

**ASME HST-3–2017**

**[Revision of ASME HST-3–1999 (R2010)]**

# **Performance Standard for Lever Hoists**

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**AN AMERICAN NATIONAL STANDARD**



**The American Society of  
Mechanical Engineers**

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Mechanical Engineers**

Two Park Avenue • New York, NY • 10016 USA

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# FOREWORD

This Standard is one in a series that provides performance requirements for hoists and was originally issued in 1985. It was developed by the ASME HST Standards Committee, Hoists — Overhead. It is intended to serve as a guide to manufacturers of the equipment and to the purchasers and users of the equipment.

Standards in this series are:

HST-1, Performance Standard for Electric Chain Hoists

HST-2, Performance Standard for Hand Chain Manually Operated Chain Hoists

HST-3, Performance Standard for Lever Hoists

HST-4, Performance Standard for Overhead Electric Wire Rope Hoists

HST-5, Performance Standard for Air Chain Hoists

HST-6, Performance Standard for Air Wire Rope Hoists

This edition contains an appendix that, in conjunction with ASME HST-3, is intended to replace MIL-H-904.

ASME HST-3-2017 is rewritten and reorganized to conform to current ASME style guidelines and harmonized with ASME B30.21 to eliminate duplication and conflicts in content. The title is revised to “Performance Standard for Lever Hoists.” Definitions have been revised. The 2017 edition does not include a corresponding section to ASME HST-3-1999 (R2010), Section 3: Mechanical, due to duplication with ASME B30.21. This revision also includes the addition of specifications and figures for lever hoists with web-strap type and wire-rope type lifting media, and the addition of tables for typical performance characteristics of these hoists, among other revisions. The requirements of this Standard shall be applied with the requirements of ASME B30.21 for the products covered.

Following the approval of the ASME HST Standards Committee and ASME, and after public review, ASME HST-3-2017 was approved by the American National Standards Institute on January 6, 2017.

# ASME HST COMMITTEE

## Hoists — Overhead

(The following is the roster of the Committee at the time of approval of this Standard.)

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The American Society of Mechanical Engineers  
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New York, NY 10016-5990  
<http://go.asme.org/Inquiry>

**Proposing Revisions.** Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

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Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard and the paragraph, figure, or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

**Interpretations.** Upon request, the HST Standards Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the HST Standards Committee.

Requests for interpretation should preferably be submitted through the online Interpretation Submittal Form. The form is accessible at <http://go.asme.org/InterpretationRequest>. Upon submittal of the form, the Inquirer will receive an automatic e-mail confirming receipt.

If the Inquirer is unable to use the online form, he/she mail the request to the Secretary of the HST Standards Committee at the above address. The request for an interpretation should be clear and unambiguous. It is further recommended that the Inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry in one or two words.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. Please provide a condensed and precise question, composed in such a way that a "yes" or "no" reply is acceptable.
Proposed Reply(ies):	Provide a proposed reply(ies) in the form of "Yes" or "No," with explanation as needed. If entering replies to more than one question, please number the questions and replies.
Background Information:	Provide the Committee with any background information that will assist the Committee in understanding the inquiry. The Inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in this format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not “approve,” “certify,” “rate,” or “endorse” any item, construction, proprietary device, or activity.

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## Chapter 3-0

# Scope, Definitions, References, and Appendix

### SECTION 3-0.1 SCOPE

(a) This Standard establishes performance requirements for chain, wire rope, and web strap lever hoists for lifting, pulling, and tensioning applications (see [Figures 3-0.1-1, 3-0.1-2, 3-0.1-3, and 3-0.1-4](#)).

(b) The specifications and information in this Standard apply to lever hoists of the following types:

- (1) ratchet-and-pawl operation with
  - (-a) roller-type load chain lifting medium
  - (-b) welded-link-type load chain lifting medium
  - (-c) web-strap-type lifting medium
  - (-d) wire-rope-type lifting medium
- (2) friction-brake operation with
  - (-a) roller-type load chain
  - (-b) welded-link-type load chain
  - (-c) web-strap-type lifting medium
  - (-d) wire-rope-type lifting medium

(c) Specially insulated lever hoists designed for handling high-voltage lines are not covered by this Standard.

(d) This Standard is applicable to hoists manufactured after the date on which this Standard is issued. This Standard is not applicable to

- (1) damaged or malfunctioning hoists
- (2) hoists that have been misused or abused
- (3) hoists that have been altered without authorization of the manufacturer or a qualified person
- (4) hoists used for lifting or supporting people
- (5) hoists used for the purpose of drawing both the load and hoist up or down the hoist's own load chain(s), wire rope(s), or web strap(s)
- (6) hoists used for marine and other applications as required by the Department of Defense (DOD).

The requirements of this Standard shall be applied together with the requirements of ASME B30.21. Refer to ASME B30.21 for requirements pertaining to marking, construction, installation, inspection, testing, maintenance, and operation.

### SECTION 3-0.2 DEFINITIONS

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

*brake:* a device for retarding and stopping motion of the load (see *load-controlling mechanism*).

*hazardous (classified) locations:* locations where fire or explosion hazards may exist. Locations are classified according to the properties of the flammable vapors, liquids, gases, or combustible dust or fibers that may be present, and the likelihood that a flammable or combustible concentration or quantity is present. Refer to ANSI/NFPA 70.

*headroom (closed height):* the distance between the saddle of the suspension hook and the saddle of the load hook when the load hook is in its fully retracted position (see [Figure 3-0.1-1](#)).

*idler sprocket:* a freely rotating device that changes the direction of the load chain, rope, or web strap.

*lever hoist:* a manually lever-operated device used to lift, lower, or pull a load and to apply or release tension.

*lever pull:* the average force, lbf (kN), exerted by the operator at the end of the operating lever (handle) to lift or pull rated load.

*lift:* the maximum distance through which the load hook can travel (see [Figure 3-0.1-1](#)).

*lifting devices:* devices that are not normally reeved onto the hoist rope, web strap, or chain, such as supplemental devices used for handling or attaching to the load. The weight of these devices is to be considered part of the load to be lifted.

*lifting medium:* the chain, wire rope, or web strap used by the lever hoist to apply a force or support the load.

*load:* the total superimposed force on the hoist load block or load hook.

