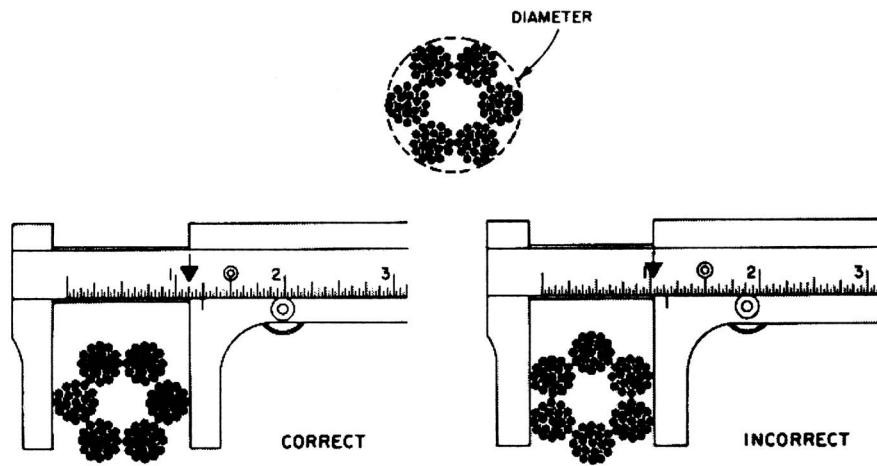


FIGURE 9

WIRE ROPE INSPECTION

WIRE ROPE INSPECTION

CAUTION

ALWAYS WEAR GLOVES OR OTHER HAND PROTECTION DEVICES WHEN HANDLING WIRE ROPE.

Wire rope items to be included for inspection during scheduled frequent and periodic inspections; or if the daily visual inspection by the operator indicates a more detailed inspection is required; are as follows:

1. Rope distortion such as kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion.
2. General corrosion.
3. Broken or cut strands.
4. Number, distribution, and type of visible broken or cut wires.
5. Reduction of rope diameter due to loss of core support, internal or external corrosion, or wear of outer wires.
6. Damage from heat.
7. Corroded or broken wires at end connections.
8. Corroded, cracked, bent, worn, damaged, or improperly applied end connections.
9. Wire rope pull through of end connection.
10. Tightening of clamping-type end connections. Checking torque of bolts of end connections for clamps that recommend a specified torque on the clamp bolts.
11. Rope lubrication, if recommended.

WIRE ROPE INSPECTION

During wire rope inspection, special attention should be directed to sections of rope subject to rapid deterioration such as the following:

- Rope sections in contact with saddles, equalizer sheaves, or other sheaves where rope travel is limited.
- Rope sections at or near terminal ends where corroded or broken wires may protrude.
- Rope sections subject to reverse bends.
- Rope sections that are normally hidden during visual inspections, such as sections passing over sheaves.

Rope conditions found during the inspection should be recorded in a written report. Amount and type of rope deterioration from one inspection report until the next inspection report should be evaluated for determination if rope replacement is required.

WIRE ROPE REPLACEMENT

Rope conditions found during an inspection, in addition to review of previous inspection reports, should be the basis for determination as to whether that hoist use should be discontinued and rope replacement is required. Rope conditions requiring replacement of the rope include the following:

1. One broken strand.
2. Twelve randomly distributed broken wires in one rope lay.
3. Four broken wires in one strand in one rope lay.
4. One outer wire broken at the contact point with the core of the rope that has worked its way out of the rope structure and protrudes or loops out from the rope structure.
5. Wear of one-third of the original diameter of outside individual wires.
6. Kinking, crushing, unstranding, birdcaging, main strand displacement, core protrusion, or any other damage resulting in deformation or distortion of the rope structure.
7. Evidence of heat damage from any cause.
8. Corroded or two broken wires at a socketed or swaged end fitting.

WIRE ROPE INSPECTION

9. Corroded, cracked, bent, damaged, or worn end fitting.
10. Reduction of rope nominal diameter greater than
 - 1/64 inch (0.4 mm) for rope diameters up to and including 5/16 inch (8 mm).
 - 1/32 inch (0.8 mm) for rope diameters over 5/16 inch up to and including 1/2 inch (13 mm).
 - 3/64 inch (1.2 mm) for rope diameters over 1/2 inch up to and including 3/4 inch (19 mm).
 - 1/16 inch (1.6 mm) for rope diameters over 3/4 inch up to and including 1-1/8 inch (29 mm).
 - 3/32 inch (2.4 mm) for rope diameters over 1-1/8 inch up to and including 1-1/2 inch (38 mm).

