BSR E1.67-202x

Entertainment Technology – Design, Inspection, Maintenance, Selection, and Use of Hand and Lever Chain Hoists in the Entertainment Industry

Approved by the ANSI Board of Standards Review on_____

Rig/2020-2001r0.2

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Voting members:

Observer (non-voting) members:

Interest category codes:

CP = custom-market producer
DE = designer
DR = dealer rental company
G = general interest
MP = mass-market producer
U = user

[TS Note: these pages go in front of the document TOC, where page numbering restarts at "1"]

Table of Contents

1 General

1.1 Scope
This standard covers the design, inspection, maintenance, selection, and use of hand chain and lever hoists used in the entertainment industry.

1.2 Purpose
These standards are intended to reduce injury and provide for the protection of life, limb, and property.

1.3 Application
This standard applies to manually operated chain and lever hoists used in the entertainment industry including, but not limited to, hoists used in theatre, musical touring, film, trade show and television industries, for the purposes of lifting, lowering, and tensioning.

1.4 References

ASME B30.16-2017 *Overhead Underhung and Stationary Hoists*
ASME B30.21-2014 *Lever Hoists*
ASME HST-2 *Performance Standard for Hand Chain Manually Operated Chain Hoists*
ASME HST-3 *Performance Standard for Lever Hoists*
ANSI E1.6-2-2018 *Design, Inspection and Maintenance of Serially Manufactured Electric Chain Hoists for the Entertainment Industry*
ANSI E1.6-3-2019 *Selection and Use of Serially Manufactured Chain Hoists in the Entertainment Industry*

2 Definitions

2.1 anchorage: The point on the support structure where the hoist, or the hoist through the rigging system, connects to the support structure.

2.2 capacity, hoist rated: The maximum load allowed to be lifted or lowered by a hoist as specified by the hoist manufacturer.

2.3 capacity rated: The maximum load allowed on an object as specified by the manufacturer.

2.4 chain container: A device that captures and stores hoist load chain when it is on the no-load side of the hoist's load sheave, it is located below the hoist body. Commonly referred to as a "chain bag".

2.5 chain dead end: The attachment point at the hoist for the load bearing static end of the load chain on multiple-reeved hoists.

2.6 chain, hand: The chains used by a person to apply force for either the lifting or lowering motion.

2.7 chain, load: The load bearing chain in a hoist.

2.8 competent person: A person capable of identifying existing and predictable hazards in the surroundings or working conditions that are hazardous or dangerous to employees, and who is authorized to take prompt corrective measures to eliminate the hazards.

2.9 compound flown system: A combination of load systems arranged such that one load system is supporting the other.

2.10 direction selector: A device used in a lever hoist to select the direction of travel of up or down, as well as allow the hoist to enter free-wheel mode.

2.11 determinate structure: A structure in which load distributions to supports are influenced by load and support locations alone. In terms of entertainment rigging in this document, a determinate structure is a load system supported by multiple hoists in such a fashion that small moves of one hoist do not cause large load shifting to occur between hoists in the lifting system.

2.12 dynamic load test: A test of the hoist wherein a test load is lifted with the hoist and, at a minimum, lifted the distance required to completely test the mechanical power transmission system.

2.13 free-wheel mode: a feature of a lever hoist which allows the chain to move freely through the hoist in an unloaded state

2.14 hazard: A situation that poses a level of threat to life, health, or property.

2.15 hoist, hand chain: A lifting device using a load chain and a lift wheel to perform the lifting and lowering of the load system by means of a manually operated hand chain

2.16 hoist, lever: A lifting or tensioning device using a load chain and a lift wheel to perform the lifting, lowering, and tensioning of a load by means of a manually operated lever

2.17 hoist operator: The person designated by the hoist user to operate the system in accordance with the provisions of this standard and any other applicable standards or regulations.

2.18 hoist owner: The person or entity who has legal title to the hoist.

2.19 hoist user: The person or entity who either by ownership, lease or other arrangement controls the use and installation of the hoist.