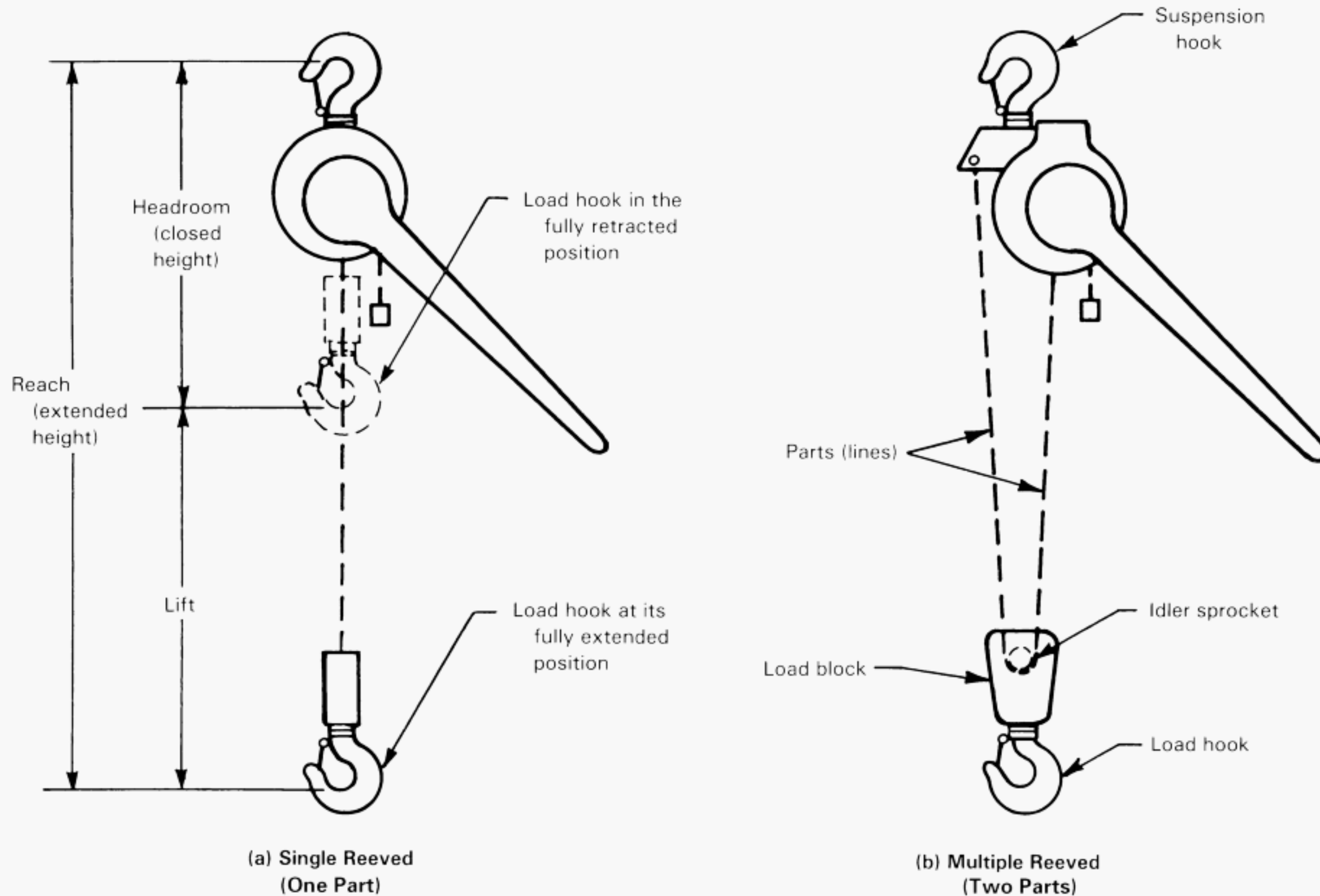
*load block:* the assembly of hook or shackle, swivel, bearings, sheaves, sprockets, pins, and frame suspended by the load chain, rope, or web strap. This shall include any appurtenances reeved into the load chain, rope, or web strap.

*load chain:* the load-bearing chain in the hoist.

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



Figure 3-0.1-1 Lever Hoist



**welded-link chain:** a chain consisting of interwoven links formed and welded.

NOTE: Load-chain properties do not conform to those shown in ASME B30.9.

**load-controlling mechanism:** a mechanism that functions automatically to hold and control the load. In each of the following general types, a reciprocating force must be applied to the hoist lever to lower the load:

**friction-brake type:** an automatic type of brake used for holding and controlling loads. This unidirectional device requires a force applied to the operating lever to lower the load but does not impose additional lever pull when lifting the load.

**ratchet-and-pawl type:** a load-controlling mechanism consisting of interlocking pawl(s) and ratchet that act to hold the load by mechanical engagement.

**load hook:** the hook used to connect the load to the hoist.

**load suspension parts:** the suspension hook, the chain, rope or web strap, the sprocket(s), the structure or housing that supports the sprocket(s), and the load block.

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

**operating lever:** the lever or handle provided to operate the hoist.

**overload:** any load greater than the rated load.

**pawl:** a device that engages the ratchet to prevent rotation.

**qualified person:** a person who, by possession of a recognized degree in an applicable field 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.

**ratchet:** a toothed member that engages with a pawl.

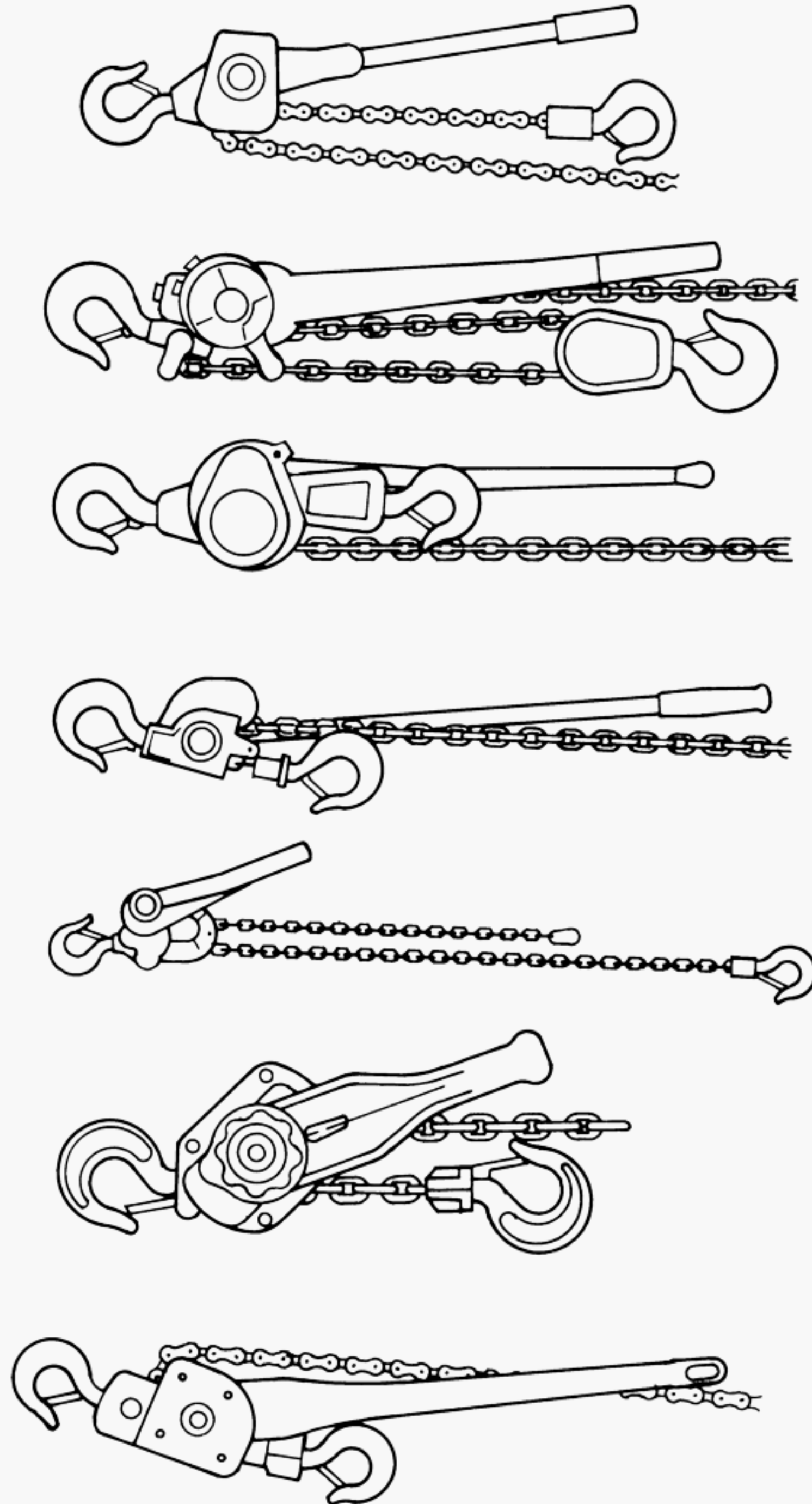
**rated load:** the maximum load that shall be applied to the hoist as specified by the manufacturer or qualified person.

