The American Society of Mechanical Engineers

PERFORMANCE STANDARD FOR HAND CHAIN MANUALLY OPERATED CHAIN HOISTS

AN AMERICAN NATIONAL STANDARD

REAFFIRMED 2004

FOR CURRENT COMMITTEE PERSONNEL
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ASME HST-2-1999

[Revision of ASME HST-2M-1989 (R1995)]

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Date of Issuance: November 8, 1999

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FOREWORD

This Standard is one in a series that provide performance requirements for hoists and was originally issued in 1983. It was developed by the ASME Standards Committee HST, 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 Electric Chain Hoists
HST-2 Hand Chain Manually Operated Chain Hoists
HST-3 Manually Lever Operated Chain Hoists
HST-4 Electric Wire Rope Hoists
HST-5 Air Chain Hoists
HST-6 Air Wire Rope Hoists

This revision adds a new appendix that, in conjunction with ASME HST-2-1999, is intended to replace MIL-H-904.

Suggestions for improvement of this Standard are welcome. They should be sent to The American Society of Mechanical Engineers; Attn: Secretary, HST Committee, Three Park Avenue, New York, NY 10016-5990.

This Standard was approved as an American National Standard on July 12, 1999.

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Hoists — Overhead

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PERFORMANCE STANDARD FOR HAND CHAIN MANUALLY OPERATED CHAIN HOISTS

1 GENERAL

1.1 Scope

(a) This Standard establishes performance requirements for hand chain manually operated chain hoists for vertical lifting service involving material handling of freely suspended (unguided) loads, using 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 wire rope; and

(6) hoists used for marine and other applications as required by the Department of Defense (DOD).

1.2 The Appendix

Nonmandatory Appendix A, Performance Requirements for Hand Chain Manualy Operated Chain Hoists Used in Marine and Other Applications as Required by the U.S. Department of Defense (DOD), applies to the performance requirements for hoists used in marine and other applications. The requirements stated in Appendix A are in addition to the requirements of ASME HST-2-1999 and shall be specifically invoked.

1.3 Reference Standards

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

ANSI Z535.4, Product Safety Signs and Labels

Publisher: National Electrical Manufacturers Association (NEMA), 1300 North 17th Street, Rosslyn, VA 22209

ANSI/NFPA 70, National Electrical Code

Publisher: National Fire Protection Association (NFPA), 1 Batterymarch Park, Quincy, MA 02269

ASME B30.9, Slings
ASME B30.10, Hooks
ASME B30.11, Monorails and Underhung Cranes
ASME B30.16, Overhead Hoists (Underhung)
ASME B30.17, Overhead and Gantry Cranes (Top Running Bridge, Single Girder, and Underhung Hoist)

Publisher: The American Society of Mechanical Engineers (ASME International), Three Park Avenue, New York, NY 10016-5990; ASME Order Department: 22 Law Drive, Box 2300, Farifield, NJ 07007-2300

1.4 Definitions

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

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.

clevis suspended hoist: a hoist suspended by means of a clevis or eye at the top of the hoist [see Fig. 1, sketch(a)].

hand chain: an endless loop of chain suspended from the hoist (or trolley) and used to provide motion to the load hook (or trolley) (see Fig. 1).

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 Fig. 1).