2.20 hook block assembly: A mechanical device that attaches the hook to the load chain.

2.21 hook throat opening: The distance from the inside of the hook body to the inside tip of the hook at its narrowest point.

2.22 indeterminate structure: A structure in which load distributions to supports are influenced by structure stiffness and load and support locations. In terms of entertainment rigging in this document, an indeterminate structure is a load system supported by multiple hoists in such a fashion that it is not practical to calculate with accuracy the dynamic load on any one of the hoists due to load shifting.

2.23 interested party: A person or entity who may be directly or indirectly affected.

2.24 lever, operating the lever or handle used to operate a lever hoist

2.25 lift wheel: A powered sprocket device that produces movement of the load chain.

2.26 lifting operation: The act of moving a load system either up or down. Small movements of individual hoists for the purpose of load balancing or leveling a load system are not considered to be a lifting operation.

2.27 link chain: A chain consisting of a series of interwoven links formed and welded.

2.28 load: The total superimposed force on the hook or load block of the hoist.

2.29 load, anticipated: The sum of the static load and any factors that can be anticipated to increase the static load any time the load system is suspended.

2.30 load block: The hook or shackle assembly, bearing, swivel, sprockets, sheaves, frame, and pins, suspended by the load chain.

2.31 load, calculated: The estimated or theoretical total load, derived using the formulas and/or estimating techniques standard in the entertainment rigging industry.

2.32 load, design: The maximum allowable load as determined by a qualified person.

2.33 load, dynamic: The component of the total force that varies over time.

2.34 load hazard zone (LHZ): The area underneath the load system where death or serious injury may occur as the result of a load system or a rigging failure.

2.35 load, static: A force or combination of forces that remains constant.

2.36 load, verified: A force that has been confirmed using a calibrated load measurement system.

2.37 overload: A load greater than the design load.

2.38 production rigger: The person designated by the hoist user to ensure the proper installation of the rigging system and hoists.

2.39 qualified person: A person who by possession of a recognized degree or 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.

2.40 risk: The possibility of loss or injury.

2.41 risk, residual: Risk remaining after risk reduction procedures have been implemented.

2.42 risk, tolerable: Risk that is accepted for a similar task and hazard combination in general industry.

2.43 service: Usage.

2.44 system, flown: All the systems and components that must be considered when using a hoist system.

2.45 system, lifting: The hoist(s) used to raise and lower the load system.

2.46 system, load: The objects attached to the hoist(s), either directly or indirectly, causing a load to be applied to the hoist(s).

2.47 system, rigging: The system of wire rope, shackles and any other equipment used to connect hoist(s) to a support structure.

3 Minimum Design Criteria

3.1 General

3.1.1 All relevant standards shall be used in the design of the hoist and shall be dependent on the intended conditions of use. These shall include the following:

3.1.1.1 American Society of Mechanical Engineers:
B30.16-2017 Overhead Underhung and Stationary Hoists
B30.21-2014 Lever Hoists
HST-2 Performance Standard for Hand Chain Manually Operated Chain Hoists
HST-3 Performance Standard for Lever Hoists

3.1.2 Any modifications to modernize, upgrade, or rerate the hoist shall be authorized by the original hoist manufacturer or by a qualified person.

3.1.3 Any replacement parts or additions shall be approved by the manufacturer or by a qualified person. Cosmetic changes to the hoist's non-load bearing parts are permitted under this standard.

3.2 Mechanical Design

3.2.1 The hoist and accessories shall be designed to withstand all stresses associated with normal operating conditions and rated loads, including the self-weight of the hoist.

3.2.2 The hoist shall be designed so that the minimum factor of safety is no less than 4 to 1 on any component under full rated load.

3.3 Lift Wheel

3.3.1 The lift wheel shall be constructed with chain pockets or teeth to engage the load chain.

3.3.2 Hoist shall be constructed to prevent binding of the load chain inside the hoist while operating under normal conditions.

