ASME HST-2–2023

(Revision of ASME HST-2–2018)

Performance Standard for Hand Chain Manually Operated Chain Hoists

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers
Two Park Avenue, New York, NY 10016-5990

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FOREWORD

ASME HST-2 is one in a series that provides performance requirements for hoists. Originally published in 1983, ASME HST-2 was developed by the ASME HST Standards Committee, Hoists — Overhead to guide manufactures, purchasers, and users of hand chain manually operated chain hoists.

Standards in the ASME HST series are as follows:

Designator	Title
ASME HST-1	Performance Standard for Electric Chain Hoists
ASME HST-2	Performance Standard for Hand Chain Manually Operated Chain Hoists
ASME HST-3	Performance Standard for Lever Hoists
ASME HST-4	Performance Standard for Overhead Electric Wire Rope Hoists
ASME HST-5	Performance Standard for Air Chain Hoists
ASME HST-6	Performance Standard for Air Wire Rope Hoists

ASME HST-2–2023 contains a Nonmandatory Appendix B that provides guidance to assist both the manufacturer and the end user in configuring a hoist for use in a potentially explosive environment. The requirements of this Standard shall be applied with the requirements of ASME B30.16.

This Standard is available for public review on a continuing basis. This provides an opportunity for additional public review input from industry, academia, regulatory agencies, and the public-at-large.

ASME HST-2–2023 was approved by the American National Standard Institute as an American National Standard on August 18, 2023.

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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Revisions and Errata. The committee processes revisions to this Standard on a continuous basis 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 in the next edition of the Standard.

In addition, the committee may post errata on the committee web page. Errata become effective on the date posted. Users can register on the committee web page to receive e-mail notifications of posted errata.

This Standard is always open for comment, and the committee welcomes proposals for revisions. 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 background information and supporting documentation.

Cases

(a) The most common applications for cases are

(1) to permit early implementation of a revision based on an urgent need

(2) to provide alternative requirements

(3) to allow users to gain experience with alternative or potential additional requirements prior to incorporation directly into the Standard

(4) to permit the use of a new material or process

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(c) A proposed case shall be written as a question and reply in the same format as existing cases. The proposal shall also include the following information:

(1) a statement of need and background information

(2) the urgency of the case (e.g., the case concerns a project that is underway or imminent)

(3) the Standard and the paragraph, figure, or table number(s)

(4) the edition(s) of the Standard to which the proposed case applies

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ASME HST-2–2023
SUMMARY OF CHANGES

Following approval by the ASME HST Committee and ASME, and after public review, ASME HST-2–2023 was approved by the American National Standards Institute on August 18, 2023.

ASME HST-2–2023 includes the following changes identified by a margin note, **(23)**.

Page	*Location*	*Change*
1	Section 2-0.1	Subparagraph (c)(7) added
1	Section 2-0.2	In-text Notes under *chain, hand* and *chain, load* revised
4	Section 2-0.3	Updated
4	Section 2-0.4	Revised
11	Form 2-1.13-1	Revised
12	A-1.2	In-text reference citation updated
12	A-1.4	Updated
13	A-2.2	Revised
14	Table A-2.3.3-1	First row, last column, and Note (4) added
13	A-2.4	Revised
14	A-2.5	Revised in its entirety
15	A-2.6	Last sentence added
15	A-3.1	Revised in its entirety
14	Table A-2.3.4-1	Last column and Note (4) added
15	A-3.2	Last sentence added
15	A-3.2.1	In-text reference citation updated
15	A-3.2.3	Revised in its entirety
15	A-3.2.4	First sentence revised
15	A-3.3	Revised
16	A-3.4	Revised in its entirety
16	A-3.5	Last two sentences added
16	Table A-3.4-1	First row added
16	A-3.5.1	First sentence added
17	A-3.5.2.1	Revised in its entirety
17	A-3.5.2.3	In first sentence, cross-reference citation updated
17	A-3.5.2.4	Added
17	A-3.8.3	Reference updated
17	A-3.8.4	References updated
17	A-4.1.1	Revised
18	A-4.1.2	(1) Title revised (2) First paragraph revised and designated as A-4.1.2.1 and subsequent paragraph redesignated (3) In para. A-4.1.2.2, last sentence added
18	A-4.1.3	Revised

Page	*Location*	*Change*
18	A-4.1.4	Last sentence added
18	A-4.1.5	Last sentence added
18	A-4.1.6	Last sentence added
19	A-4.3	Revised
19	A-5	Revised
20	Nonmandatory Appendix B	Added

Chapter 2-0
Scope, Definitions, References, and Appendix

SECTION 2-0.1: SCOPE (23)

(a) This Standard establishes performance requirements for hand chain manually operated chain hoists for vertical lifting service involving material handling of freely suspended (i.e., unguided) loads, using a welded link type load chain as a lifting medium, with one of the following types of suspension:

(1) hook or clevis

(2) trolley

(b) This Standard is applicable to hoists manufactured after the date on which this Standard is issued. Differential pulley and self-locking worm drive type hoists are not covered in this Standard.

(c) 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 the hoist up or down the hoist's own load chain

(6) hoists used in applications where the load on the hand chain hoist is not freely suspended from the hand chain hoist

(7) hoists used for marine and other applications as required by the Department of Defense (DOD) unless Nonmandatory Appendix A has been invoked

The requirements of this Standard shall be applied together with the requirements of ASME B30.16. Please also refer to ASME B30.16 for requirements pertaining to marking, construction, installation, inspection, testing, maintenance, and operation.

SECTION 2-0.2: DEFINITIONS (23)

ambient temperature: the temperature of the atmosphere surrounding the hoist.

beam: an overhead standard structural shape or specially fabricated shape on which a trolley operates.

chain, hand: the chain provided to control movement of a hand-chain-operated hoist or trolley (see Figure 2-0.2-1).

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

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

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

conditions, abnormal operating: 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.

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

hand chain drop: the distance to the lowest point of the hand chain measured from the saddle of the load hook at its upper limit of travel (see Figure 2-0.2-1).

hand chain overhaul: the number of feet (meters) the hand chain must travel to raise the load hook 1 ft (1 m).

hand chain pull: the average force measured in pounds (kilonewtons) exerted by the operator on the hoist hand chain to lift the rated load.

hand chain wheel: a wheel with formed pockets on its periphery to allow torque to be transmitted when a force is applied to the hand chain.

hazardous (classified) locations: locations where fire or explosion hazards may exist. Locations are classified depending on the properties of the flammable vapors, liquids, or 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 NFPA 70.

headroom: headroom is measured with the load hook at its upper limit of travel, and is the distance from the saddle of the load hook to the following (see Figure 2-0.2-1):

(a) saddle of the top hook on hook-suspended hoists

(b) saddle of clevis on clevis-suspended hoists

(c) wheel tread line on trolley-suspended hoists

hoist, hand-chain-operated: a suspended machinery unit that, by use of manual operation, is used for lifting or lowering a freely suspended (i.e., unguided) load.