WIRE ROPE MAINTENANCE

Only authorized replacement wire rope assemblies, with wire rope constructions and end fittings in accordance with design specifications established by the hoist manufacturer, should be used when replacing wire rope on the hoist.

Specific attention should be directed to the following:

- Wire rope should be stored in a manner to prevent damage or deterioration to the rope.
- Wire rope shall be unreeled or uncoiled in a manner to avoid kinking of or inducing a twist in the rope.
- During installation of wire rope, care should be exercised to avoid dragging the rope in dirt or around objects that will scrape, nick, cut, crush, or induce sharp bends in the rope.
- If recommended, rope should be maintained in a lubricated condition.

The load block on new hoists or after installation of replacement rope may turn when a load is applied or released. Such load block turning may cause the lines of rope to twist about each other. Do not operate the hoist in this condition. This indicates a twist was induced into the rope during installation. Remove the rope from the hoist, lay the rope out to remove any twist, and re-install on the hoist. For additional information on removing a twist in the wire rope, refer to the manual furnished with the hoist or contact the hoist manufacturer.

WIRE ROPE INSPECTION

When replacing wire rope, inspect the drum and sheaves. Drums that have scored grooves or have sharp edges from wear should be smoothed out or the drum should be replaced. Sheaves that have scored grooves, cracked or broken flanges, or sharp edges from wear should be replaced.

TO REPLACE WIRE ROPE

Wire rope should be replaced in accordance with the instructions outlined in the manual furnished by the manufacturer with the hoist. The original reeving arrangement of the hoist must be followed when replacing wire rope.

CAUTION

WHEN GUIDING THE WIRE ROPE INTO THE DRUM GROOVES, USE ONLY A LIGHT SQUEEZING PRESSURE. DO NOT SQUEEZE ROPE THAT WILL PERMIT HAND BEING PULLED INTO THE GROOVES AND ROPE. KEEP HANDS WELL POSITIONED AWAY FROM DRUM. ALWAYS WEAR GLOVES OR OTHER HAND PROTECTION DEVICES WHEN HANDLING WIRE ROPE. NEVER HANDLE MOVING WIRE ROPE WITH BARE HANDS.

After wire rope has been replaced, reset and test all limit switches before returning the hoist to regular service.

WARNING

NEVER OPERATE HOIST WITHOUT THE PROTECTION OF PROPERLY FUNCTIONING LIMIT SWITCHES.

LOAD CHAIN INSPECTION

Load chain on hoists in regular service should be visually inspected daily by the operator. If the hoist is used in multiple-shift operations, load chain should be visually inspected by the operator at the start of each shift. The daily inspection by the operator is for visual damage to the load chain. Such damage includes wear, gouges, nicks, weld spatter, corrosion, and distorted links. The load chain should feed smoothly into and away from chain sprockets when the hoist is operated. When visual damage is present, the operator shall report such damage to the supervisor, and shall not operate the hoist until a more detailed inspection is performed to determine that the load chain can be used, or the load chain has been replaced. The following are some recommended inspection procedures in addition to what is stated in the manual furnished by the manufacturer with the hoist. These procedures also would apply to scheduled frequent and periodic inspections.

WARNING

DO NOT OPERATE A HOIST WITH LOAD CHAIN THAT SHOWS ANY SIGN OF DAMAGE, DEFORMATION, OR EXCESSIVE WEAR.

LOAD CHAIN INSPECTION

Load chain items to inspect, and conditions which may require replacement, during scheduled frequent and periodic inspections, or if the daily visual inspection by the operator indicates a more detailed inspection is required, are as follows:

1. Clean chain before inspection to permit full inspection of the load chain.
2. Attach a load to the hoist and operate hoist in the lifting and lowering directions. Observe operation of load chain and chain sprockets. The chain should feed smoothly into and away from chain sprockets. If the load chain binds, jumps, or is noisy, inspect the chain and mating parts for wear, distortion, or other damage.
3. Attach a light load (approximately 50 to 100 pounds) on the hook and check load chain for wear and elongation. Chain wear and elongation are checked by measuring a specified length (specified number of chain links called gauge length) of chain. Gauge length is shown in Figure 10, page 44. Figure 10 shows two gauge length figures because hoist manufacturers may denote gauge length in two different ways.

The chain gauge length for a new length of load chain, and the measured gauge length when load chain should be replaced is normally outlined in the manual furnished with the hoist. If such information is not available, proceed as follows:

LOAD CHAIN INSPECTION

- a. Select an unworn and unstretched length of chain (e.g., at the slack end of the chain). The number of links selected must be an odd number and should be approximately 12 inches to 24 inches in length.