3.3.3 Hoists shall have a guard covering the lift wheel to prevent disengagement of the load chain.

3.4 Hand Chain Wheel

3.4.1 Hand chain hoists shall have a guard covering the hand chain wheel to prevent disengagement of the hand chain.

3.4.2 The hand chain wheel shall be constructed with chain pockets or teeth to engage the hand chain.

3.5 Load Chain Design

3.5.1 Chain shall be designed based on the highest stress generated anywhere along the load path.

3.5.2 Chain pitch shall be designed to prevent binding when chain passes over lift wheels and sheaves.

3.5.3 Proof testing of welded link type load chain is required by either the chain or hoist manufacturer using a load of at least 1 ½ times the hoist's rated load divided by the number of chain parts supporting the load.

3.6 Hand Chain Design

3.6.1 The hand chain shall be designed to fit the hand chain wheel without binding.

3.6.2 The hand chain shall be designed to withstand a force of three times the pull required to lift the rated load.

3.7 Overtravel Restraint

3.7.1 A chain overtravel restraint shall be installed to prevent overtravel of the chain through the hoist and disengagement from the lift wheel.

3.8 Reeving

3.8.1 Reeving blocks shall be designed in such a manner as to prevent chain from jamming while under normal operating conditions.

3.8.2 When more than one part of the load chain is supporting a load, the tension on all parts shall be equal.

3.8.3 Addition of reeving blocks to any hoist will be designed by a qualified person and approved by the manufacturer. Special considerations must be made to determine that all hoist components can support the additional loads created by adding reeving blocks.

3.9 Hook Design

3.9.1 The hook shall be designed to deform, elongate, or otherwise yield in a clearly visible manner prior to its ultimate failure.

3.9.2 The hook shank and all restraining components shall be designed to yield at values higher than the hook yield point.

3.9.3 The hook shall be provided with latches.

3.9.4 Hooks of the swivel type shall be able to rotate under load to prevent twisting of the load chain.

3.10 Brake Design

3.10.1 The brake on the chain hoist shall have the capacity to stop and hold the load when actuating force is removed.

3.11 Operating Lever

3.11.1 The operating lever shall withstand a force of three times the amount of force required to lift the rated load.

3.12 Direction Selector

3.12.1 Direction selector shall be designed in a way to prevent unintended lowering of the load while under tension.

3.13 Chain Containers

3.13.1 The chain container, attachment point(s), and mount(s) shall be designed by a qualified person or the hoist manufacturer to ensure the chain container is suitable for its intended use.

3.13.2 Shall be sufficiently designed to support the weight of the chain.

3.13.3 Shall be large enough to adequately hold the entire length of chain within the container.

3.13.4 All attachment points, and mounts must be capable of withstanding the total weight of the chain and container.

3.13.5 Shall be positioned so that it does not interfere with normal and safe operation of the hoist.

4 Inspections, Testing, and Maintenance

The intent of this section is to establish minimum required inspection routines and guidelines for the hoist user. While every effort is made to provide a thorough listing of situations and inspection criteria, complete listings are beyond the scope of this standard. Specific advice shall be sought by the user for specific inspection routines from the manufacturer or a qualified person.

All hoists shall be inspected in accordance with the manufacturer's recommendations.

4.1 Inspection records

4.1.1 Initial inspections and periodic inspections shall be documented.

4.1.2 Frequent inspections shall not require documentation.

4.1.3 Inspection records for each hoist shall be kept on file by the owner for the lifetime of the hoist.

4.1.4 Inspection records shall be dated and signed by the person conducting the inspection.

4.1.5 Repairs, and removal from service, shall be documented in the inspection records.

4.2 Initial Inspection
When purchased from the manufacturer all hoists shall be inspected in accordance with Section 4.3.

When acquired used all hoists shall be inspected in accordance with Section 4.4.

4.3 Frequent Inspection
Frequent inspections shall be conducted by a competent person prior to each use.

4.3.1 The following items shall be inspected as part of a frequent inspection.

4.3.1.1 Brake. Hoist braking system for proper operation.

4.3.1.2 Hooks. Hooks and attachment hardware for correct assembly, damage, cracks, twists, excessive throat openings, latch engagement, and latch operation.