(a) hoist, clevis-suspended: a hoist suspended by means of a clevis or eye at the top of the hoist (see Figure 2-0.2-1).

(b) hoist, hook-suspended: suspension of a hoist from a trolley or rigid structure by means of a hook at the top of the hoist (see Figure 2-0.2-1).

(c) hoist, trolley-suspended: a hoist suspended from a trolley. A hoist can be connected to a trolley by hook or clevis, or the hoist can be integral with the trolley (see Figure 2-0.2-1).

hook latch: a mechanical device to close (bridge) the throat opening of a hook; a rigging aid not intended to support the load.

lift: the maximum vertical distance through which the load hook can travel; the total allowable hook movement between its upper limit of travel and its lower limit of travel (see Figure 2-0.2-1).

lifting devices, below-the-hook: devices that are not normally reeved onto the hoist chains, such as hook-on buckets, magnets, grabs, and other supplemental devices used for hanging or attaching to the load. The weight of these devices shall be considered part of the load to be lifted.

load: the total superimposed weight on the load block or load hook, including lifting devices.

load block: the assembly of hook or shackle, swivel, bearing, pins, sprocket, and frame suspended by the load chain. This shall include all appurtenances reeved into the load chain.

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

load sprocket: 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.

load suspension parts: the means of suspension (trolley, hook, or clevis), the chain, the sprocket(s), the structure or housing that supports the sprocket(s), and the load block.

minimum radius: the smallest radius of the beam, measured to the centerline of the web of the beam, on which the trolley will operate.

overload: any load greater than the rated load.

parts (lines): number of lines of chain supporting the load block or hook.

qualified person: a person who, by possession of a recognized degree in an applicable field or a certificate of professional standing, or 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: the maximum load for which a hoist or trolley is designated by the manufacturer or qualified person.

reach: the distance from the saddle of the load hook at its lower limit of travel to the upper point of the headroom measurement. Reach is equal to lift plus headroom (see Figure 2-0.2-1).

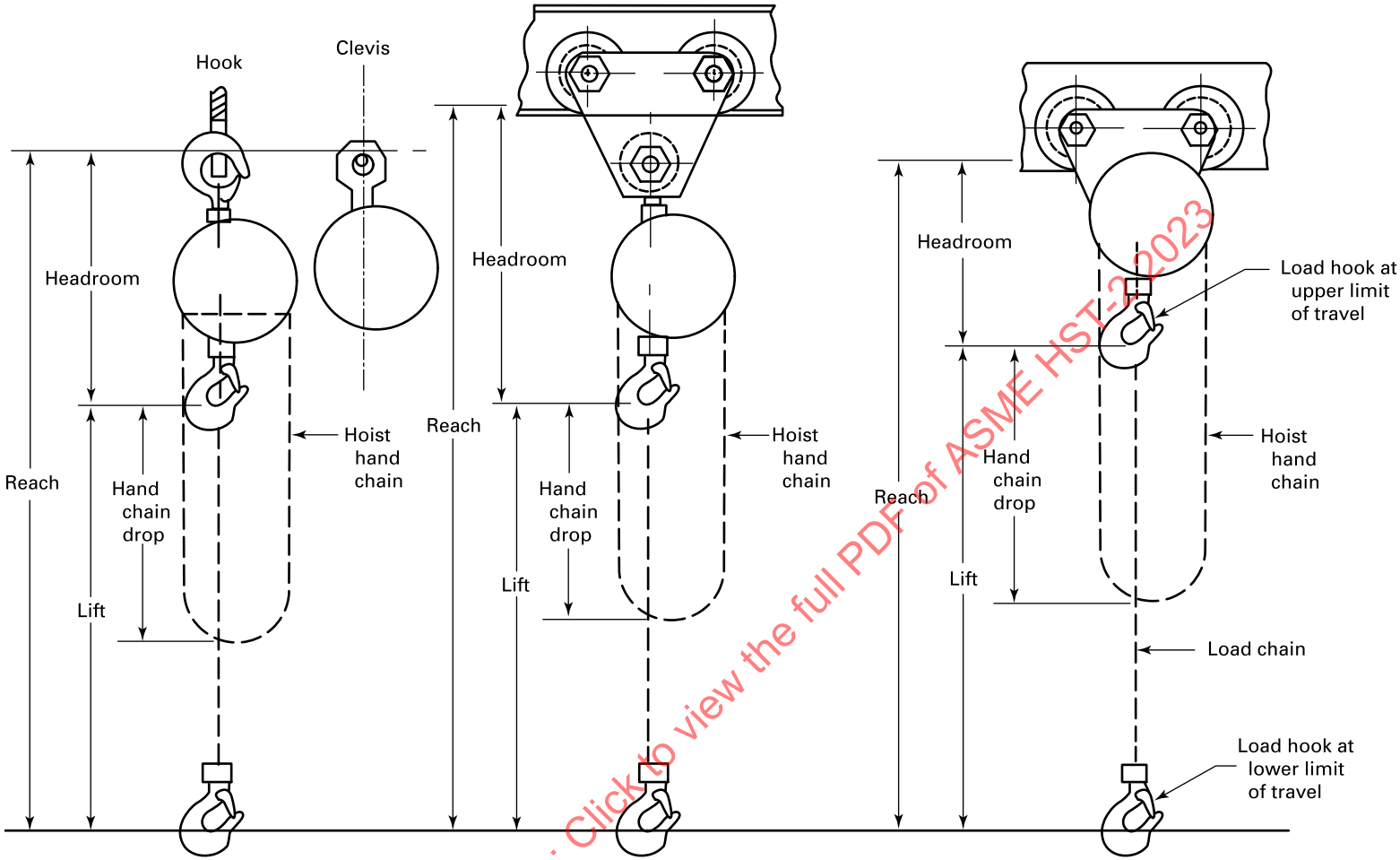
reeving: a system in which a chain travels around sprockets.

shall: a word indicating a requirement.

should: a word indicating a recommendation.

trolley: a wheeled mechanism from which a hoist is suspended to provide horizontal motion of the hoist along a beam.

Figure 2-0.2-1
Headroom, Lift, and Reach



(a) Hook or Clevis Suspended

(b) Trolley Suspended

(c) Trolley Suspended (Integral)

(23) SECTION 2-0.3: REFERENCES

The following is a list of publications referenced in this Standard. The latest issue shall apply.

ASME B30.9. Slings. The American Society of Mechanical Engineers.
ASME B30.10. Hooks. The American Society of Mechanical Engineers.
ASME B30.16. Overhead Underhung and Stationary Hoists. The American Society of Mechanical Engineers.
NFPA 70. National Electrical Code. National Fire Protection Association.