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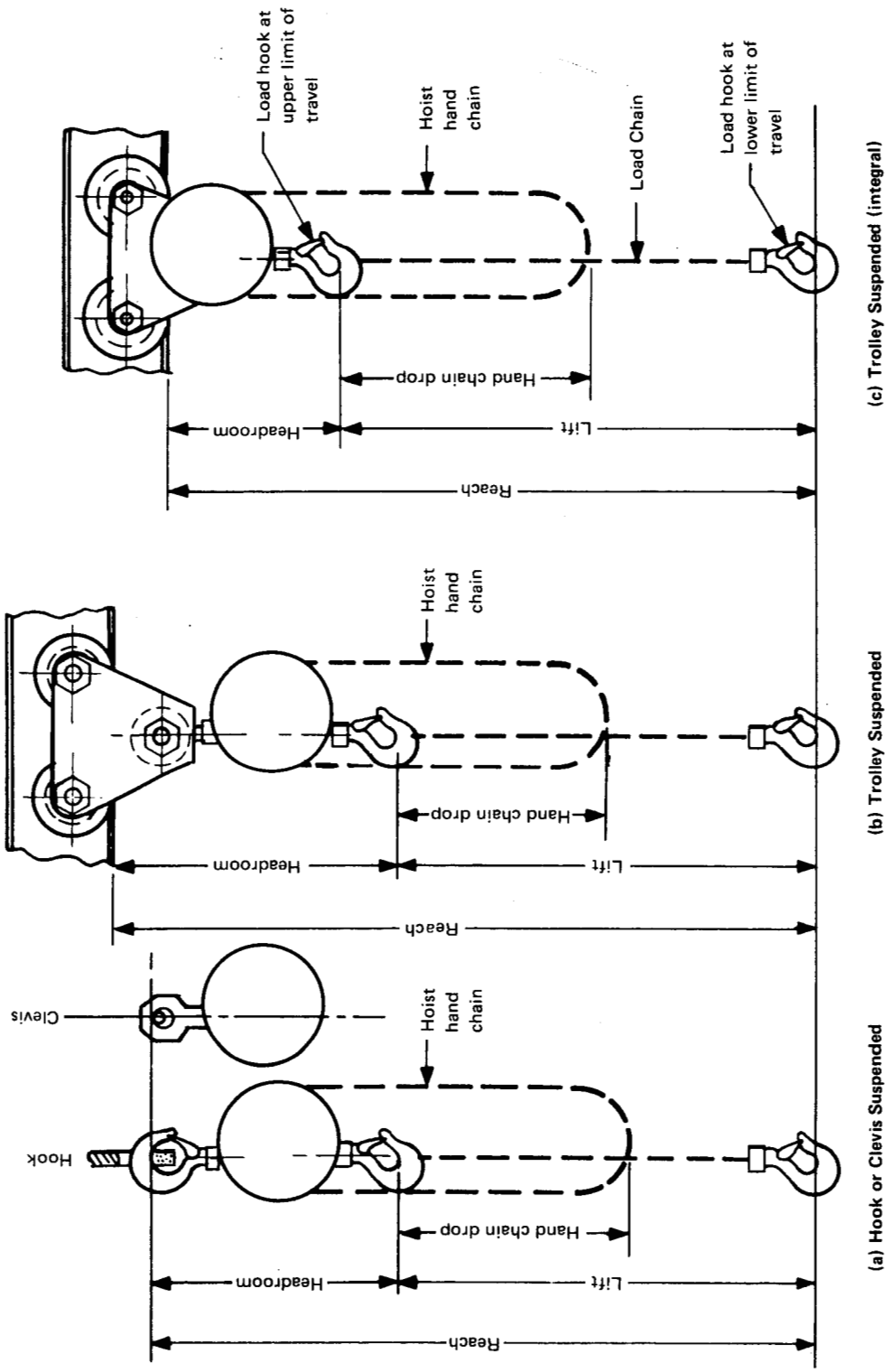

FIG. 1 HEADROOM, LIFT, AND REACH

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

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 (kN) 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 ANSI/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 Fig. 1):

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

(b) saddle of clevis on clevis suspended hoists;

(c) bottom of beam on trolley suspended hoists.

hook latch: a mechanical device to close (bridge) the throat opening of a hook.

hook suspended hoist: suspension of a hoist from a trolley or rigid structure by means of a hook at the top of the hoist (see Fig. 1).

idler sprocket: a device free to rotate, that changes the direction of the load chain. This device is sometimes called idler wheel, idler sheave, pocket wheel, or chain wheel.

lift: the maximum vertical distance through which the load hook can travel, and the total allowable hook movement between its upper limit of travel and its lower limit of travel (see Fig. 1).

lifting devices: devices that are not normally reeved into the hoist chain(s) such as supplemental devices used for hanging or attaching to the load. The weight of these devices is to be considered part of the load to be lifted.

load: the total imposed weight on the load block or load hook including the weight of 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 chain: the load suspension chain in the hoist consisting of a series of interwoven links formed and welded.

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

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 load suspension parts are 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.

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

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

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

overload: any load greater than the rated load.

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

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

rated load: the maximum load for which a hoist or trolley is designated by the manufacturer.

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

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

shall: the word *shall* indicates that adherence to the particular requirement is necessary to conform to the Standard.

should: the word *should* indicates a recommendation, the use of which depends on the facts in each situation.

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

trolley suspended hoist: 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 Fig. 1).

2 PERFORMANCE

2.1 General

All equipment selected in accordance with this Standard is designed to perform satisfactorily when installed in accordance with para. 4.4 and used in accordance with para. 4.5, within the rated load.

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.

2.2 Application

Manually operated hand chain hoists shall be capable of vertical lifting or lowering a freely suspended (unguided) load within their 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.