4.3.1.3 Load Chain. Load chain for adequate lubrication, signs of wear, damaged links, corrosion, or foreign matter.

4.3.1.4 Hoist Body. Hoist body and lever for deformation, cracks, and other damage such as signs of impact damage to housing or cracked covers.

4.3.1.5 Mechanisms. All functional mechanisms for maladjustment or unusual sounds.

4.3.1.6 Connecting Components. Evidence of loose screws, bolts, or nuts.

4.4 Periodic Inspection
Periodic inspections shall be conducted by a qualified person at least once every 12 months. The hoist shall be removed from service during the inspection.

4.4.1 Periodic inspections shall include the same criteria as frequent inspections.

4.4.2 The following additional items shall be inspected as part of the periodic inspection.

4.4.2.1 Suspension Components. Evidence of worn, corroded, cracked, or distorted hook block body, suspension screws, gears, chain dead end / overtravel restraint and chain pin. Suspension components for damage, cracks, wear and correct operation.

4.4.2.2 Brake. Brake mechanisms on friction brake hoists for evidence of worn, glazed, or oil-contaminated friction disks; worn pawls, cams, or ratchets; corroded, stretched, or broken pawl springs. Evidence of excessive wear and/or damage of brake parts

4.4.2.3 Internal Components. Evidence of damage or excessive wear to Ratchet disk / load sprocket, ratchet pawl, load holding pawl, or drive pinion

4.4.2.4 Lift Wheel. Evidence of damage or excessive wear of the lift wheel and hook block sheave chain pockets.

4.4.2.5 Hand Chain. Hand chain for excessive wear and proper length.

4.4.2.6 Load Chain. Link by link inspection of the chain for evidence of excessive wear, stretch, and damage.

4.4.2.7 Hooks. Evidence of damage to hook retaining nuts or collars, and pins and welds or rivets used to secure the retaining members.

4.4.2.8 Chain Guide. Evidence of chain guide wear or damage where the chain enters the hoist.

4.4.2.9 Bearings. Check bearings for excessive wear or damage.

4.4.2.10 Load Test. A load test shall be performed on the hoist in accordance with section 4.5.

4.5 Testing

4.5.1 Hoists shall be dynamically load tested no less than one time per year, with records of the test recorded.

4.5.2 Dynamic load testing shall be required whenever a load bearing component is altered, repaired, or replaced. Prior to dynamic load testing the following tests shall be performed:

4.5.2.1 An operational test without a load

4.5.2.2 A load test of 100 lbs. multiplied by the number of load-supporting parts of chain to check proper load control.

4.5.2.3 A test of the lever hoist direction selector to ensure that it does not operate under load and allow the load to be released.

4.5.3 Dynamic **l**oad testing shall be at 125% of the hoist's rated capacity, if approved by the manufacturer.

4.5.3.1 If the manufacturer prohibits load testing at 125% of the rated capacity, the load testing shall be done with the load specified by the manufacturer.

4.5.3.2 If the operation of an overload protection device prevents lifting a 125% load, then the load shall be tested at a minimum to the rated capacity and the test completed.

4.5.4 Lever hoist direction selector shall be tested to ensure that it does not operate under load and allow the load to be released.

4.6 Removal from Service

4.6.1 Hoists showing questionable results from the frequent inspection, showing visible damage, or that are suspected of containing a damaged element, whether visible or not, shall be removed from service.

4.6.2 An inspection shall be performed by a qualified person before returning the hoist to service.

4.6.3 Unrepairable hoists shall be permanently removed from service.

4.6.4 Damaged hoists shall be marked in a manner that clearly and visibly indicates their condition.

4.7 Repairs

4.7.1 A qualified person shall perform and document an assessment of the hoist, to determine if it can be repaired and subsequently returned to service. If repairable, the person performing the assessment shall define the repair methods.