(23) SECTION 2-0.4: APPENDICES

Nonmandatory Appendix A applies to the performance requirements for hoists used in marine and other applications as required by the DOD. The requirements in Nonmandatory Appendix A are in addition to the requirements of ASME HST-2 and ASME B30.16 and shall be specifically invoked.

Nonmandatory Appendix B applies to hoists used in locations defined as hazardous (potentially explosive). The guidance provided in Nonmandatory Appendix B is in addition to the requirements of ASME HST-2.

Chapter 2-1
Performance

SECTION 2-1.1: GENERAL

All equipment selected in accordance with this Standard is designed to perform satisfactorily when installed, inspected, tested, operated, and maintained in accordance with ASME B30.16, Chapters 16-1 through 16-4.

All equipment shall provide hand chain pull, hand chain overhaul, lift, and headroom in accordance with manufacturer's specifications or to specifications agreed upon by the manufacturer and user.

SECTION 2-1.2: CHARACTERISTICS

Table 2-1.2-1 denotes the typical hoist characteristics for hook-suspended or clevis-suspended hoists.

Table 2-1.2-2 denotes the typical hoist characteristics for trolley-suspended hoists where the trolley is separate from the hoist.

Table 2-1.2-3 denotes the typical trolley hoist characteristics where the trolley is integral with the hoist.

Characteristics not shown, such as minimum radius of beam, size of beam, number of parts (lines), and reach, should be obtained from the hoist and trolley manufacturer.

SECTION 2-1.3: APPLICATION ANALYSIS

Manually operated hand chain hoists shall be capable of vertical lifting or lowering a freely suspended (i.e., unguided) rated load. The supporting structure, including trolley(s), monorail, or crane, if any, shall be designed to withstand the loads and forces imposed by the hoist.

NOTE: Manual chain hoists shall be used only for vertical lifting of freely suspended loads unless otherwise approved by the manufacturer.

SECTION 2-1.4: SPECIFICATIONS OF LIFT, HEADROOM, AND REACH

2-1.4.1 Lift

Most hoists are manufactured with standard lifts. One of these standard lifts will normally be adequate for the particular requirement. It is recommended that the purchaser specify the required lift on the inquiry or bid request.

2-1.4.2 Headroom

Headroom should be specified if important to the application.

2-1.4.3 Reach

Reach should be specified if important to the application.

SECTION 2-1.5: TROLLEYS

2-1.5.1 Plain Type

The plain type is recommended where trolley motion is infrequent or relatively short. Due to the required force to manually operate this type of trolley, it is also recommended that plain trolleys be limited to a maximum of 3 tons (3 000 kg) capacity with the elevation of the beam not more than 20 ft (6 m) above the operator's floor level.

2-1.5.2 Hand Chain Pull (Geared Trolley)

The hand-chain-operated type is recommended where trolley motion is relatively infrequent or short, and for those loads and beam heights where a plain-type trolley would be impractical. The hand-chain-operated trolley provides good load spotting ability.

The trolley hand chain shall be guarded to prevent hand chain disengagement from the hand chain wheel. The trolley hand chain shall withstand, without permanent distortion, a pull of 3 times the pull required to traverse the trolley with rated load.

The trolley motion is obtained by pulling on the hand chain, which rotates a hand chain wheel, which in turn is directly connected to the trolley wheels through gears or sprockets. Hand-chain-operated trolleys are recommended for

(a) capacities over 3 tons (3 000 kg)

(b) beam elevations greater than 20 ft (6 m) above the operator's floor level

(c) accurate load spotting ability

SECTION 2-1.6: OVERLOAD LIMITING DEVICE

An overload limiting device, when furnished, shall be designed to permit operation of the hoist within its rated load and to limit the amount of overload that can be lifted by a properly maintained hoist under normal operating conditions.

The overload limiting device may allow the lifting of an overload, but shall be designed to prevent the lifting of an overload that could cause damage to the hoist. This does not imply that any overload is to be intentionally applied to the hoist.

The overload limiting device is an emergency device and shall not be used to measure the maximum load to be lifted, and shall not be used to sense the overload imposed by a constrained load.

SECTION 2-1.7: LOAD SPROCKETS (POCKET WHEELS)

(a) Load sprockets shall have pockets formed to allow proper engagement of the load chain.

(b) Load sprockets shall be guarded to minimize entrance of foreign objects.

(c) Provision shall be made to guard against jamming of the load chain with the hoist mechanism under normal operating conditions.

SECTION 2-1.8: LOAD CHAIN

The hoist shall lift or lower the rated load in a controlled manner when a manual force is applied to the hand chain. When equipped with more than one hand chain, the hand chain pull indicates the required pull for each hand chain.

(a) Load chain shall be suitable for hoist service. Chain shall be accurately pitched to pass over sprockets without binding.

(b) Load chains shall be proof tested by the chain manufacturer or hoist manufacturer with a load at least equivalent to $1\frac{1}{2}$ times the hoist-rated load divided by the number of chain parts (lines) supporting the load.

(c) If a load is supported by more than one part (line) of load chain, the tension on the parts (lines) shall be equalized.

SECTION 2-1.9: HOOKS

Hooks shall follow the guidance of ASME B30.10.

(a) If the hooks are of the swiveling type, they should be free to rotate. Load hooks should be capable of rotating through 360 deg when supporting the rated load.

(b) Hooks shall incorporate latches unless the application makes the use of the latch impractical. When required, a latch shall be provided to bridge the opening of the hook for the purpose of retaining slings, chains, etc., under slack conditions.

SECTION 2-1.10: LOAD BLOCKS

Load blocks shall be guarded against load chain jamming under normal operating conditions.

SECTION 2-1.11: BRAKES

The hoist shall be equipped with a brake that shall sustain and control the rated load when the hoist is being operated in either direction.

The hoist shall be equipped with a mechanical load brake that shall perform the following functions under normal operating conditions with rated loads and under test conditions with test loads up to 125% of rated load:

(a) stop and hold the load when hand chain(s) is released
(b) permit smooth controlled lowering of a load when manual power is applied to the hand chain(s)
(c) have provision for adjustment where necessary to compensate for wear
(d) have heat dissipation capability for the specified frequency of operation

SECTION 2-1.12: OVERTRAVEL RESTRAINT

Before the load chain can be completely run out of the hoist, it shall be restrained in its fully extended position. The restraint shall be such that the unloaded hoist can withstand a lowering hand chain force equal to twice the pull required to lift the rated load, or the hoist with rated load can withstand a lowering hand chain force equivalent to the pull required to lift the rated load.

SECTION 2-1.13: TYPICAL HOIST INQUIRY DATA FORM

See Form 2-1.13-1.