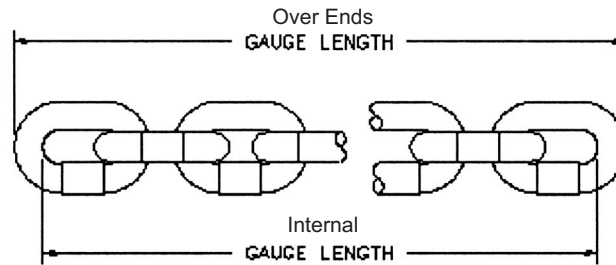


FIGURE 10

- b. Measure the gauge length of the unworn and unstretched length of chain selected by use of a caliper-type gauge.
- c. Measure the gauge length of the same number of links in a used section of the load chain.
- d. Replace the load chain if:
- the used gauge length is 2-1/2% longer than the unused gauge length for manually-operated hoists.
 - the used gauge length is 1-1/2% longer than the unused gauge length for power-operated hoists.
4. Conduct a link by link inspection for gouges, nicks, weld spatter, corrosion, and distorted links. The existence of any of these types of damage shall be reason to replace load chain.
5. Slacken the load chain and move adjacent links to one side and inspect each link for inter-link wear at the link contact points. If inter-link wear is observed, measure the thickness of the link at the contact point. If wear is greater than 10% of the original wire diameter of the chain, for manually operated hoists, or 5% of the original wire diameter of the chain for power-operated hoists, the load chain shall be replaced.

⚠ CAUTION

NEVER REPAIR LOAD CHAIN BY WELDING OR RESHAPING. HEAT APPLIED TO THE LOAD CHAIN WILL ALTER THE ORIGINAL HEAT TREATMENT OF THE CHAIN MATERIAL AND CHANGE THE STRENGTH OF THE CHAIN, AND WILL DISTORT THE CHAIN LINKS RESULTING IN LINKS NOT FITTING POCKETS OF CHAIN SPROCKET.

LOAD CHAIN INSPECTION

LOAD CHAIN REPLACEMENT

Only authorized replacement load chain, with design specifications established by the hoist manufacturer, should be used when replacing load chain on the hoist. Load chain is specifically designed for a particular hoist. Load chain from one manufacturer should not be used on a hoist manufactured by a different manufacturer.

When replacing load chain, inspect the chain sprockets and all mating parts such as chain guides and chain strippers. Sprockets that have scored pockets, cracked or broken flanges, excessive pocket wear, or sharp edges from wear should be replaced. Guides and strippers that are worn or damaged should be replaced.

Load chain should be replaced in accordance with the instructions outlined in the manual furnished by the manufacturer with the hoist. The original reeving arrangement of the hoist must be followed when replacing load chain.

Load chain links that pass over the hoist drive load sprocket on edge (alternate to those links that lie flat in the sprocket pockets) shall be installed (unless otherwise recommended by the hoist manufacturer) with the welds away from the center of the drive sprocket.

Load chain shall be installed without any twist between the hoist and load block or between hoist or load block and an anchored end connection on either the loaded side or slack side of the load chain.

Load chain should be maintained in a lubricated condition.

After load chain has been replaced, reset and test all limit switches before returning the hoist to regular service.

WARNING

NEVER OPERATE A HOIST WITHOUT THE PROTECTION OF PROPERLY FUNCTIONING LIMIT SWITCHES.

ELECTRICAL COMPONENTS INSPECTION

DANGER

HAZARDOUS VOLTAGES PRESENT.

DISCONNECT POWER AND LOCKOUT DISCONNECTING MEANS BEFORE INSPECTING OR SERVICING A HOIST. LOCK AND TAG THE MAIN SWITCH IN THE DE-ENERGIZED POSITION IN ACCORDANCE WITH ANSI Z244.1.

ONLY QUALIFIED ELECTRICIANS SHOULD INSPECT, SERVICE, REPAIR, OR REPLACE ELECTRICAL COMPONENTS.

ELECTRICAL COMPONENTS INSPECTION

Electrical components should be inspected on a schedule as outlined in the manual furnished with the equipment, and during scheduled frequent and periodic inspections, as follows:

Follow the procedures and instructions listed in the HOIST INSPECTION AND MAINTENANCE PROCEDURES section of this manual.

COMPONENTS TO EXAMINE

- Magnetic contactors.
- Limit switches.
- Control devices.
- Wiring and connections.