4.7.2 Repairs shall be made by a qualified person.

5 Labeling, Identification, and Documentation

5.1 Rated capacity
The rated lifting capacity of the hoist shall be clearly and legibly labeled on the hoist.

5.2 Identification
The manufacturer and model number of the hoist shall be clearly and legibly labeled on the hoist.

5.3 Serial Number
If the hoist does not have a unique serial number, the hoist owner shall assign and affix a unique serial number for the individual hoist to the main hoist section

5.3.1 The owner shall maintain hoist serial records as part of their permanent files.

5.4 Documentation

5.4.1 Manufacturer shall provide a maintenance and operation manual. Manuals shall include information on operation, inspection, repair, maintenance, lubrication, and testing.

5.4.2 The hoist owner shall affix documentation to the hoist indicating the date of the last periodic service performed.

6 System Requirements

6.1 General
To comply with this standard, the flown system including the hoists shall meet the following requirements:

6.1.1 All components shall be used in a fashion approved by the manufacturer or in writing by a qualified person.

6.1.2 The system design shall be such that the intentional operation of one or more hoists shall overload neither the anchorage nor any rigging, hoist, or load system component.

6.1.3 Dynamic loads associated with starting and stopping the hoist shall be considered when evaluating the anchorage or any rigging or load system component for overloading.

6.1.4 On a multiple hoist system, all applicable load distribution scenarios for the planned operations shall be evaluated and accounted for.

6.2 Anchorage
The anchorage point on the structure shall have a design load equal to or greater than the sum of the anticipated loads attached to it.

6.3 Rigging System
All rigging system components shall have a design load equal to or greater than the maximum anticipated load to which they are to be subjected.

6.4 Lifting System
To comply with this standard, all lifting system components shall meet the following requirements:

6.4.1 There shall be a straight path between the hoist's upper and lower attachment points, except in situations where necessary redirection of the chain has been designed by a qualified person

6.4.2 The attachment means to the load shall be properly seated in the hook and shall be of a design that prevents unintentional disengagement (rollout). The latch or tip of the hook shall not be allowed to support any part of the load.

6.4.3 If chain containers are used the following conditions shall be met:

6.4.3.1 The hoist owner shall provide hoist user with written installation instructions and capacity data.

6.4.3.2 The hoist user shall comply with the chain container installation instructions and capacity data supplied by the hoist owner.

6.5 Load System

To comply with this standard, all load system components shall meet the following requirements:

6.5.1 Hoists should be rigged such that the load system can travel the full distance allowed by the hoists.

6.5.2 If the provisions of 6.5.1 cannot be met, precautions shall be taken to prevent the load system from striking any obstruction in the path of travel. Ensure the hoist and load system will not encounter any obstructions in the path of travel.

7 Areas of Responsibility

7.1 Hoist Owner

The hoist owner is responsible for all maintenance or repair of the hoist.

7.1.1 The owner shall provide documentation of the most recent periodic inspection when requested by affected parties.

7.2 Hoist User

The hoist user shall ensure the hoists are selected and used in accordance with the provisions laid out in this standard. In addition, the user shall provide all necessary documentation and equipment required to comply with this section.

7.2.1 Any visual inspections required on site shall be carried out by a competent person designated by the hoist user.

7.2.2 If maintenance is required on a hoist, the hoist user shall remove the hoist from service according to section 4.6, until the hoist owner or their designated person has performed the required service according to section 4.7.

7.2.3 If load verification techniques are employed during lifting operations, such as load cells or dynamometers, the hoist user shall be responsible for implementing the system, including verifying proper working condition.

7.3 Production Rigger

The production rigger is responsible for overseeing the installation of the hoists.

7.3.1 The production rigger is responsible for calculating both the estimated loads and anticipated loads with respect to any hoists attached to the rigging system.

7.3.2 When requested, the production rigger shall make this information available, in writing, to the hoist user and all other affected parties.

7.4 Hoist Operator

The operator shall be designated by the hoist user and trained in the proper operation of the lifting system.

7.4.1 The operator shall avoid overload or unintentional slack chain situations during operation.

8 Risk Reduction Process

To ensure hoist use in the entertainment industry is no more dangerous than hoisting operations in general industry, a risk reduction process shall be performed prior to all lifting operations.