Table 2-1.2-1
Typical Hoist Characteristics — Hook Suspended or Clevis Suspended

Rated Load, ton (kg) [Note (1)]	Hoist Weight, lb (kg) [Note (2)]	Headroom, in. (mm)	Hand Chain Pull, lbf (kN) [Note (3)]	Hand Chain Overhaul to Lift Load, ft [Note (3)]
¼ (227)	15–60 (7–27)	10–13 (255–330)	15–50 (0.07–0.22)	10–50
½ (454)	15–60 (7–27)	10–15 (255–380)	26–65 (0.12–0.29)	15–50
1 (908)	20–90 (9–41)	12–16 (300–405)	50–80 (0.22–0.36)	25–50
1½ (1 361)	40–130 (18–60)	13–21 (330–530)	50–105 (0.22–0.47)	35–80
2 (1 815)	45–190 (20–85)	15–21 (380–530)	70–115 (0.31–0.51)	40–80
3 (2 722)	65–240 (30–110)	19–32 (480–810)	54–110 (0.24–0.49)	70–160
4 (3 629)	90–280 (41–125)	21–38 (530–965)	70–120 (0.31–0.53)	80–130
5 (4 536)	70–345 (32–155)	24–44 (610–1 120)	65–105 (0.29–0.47)	125–240
6 (5 443)	125–345 (55–155)	24–44 (610–1 120)	80–125 (0.36–0.56)	125–175
8 (7 258)	140–430 (65–195)	26–48 (660–1 220)	50–130 (0.22–0.58)	165–390
10 (9 072)	135–560 (60–255)	27–52 (685–1 320)	70–135 (0.31–0.60)	210–395
12 (10 887)	210–830 (95–375)	32–52 (810–1 320)	85–125 (0.38–0.56)	170–390
16 (14 516)	550–1,010 (250–460)	34–60 (860–1 525)	80–130 (0.36–0.58)	235–540
20 (18 144)	990–1,180 (450–535)	57–66 (1 450–1 680)	70–135 (0.31–0.60)	290–420
25 (22 680)	1,000–1,250 (455–565)	57–66 (1 450–1 680)	90–165 (0.40–0.73)	345–420
30 (27 216)	1,400–2,600 (635–1 180)	63–70 (1 600–1 780)	90–120 (0.40–0.53)	380–510
40 (36 288)	2,000–3,200 (910–1 450)	77–80 (1 955–2 030)	85–135 (0.38–0.60)	460–770
50 (45 360)	2,000–3,200 (910–1 450)	77–80 (1 955–2 030)	110–135 (0.49–0.60)	460–770

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Those values including a dash (e.g., 11–44) denote typical ranges. Consult manufacturer for specifics.

NOTES:
(1) 1 ton = 2,000 lb
(2) Standard lifts are 8 ft, 0 in. (2.4 m). Weights are predicated on standard lifts. Corresponding hand chain drop is normally 2 ft, 0 in. (0.6 m) less than the reach. Other lifts are available.
(3) Values refer to each hand chain where two hand chains are required.

Table 2-1.2-2
Typical Trolley-Suspended Hoist Characteristics (Hoist Suspended From a Separate Trolley)

Rated Load, ton (kg) [Note (1)]	Hoist Weight, lb (kg) [Note (2)]	Headroom, in. (mm)	Hand Chain Pull, lbf (kN) [Note (3)]	Hand Chain Overhaul to Lift Load, ft [Note (3)]
¼ (227)	40–260 (18–120)	10–19 (255–485)	15–50 (0.07–0.22)	10–50
½ (454)	40–260 (18–120)	14–19 (355–485)	20–60 (0.09–0.27)	15–60
1 (908)	55–260 (25–120)	14–19 (355–485)	45–80 (0.20–0.36)	25–60
1½ (1 361)	60–310 (27–140)	18–25 (460–635)	40–105 (0.18–0.47)	35–90
2 (1 815)	85–325 (39–145)	18–25 (460–635)	55–115 (0.24–0.51)	40–90
3 (2 722)	155–565 (70–255)	23–31 (585–790)	40–110 (0.18–0.49)	65–180
4 (3 629)	179–575 (81–260)	24–35 (610–890)	55–140 (0.24–0.62)	70–180
5 (4 536)	250–950 (115–430)	27–37 (685–940)	45–105 (0.20–0.47)	125–260
6 (5 443)	264–1,350 (119–610)	28–36 (710–915)	55–140 (0.24–0.62)	155–260
8 (7 258)	410–1,460 (185–660)	36–44 (915–1 120)	45–165 (0.20–0.73)	130–500
10 (9 072)	483–1,460 (219–660)	36–44 (915–1 120)	55–115 (0.24–0.51)	230–500
12 (10 887)	490–2,410 (220–1 095)	36–63 (915–1 600)	60–176 (0.27–0.78)	105–500
16 (14 516)	1,051–2,700 (476–1 225)	39–71 (990–1 800)	70–182 (0.31–0.81)	232–710
20 (18 144)	1,400–2,700 (635–1 225)	70–78 (1 780–1 980)	73–190 (0.32–0.84)	290–770
24 (21 816)	1,400–2,700 (635–1 225)	70–78 (1 780–1 980)	100–206 (0.44–0.92)	348–770

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Those values including a dash (e.g., 11–44) denote typical ranges. Consult manufacturer for specifics.

NOTES:
(1) 1 ton = 2,000 lb
(2) Standard lifts are 8 ft, 0 in. (2.4 m). Weights are predicated on standard lifts and include typical trolley weight. Corresponding hand chain drop is normally 2 ft, 0 in. (0.6 m) less than the reach. Other lifts are available.
(3) Values refer to each hand chain where two hand chains are required.

Table 2-1.2-3
Typical Trolley-Suspended Hoist Characteristics (Integral)