DAMAGE TO LOOK FOR

- Pitting.
- Corrosion.
- Broken parts.
- Damage and deterioration of any kind.
- Damaged or frayed wire.
- Loose terminal connections.

ELECTRICAL COMPONENTS INSPECTION

CORRECTIVE ACTION REQUIRED

- Tighten any loose connections.
- Replace any damaged or frayed wires.
- Replace any pitted, burned, or corroded contacts or the entire contactor. Replace contacts in sets only. NEVER attempt to smooth contacts by filing or other means.
- Replace damaged components.
- Lubricate controller parts only if recommended by the controller manufacturer.

Operation of multiple-speed controls and soft-start devices should be checked and adjustments made as required.

HOIST BRAKING SYSTEM INSPECTION

Hoist braking systems on powered hoists are designed to perform the following functions: (a) stop and hold the load hook when controls are released; (b) limit the speed of load during lowering, with or without power, to a maximum speed of 120% of rated lowering speed for the load being handled; and (c) stop and hold the load hook in the event of a complete power failure.

The hoist braking system on hoists in regular service should be checked without load on the hook by the operator at the start of each shift, or the first time the hoist is to be operated during each shift. The hoist braking system should be checked during scheduled frequent and periodic inspections.

Every hoist manufacturer has a braking system design that is unique in the manner in which it operates and performs. Therefore, general guidelines for testing and adjusting all hoist braking systems cannot be outlined. Refer to the manual furnished by the manufacturer with the hoist for testing procedures, inspection, adjustment, and replacement of components of the braking system.

TROLLEY INSPECTION

Trolleys should be inspected in accordance with the manual furnished by the hoist or trolley manufacturer, and during scheduled frequent and periodic inspections. Recommended inspection procedures would also include:

1. Follow the procedures and instructions listed in the HOIST INSPECTION AND MAINTENANCE PROCEDURES section of this manual.
2. Inspect trolley wheel bearings for wear by manually rotating and rocking wheels. If excessive bearing play is present, replace bearings.
3. Inspect for wear, flat spots, or damage to wheel tread; and cracked or broken wheel flanges. Replace wheels as required. When wheel replacement is required, all the wheels of a trolley should be replaced.
4. Inspect gear teeth of geared wheels and pinion for wear, cracks, or damage. Replace geared wheels or pinion as required. Geared wheels should always be replaced in pairs. Use open gear lubricant on open gears and pinions as recommended by the trolley manufacturer.
5. Inspect and tighten or replace as required all bolts, nuts, and locking devices.
6. Check all structural members and braces for cracks, weld cracks, and distortion.
7. Check drive shafts and couplings for looseness and tighten as required.
8. Inspect operating surface of monorail track for wear, damage, or distortion. Check straightness of monorail track.
9. If travel motion uses a rubber tire against under side of track, check tire for wear and damage, and check tire pressure against track.
10. Check monorail electrical conductors for support and operate trolley to verify contact is continuous over the length of conductor. Check wiring connections to conductor bars.
11. Check lubrication in accordance with the instructions outlined in the manual furnished by the hoist or trolley manufacturer.
12. Check bumpers, bumper stops, and rail sweeps for damage and contact.
13. If trolley is furnished with a warning device, check that device is operating.

NOTE: Strict execution and observation of ALL procedures in this manual will better qualify personnel to inspect and maintain the hoist in a safe manner, but do not release such personnel and users from the responsibility of obtaining, reading and fully understanding the specific manufacturer's manual and instructions.

DEFINITIONS OF VARIOUS HOIST TERMS

abnormal operating conditions - Environmental conditions that are unfavorable, harmful, or detrimental to or for the operation of a hoist, such as excessively high or low ambient temperatures, exposure to weather, corrosive fumes, dust laden or moisture laden atmospheres, and hazardous locations.

below-the-hook lifting device – A structural, mechanical, electro-mechanical, pneumatic, vacuum, or other supplemental device, other than slings, that is supported by the hoist load hook and hangs below the hoist hook, used for ease in handling certain types of loads. The weight of such devices are to be considered as part of the rated load to be lifted.

block loads – An action that facilitates the removal of slings or other lifting devices from under the load, accomplished by bringing the load to rest on wood, metal, or other spacers between the floor and load.

brake - A device, other than a motor, used for retarding or stopping motion by friction or power means.

brake, holding - A friction brake for a hoist that is automatically applied and prevents motion when power to the brake is de-energized.

brake, mechanical load - An automatic type of friction brake used for controlling loads in a lowering direction. This unidirectional device requires torque from the motor or hand chain wheel to lower a load but does not impose any additional load on the motor or hand chain wheel when the hoist is lifting a load. A mechanical load brake is a mechanical control braking means.

braking means – A method or device used for stopping or holding motion by friction or power.

braking means, control - A method of controlling speed by removing energy from the moving body or by imparting energy in the opposite direction.

braking means, countertorque (plugging) - A method of control by which the power to the motor is reversed to develop torque in the direction opposite to the rotation of the motor.

braking means, dynamic - A method of controlling speed by using the motor as a generator, with the energy being dissipated by resistance.

braking means, eddy current - A method of controlling or reducing speed by means of an energy induction load brake.