**reach (extended height):** the distance from the saddle of the load hook at its fully extended position (lower limit of travel) to the saddle of the suspension hook. Reach is equal to lift plus headroom (see Figure 3-0.1-1).

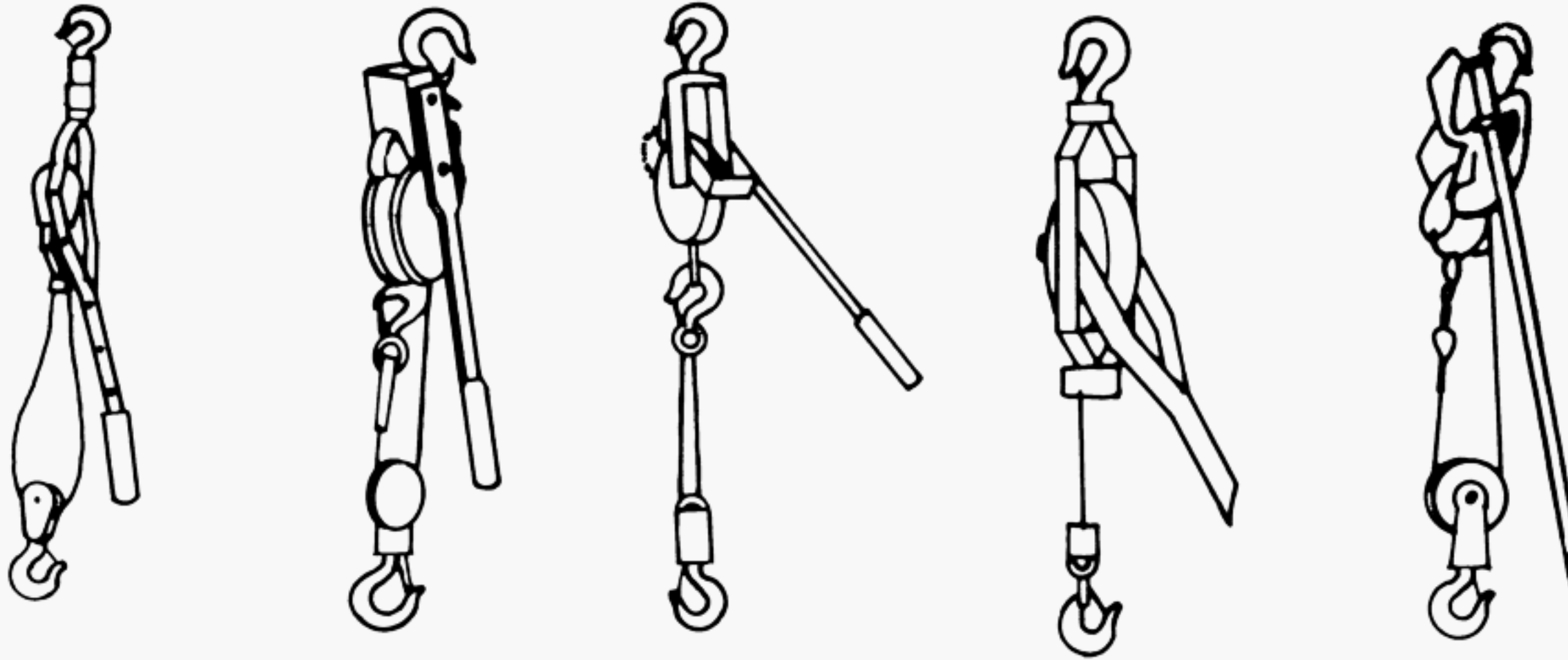
**reeving:** a system in which the chain, rope, or web strap travels around sprockets (drums) and sheaves (see Figure 3-0.1-1).