Rated Load, ton (kg) [Note (1)]	Hoist Weight, lb (kg) [Note (2)]	Headroom, in. (mm)	Hand Chain Pull, lbf (kN) [Note (3)]	Hand Chain Overhaul to Lift Load, ft [Note (3)]
¼ (227)	27–258 (12–117)	6–13 (152–330)	17–24 (0.08–0.11)	25–33
½ (454)	27–258 (12–117)	6–14 (152–356)	23–46 (0.10–0.20)	22½–57
1 (908)	36–258 (16–117)	6–14½ (152–368)	46–70 (0.20–0.32)	30–57
1½ (1 361)	55–267 (25–121)	6–19 (152–483)	41–80 (0.18–0.36)	40½–87
2 (1 815)	55–270 (25–122)	6–19 (152–483)	54–95 (0.24–0.42)	52–87
3 (2 722)	179–469 (81–213)	7–21 (178–535)	42–85 (0.19–0.38)	60–176
4 (3 629)	236–469 (107–213)	8–27⅛ (203–689)	56–94 (0.25–0.42)	100–176
5 (4 536)	314–683 (142–310)	8–28 (203–711)	50–81 (0.22–0.36)	156–250
6 (5 443)	325–683 (147–310)	8–28 (203–711)	60–97 (0.27–0.43)	156–250
8 (7 258)	491–1,020 (223–463)	11–27 (279–685)	45–91 (0.20–0.40)	220–500
10 (9 072)	491–1,105 (223–501)	11–27 (279–685)	55–98 (0.24–0.44)	254–500
12 (10 887)	1,022–1,376 (510–624)	11–13 (279–330)	65–104 (0.29–0.46)	174–500
16 (14 516)	1,314–1,681 (596–763)	13–14 (330–356)	64–95 (0.28–0.42)	232–710
20 (18 144)	1,431–2,110 (649–957)	17–18 (432–457)	80–87 (0.36–0.39)	290–762
24 (21 816)	1,431–2,110 (649–957)	17–18 (432–457)	100–108 (0.44–0.48)	348–762

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Those values including a dash (e.g., 11–44) denote typical ranges. Consult manufacturer for specifics.

NOTES:
(1) 1 ton = 2,000 lb
(2) Standard lifts are 8 ft, 0 in. (2.4 m). Weights are predicated on standard lifts and include typical trolley weight. Corresponding hand chain drop is normally 2 ft, 0 in. (0.6 m) less than the reach. Other lifts are available.
(3) Values refer to each hand chain where two hand chains are required.

(23)

Form 2-1.13-1 Typical Hoist Inquiry Data Form

Hoist

Quantity of hoists required _____

Rated capacity _____ tons (_____ kg)

Lift [Note (1)] _____ ft (_____ m)

Reach_____ ft (_____ m)

Hand chain drop _____ ft (_____ m)

Headroom _____ in. (_____ mm)

Type of suspension:

☐ Hook ☐ Clevis ☐ Trolley

Trolley (Separate)

Quantity of trolleys required _____

Rated capacity _____ tons (_____ kg)

Type: ☐ Plain ☐ Hand chain operated

Hand chain drop _____ ft (_____ m)

Trolley (Integral)

Type: ☐ Plain ☐ Hand chain operated

Headroom (including hoist) _____ in. (_____ mm)

Hand chain drop _____ ft (_____ m)

Beam Data (Trolley-suspended hoists only)

Type and size of beam _____

Width of running flange _____ in. (_____ mm)

Minimum radius of beam curves

_____ ft _____ in. (_____ m)

Clearance dimensions of interlocks, switches, or beam splices (if used) _____

_____

_____

_____

Environmental conditions: Furnish complete information regarding any abnormal operating conditions such as ambient temperatures below 0°F (–18°C) or above 130°F (54°C), long exposure to weather, corrosive fumes, dust-laden or moisture-laden atmospheres, and hazardous locations. For hazardous locations, identify location classification as specified in NFPA 70 NEC, if applicable, and additional information that might impact a spark resistance assessment.

_____

_____

_____

NOTE: (1) Refer to manufacturer's catalog for standard lift that will meet the application requirement.

NONMANDATORY APPENDIX A
PERFORMANCE REQUIREMENTS FOR HAND CHAIN MANUALLY OPERATED CHAIN HOISTS USED IN MARINE AND OTHER APPLICATIONS AS REQUIRED BY THE U.S. DEPARTMENT OF DEFENSE

A-1 GENERAL

A-1.1 Scope

This Appendix provides performance requirements beyond those cited in ASME HST-2 for hand operated chain hoists for use in marine and other applications as required by the U.S. Department of Defense (DOD).

This Appendix, in conjunction with ASME HST-2, is replacing the requirements of MIL-H-904 for hand operated chain hoists.

(23) ### A-1.2 Classification

Hand chain manually operated chain hoists shall be of the following classes and types [see para. A-5(b)].

A-1.2.1 Classes

Class 1 Conventional weight, for general material handling

Class 2 Light weight, for general material handling

Class 3 Free of cast iron load-bearing parts, used for special purpose service (such as reactor component handling)

A-1.2.2 Types

Type A Hand-chain-operated hoist, link chain, hook suspension

Type B Hand-chain-operated hoist, link chain, plain trolley suspension

Type C Hand-chain-operated hoist, link chain, geared trolley suspension

Type D Hand-chain-operated hoist, link chain, low headroom, plain trolley suspension

Type E Hand-chain-operated hoist, link chain, low headroom, geared trolley suspension

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 lift 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.

(23) ### 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 edition bearing the latest date of issuance shall be used.

ASTM A48/A48M. Standard Specification for Gray Iron Castings (DOD adopted). ASTM International.

ASTM A143/A143M. Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement (DOD adopted). ASTM International.
ASTM B26/B26M. Standard Specification for Aluminum-Alloy Sand Castings (DOD adopted). ASTM International.
ASTM B108/B108M. Standard Specification for Aluminum-Alloy Permanent Mold Castings (DOD adopted). ASTM International.
ASTM B633. Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel (DOD adopted). ASTM International.
MIL-DTL-917. Detail Specification: Electric Power Equipment, Basic Requirements for. U.S. Department of Defense.
MIL-SDTL-901. Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for. U.S. Department of Defense.
MIL-DTL-24441. Paint, Epoxy-Polyamide, General Specification for. U.S. Department of Defense.
MIL-PRF-24635. Coating System, Weather-Resistant, Exterior Use. U.S. Department of Defense.
MIL-STD-889. Galvanic Compatibility of Electrically Conductive Materials. U.S. Department of Defense.
SSPC SP-10. Near-White Metal Blast Cleaning. Association for Materials Protection and Performance.
TT-C-490. Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings. U.S. General Services Administration.

A-2 PERFORMANCE REQUIREMENTS

A-2.1 General

Performance requirements shall be in accordance with ASME HST-2, and as specified in this Appendix.

A-2.2 Application (23)

Metals susceptible to corrosion attack in a seawater environment shall be treated, plated, or painted to provide corrosion resistance. Assemblies containing dissimilar metals shall be protected against galvanic corrosion in accordance with MIL-DTL-917 and MIL-STD-889. 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. The hoists shall operate in ambient temperatures from 0°F to 130°F (−18°C to 54°C).

When specified [see para. A-5(c)], hooks shall be zinc plated in accordance with ASTM B633, Type 11, Class Fe/Zn 12. The hook throat safety device shall be constructed of noncorrosive material or treated for corrosion resistance.

When specified [see para. A-5(d)], the link load chain and link hand chain shall be zinc plated in accordance with ASTM B633, Type 11, Class Fe/Zn 12. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A143/A143M.