APPENDIX A

braking means, mechanical - A method of controlling or reducing speed by friction.

braking means, pneumatic - A method of controlling or reducing speed by means of a compressed gas.

braking means, regenerative - A method of controlling speed in which the electrical energy generated by the motor is fed back into the power system.

chain guide – See **guide, chain**.

chain, hand - The chain grasped by a person to apply force required for the lifting or lowering motion.

chain, load - The load-bearing chain in a hoist.

chain, roller - A series of alternately assembled roller links and pin links in which the pins articulate inside the bushings and the rollers are free to turn on the bushings. Pins and bushings are press fit in their respective link plates.

chain, welded link - A chain consisting of a series of interwoven links formed and welded.

designated person – A person selected or assigned by the employer or the employer’s representative as being competent to perform specific duties.

guide, chain - A means to guide the load chain at the load sprocket.

hand chain wheel - See **wheel, hand chain**.

hoist - A machinery unit that is used for lifting or lowering a freely suspended (unguided) load.

lifting devices - Devices that are not normally reeved onto the hoist ropes or chain, such as hook-on buckets, magnets, grabs, and other supplemental devices used for ease of handling certain types of loads. The weight of these devices is to be considered part of the load to be lifted.

limit device - A device that is operated by some part or motion of a power driven hoist to limit motion.

limit device, primary upper- – See **primary upper-limit device**.

load - The total superimposed weight on the load block or hook.

APPENDIX A

load, rated - The maximum load for which a hoist is designated by the manufacturer or a qualified person.

load block - The assembly of hook or shackle, swivel, bearing, sheaves, sprockets, pins, and frame suspended by the hoisting rope or load chain. This shall include any appurtenances reeved in the hoisting rope or load chain.

load chain – See **chain, load**.

load suspension parts - The load suspension parts of the hoist are the means of suspension (hook or lug), the structure or housing which supports the drum or load sprocket, the drum or load sprocket, the rope or load chain, the sheaves or sprockets, and the load block or hook.

mouse (moused) – A method used to close the throat opening of a hook wherein rope or wire is wrapped around the back of the hook and the tip of the hook.

normal operating conditions - Conditions during which a hoist is performing functions within the scope of the original design.

overload - Any load greater than the rated load.

overtravel restraint - A device used to prevent the slack load chain from inadvertently being lowered out of the load sprocket.

parts (lines) - Number of lines of rope or chain supporting the load block or hook.

pendant station - Controls suspended from the hoist for operating the unit from the floor.

power transmission parts - The machinery components including the gears, shafts, clutches, couplings, bearings, motors, and brakes.

primary upper-limit device – The primary upper-limit device is the first limit device that will be activated to control the upper limit of travel of the load block when a hoist is equipped with more than one upper-limit device

qualified person - A person who, by possession of a recognized degree in an applicable field or a certificate of professional standing, or who by extensive knowledge, training, and experience, has successfully demonstrated the ability to solve or resolve problems relating to the subject matter and work.

rated load – See **load, rated**.

APPENDIX A

reeving – A system in which a rope or chain travels around drums, sheaves or sprockets.

roller chain – See **chain, roller**.

sheave - A grooved wheel or pulley used with a rope or chain to change direction and point of application of a pulling force.

sheave, nonrunning - A sheave used to equalize tension in opposite parts of the rope or chain. Because of its slight movement, it is not termed a running sheave.

sheave, running - A sheave, which rotates as the load block, is lifted or lowered.

side pull - The component of the hoist pull acting horizontally when the hoist lines are not operated vertically.

sprocket, idler - A freely rotating device that changes the direction of the load chain.

sprocket, load - A hoist component that transmits motion to the load chain. This component is sometimes called **load wheel, load sheave, pocket wheel, chain wheel, or lift wheel**.

switch - A device for making, breaking, or changing the connections in an electric or pneumatic circuit (valve).

trolley – A machine unit that travels on a monorail track or crane bridge girder.

trolley hoist - A hoist and trolley unit consisting of a hoist suspended from or mounted to a trolley, or a hoist with an integral trolley.