The hoists and trolleys covered by this Standard are intended for industrial use in ambient temperatures from 0°F (−18°C) to 130°F (54°C) and shall perform satisfactorily when applied and operated in the manner described in the pertinent Sections of this Standard.

Because of the varying environmental conditions, loading, and usage, the hoist and trolley service life is interrelated to the type and frequency of maintenance performed on the units. This equipment should be installed and maintained according to section 4, Installation and Maintenance.

2.3 Characteristics

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

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

Table 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.

Typical trolleys are:

(a) plain type: 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.

(b) hand chain operated type: 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.

2.4 Operation

2.4.1 Hand Chain Pull (Hoist). 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.

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.

2.4.2 Hand Chain Pull (Geared Trolley). 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 operator's position;

(c) accurate load spotting ability.

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TABLE 1 TYPICAL HOIST CHARACTERISTICS — HOOK OR CLEVIS SUSPENDED

Rated Load [Note (1)]		Weight [Note (2)]		Headroom		Hand Chain Pull [Note (3)]		Hand Chain Overhaul to Lift Load [Note (3)] Feet/Foot Meters/Meter
tons	kg	lb	kg	in.	mm	lbf	kN	
1/4	227	15–60	7–27	10–13	255–330	15–50	0.07–0.22	10–50
1/2	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
1 1/2	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 dash (e.g., 11–44) denote typical ranges. Consult manufacturer for specifics.

NOTES:

(1) Tons of 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.

3 MECHANICAL

3.1 Design Stresses

(a) The hoist and the means of suspension supplied with the hoist shall be designed to withstand all stresses imposed under normal operating conditions while handling loads within the rated load.

(b) Load suspension parts shall be designed so that the static stress calculated for the rated load shall not exceed 25% of the average ultimate material strength.

(c) Modifications to upgrade or rerate hoist equipment shall be as authorized only by the original equipment manufacturer or a qualified person. After such modifications are made, the hoist shall be tested in accordance with ASME B30.16.

3.2 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.

3.3 Load 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 one and a half 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.

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TABLE 2 TYPICAL TROLLEY SUSPENDED HOIST CHARACTERISTICS (HOIST SUSPENDED FROM A SEPARATE TROLLEY)

Rated Load [Note (1)]		Weight [Note (2)]		Headroom		Hand Chain Pull [Note (3)]		Hand Chain Overhaul to Lift Load [Note (3)] Feet/Foot Meters/Meter
tons	kg	lb	kg	in.	mm	lbf	kN	
1/4	227	40–260	18–120	10–19	255–485	15–50	0.07–0.22	10–50
1/2	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
1 1/2	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 dash (e.g., 11–44) denote typical ranges. Consult manufacturer for specifics.

NOTES:
(1) Tons of 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.

3.4 Hooks

(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 be equipped with 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.

3.5 Load Blocks

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

3.6 Brakes, Mechanical Load

(a) The hoist shall be equipped with a mechanical load brake, which 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.

(1) Stop and hold the load when hand chain(s) is released.

(2) Permit smooth controlled lowering of a load when manual power is applied to the hand chain(s).

(b) The mechanical load brake shall have provision for adjustment where necessary to compensate for wear.

(c) The mechanical load brake shall have heat dissipation capability for the specified frequency of operation.

3.7 Hand Chain (Hoist) and Hand Chain (Trolley)

(a) The hand chain shall be guided to guard against disengagement from the hand chain wheel.

(b) The hand chain shall withstand, without permanent distortion, a pull of three times the pull required to lift rated load (hoist) or a pull of three times the pull required to traverse the trolley with rated load.

3.8 Overtravel Restraint

Before the load chain can be completely run out of the hoist, it shall be restrained in its fully extended

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TABLE 3 TYPICAL TROLLEY SUSPENDED HOIST CHARACTERISTICS (INTEGRAL)

Rated Load [Note (1)]		Weight [Note (2)]		Headroom		Hand Chain Pull [Note (3)]		Hand Chain Overhaul to Lift Load [Note (3)] Feet/Foot Meters/Meter
tons	kg	lb	kg	in.	mm	lbf	kN	
1/4	227	27–258	12–117	6–13	152–330	17–24	0.08–0.11	25–33
1/2	454	27–258	12–117	6–14	152–356	23–46	0.10–0.20	22 1/2–57
1	908	36–258	16–117	6–14 1/2	152–368	46–70	0.20–0.32	30–57
1 1/2	1,361	55–267	25–121	6–19	152–483	41–80	0.18–0.36	40 1/2–87
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	8–27 1/8	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 dash (e.g., 11–27) denote typical ranges. Consult manufacturer for specifics.