When specified [see para. A-5(j)], the roller chain shall have a blue oxide finish supplemented by a coating of combination lubricant and rust preventative.

A-2.3 Characteristics

A-2.3.1 Type A, Hand-Chain-Operated Hoist, Link Chain, Hook Suspension. Type A hook suspension shall be in accordance with Table 2-1.2-1 and as specified herein.

A-2.3.2 Types B and C, Hand-Chain-Operated Hoist, Link Chain, Plain and Geared Trolley Suspension. Type B plain trolley suspension and Type C geared trolley suspension shall be in accordance with Tables 2-1.2-2 and 2-1.2-3 and as specified herein.

A-2.3.3 Type D, Hand-Chain-Operated Hoist, Link Chain, Low Headroom, Plain Trolley Suspension. Type D, low headroom, plain trolley suspension shall be in accordance with the requirements of Table A-2.3.3-1 and as specified herein.

A-2.3.4 Type E, Hand-Chain-Operated Hoist, Link Chain, Low Headroom, Geared Trolley Suspension. Type E shall be in accordance with the requirements of Table A-2.3.4-1 and as specified herein.

A-2.4 Lubrication (23)

Lubricants used shall be readily available and be free of ozone-depleting chemicals (ODC). Means shall be provided for lubrication of all moving parts of hoists and trolleys. Where life-lubricated bearings are used, no means of external lubrication is required.

(23) **Table A-2.3.3-1**
Type D, Hand-Chain-Operated Hoist, Link Chain, Low Headroom, Plain Trolley Suspension

Rated Load, ton [Note (1)]	Minimum Standard Lift, ft [Note (2)]	Standard Size of "I" Beam, in.	Maximum Headroom, in.	Maximum Pull to Traverse Hoist, lbf [Note (3)]	Maximum Weight Less Track Clamp (Class 1), lb	Track Radius [Note (4)]
1/4	8	5	6	15	124	21
1/2	8	5	6	20	189	21
1	8	6	6	40	210	21
1 1/2	8	7	6 3/4	45	294	36
2	8	8	7	60	341	36
3	8	9	8	65	473	48

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Consult manufacturer for specifics.

NOTES:
(1) 1 ton = 2,000 lb
(2) Standard lifts are 8 ft, 0 in. Weights are predicated on standard lifts and include typical trolley weight. Other lifts are available.
(3) Direct pull on trolley (along direction of track) when moving on straight level track.
(4) Minimum curve of track.

(23) **Table A-2.3.4-1**
Type E, Hand-Chain-Operated Hoist, Link Chain, Low Headroom, Geared Trolley Suspension

Rated Load, ton [Note (1)]	Standard Lift, ft [Note (2)]	Standard Size of "I" Beam, in.	Maximum Headroom, in.	Maximum Pull to Traverse Hoist, lbf [Note (3)]	Maximum Weight Less Track Clamp (Class 1), lb	Track Radius [Note (4)]
1 1/2	8	7	6 3/4	13	326	21
2	8	8	7	15	373	36
3	8	9	8	21	499	48
4	8	10	9 1/2	30	735	66
5	8	12	10 1/2	38	1,008	66
6	8	12	10 1/2	45	1,019	66

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Consult manufacturer for specifics.

NOTES:
(1) 1 ton = 2,000 lb
(2) Standard lifts are 8 ft, 0 in. Weights are predicated on standard lifts and include typical weight. Other lifts are available.
(3) Direct pull on trolley (along direction of track) when moving on straight level track.
(4) Minimum curve of track.

(23) A-2.5 Painting

Paints and coatings shall be lead free and chromate free. Exposed surfaces, except hooks, chains, and other wear surfaces, shall be painted as specified herein. Prepare surfaces to be painted by abrasive blasting to SSPC-SP 10 near-white metal condition and establish a surface profile of 2 mils to 4 mils; if abrasive blasting to SSPC-SP 10 is not possible, then new bare steel enclosures shall be chemically cleaned and pretreated with a zinc or iron phosphate treatment per TT-C-490. The first coat of paint applied shall be MIL-DTL-24441, Type III, Formula 159 zinc-rich epoxy at a thickness of 3 mils to 4 mils dry film thickness (DFT). The second coat of paint applied shall be MIL-DTL-24441, Type IV, Formula 150 green epoxy at a thickness of 4 mils to 6 mils DFT. The top coat of paint applied, color as specified [see para. A-5(k)] shall be MIL-PRF-24635, Type V or VI polysiloxane coating at a thickness of 5 mils to 8 mils DFT. Follow all manufacturer's instructions regarding application conditions and procedures (e.g., temperatures, humidity, pot life, and cure times.).

A-2.6 Workmanship (23)

The hoist shall perform 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. Bolted connections shall use standard bolts and nuts; self-locking nuts are acceptable. All threads shall have full thread engagement.

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 (23)

Handling equipment shall be capable of holding the rated load and maintaining its static position under equipment specified holding conditions. Under the equipment operating conditions, the combined stresses, acting both individually and concurrently, in load-bearing structural and mechanical components of the equipment, shall not exceed 35% of the yield strength of the material used, calculated on the basis of the operating design load. Under the equipment holding conditions, the combined stresses, acting both individually and concurrently, in load-bearing structural and mechanical components of the equipment, shall not exceed 70% of the yield strength of the material used, calculated on the basis of operating design load. For all classes of hoists at rated load, the safety factor for load-bearing parts shall be not less than three, based on the yield strength of the materials used, or a minimum safety factor of five, based on the ultimate strength, whichever provides the lowest design stress.

When specified [see para. A-5(e)], the hoist shall withstand the grade A or grade B high-impact shock. When specified, unloaded hoists, when stowed (not operating) on the rail, shall withstand high-impact shock in accordance with grade A of MIL-DTL-901, without permanent deformation or degradation of any operating functions. It will be permissible for the trolley hoist to drift along the track under shock conditions, provided no damage to the trolley hoist or the brake results and the brake holds the hoist to the rail after the shock. Drift shall be not greater than 1 in.

A-3.2 Load Chain (23)

As specified [see para. A-5(f)], load chain shall be link type or roller type. The ends of the load chain shall permit ready replacement of the chain. The load chain shall have a safety factor of five for the rated load of the hoist, based on the ultimate strength of the material. The load chain shall be alloy steel.