**shall:** indicates a requirement.

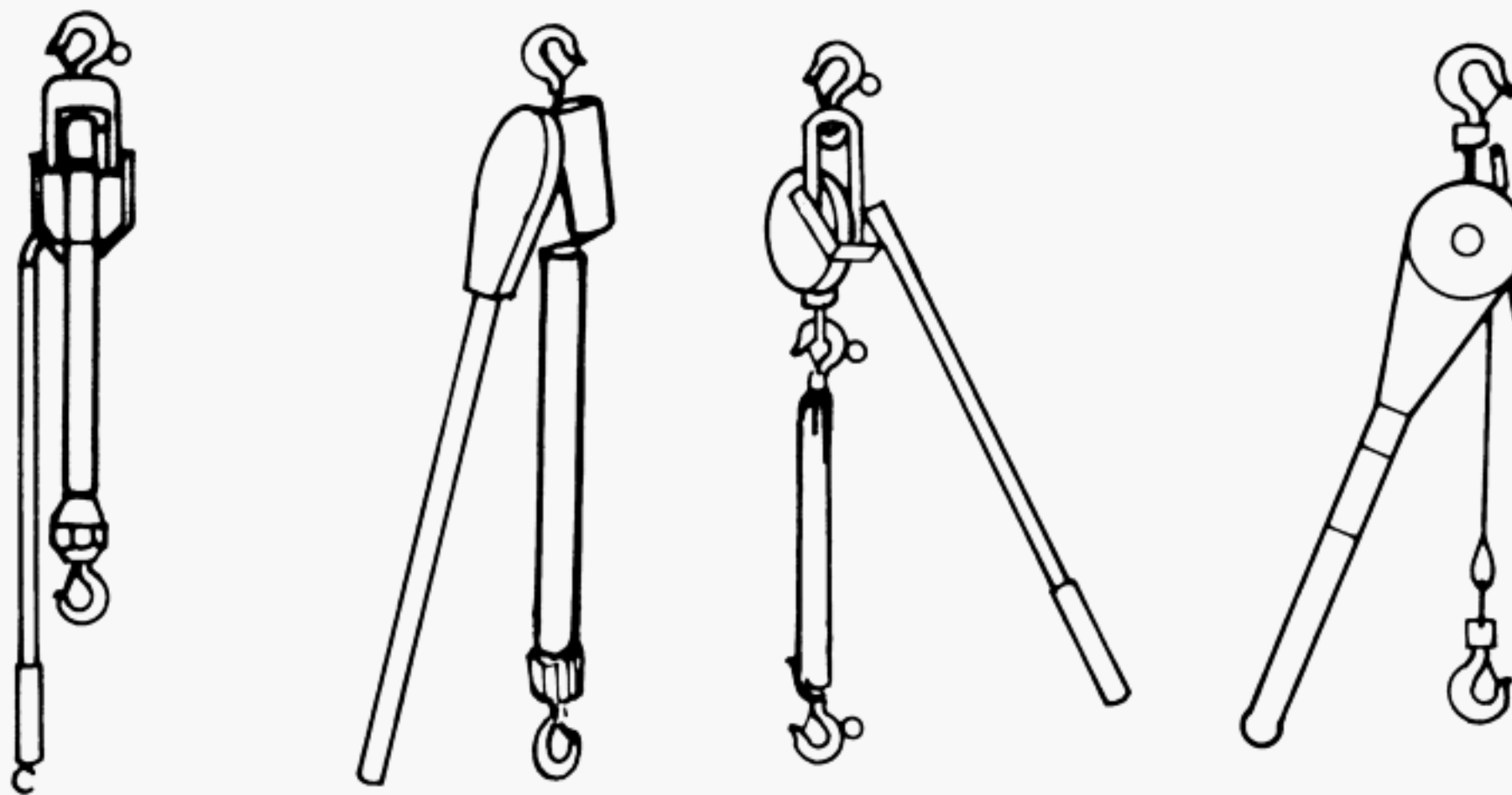
Figure 3-0.1-2 Lever Hoist — Chain Type



**Figure 3-0.1-3 Lever Hoist — Rope Type**



**Figure 3-0.1-4 Lever Hoist — Web-Strap Type**



*sheave*: a grooved wheel or pulley used with a chain, rope, or web strap to change the direction and point of application of a pulling force.

*should*: indicates a recommendation.

*side pull*: any force or operating condition that restricts the load block, chain, rope, or web strap, and hoist body from forming a straight line with the direction of loading.

*suspension hook*: the hook attached to the body of the hoist.

*web strap*: a fabric woven of high-tenacity synthetic yarns.

### SECTION 3-0.3 REFERENCES

The following documents form a part of this Standard to the extent specified herein. The latest edition shall apply.

ANSI Z535.4, Product Safety Signs and Labels

Publisher: National Electrical Manufacturers Association (NEMA), 1300 North 17th Street, Rosslyn, VA 22209 ([www.nema.org](http://www.nema.org))

ANSI/NFPA 70, National Electrical Code

Publisher: National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02169 ([www.nfpa.org](http://www.nfpa.org))

ASME B30.9, Slings

ASME B30.21, Lever Hoists

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016 ([www.asme.org](http://www.asme.org))

## **SECTION 3-0.4 APPENDIX**

[Nonmandatory Appendix A](#) applies to the performance requirements for hoists used in marine and other applications. The requirements in [Nonmandatory Appendix A](#) are

in addition to the requirements of ASME HST-3 and ASME B30.21 and must be separately invoked.



## Chapter 3-1 Performance

### SECTION 3-1.1 GENERAL

All equipment selected in accordance with this Standard shall perform satisfactorily when used in accordance with ASME B30.21, Chapters 21-2 through 21-4 and used within the rated load.

All equipment shall provide for operating lever pull, lift, and headroom in accordance with the manufacturer's specifications or the specifications agreed upon by the manufacturer and user.

### SECTION 3-1.2 APPLICATION

Lever hoists shall be suitable for lifting or lowering, pulling or tensioning loads within their rated load. They shall be capable of being used in pulling or tensioning applications at any angle, provided the load block, lifting medium, and hoist body are not restricted from forming a straight line with the direction of loading.

The hoists covered by this Standard are intended for industrial use in ambient temperatures from 0°F to 130°F (−18°C to 54°C) and should perform satisfactorily when applied and operated in the manner described in this Standard. The user should consult with the manufacturer for lever hoists to be used in hazardous (classified) locations or under abnormal operating conditions. Refer to ASME B30.21 for construction, installation, inspection, testing, operation, and maintenance.

Because of varying environmental conditions, loading, and usage, the hoist service life is interrelated to the type and frequency of maintenance performed on the unit.

Equipment covered by this Standard should be inspected and maintained according to ASME B30.21, Chapter 21-4.

### SECTION 3-1.3 OPERATING CHARACTERISTICS

Lever hoists shall be constructed to provide the following operating characteristics:

(a) The hoist shall lift, lower, or pull a load, and apply or release tension in controlled increments when a manual force is applied to the operating lever (handle).

(b) The hoist shall lift or pull the rated load when an appropriate lever pull is exerted by one operator (see [section 3-1.4](#)).

(c) The hoist shall be equipped with a mechanism (friction brake or ratchet-and-pawl) that shall hold and control loads within the rated load when the hoist is being operated in either direction.

(d) The hoist shall be equipped with accessible operating controls.

(e) The hoist should have a free-wheeling capability that will allow the operator to adjust the load hook position when the unit is not under load.

### SECTION 3-1.4 PERFORMANCE CHARACTERISTICS

See [Tables 3-1.4-1](#), [3-1.4-2](#), [3-1.4-3](#), and [3-1.4-4](#) for generally available lever hoist capacities and typical performance characteristics.