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

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.

3.9 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.

3.10 Trolley

When a trolley hoist is required or a trolley is required for use with a hoist, the type and size of support beam and minimum radius of beam, where applicable, shall be specified by the user to ensure that the trolley is suitable for operation on the beam.

4 LOAD TESTING, MARKING, MANUALS, INSTALLATION, MAINTENANCE, AND OPERATING PROCEDURES

4.1 Load Testing of New Hoists

All hoists shall be tested by the manufacturer in accordance with ASME B30.16.

4.2 Marking

4.2.1 Rated Load. The rated load shall be marked on the hoist or load block.

4.2.2 Identification. The hoist shall be marked with the following information:

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(a) name of the manufacturer;

(b) manufacturer's model or serial number.

4.2.3 Warnings. All hoists shall have affixed to the hoist, hand chain, or load block, in a readable position, labels or embossed areas displaying information concerning operating procedures. The label or labels shall be in compliance with ANSI Z535.4, and shall include cautionary language against:

(a) lifting more than the rated load;

(b) operating a hoist with a twisted, kinked, or damaged chain;

(c) operating a damaged or malfunctioning hoist;

(d) lifting people or loads over people;

(e) operating a hoist with other than manual power; and

(f) removing or obscuring a warning label.

4.3 Manual

The manufacturer shall furnish with each hoist one copy of an instruction manual.

The manual shall include information on the following:

(a) installation;

(b) operation;

(c) inspection and testing; and

(d) lubrication, maintenance, and repair.

4.4 Installation

4.4.1 Procedures. All equipment should be installed according to the manufacturer's recommendations, the applicable Sections of ASME B30.16, B30.11, B30.17, ANSI/NFPA 70, and any other pertinent federal, state, or local regulation.

4.4.2 Support

(a) Supporting structure, including any trolleys, shall be designed to withstand the loads and forces imposed by the hoist.

(b) Trolley stops shall be installed at the limits of trolley travel. Trolley stops should not be used as a continuing means of stopping the trolley.

4.4.3 Location

(a) The hoist shall be installed and operated only in locations that will allow the operator to be clear of the load at all times.

(b) The hoist should be installed in locations where the length of the load chain will allow the load hook to rest on the floor or the lowest level on which the load rests.

4.4.4 Check Points. After installation, the following items should be checked to see that:

(a) the trolley wheels have proper spacing in relation to the beam flange;

(b) the hoist and trolley mechanisms and the load chain are properly lubricated;

(c) the load chain is installed without any twist between the hoist and an anchored end on either the loaded side or slack side;

(d) the load chain is reeved in accordance with hoist manufacturer's recommendation and that multi-reeved chains are not twisted;

(e) the hoist is tested under load in lifting and lowering directions and the operation of the chain and sprocket(s) is observed. The chain(s) should feed smoothly into and away from the sprocket(s).

(f) all functional operating mechanisms, including mechanical load brake, are operating properly;

(g) the hook latch, if used, is operating properly; and

(h) all installation and operating instructions in the manufacturer's manual have been read and understood.

4.5 Maintenance and Operating Procedures

All equipment should be inspected, tested, operated, and maintained according to the manufacturer's recommendations, the applicable Sections of ASME B30.16, B30.11, and B30.17. Consideration shall also be given to pertinent federal, state, and local regulations.

5 TYPICAL HOIST INQUIRY DATA

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TYPICAL HOIST INQUIRY DATA FORM

HOIST

Quantity of hoists required _____
Rated capacity _____tons (_____kg)
Lift[1] _____ft (_____m)
Reach _____ft (_____m)
Hand chain drop _____ft (_____m)
Headroom _____in. (_____mm)

Type of Suspension:
☐ Hook ☐ Clevis ☐ Trolley (See Below)

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 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

[1] Refer to manufacturer's catalog for standard lift that will meet the application requirement.

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

A1 GENERAL

A1.1 Scope

This Appendix provides performance requirements beyond those cited in ASME HST-2-1999 for hand 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-2-1999, is replacing the requirements of MIL-H-904 for Hand Operated Chain Hoists.

A1.2 Classification

Hand chain manually operated chain hoists shall be of the following classes and types [see A5.1(b)].

A1.2.1 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).

A1.2.2 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

A1.3 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.