A-3.2.1 Load Chain Container. When specified [see para. A-5(f)], 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. (23)

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-3.2.3 Link Chain. Link chain shall provide a safety factor not less than five for the hoist rated load, based on the ultimate strength of the material. The load chain links shall be electric or forge welded. Each link shall be of uniform size and shape and shall seat properly in the hoist chain sheave pockets. The chain shall be free from any tendency to snarl. The ends of the load chain shall be securely attached to the load block or hook swivel (except multiple reeved) and to the hoist, or provided with a means to prevent the end of the chain passing through the hoist. (23)

A-3.2.4 Roller Chain. The roller chain shall be manufactured from carbon or alloy steel. Each roller chain link shall be of uniform size and shape and shall seat properly in the hoist chain sprocket. The roller chain shall provide a safety factor of at least five for the rated load, based on the ultimate strength of the material. The chain shall be securely attached to the hoist and easily removed. (23)

A-3.3 Hand Chain (23)

A-3.3.1 General. The hand chain shall be carbon steel or alloy steel endless link chain and shall have a drop that is approximately 2 ft less than the specified lift of the hoist. The hand chain shall have a minimum rated strength of at least three times the maximum chain pull required to lift the rated load.

(23) **Table A-3.4-1**
Hook Throat Openings

Hoist Rated Load, lb	Minimum Hook Throat Opening, in.
500	0.750
1,000	0.750
2,000	0.906
3,000	1.000
4,000	1.125
5,000	1.125
6,000	1.500
7,500	1.375
10,000	1.625
11,000	2.000
13,000	2.063
15,000	2.063
17,000	2.063
20,000	2.250
25,000	2.250
30,000	2.750
40,000	3.000

A-3.3.2 Hand Chain Wheels. Hand chain wheels shall have accurately shaped pockets to fit the hand chain. The wheels shall be equipped with a chain guide that will permit operation of the hand chain from an angle 10 deg out from either side of the chain wheel without slipping or jumping the wheel rim. The hand chain wheel shall be compatible with the chain material selected.

(23) A-3.4 Load Hooks

The load and hoist support hooks shall be forged steel. Hook throat openings shall be in accordance with the dimensions shown in Table A-3.4-1. 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. Unless specified in para. A-5(l), load and hoist support hooks shall be fitted with a swivel and hook throat opening safety devices. The safety device shall consist of a spring latch or swivel closure to bridge the throat opening and shall be attached to or be integral with the hook. The safety device shall be constructed of noncorrosive metal or metal with corrosion-resistant finish as specified in para. A-2.2.

(23) A-3.5 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. Each link of the load chain (link chain type) shall be of uniform size and shape, free from scale and laminations at the welds, and shall seat properly in the hoist chain sheave pockets. The chain shall be free from any tendency to snarl. 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. For hoists requiring repair parts, all wear parts shall be readily accessible for replacement. Equivalent spares for the same class and type hoist shall be interchangeable.

(23) **A-3.5.1 Hoist Brake.** Hoist construction shall provide for a brake that ensures positive control of the hoist load at all times. Hoist construction shall provide for automatic brake operation to secure a suspended load if the hand chain is released or the operating mechanism fails. Lowering shall be possible only by manual operation of the hoist hand chain. 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-3.5.2 Trolleys (Plain and Geared)

A-3.5.2.1 Trolley Wheels. Trolleys shall be provided with at least four steel wheels. Trolleys up to and including 3-ton capacity shall have wheels of steel with treads hardened to a minimum depth of 0.020 in. For trolleys over 3-ton capacity, wheels shall be forged or solid steel with treads hardened to a minimum depth of 0.063 in. Trolley wheels shall have treads hardened to a minimum 285 Brinell hardness number. Wheels shall be concentric within 0.030 in., and cast wheels shall be machined, if necessary, to maintain a concentricity of 0.030 in. Unless otherwise specified [see para. A-5(g)], trolley wheel spacing shall be suitable for use on applicable standard "I" beam flange size. Means shall be provided to prevent the trolley wheel flanges from riding up onto the supporting beam. The operating device for geared trolleys shall be a chain wheel equipped with an endless link chain that shall have a drop of approximately 2 ft less than the specified lift of the hoist. The trolley wheels shall be equipped with anti-friction bearings. The wheel bearings shall have an IP rating of IP64 to be protected from foreign matter. (23)

A-3.5.2.2 Trolley Equalizers. Means shall be provided for distributing the hoist load equally into the trolley side frames (side plates).

A-3.5.2.3 Hoist Track Clamps. When specified [see para. A-5(h)], quick-acting track clamps shall be provided for locking fully loaded trolley hoists to the track. The clamps shall be adjustable for wear and shall function on curved or straight track. The clamps shall function without increasing the trolley wheel shaft or wheel bearing load, and in such a manner that the stresses resulting from locking will be taken up in the trolley frame. The hand pull required to set or release the trolley track clamps shall be not greater than 80 lb. The chain or lanyard drop from the beam shall end approximately 2 ft less than the specified lift of the hoist. (23)

A-3.5.2.4 Curved Track. Unless otherwise specified [see para. A-5(m)], the trolley wheels shall be spaced to negotiate curved track at the radii shown in Tables A-2.3.3-1 and A-2.3.4-1. (23)

A-3.6 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-3.7 Overload Protection

Overload limiting devices shall not be used in naval applications.

A-3.8 Materials

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

A-3.8.1 Recycled, Recovered, or Environmentally Preferable Materials. Recycled, recovered (see para. A-1.3), or environmentally preferable materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements and promotes economically advantageous life cycle costs.

A-3.8.2 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-3.8.3 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/A48M, Class 35 or better. (23)

A-3.8.4 Aluminum. Aluminum castings shall be in accordance with ASTM B26/B26M or ASTM B108/B108M, Type UNS A03560, temper T6. (23)

A-4 TESTING, MARKING, AND DATA

A-4.1 Testing

A-4.1.1 High-Impact Shock. Hoists, when specified [see para. A-5(e)], shall undergo the high-impact shock test in accordance with MIL-DTL-901. Hoists shall undergo the grade A tests specified for a principal unit. Resilient mountings shall not be used. Trolley hoists shall be secured only by their own track clamps. Trolley hoists and hook suspension hoists shall be mounted in their normal position. Hoists shall have the load hook or load block retracted for the test. The chain (23)

shall be looped in loops not to exceed 2 ft, and secured in or lashed to the load hook during the test. The test fixture for mounting the hoist shall conform, as applicable, to the deck-platform or bulkhead mounting figures shown in MIL-DTL-901. The test fixture for mounting hoists differing from those specified shall require prior review by the acquisition activity. Shock tests shall conform to the requirements as specified for the lightweight or medium weight test. Separation of component parts of the hoist during the test, evidence of permanent deformation of the hoist during inspection, or failure of the hoist to operate shall result in failure of the test. Following successful completion of high-impact shock test, the hoist shall be subjected to the following tests. See paras. A-4.1.2 through A-4.1.6.

A-4.1.2 Load Tests.

(23) **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. Evidence of failure or permanent deformation of hoist parts shall constitute failure of this test.