**Table 3-1.4-1 Typical Characteristics of Manually Lever-Operated Chain Hoists: Ratchet-and-Pawl Type, Welded Link and Roller Chain**

Rated Load, ton (kg) [Note (1)]	Number of Chains	Headroom, in. (mm)	Lever Pull-to-Lift Rated Load, lbf (kN)	Weight, lb (kg) [Note (2)]	Lever Length, in. (mm)
$\frac{1}{2}$ (454)	1	9–11 (230–280)	98–105 (0.44–0.47)	5–9 (2–4)	12–15 (305–380)
$\frac{3}{4}$ (680)	1	11–13 (280–330)	56–98 (0.25–0.44)	8–14 (3–7)	15–22 (380–560)
1 (908)	1	11–15 (280–380)	80–90 (0.36–0.40)	13–15 (6–7)	20–24 (510–610)
$1\frac{1}{2}$ (1 361)	1	11–17 (280–430)	60–116 (0.27–0.52)	13–27 (6–12)	17–28 (430–710)
$1\frac{1}{2}$ (1 361)	2	15–18 (380–460)	60–98 (0.27–0.44)	17–21 (8–10)	18–21 (460–535)
2 (1 815)	2	15–18 (380–460)	85–90 (0.38–0.40)	20–22 (9–10)	20–24 (510–610)
$2\frac{1}{2}$ (2 268)	1	15–18 (380–460)	70–76 (0.31–0.34)	21–36 (10–16)	14–33 (355–840)
3 (2 722)	2	16–20 (405–510)	62–120 (0.28–0.53)	22–35 (10–16)	17–28 (430–710)
$4\frac{1}{2}$ (4 082)	3	19–27 (480–690)	72–124 (0.32–0.55)	36–53 (16–24)	17–34 (430–865)
5 (4 536)	2	22–27 (560–690)	74–125 (0.33–0.56)	55–65 (25–30)	33–36 (840–915)
5 (4 536)	4	18–25 (460–640)	76–82 (0.34–0.36)	42–60 (19–27)	14–18 (355–460)
6 (5 443)	4	22–27 (560–690)	75–124 (0.33–0.55)	46–65 (21–30)	17–34 (430–865)
9 (8 164)	5	30–36 (760–915)	124–140 (0.55–0.62)	120–145 (54–66)	34–37 (865–940)
11 (9 979)	6	30–36 (760–915)	124–145 (0.55–0.64)	130–155 (59–70)	34–37 (865–940)
13 (11 793)	7	30–36 (760–915)	124–150 (0.55–0.67)	140–165 (64–75)	34–37 (865–940)
15 (13 607)	8	30–36 (760–915)	124–155 (0.55–0.69)	150–175 (68–80)	34–37 (865–940)

## GENERAL NOTES:

- (a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98 – 105) denote typical ranges. Consult individual manufacturer's catalog for specific values.
- (b) Standard lifts (not shown in Table) range from 48 in. to 60 in. (1 220 mm to 1 525 mm). Longer lifts are available on application.

## NOTES:

- (1) Indicates ton of 2,000 lb.
- (2) Weight ranges shown are based on standard lift range [see General Note (b)].



**Table 3-1.4-2 Typical Characteristics of Manually Lever-Operated Chain Hoists: Friction-Brake Type, Welded Link and Roller Chain**

Rated Load, ton (kg) [Note (1)]	Number of Chains	Headroom, in. (mm)	Lever Pull-to-Lift Rated Load, lbf (kN)	Weight, lb (kg) [Note (2)]	Lever Length, in. (mm)
$1/4$ (226)	1	9–14 (230–355)	28–40 (0.12–0.18)	6–16 (3–8)	12–15 (305–380)
$1/2$ (454)	1	9–14 (230–355)	40–60 (0.18–0.27)	9–16 (4–8)	14–16 (355–405)
$3/4$ (680)	1	10–14 (255–355)	32–70 (0.14–0.31)	12–16 (6–8)	10–22 (255–560)
1 (908)	1	12–15 (304–380)	40–75 (0.18–0.33)	16–20 (8–9)	12–20 (305–510)
$1\frac{1}{2}$ (1 361)	1	13–17 (330–430)	40–87 (0.18–0.39)	16–32 (8–15)	16–22 (405–560)
$1\frac{1}{2}$ (1 361)	2	15–17 (380–430)	34–87 (0.15–0.39)	20–36 (9–16)	12–21 (305–535)
2 (1 815)	2	15–18 (380–460)	42–90 (0.19–0.40)	23–38 (10–17)	12–21 (305–535)
3 (2 722)	1	17–19 (430–485)	65–90 (0.29–0.40)	41–45 (19–21)	16–21 (405–535)
3 (2 722)	2	17–21 (430–535)	49–95 (0.22–0.42)	34–50 (16–23)	18–22 (460–560)
$4\frac{1}{2}$ (4 082)	3	20–24 (510–610)	54–96 (0.24–0.43)	48–90 (22–41)	18–21 (460–535)
6 (5 443)	2	21–24 (535–610)	51–71 (0.23–0.32)	61–70 (28–32)	16–21 (405–535)
6 (5 443)	4	21–25 (535–635)	58–108 (0.26–0.48)	61–110 (28–50)	18–24 (460–610)
15 (13 607)	8	31–36 (785–915)	86–120 (0.38–0.53)	243–260 (110–118)	18–24 (460–610)

## GENERAL NOTES:

- (a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98–105) denote typical ranges. Consult individual manufacturer's catalog for specific values.
- (b) Standard lifts (not shown in Table) range from 48 in. to 60 in. (1 220 mm to 1 525 mm). Longer lifts are available on application.

## NOTES:

- (1) Indicates ton of 2,000 lb.
- (2) Weight ranges shown are based on standard lift range [see General Note (b)].

**Table 3-1.4-3 Typical Characteristics of Manually Lever-Operated Web-Strap Hoists: Ratchet-and-Pawl Type**

Rated Load, ton (kg) [Note (1)]	Number of Falls	Headroom, in. (mm)	Lever Pull-to-Lift Rated Load, lbf (kN) [Note (2)]	Weight, lb (kg) [Note (3)]	Lever Length, in. (mm)
$1/2$ (454)	1	16–21 (406–533)	50–130 (0.22–0.58)	9–12 (4–6)	20–30 (508–762)
$3/4$ (680)	1	19–26 (483–660)	60–145 (0.27–0.65)	9–14 (4–7)	20–32 (508–813)
1 (908)	1	17–26 (432–660)	65–160 (0.31–0.72)	11–16 (5–8)	24–38 (610–965)
1 (908)	2	17–26 (432–660)	50–130 (0.22–0.58)	9–12 (4–6)	20–30 (508–762)
$1\frac{1}{2}$ (1 361)	2	18–30 (457–762)	60–145 (0.27–0.65)	9–14 (4–7)	20–32 (508–813)
2 (1 815)	2	22–30 (584–762)	70–160 (0.31–0.72)	11–16 (5–8)	24–38 (610–965)
3 (2 722)	2	27–30 (686–762)	70–160 (0.31–0.72)	24–30 (12–15)	20–38 (508–965)

## GENERAL NOTES:

- (a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98–105) denote typical ranges. Consult individual manufacturer's catalogs for specific values.
- (b) Standard lifts (not shown in Table) range from 40 in. to 135 in. (102 cm to 343 cm). Longer lifts are available on application.

## NOTES:

- (1) Indicates ton of 2,000 lb.
- (2) Lever pull-to-lift rated load will vary with the number of web-strap wraps on drum.
- (3) Weight ranges shown are based on standard lift range [see General Note (b)].