APPENDIX B

HOIST REFERENCE DOCUMENTS AND STANDARDS

HMI Recommended Practices - Hand Chain Manually Operated Chain Hoists

HMI Recommended Practices - Electric And Air Powered Chain and Wire Rope Hoists

HMI Consensus of the NEC (National Electrical Code)

HMI Hoist Operators Manual, July 2000

Publisher: Hoist Manufacturers Institute
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28217

ASME HST-1-1999	Performance Standard for Electric Chain Hoists
ASME HST-2-1999	Performance Standard for Hand Chain Manually Operated Chain Hoists
ASME HST-4-1999	Performance Standard for Overhead Electric Wire Rope Hoists
ASME HST-5-1999	Performance Standard for Air Chain Hoists
ASME HST-6-1999	Performance Standard for Air Wire Rope Hoists
ASME B30.2-2001	Safety Standard, Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)
ASME B30.9-1996	Safety Standard, Slings
ASME B30.10-1999	Safety Standard, Hooks
ASME B30.11-1998	Safety Standard, Monorails and Underhung Cranes
ASME B30.16-1998	Safety Standard, Overhead Hoists (Underhung)
ASME B30.17-1998	Safety Standard, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, Underhung Hoist)
ASME B30.20-1999	Safety Standard, Below-the-Hook Lifting Devices

APPENDIX B

ASME B29.24M-1995 Roller Load Chains for Overhead Hoists

Publisher: The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016

ASME Order Department
22 Law Drive
Box 2900
Fairfield, NJ 07007-2900

CMAA Specification No. 70, Revised 2000 Specifications for Top Running Bridge and Gantry Type Multiple Girder Electric Overhead Traveling Cranes

CMAA Specification No. 74, Revised 2000 Specifications for Top Running & Under Running Single Girder Electric Overhead Traveling Cranes Utilizing Under Running Trolley Hoist

CMAA Crane Operators Manual

Publisher: Crane Manufacturers Association of America, Inc.
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28217

ANSI/MMA MH27.1-1996 Specifications for Patented Track Underhung Cranes and Monorail Systems

Publisher: Monorail Manufacturers Association, Inc.
8720 Red Oak Blvd., Suite 201
Charlotte, NC 28217

APPENDIX B

NFPA 70-2002 National Electrical Code

Publisher: National Fire Protection Association
Batterymarch Park
Quincy, MA 02269

ANSI Z241.2-1999 Safety Requirements for Melting and Pouring of Metals in the Metalcasting Industry

Publisher: American Foundrymen's Society
505 State Street
Des Plaines, IL 60016

ANSI Z244.1-1982 (R1993) Safety Requirements for the Lock Out/Tag Out of Energy Sources

Publisher: American National Standards Institute
11 West 42nd Street
New York, NY 10036

APPENDIX C2 (SAMPLE REPORT FORM)

COMPANY _____

**HAND HOIST INSPECTION REPORT (FORM NO. C2)
SHEET 1 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C2.1	All Functional Operating Mechanisms: Maladjustment that interferes with proper operation. Unusual sounds.			
C2.2	Braking Mechanism: Slipping under load. Difficult to release.			
C2.3	Brake Parts: Brake Discs: Glazing. Oil contamination. Pawl and Ratchet: Wear Pawl Spring: Corrosion & stretch			
C2.4	Load Chain: Refer to Load Chain Inspection Report Form No. C7.			
C2.5	Hand Chain: Nicks, gouges, cracks, distortion.			
C2.6	Hooks: Refer to Hook Inspection Report Form No. C8.			
C2.7	Hook Retaining Members: Not tight or secure.			
C2.8	Hook Latch: Missing, damaged, does not close hook opening.			

APPENDIX C2 (SAMPLE REPORT FORM)

COMPANY _____

HAND HOIST INSPECTION REPORT (FORM NO. C2) SHEET 2 OF 3

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C2.9	Suspension Members, Including Chain Attachments, Suspension Bolts, Pins, and Nuts: Wear, distortion, cracks, loose.			
C2.10	Chain Sprokets and Handwheels: Wear, cracks, broken, distortion.			
C2.11	Gears: Wear, broken teeth, cracks, lubrication.			
C2.12	Bearings & Shafts: Wear, distortion, cracks, loose, lubrication			
C2.13	Lubrication: Lack of amount, dirty.			
C2.14	Load Block: Cracks, distortion, loose bolts, pins, or nuts.			
C2.15	Trolley: Refer to Trolley Inspec- tion Report Form No. C5.			
C2.16	Supporting Structure: Distortion, cracks.			
C2.17	All Bolts, Pins, and Nuts: Missing, damaged, distortion, loose.			