A-4.1.2.2 Dynamic Load. The hoist 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 hand speed of 10 ft/min. Trolley-type hoists shall be operated back and forth over a section of track 8 ft or more in length, with the 150% load in suspension. This test shall be performed 10 times at a minimum trolley speed of 15 ft/min. Hoist and trolley shall operate satisfactorily and the brake shall exhibit no sign of slippage. Evidence of failure or permanent deformation of hoist parts shall constitute failure of this test.

(23) **A-4.1.3 Efficiency.** The hoists shall be loaded to rated capacity and operated to raise the load through any conveniently measured distance. The number of feet of hand chain passed by a reference mark in raising the load to the selected height and the tension in the hand chain, measured with an accurate spring balance for attached weights, shall be recorded. Failure of hoists to conform to the specified minimum mechanical efficiency shall constitute failure of this test. The mechanical efficiency of the hoist shall be determined from the following formula:

$$E = C \times L \times 100/(P \times T)$$

where

C = rated capacity of hoists, lb
E = mechanical efficiency in percent of 100
L = distance lifted, ft
P = mean operating force, lbf
T = number of feet of hand chain to raise load

(23) **A-4.1.4 Plain Trolley.** The pull required to move the hoist loaded to its rated load (plain trolley suspension) along a straight portion of track shall be determined by attaching a cable or cord to the trolley, passing the cable or cord over a sheave suspended from the track at a reasonable distance from the trolley, and measuring the required pull by means of weights or a spring balance attached to the cable or cord. Failure to meet the requirements for maximum pull to traverse the hoist shall constitute failure of this test (see Table A-2.3.3-1).

(23) **A-4.1.5 Geared Trolley.** The pull required on the geared trolley hand chain to move a capacity-loaded hoist (gear trolley suspension) along a straight portion of track shall be determined by attaching weights or a spring balance attached to the chain. Failure to meet the requirements for maximum pull to traverse the hoist shall constitute failure of this test (see Table A-2.3.4-1).

(23) **A-4.1.6 Track Clamp.** The track clamp shall be tested with the hoist loaded to its rated load by subjecting the trolley to a pull in either direction, parallel to the track, equal to one-third of the hoist rated load. The trolley track clamps shall show no sign of slipping or of permanent deformation. Failure of the hoist to remain stationary during the test shall constitute failure of this test.

A-4.1.7 Endurance. Hoists of all classes and types shall be tested to 5,000 continuous operating cycles (see para. A-1.3) when single reeved. The operating cycles for testing multiple reeved hoists shall be determined by dividing 5,000 by the number of hoist load lines. This test shall be performed at a minimum speed of 15 ft/min and a maximum speed of 70 ft/min. All 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. Operation of the hoists may be accomplished by means of power-operated equipment.

A-4.2 Marking

A-4.2.1 Identification. In addition to the requirements of ASME B30.16, Section 16-1.1, 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 HST-2, Nonmandatory Appendix A
(e) national stock number (NSN), if established
(f) manufacturer's model number, part number, or serial number
(g) contract or order number
(h) manufacturer's name or trademark
(i) 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. (min.) 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.

A-4.3 Data: Technical Manuals (23)

When specified [see para. A-5(i)] in the contract or order, 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: ACQUISITION (23)

In addition to the typical hoist inquiry data of ASME HST-2, acquisition documents shall specify the following:

(a) ASME HST-2, Nonmandatory Appendix A.
(b) Class, Type, and rated load of hoist required (see para. A-1.2). When Class 3 is specified, special service should be defined.
(c) if zinc coating of hooks is required (see para. A-2.2).
(d) if zinc plating is required for load chain (see para. A-2.2).
(e) hoist shock resistance grade A or grade B (see para. A-3.1).
(f) if a chain container is required (see para. A-3.2.1).
(g) trolley wheel spacing, if other than specified (see para. A-3.5.2.1).
(h) specify track clamps, if required (see para. A-3.5.2.3). Trolley hoists for U.S. Navy ships shall have track clamps.
(i) if a technical manual is required (see para. A-4.3).
(j) if blue oxide finish supplemented by a coating of combination lubricant and rust preventative is required (see para A-2.2).
(k) hoist paint color (see para. A-2.5).
(l) load hook type (see para. A-3.4).
(m) trolley wheel spacing for curved track (see para. A-3.5.2.4).

(23)

NONMANDATORY APPENDIX B
MECHANICAL SPARK RESISTANCE GUIDANCE FOR APPLICATIONS IN HAZARDOUS (POTENTIALLY EXPLOSIVE) LOCATIONS

B-1 GENERAL

B-1.1 Introduction

The electrical requirements for hoists used in hazardous locations in North America are well defined by recognized standards and codes published by NEMA, NFPA, and ANSI. However, none of these documents address mechanical spark resistance for hoists used in these locations.

In general, spark avoidance is required for applications in explosion hazard areas to address the explosive potential of the following three areas:

(a) buildup of electrostatic charges

(b) sparking caused by the impacting and friction of components

(c) excessive surface temperatures

Grounding and bonding of equipment to avoid the buildup of electrostatic charges and maximum surface temperatures for electrical components used in hazardous locations are addressed in electrical codes and are not addressed in this Appendix.

This Appendix focuses on recommendations for physical features aimed at reducing the potential for generating sparks caused by the impacting and sliding of components and excessive surface temperatures that could result from operation of the hoist's mechanical components.

Ensuring that a hoist is suitable for use in a potentially explosive atmosphere requires a collaborative effort of the hoist manufacturer and the end user of the hoist. The end user of the hoist must identify one or more qualified persons who are familiar with the specifics of the application and can work with the manufacturer to provide application details. This information may include a detailed specification for the hoist to allow the manufacturer to configure the hoist to suit the application. This configuration will be based on the information provided by the end user, any applicable standards, and the manufacturer's experience. However, the ultimate responsibility for ensuring the hoist is suitable for the application remains with the qualified person(s) identified by the end user. Collaboration between the manufacturer and the end user during the design and procurement portion of the project is recommended.

After installation, the equipment must be operated and maintained per the manufacturer's recommendations, as verified by the overseeing qualified person, to ensure continued successful operation in hazardous atmospheres.

B-1.2 Scope

This Appendix provides guidance and recommendations for providing mechanical spark resistance for hoists covered under this Standard when hoists are to be used in hazardous (potentially explosive) locations as defined by the NFPA 70 National Electric Code. These recommendations are not intended to be all inclusive, and the features required to render a hoist suitable for use in a specific hazardous location and application must be determined by a qualified person who is familiar with that location and application.

B-1.3 Hazardous Location Classification

The NFPA 70 defines hazardous locations by Class, Division, and Group as follows:

Class I: a location where explosive gases, vapors, or liquids are present.

Class II: a location where explosive or combustible dust is present.

Class III: a location where combustible fibers or flyings are present.