**Table 3-1.4-4 Typical Characteristics of Manually Lever-Operated Wire-Rope Hoists: Ratchet-and-Pawl Type**

Rated Load, ton (kg) [Note (1)]	Number of Falls	Headroom, in. (mm)	Lever Pull-to-Lift Rated Load, lbf (kN) [Note (2)]	Weight, lb (kg) [Note (3)]	Lever Length, in. (mm)
$\frac{1}{4}$ (226)	1	16-18 (406-457)	40-100 (0.18-0.45)	6-8 (3-4)	16-30 (406-762)
$\frac{1}{2}$ (454)	1	19-21 (483-533)	50-110 (0.22-0.49)	7-13 (3-6)	16-30 (406-762)
$\frac{1}{2}$ (454)	2	19-21 (483-533)	40-100 (0.18-0.45)	6-8 (3-4)	16-30 (406-762)
$\frac{3}{4}$ (680)	1	17-25 (432-635)	55-120 (0.27-0.54)	8-17 (4-8)	20-32 (508-813)
1 (908)	1	20-23 (508-584)	70-130 (0.31-0.58)	12-17 (6-8)	20-36 (508-914)
1 (908)	2	24-28 (610-711)	40-105 (0.18-0.45)	7-13 (3-6)	16-30 (406-762)
$1\frac{1}{2}$ (1 361)	2	22-34 (559-864)	60-120 (0.27-0.54)	8-17 (4-8)	20-32 (508-813)
2 (1 815)	2	22-34 (559-864)	70-130 (0.31-0.58)	12-17 (6-8)	20-36 (508-914)

## GENERAL NOTES:

- (a) This Table indicates the range of capacities and characteristics generally available. Those values including a dash (e.g., 98-105) denote typical ranges. Consult individual manufacturer's catalogs for specific values.
- (b) Standard lifts (not shown in Table) range from 6 ft to 40 ft (1.8 m to 12.2 m). Longer lifts are available on application.

## NOTES:

- (1) Indicates ton of 2,000 lb.
- (2) Lever pull-to-lift rated load will vary with the number of wraps of wire rope on drum.
- (3) Weight ranges shown are based on standard lift range [see General Note (b)].



## Chapter 3-2

# Load Testing, Manual, Operation, and Inspection and Maintenance Procedures

### SECTION 3-2.1 LOAD TESTING

(a) *Load Testing of New Hoists.* All complete new hoists shall be tested by the manufacturer with a test load of at least 125% of rated load, except hoists incorporating overload devices, in which case the hoist shall be tested with at least rated load. In addition, all operating functions shall be checked to ensure proper operation.

(b) *Load Testing of Altered Hoists.* All hoists in which load sustaining parts have been altered, replaced, or repaired shall be tested statically or dynamically by or under the direction of an appointed person, and a record of the test should be made. The applied test load shall be at least equal to the rated load or greater, as approved by the manufacturer. The replacement of the lifting medium is specifically excluded from this hoist load test; however, a functional test of the hoist should be made prior to putting the hoist back in service.

### SECTION 3-2.2 MANUAL

The manufacturer shall furnish with each hoist one copy of an instruction manual. The manual shall include information on the following:

- (a) operation
- (b) inspection and testing
- (c) lubrication, maintenance, and repair

### SECTION 3-2.3 OPERATION

#### 3-2.3.1 Procedures

Operating procedures recommended in the manufacturer's instruction manual should be followed. In addition to these recommendations, operating practices (para. 3-2.3.2) and load handling procedures (para. 3-2.3.3) should be followed.

#### 3-2.3.2 Operating Practices

It is recommended that the following practices be adhered to when using a lever-operated hoist:

(a) The supporting structure or anchoring means shall have a load rating at least equal to that of the hoist.

(b) The operator shall familiarize himself with the operation of the equipment and its proper care. If adjustments are necessary or any damage is known or suspected, the hoist shall be removed from service and not used until corrections are made.

(c) Hoists shall be used only in locations that will allow the operator to be free of the load.

(d) The operator shall ensure that he has firm footing and is otherwise secured before operating the hoist.

(e) The operator shall have access to the operating lever.

(f) Before using the hoist, the operator shall be certain that all people in the area are clear of the load.

(g) The operator shall not engage in any activity that will divert his attention while operating the hoist.

(h) The operator shall not attempt to use the free-wheeling feature with any load on hoist. Load shall not be applied with the hoist control in the free-wheeling mode.

(i) Hoists shall not be operated by means other than hand power nor operated with an extension on the lever.

#### 3-2.3.3 Handling the Load

(a) The rated load shall not be exceeded.

(b) The hoist lifting medium shall not be wrapped around the load.

(c) The load shall be attached to the hook or attached by means of slings or other approved devices.

(d) The load slings or other approved devices shall be seated properly in the saddle of the hook, and the hook latch (if used) shall be closed before operating the hoist. Hooks shall not be tip loaded.

(e) Before lifting or pulling a load, the operator shall be certain that

(1) the lifting medium is not kinked, twisted, or fouled, and is properly seated in the sprocket(s) or drum(s)

(2) load is not caught on any obstructions

(3) multiple-strand parts are not twisted and are free to take up load with the load equalized on each supporting strand

(4) clearance is available to avoid personal injury or property damage





# Nonmandatory Appendix A

## Performance Requirements for Manually Lever-Operated Chain Hoists Used in Marine and Other Applications As Required by the U.S. Department of Defense (DOD)

### A-1 GENERAL

#### A-1.1 Scope

This Appendix provides performance requirements beyond those cited in ASME HST-3 for manually lever-operated chain hoists for use in marine and other applications as required by the Department of Defense (DOD). This Appendix, in conjunction with ASME HST-3, is replacing the requirements of MIL-H-904 for manually lever-operated chain hoists.

#### A-1.2 Classification

Manually lever-operated chain hoists shall be of the following classes and types [see A-5.1(b)].

##### A-1.2.1 Classes

- (a) Class 1: conventional weight for general material handling
- (b) Class 2: lightweight for general material handling
- (c) Class 3: free of cast-iron load-bearing parts, used for special purpose service (such as reactor component handling)

##### A-1.2.2 Types

- (a) Type A: manually lever-operated hoist, link or roller chain hoist, hook suspension fixed capacity
- (b) Type B: manually lever-operated, link or roller chain hoist, hook suspension convertible capacity

#### A-1.3 Definitions

*brittle material*: material showing less than 10% elongation in gage length for the tensile test specimen.

*operating cycle*: the lifting and lowering of the hoist rated load through a minimum distance of 4 ft with a 6-sec maximum pause between lifting and lowering.

*recovered materials*: materials that have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials.

#### A-1.4 References to Other Codes and Standards

Refer to the following publications, copies of which may be obtained from the publisher as indicated. The latest edition shall be used.