APPENDIX C2 (SAMPLE REPORT FORM)

COMPANY _____

**HAND HOIST INSPECTION REPORT (FORM NO. C2)
SHEET 3 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C2.18	WARNING, Instruction Labels, and Load Markings: Missing, illegible.			

Signature & Date of Inspector: _____

Signature & Date of Supervisor: _____

APPENDIX C3 (SAMPLE REPORT FORM)

COMPANY _____

**ELECTRIC CHAIN HOIST INSPECTION REPORT (FORM NO. C3)
SHEET 1 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C3.1	All Functional Operating Mechanisms: Maladjustment that interferes with proper operation. Unusual sounds.			
C3.2	Control Devices: Improper operation.			
C3.3	All Limit Switch Devices: Maladjustment or malfunction.			
C3.4	Hooks: Refer to Hook Inspection Report Form No. C8.			
C3.5	Hook Retaining Members: Not tight or secure.			
C3.6	Hook Latch: Missing, damaged, does not close hook opening.			
C3.7	Load Chain Reeving: Not in accordance with reeving of manufacturer.			
C3.8	Load Chain: Refer to Load Chain Inspection Report Form No. C7.			
C3.9	Suspension Members, Including Chain Attachments, Suspension Bolts, Pins, and Nuts: Wear, distortion, cracks, loose.			
C3.10	Chain Sprockets: Wear, cracks, broken, distortion.			

APPENDIX C3 (SAMPLE REPORT FORM)

COMPANY _____

**ELECTRIC CHAIN HOIST INSPECTION REPORT (FORM NO. C3)
SHEET 2 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C3.11	Lubrication: Level low, dirty.			
C3.12	Load Block: Cracks, distortion, loose bolts, pins, or nuts.			
C3.13	Motor Brake: Drift, lining wear, out of adjustment.			
C3.14	Load Brake: Drift.			
C3.15	Contactors: Pitting, deterioration, wear, improper operation.			
C3.16	Electrical components: Pitting, deterioration, wear.			
C3.17	Wiring and Fittings: Loose connections, abraded, cut, or nicked insulation.			
C3.18	Trolley: Refer to Trolley Inspection Report Form No. C5.			
C3.19	Supporting Structure: Distortion, cracks.			
C3.20	All Bolts, Pins, and Nuts: Missing, damaged, distortion, loose.			
C3.21	Control Device Markings (Function and Direction Labels): Missing, illegible.			

APPENDIX C3 (SAMPLE REPORT FORM)

COMPANY _____

**ELECTRIC CHAIN HOIST INSPECTION REPORT (FORM NO. C3)
SHEET 3 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C3.22	WARNING, Instruction Labels, and Load Markings: Missing, illegible.			

Signature & Date of Inspector: _____

Signature & Date of Supervisor: _____

APPENDIX C4 (SAMPLE REPORT FORM)

COMPANY _____

**ELECTRIC WIRE ROPE HOIST INSPECTION REPORT (FORM NO. C4)
SHEET 1 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C4.1	All Functional Operating Mechanisms: Maladjustment that interferes with proper operation. Unusual sounds.			
C4.2	Control Devices: Improper Operation.			
C4.3	All Limit Switch Devices: Maladjustment or mal-function.			
C4.4	Hooks: Refer to Hook Inspection Report Form No. C8.			
C4.5	Hook Retaining Members: Not tight or secure.			
C4.6	Hook Latch: Missing, damaged, does not close hook opening.			
C4.7	Wire Rope Reeving: Not in accordance with reeving of manufacturer.			
C4.8	Wire Rope: Refer to Wire Rope Inspection Report Form No. C6.			
C4.9	Suspension Members, including Wire Rope Attachments, Suspension Bolts, Pins, and Nuts: Wear, distortion, cracks, loose.			
C4.10	Drum and Sheaves: Wear, cracks, broken, distortion.			

APPENDIX C4 (SAMPLE REPORT FORM)

COMPANY _____

ELECTRIC WIRE ROPE HOIST INSPECTION REPORT (FORM NO. C4) SHEET 2 OF 3

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C4.11	Lubrication: Level low, dirty.			
C4.12	Load Block: Cracks, distortion, loose bolts, pins, or nuts.			
C4.13	Motor Brake: Drift, lining wear, out of adjustment.			
C4.14	Load Brake: Drift.			
C4.15	Contactors: Pitting, deterioration, wear, improper operation.			
C4.16	Electrical components: Pitting, deterioration, wear.			
C4.17	Wiring and Fittings: Loose connections, abraded, cut, or nicked insulation.			
C4.18	Trolley: Refer to Trolley Inspection Report Form No. C5.			
C4.19	Supporting Structure: Distortion, cracks.			
C4.20	All Bolts, Pins, and Nuts: Missing, damaged, distortion, loose.			