A1.4 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 issue shall be used.

ASTM A 48, Standard Specification for Gray Iron Castings (DOD adopted)

ASTM A 143, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement (DOD adopted)

ASTM B 26, Standard Specification for Aluminum-Alloy Sand Castings (DOD adopted)

ASTM B 108, Standard Specification for Aluminum-Alloy Permanent Mold Castings (DOD adopted)

ASTM B 633, Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel (DOD adopted)

Publisher: American Society for Testing and Materials (ASTM), 100 Barr Harbor, West Conshohocken, PA 19428

MIL-E-917, Electric Power Equipment, Basic Requirements

MIL-S-901, Shock Tests, H.I. (High Impact) Shipboard Machinery, Equipment, and Systems, Requirements for

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Publisher: Department of Defense (DOD), Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094

A2 PERFORMANCE REQUIREMENTS

A2.1 General

Performance requirements shall be in accordance with ASME HST-2-1999, and as specified in this Appendix.

A2.2 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 contacts shall be limited to those metals, which when coupled, are in accordance with sea water corrosion of galvanic couples requirements of MIL-E-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 para. A5.1(c)], hooks shall be zinc plated in accordance with ASTM B 633, 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 para. A5.1(d)], the link load chain and link hand chain shall be zinc plated in accordance with ASTM B 633, Type II, Class Fe/Zn 12.

The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A 143.

A2.3 Characteristics

A2.3.1 Type A, Hand Chain Operated Hoist, Link Chain, Hook Suspension. Type A hook suspension shall be in accordance with Table 1 of ASME HST-2-1999 and as specified herein.

A2.3.2 Types B and C, Hand Chain Operated Hoist, Link Chain, Plain and Geared Trolley Suspension. Types B and C plain and geared trolley suspension shall be in accordance with Tables 2 and 3 of ASME HST-2-1999 and as specified herein.

A2.3.3 Type D, Hand Chain Operated Hoist, Link Chain, Low Head Room, Plain Trolley Suspension. Type D, low head room, plain trolley suspension shall be in accordance with the requirements of Table A1 and as specified herein.

A2.3.4 Type E, Hand Chain Operated Hoist, Link Chain, Low Headroom, Geared Trolley Suspension. Type E shall be in accordance with the requirements of Table A2 and as specified herein.

A2.4 Lubrication

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

A2.5 Painting

Paints and coatings shall be lead and chromate free.

A2.6 Workmanship

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.

A2.7 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.

A3 MECHANICAL REQUIREMENTS

A3.1 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 be not 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 para. A5.1(e)], the hoist shall withstand the grade A or B high-impact shock. When

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TABLE A1 TYPE D, HAND CHAIN OPERATED HOIST, LINK CHAIN, LOW HEADROOM, PLAIN TROLLEY SUSPENSION

Rated Load [Note (1)], ton	Standard Lift, Min. [Note (2)], ft	Standard Size of "I" Beam, in.	Headroom, Max., in.	Pull to Traverse Hoist, Max. [Note (3)], lbf	Weight Less Track Clamp (Class 1), Max., lb
½	8	5	6	20	189
1	8	6	6	40	210
1½	8	7	6¾	45	294
2	8	8	7	60	341
3	8	9	8	65	473

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Consult manufacturer for specifics.
NOTES:
(1) 2,000 lb per ton.
(2) Standard lifts are 8 ft-0 in. Weights are predicted 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.

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

A3.2 Load Chain

As specified [see para. A5.1(f)], load chain shall be link 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 5 for the rated load of the hoist, based on the ultimate strength of the material.

A3.2.1 Load Chain Container. When specified [see para. A5.1(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.

A3.2.2 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.

A3.2.3 Link Chain. Link chain shall provide a safety factor not less than 5 for the hoist rated load based on the ultimate strength of the material.

A3.2.4 Roller Chain. Roller chain shall be manufactured from an 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 5 for the rated load based on the ultimate strength of the material. The chain shall be securely attached to the hoist and easily removed.

A3.3 Hand Chain

The hand chain shall be 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 3 times the maximum chain pull required to lift the rated load.

A3.3.1 Hand Chain Wheels. 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.

A3.4 Load Hooks

Hook throat openings shall be in accordance with the dimensions shown in Table A3. 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.