- ASTM A48, Standard Specification for Gray Iron Castings (DOD adopted)
- ASTM A143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement (DOD adopted)
- ASTM A304, Standard Specification for Carbon and Alloy Steel Bars Subject to End-Quench Hardenability Requirements (DOD adopted)
- ASTM A322, Standard Specification for Steel Bars Alloy, Standard Grades (DOD adopted)
- ASTM B26, Standard Specification for Aluminum Alloy Sand Castings (DOD adopted)
- ASTM B108, Standard Specification for Aluminum Alloy Permanent Mold Castings (DOD adopted)
- ASTM B633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel (DOD adopted)
- Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor Drive, West Conshohocken, PA 19428 ([www.astm.org](http://www.astm.org))
- MIL-DTL-917, Electric Power Equipment, Basic Requirements for
- MIL-S-901, Shock Tests, H.I. (High Impact) Shipboard Machinery, Equipment, and Systems, Requirements for
- Publisher: Department of Defense, Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094 (<http://www.dsp.dla.mil/Specs-Standards>)

### A-2 PERFORMANCE REQUIREMENTS

#### A-2.1 General

Performance requirements shall be in accordance with ASME HST-3 and as specified in this Appendix.



## A-2.2 Application

Metals susceptible to corrosion attack in a sea-water environment shall be treated, plated, or painted to provide corrosion resistance. In order to minimize electrolytic corrosion between dissimilar metals in contact with each other, metal-to-metal contact shall be limited to those metals that, when coupled, are in accordance with sea water corrosion of galvanic couples requirements of MIL-DTL-917. If a metal is coated or plated, the coating or plating metal rather than the base metal shall be considered in metal-to-metal contact between parts that depend upon coating or plating for corrosion resistance.

When specified [see A-5.1(c)], hooks shall be zinc plated. Zinc plating shall be in accordance with ASTM B633, Type II, Class Fe/Zn 12. The hook throat safety device shall be constructed of noncorrosive material or treated for corrosion resistance.

When specified [see A-5.1(d)], the link load chain shall be protected by zinc coating in accordance with ASTM B633, Type II, Class Fe/Zn 12. The roller chain shall have a blue oxide finish supplemented by a coating of combination lubricant and rust preventative. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A143.

## A-2.3 Characteristics: Types A and B, Manually Lever-Operated Link or Roller-Chain Hoist, Hook Suspension, Fixed (A) and Convertible (B) Capacity

Types A and B shall be hook suspended, lever-operated, and shall contain a mechanism for hoisting and lowering, which is either a pawl-ratchet-and-lever or a spur-gear (friction brake) arrangement constructed for safe operation of the hoist. There shall be no limitation on position of the hoist when in use. Hoists shall be in accordance with Tables 3-1.4-1 and 3-1.4-2 and as specified herein.

## A-2.4 Lubrication

Lubricants used shall be readily available and be free of ozone-depleting chemicals (ODC).

## A-2.5 Painting

Paints and coatings shall be lead- and chromate-free.

## A-2.6 Workmanship

The hoist shall withstand any operation specified herein without malfunction or component failure caused by faulty workmanship. Edges and surfaces exposed to operating and maintenance personnel shall be smooth and rounded so that a hazardous surface does not exist.

## A-2.7 Interchangeability

In no case shall parts be physically interchangeable or reversible unless such parts are also interchangeable or reversible with regard to function, performance, and strength. Component parts for the same type of hoists from the same manufacturer shall be interchangeable to the greatest extent possible.

## A-3 MECHANICAL REQUIREMENTS

### A-3.1 Design Stress

The maximum combined stress in component parts shall not exceed 35% of the tensile yield strength of the material for hoist operation at rated load. The maximum combined stress in component parts shall not exceed 70% of the tensile yield strength of the material. For all classes of hoists at rated load, the safety factor for load-bearing parts shall not be less than 3, based on the yield strength of the materials used; or a minimum safety factor of 5, based on the ultimate strength, whichever provides the lowest design stress. For hoists requiring repair parts, all wear parts shall be readily accessible for replacement. Equivalent spares for the same class and type hoists shall be interchangeable.

When specified [see A-5.1(e)], the hoist shall withstand grade A high-impact shock. Unloaded hoists, when stowed on a pad, shall withstand high impact shock in accordance with grade A of MIL-S-901, without permanent deformation or degradation of any operating functions.

### A-3.2 Load Chain

As specified in A-5.1(f), load chain shall be link- or roller-type. The load chain shall have a safety factor of 5 for the rated load of the hoist, based on the ultimate strength of the material. The load chain shall be selected from any of the AISI grade designations of ASTM A304 or ASTM A322. The load chain shall be easily replaceable.

**A-3.2.1 Load Chain Container.** When specified [see A-5.1(g)], hoists shall be equipped with a load chain container of durable construction to store the slack load chain. The load chain container shall have sufficient volume to contain the slack load chain and shall be located to prevent interference with the hoist operation.

**A-3.2.2 Load Chain Sprocket and Shaft.** The load chain sprocket may be integral with or rigidly connected to the load chain shaft. Welding of the load chain sprocket to the shaft is not permitted.

### A-3.3 Chain Stop

Type B convertible capacity hoist may have a chain stop attached to the load chain end in lieu of securing the chain to the hoist. The chain stop shall prevent unreeving of the hoist and shall be removable.



**Table A-3.5-1 Hook Throat Openings**

Hoist Rated Load, lb (kg)	Minimum Hook Throat Opening, in. (mm)
1,000 (453.6)	0.75 (19.1)
2,000 (907.2)	0.906 (23.0)
3,000 (1 360.8)	1.0 (25.4)
4,000 (1 814.4)	1.125 (28.6)
5,000 (2 268.0)	1.125 (28.6)
6,000 (2 721.6)	1.5 (38.1)
7,500 (3 402.0)	1.375 (34.9)
10,000 (4 536.0)	1.625 (41.3)
11,000 (4 989.5)	2.0 (50.8)
13,000 (5 896.7)	2.063 (52.4)
15,000 (6 803.9)	2.063 (52.4)
17,000 (7 711.1)	2.063 (52.4)
20,000 (9 071.9)	2.25 (57.2)
25,000 (11 339.9)	2.25 (57.2)
30,000 (16 607.8)	2.75 (70.0)
40,000 (18 143.7)	3.0 (76.2)

### A-3.4 Lever

The operating lever length for Types A and B shall be a maximum of 34 in. measured from the center of the yoke pin to the extreme end. The hoist shall engage to lift or lower with a lever stroke of 36 deg or less. The hoist shall permit a lever power stroke through a minimum arc of 60 deg.

### A-3.5 Load Hooks

Hook throat openings shall be in accordance with the dimensions shown in [Table A-3.5-1](#). The hook shall be clearly marked with manufacturer identification and allowable hook load or allowable hook load designator. Positive means shall be provided to prevent the load hook from loosening due to rotation of the load.

### A-3.6 Construction

Rotating shafts shall be supported in antifriction, lubricated, or self-lubricated bearings or bushings. Shaft bushings or bearings shall be enclosed against entry of foreign matter. Rotating and sliding surfaces shall be lubricated. Chain replacement shall be accomplished by use of simple hand tools. Gears shall be enclosed against foreign matter (such as dirt, dust, and water spray) in a casing that will permit ready access for inspection and cleaning. Positive means of securing loose parts shall be provided to prevent any component from working loose.