This process requires that all hazards associated with the lifting operation be identified. The risks associated with these hazards shall then be evaluated and reduced to a tolerable level.

8.1 Requirement for a Designated Person

The hoist user shall designate a competent person to perform a risk assessment prior to any lifting operation.

8.2 Requirement for a Qualified Person

Certain hazards or combination of hazards produce risks that require a qualified person to evaluate and reduce the risks. If the person making the assessment recognizes that the situation warrants a qualified person to complete the risk reduction process, the competent person shall notify the hoist user of this requirement.

8.3 Assessment

Hazards associated with the lifting operation shall be identified. See Section 9 : Hazard Assessment

8.4 Reduction

For each identified hazard, the risk shall be reduced to a tolerable level.

8.5 Evaluation

Once risk reduction procedures have been selected, a system evaluation shall be undertaken to determine that the residual risk has been reduced to a tolerable risk level.

8.6 Implementation

Once the risk reduction procedures have been selected and an evaluation completed, the procedures shall be implemented prior to the lifting operation.

8.6.1 If specific risk reduction procedures are required for hoist operation, these procedures shall be communicated to the hoist operator.

9 Hazard Assessment

The hazard assessment shall identify existing and potential hazards, and consider, but not be limited to, the hazards listed below.

9.1 Personnel Hazards

9.1.1 Designated persons in the LHZ.

9.1.2 Persons in the LHZ while the load system is moving.

9.1.3 All personnel shall be alert and free of any impairment which prevents proper execution of duties.

9.2 Multiple Hoist Lifting Operation Hazards

9.2.1 Multiple operators controlling the movement of one load system.

9.2.2 Mislabeled hoists.

9.2.3 Ambient noise levels from unrelated activity or the operation of the hoists.

9.2.4 The reduced ability for the operator(s) to visually monitor the entire multiple hoists lifting operation.

9.2.5 Overloading caused by load shifting hazards associated with load systems that are indeterminate structures.

9.2.6 The inadvertent operation of any hoist in the rigging system.

9.3 Compound Flown System Hazards

9.3.1 Load shifting in one load system caused by the other load system.

9.3.2 An unexpected hoist stoppage in either the upper or lower rigging system.

9.3.3 The inadvertent operation of any hoist in the rigging system.

9.3.4 A structural failure in the upper rigging system.

9.4 Hoist Capacity Hazards

9.4.1 Hoist capacity greater than rigging system component capacity.

9.4.1.1 The reduction of the risk associated with this condition shall prevent the overloading of the rigging system throughout the lifting operation.

9.4.2 Hoist capacity greater than anchorage capacity.

9.4.2.1 The reduction of the risk associated with this condition shall prevent the overloading of the anchorage throughout the lifting operation.

9.5 Environmental Hazards

9.5.1 Environmental hazards that would create an increase in forces on the system.

9.5.2 Environmental hazards that would degrade the system.

10 Risk Reduction Techniques

Risk assessment and risk reduction preferably shall be performed by a group of two or more competent persons. When the risk assessment and risk reduction is completed by a single individual, that individual shall be a qualified person.

Hazards shall be identified and eliminated, or the risks associated with them minimized in the planning process whenever possible. If hazards cannot be eliminated as part of the planning process, the risks associated with them shall be reduced to acceptable levels in the field as determined by the person(s) completing the risk assessment.

The methods used to develop procedures for reducing risks may include, but not be limited to, the risk reduction factors listed below.

10.1 Load Calculation

Load calculation shall be permitted as a risk reduction technique for overload conditions of the hoist, rigging system, or anchorage only in conditions where: (a) the weights of all the elements of the load system are known and accounted for, (b) an accurate calculation method is used for the proper distribution of the load system weight to the lifting system hoists and (c) any load shifting during the lifting operation will not be of sufficient magnitude to cause an overload condition.

10.2 Load Verification

Load verification shall be permitted as a risk reduction technique for overload conditions of the anchorage or any rigging, hoist or load system component by the operator continuously monitoring and taking corrective action before an overload occurs.