A3.5 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

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TABLE A2 TYPE E, HAND CHAIN OPERATED HOIST, LINK CHAIN, LOW HEADROOM, GEARED TROLLEY SUSPENSION

Rated Load [Note (1)], ton	Standard Lift [Note (2)], ft	Standard Size of "I" Beam, in.	Headroom, Max., in.	Pull to Traverse Hoist, Max. [Note (3)], lbf	Weight Less Track Clamp (Class 1), Max., lb
1½	8	7	6¾	13	326
2	8	8	7	15	373
3	8	9	8	21	499
4	8	10	9½	30	735
5	8	12	10½	38	1,008
6	8	12	10½	45	1,019

GENERAL NOTE: This table indicates the characteristics of hoists generally available. Consult manufacturer for specifics.
NOTES:
(1) 2,000 lb per ton.
(2) Standard lifts are 8 ft-0 in. Weights are predicted 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.

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.

A3.5.1 Hoist Brake. Hoist construction shall provide for automatic brake operation to secure a suspended load if the hand chain is released or 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.

A3.5.2 Trolleys (Plain and Geared)

A3.5.2.1 Trolley Wheels. Unless otherwise specified [see para. A5.1(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.

A3.5.2.2 Trolley Equalizers. Means shall be provided for distributing the hoist load equally into the trolley side frames (side plates).

A3.5.2.3 Hoist Track Clamps. When specified [see para. A5.1(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.

A3.6 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.

A3.7 Overload Protection

Overload limiting devices shall not be used in Naval applications.

A3.8 Materials

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

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TABLE A3 HOOK THROAT OPENINGS

Hoist Rated Load, lb	Hook Throat Opening, Min., in.
1,000	0.75
2,000	0.906
3,000	1.0
4,000	1.125
5,000	1.125
6,000	1.5
7,500	1.375
10,000	1.625
11,000	2.0
13,000	2.063
15,000	2.063
17,000	2.063
20,000	2.25
25,000	2.25
30,000	2.75
40,000	3.0

A3.8.1 Recycled, Recovered, or Environmentally Preferable Materials. Recycled, recovered (see para. A1.3), 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.

A3.8.2 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.

A3.8.3 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 A 48, Class 35 or better.

A3.8.4 Aluminum. Aluminum castings shall be in accordance with ASTM B 26 or ASTM B 108, Type UNS A03560, temper T6.

A4 TESTING, MARKING, AND DATA

A4.1 Testing

A4.1.1 High-Impact Shock. Hoists when specified [see para. A5.1(e)] shall undergo the high-impact shock test in accordance with MIL-S-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 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-S-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. Following successful completion of high-impact shock test, the hoist shall be subjected to the following tests:

A4.1.2 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.

A4.1.2.1 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.

A4.1.3 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. The mechanical efficiency of the hoist shall be determined from the following formula:

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

where:

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

A4.1.4 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.

A4.1.5 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.

A4.1.6 Track Clamp. The track clamp shall be tested with 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.

A4.1.7 Endurance. Hoists of all classes and types, shall be tested to 5,000 continuous operating cycles (see para. A1.3) 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 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.

A4.2 Marking

A4.2.1 Identification. In addition to the requirements of para. 4.2.2 of ASME HST-2-1999, 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) Appendix A, ASME HST-2-1999;
(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; and
(i) date of manufacture.

A4.2.2 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.

A4.3 Data

A4.3.1 Technical Manuals. When specified [see para. A5.1(j)] 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; and
(c) final drawings.

A5 TYPICAL HOIST INQUIRY DATA

A5.1 Acquisition

In addition to the typical hoist inquiry data of ASME HST-2-1999, acquisition documents must specify the following:

(a) Appendix A, ASME HST-2-1999;
(b) Class, Type, and rated load of hoist required (see para. A1.2). When Class 3 is specified, special service should be defined.
(c) if zinc coating of hooks is required (see para. A2.2);
(d) if zinc plating is required for load chain (see para. A2.2);
(e) hoist shock resistance grade A or B (see para. A3.1);
(f) if chain container is required (see para. A3.2.1);
(g) trolley wheel spacing, if other than specified (see para. A3.5.2.1);
(h) specify track clamps, if required (see para. A3.5.2.3); and
(i) if technical manual is required (see para. A4.3.1).

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AMERICAN NATIONAL STANDARDS FOR HOISTS, PALLETS, AND TRANSMISSION CHAINS

Performance Standard for Electric Chain Hoists HST-1-1999
Performance Standard for Hand Chain Manually Operated Chain Hoists HST-2-1999
Performance Standard for Manually Lever Operated Chain Hoists HST-3-1999
Performance Standard for Overhead Electirc Wire Rope Hoists HST-4-1999
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