**A-3.6.1 Hoist Brake.** Hoist construction shall provide for automatic brake operation to secure a suspended load if the hand lever is released or operating mechanism fails. Lowering shall be possible only by manual operation of the hoist hand-lever. The brake device shall be self-adjusting for the service life of the brake lining. The brake shall

support the required hoist loads with no evidence of permanent deformation or excessive wear. The brake device and brake surfaces shall be protected against the retention of dirt, dust, and water.

### A-3.7 Chain Guides

Enclosed chain guides shall be provided to ensure that the hoist load chain enters the sprocket in the proper position to prevent misalignment or jamming of the hoist load chain and sprocket. These guides, if bolted on, shall have means to prevent loosening under vibration.

### A-3.8 Overload Protection

Mechanical overload limiting devices shall not be permitted in naval applications unless the hoist is provided with a mechanical load brake and the mechanical overload limiting device is not installed on the load side of the hoist.

### A-3.9 Materials

Materials used shall be of sufficient hardness and strength to withstand intended use and applicable tests.

**A-3.9.1 Recycled, Recovered, or Environmentally Preferable Materials.** Recycled, recovered (see [A-1.3](#)), or environmentally preferable materials should be used to the maximum extent possible, provided the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

**A-3.9.2 Prohibited Materials.** Cadmium, asbestos, beryllium, brittle materials, and magnesium or magnesium-based alloys (except steel or aluminum alloys that contain less than 0.5% magnesium) shall not be used unless otherwise specified.

**A-3.9.3 Material for Class 3 Hoists.** Metal castings, weldments, and steel forging used for load-bearing parts on Class 3 hoists shall be inspected as specified. Cast iron shall not be used for load-bearing parts. Cast iron for nonload-bearing parts shall be in accordance with ASTM A48, Class 35 or better. Aluminum castings for load-bearing or nonload-bearing parts shall be in accordance with ASTM B26 or ASTM B108, Type UNS A03560, temper T6.

## A-4 TESTING, MARKING, AND DATA

### A-4.1 Testing

**A-4.1.1 High-Impact Shock.** When specified [see [A-5.1 \(f\)](#)], the hoist shall undergo the high-impact shock test in accordance with MIL-S-901. Resilient mountings shall not be used. Hoists shall be tested in stowed position (horizontal attitude), constrained (not fastened) to prevent lateral movement, and clamped or strapped to resist



vertical movement. Hoists shall have the load hook or load block retracted for the test. The test fixture for mounting the hoist shall conform, as applicable, to the deck-platform or bulkhead mounting figures shown in MIL-S-901. Following successful completion of highimpact shock test, the hoist shall be subjected to the following tests:

#### A-4.1.2 Load Testing

**A-4.1.2.1 Static Load.** The hoist shall support a static load of twice the maximum rated load for 10 min. The load shall be suspended with the hoist load chain extended to the limit of the hoist rated lift height. This extension may be changed to not less than 1 ft, provided the contractor demonstrates that the entire length of chain will support 200% of rated load. The suspended test load shall be held by the hoist brake for 10 min.

**A-4.1.2.2 Dynamic Load.** The hoist, fixed capacity and convertible capacity (convertible hoists shall be reeved for their fixed load rating), shall be loaded to 150% of rated load and operated by hoisting and lowering the test load through the required lift height. With the test load clear of the ground, a minimal length of 1 ft of load chain shall be overhauled in each direction. This test shall be performed at a minimum speed of 10 ft/min. Hoist shall operate satisfactorily, and the brake shall exhibit no sign of slippage.

**A-4.1.3 Efficiency.** The hoists shall be loaded to rated capacity and operated to raise the load through any conveniently measured distance. A spring balance shall be connected not more than 2 in. from the end of the opening lever of the hoist. The mean force required to operate the lever through one operating stroke shall be determined by measuring the force at five equidistant positions over the operating stroke. Measurement shall be made with the spring balance always at a right angle to the lever and for at least six successive operating strokes. The total distance through which the operating force acts and the distance through which the load is lifted shall be noted. The mechanical efficiency of the hoist shall be determined from the following formula:

$$E = \frac{C \times L \times 100}{P \times T}$$

where

$E$  = mechanical efficiency, %

$C$  = rated capacity of hoists, lb

$L$  = distance lifted, ft

$P$  = mean operating force, lbf

$T$  = total distance through which  $P$  acts

**A-4.1.4 Endurance.** Types A and B hoists shall be tested to 2,000 continuous operating cycles when single-reeved. The operating cycles for testing multiple-reeved hoists shall be determined by dividing

2,000 by the number of hoist load lines. Convertible hoists shall be reeved for their fixed rated load. An operating cycle for these hoists shall consist of lifting and lowering the hoist rated load through a distance of 6 in. Lever-operated hoists shall be operated at a minimum speed of 15 ft/min and a maximum of 70 ft/min. Hoists shall be clean and free of foreign material and excess lubricant. During operation of these hoists, no wear particles greater than 0.031 in. in any direction shall be generated.

#### A-4.2 Marking

**A-4.2.1 Identification.** In addition to the requirements of ASME B30.21, para. 21-1.1.3, the hoist shall be identified with the following:

- (a) hoist weight and shock (grade), as applicable
- (b) class and type, as applicable
- (c) rated load
- (d) ASME B30.21, para. 21-1.1.3
- (e) national stock number (NSN) (if established)
- (f) contract or order number
- (g) date of manufacture

**A-4.2.2 Class 3 Marking.** For Class 3 hoists, space shall be provided, either on the identification plate or in another prominent location, for a 21-word inscription (135 spaces) of 0.125 in. minimum size lettering.

Metal castings for load bearing parts of Class 3 hoists shall be identified with the foundry heat number cast or stamped on a raised pad 0.125 in. above the casting surface using 0.250 in. letters. When a raised pad is not practical due to space or function, the heat number shall be applied in a legible, permanent manner. Marking stamps shall be of the low-stress type.

#### A-4.3 Data

**A-4.3.1 Technical Manuals.** When specified in the contract or order [see A-5.1(h)], the manufacturer shall prepare technical manuals in accordance with the data ordering documents and include the following:

- (a) complete list of material
- (b) identification of each component for replacement
- (c) final drawings

### A-5 TYPICAL HOIST INQUIRY DATA

#### A-5.1 Acquisition

In addition to the typical hoist inquiry data of ASME HST-3, acquisition documents must specify the following:

- (a) [Nonmandatory Appendix A](#), ASME HST-3-2017.
- (b) class, type, and rated load of hoist required (see A-1.2). When Class 3 is specified, special service should be defined.
- (c) if zinc coating of hooks is required (see A-2.2).
- (d) if zinc plating is required for load chain (see A-2.2).

(e) hoist shock-resistance grade A or B (see [A-3.1](#) and [A-4.1.1](#)).

(f) type of load chain, link or roller (see [A-3.2](#)).

(g) if chain container is required (see [A-3.2.1](#)).

(h) if technical manual is required (see [A-4.3.1](#)).

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