10.3 Load Reduction
It shall be permissible to reduce risk by reducing the load.

10.4 Controlling Personnel Access to LHZ or Load System

10.4.1 Restrict or eliminate access to suspended loads.

10.4.2 Restrict or eliminate access to the LHZ.

10.4.3 Provide a means for emergency evacuation from suspended loads.

10.4.4 Provide a means for emergency evacuation from LHZ.

10.5 Reducing Load Shifting Effects

10.5.1 Elimination of indeterminate structures where possible.

10.5.2 Reduction of load system rigidity.

10.5.2.1 Introduce hinges to increase the system flexibility.

10.5.2.2 Employ dampers to reduce the speed of load shifting.

10.5.2.3 Use flexible construction materials or structures.

10.6 Other Actions

10.6.1 Addition of redundant hoists in system design.

10.6.2 Lowering the maximum working load of the hoist and associated rigging system below the design load.

10.6.3 Employ overload warning devices.

11 Inspections Prior to Use

Prior to operation under load the following items shall be checked by a person designated by the hoist user. Inspections may include, but are not limited to the following:

11.1 Lifting System

11.1.1 Hoists shall be inspected for proper capacity.

11.1.2 Hooks shall be checked for proper seating.

11.1.3 Chain containers shall be inspected for worn or distorted fittings; snags, cuts, fraying or other fabric damage; and the presence of foreign matter.

11.1.4 Chain containers shall be checked for proper installation and capacity.

11.1.5 Hoists shall be inspected according to the Frequent Inspection requirements listed in Section 4.3.

11.2 Load System

11.2.1 Confirm that the load system can travel the full distance allowed by the hoist(s).

11.2.2 The load system shall be inspected to ensure proper assembly and attachment to the hoist(s).

11.2.3 The hoist user shall review and follow the load distribution scenarios within this standard.

11.2.4 Ensure the load system and hoist are positioned under the anchorage point to prevent a swing hazard.

12 Operation

12.1 General Operating Practices

While performing any lifting operation, the operator shall adhere to the following general operating practices.

12.1.1 Only operate hoist in an orientation approved by the manufacturer.

12.1.2 Focus full attention on the lifting operation.

12.1.3 Respond to signals from designated persons only, except that the operator shall respond to a stop signal from anyone.

12.1.4 When a load approaching the rated capacity of the hoist is to be moved check brake action by lifting the load system off the ground a few inches and stopping. Continue only after the brake action is verified.

12.1.5 Check the balance of load system to prevent tipping.

12.1.6 Precaution should be taken to prevent chain jams.

12.1.7 Only move the load system when all personnel are clear unless the appropriate risk reduction actions have been taken.

12.1.8 While moving a load, ensure that the lift is progressing in the intended manner and rate.

12.1.9 Stop the lifting operation if something unexpected happens. Evaluate the situation and implement corrective action(s) before moving the load system in any direction.

12.1.10 Lifting or supporting of personnel shall not be permitted.

12.1.11 Only lift loads at or below the rated capacity of the hoist(s).

12.1.12 Monitor the load system visually or by other means throughout the entire move.

12.1.13 After the lifting operation is completed, loads shall be properly transferred to a static rigging support with the manual chain hoist removed from the load path.

12.1.14 Tensioned or suspended loads shall not be left unattended unless specific precautions to prevent the load from inadvertently releasing have been instituted and are in place.

12.2 Overload Prevention

To prevent overload:

12.2.1 Hoists shall not be operated using non-manufacturer approved mechanical advantage devices.

12.2.2 Hoists shall only be operated using manual hand power.

12.2.3 A single hoist shall only be operated by one operator at a time.

12.3 Specific Operating Practices
In addition to the above general operating practices, any specific practices identified by the risk reduction process shall be implemented.

12.4 Engineered Lifting Operations
During the risk reduction process, if a qualified person is deemed necessary, any risk reducing factors identified shall be implemented. The operator shall follow written or other instructions provided by the qualified person.