APPENDIX C4 (SAMPLE REPORT FORM)

COMPANY _____

**ELECTRIC WIRE ROPE HOIST INSPECTION REPORT (FORM NO. C4)
SHEET 3 OF 3**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C4.21	Control Device Markings (Function and Direction Labels): Missing, illegible.			
C4.22	WARNING, Instruction Labels, and Load Markings: Missing, illegible.			

Signature & Date of Inspector: _____

Signature & Date of Supervisor: _____

APPENDIX C5 (SAMPLE REPORT FORM)

COMPANY _____

TROLLEY INSPECTION REPORT (FORM NO. C5)

SHEET 1 OF 2

(ALL ITEMS MAY NOT BE APPLICABLE)

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C5.1	All Functional Operating Mechanisms: Maladjustment that interferes with proper operation. Unusual sounds.			
C5.2	Control Devices: Improper operation.			
C5.3	Limit Switch Devices: Maladjustment or malfunction.			
C5.4	Lubrication: Level low, dirty.			
C5.5	Trolley Frame: Distortion, cracks.			
C5.6	Supporting Structure: Distortion, cracks, and track wear.			
C5.7	All Bolts, Pins, and Nuts: Missing, damaged, distortion, loose.			
C5.8	Wheels: Flat spots, wear, cracks, damage.			
C5.9	Wheel Bearings: Excessive play, damage.			
C5.10	Gear Teeth: Wear, cracks, broken teeth, damage.			
C5.11	Drive Pinion and Coupling: Wear, cracks, broken teeth, loose, excessive play.			

APPENDIX C5 (SAMPLE REPORT FORM)

COMPANY _____

TROLLEY INSPECTION REPORT (FORM NO. C5)

SHEET 2 OF 2

(ALL ITEMS MAY NOT BE APPLICABLE)

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C5.12	Bumpers and Bumper Stops: Damage, distortion, im proper contact.			
C5.13	Motor Brake: Drift, lining wear, out of adjustment.			
C5.14	Contactors: Pitting, deterioration, wear, improper operation.			
C5.15	Electrical Components: Pitting, deterioration, wear.			
C5.16	Wiring and Fittings: Loose connections, abraded, cut, or nicked insulation.			
C5.17	Control Device Markings (Function and Direction La- bels): Missing, illegible.			
C5.18	WARNING and instruction Labels: Missing, illegible.			

Signature & Date of Inspector: _____

Signature & Date of Supervisor: _____

APPENDIX C6 (SAMPLE REPORT FORM)

COMPANY _____

WIRE ROPE INSPECTION REPORT (FORM NO. C6) SHEET 1 OF 2

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C6.1	Rope Distortion: Kinking, crushing, unstranding, birdcaging, main strand displacement, or core protrusion. Replace if distortion exists.			
C6.2	Corrosion: Replace if corrosion has caused broken wires.			
C6.3	Broken or Cut Strands: Replace immediately if one strand is broken or cut.			
C6.4	Broken or Cut Wires: Replace if twelve randomly distributed broken wires in one rope lay or four broken wires in one strand in one rope lay.			
C6.5	Reduction of Outside Diameter: Loss of core support, wear of outer wires, stretch. Refer to equipment manual or ASME standard for replacement data.			
C6.6	End Connection or Fitting: Corroded, cracked, bent, damaged or worn. Loose or missing bolts or low bolt torque.			

APPENDIX C6 (SAMPLE REPORT FORM)

COMPANY _____

**WIRE ROPE INSPECTION REPORT (FORM NO. C6)
SHEET 2 OF 2**

Date: _____

S/N: _____

ITEM NO.	DESCRIPTION DAMAGE TO LOOK FOR	PASS	NEEDS ATTN.	COMMENTS
C6.7	Broken Wires at Socketed or Swaged End Fitting: Replace if two broken wires at fitting.			
C6.8	Rope at End Fitting: Rope pulling through fitting.			
C6.9	Sheaves: Damage to grooves, flanges, and bearings, wear, distortion, cracks.			
C6.10	Drum: Damage to grooves, wear, distortion, cracks.			

Signature & Date of Inspector: _____

Signature & Date of Supervisor: _____