

INCH-POUND

MIL-H-2813B

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SUPERSEDING

MIL-H-2813A

28 March 1956

(See 6.11)

MILITARY SPECIFICATION

HOISTS, CHAIN AND WIRE ROPE, PNEUMATIC

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification covers pneumatic powered chain and wire rope hoists.

1.2 Classification. Hoists are of the following classes and types as specified (see 6.2):

Class 1 - Steel, conventional weight.

Class 2 - Steel or aluminum alloy, light weight.

Type A - Hook suspension.

Type B - Plain trolley suspension.

Type C - Geared trolley suspension, hand operated.

Type D - Geared trolley suspension, pneumatic-motor operated.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03R42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 3950

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- NN-B-621 - Boxes, Wood, Nailed and Lock Corner.
- RR-W-410 - Wire Rope and Strand.
- PPP-B-601 - Boxes, Wood, Cleated-Plywood.
- PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner.
- PPP-B-1055 - Barrier Material, Waterproofed, Flexible.

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- MIL-C-104 - Crates, Wood: Lumber and Plywood Sheathed, Nailed, and Bolted.
- MIL-P-116 - Preservation, Methods of.
- MIL-S-901 - Shock Tests, H.I. (High-Impact) Shipboard Machinery, Equipment, and Systems, Requirements for.
- MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-L-10547 - Liners, Case, and Sheet, Overwrap; Water-Vaporproof or Waterproof, Flexible.
- MIL-P-15024 - Plates, Tags, and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-L-17331 - Lubricating Oil, Steam Turbine and Gear, Moderate Service.
- MIL-A-21180 - Aluminum-Alloy Castings, High Strength.
- MIL-S-24093 - Steel Forgings, Carbon and Alloy Heat Treated.
- MIL-P-24441 - Paint, Epoxy-Polyamide General Specification for.
- MIL-P-24441/1 - Paint, Epoxy-Polyamide, Green Primer, Formula 150, Type I.
- MIL-P-24441/2 - Paint, Epoxy-Polyamide, Exterior Topcoat, Haze Gray, Formula 151, Type I.
- MIL-G-24508 - Grease, High Performance, Multipurpose. (Metric)
- MIL-E-24635 - Enamel, Silicone Alkyd Copolymer (Metric)
- DOD-P-24648 - Primer Coating, Zinc Dust Pigmented For Exterior Steel Surfaces. (Metric)
- MIL-C-24707 - Castings, Ferrous, General Specification for.
- MIL-C-24707/1 - Castings, Ferrous, for Machinery and Structural Applications.
- MIL-C-24707/5 - Castings, Ductile Iron and Austenitic Ductile Iron.

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STANDARDS

MILITARY

- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment
(Type I - Environmental and Type II - Internally
Excited).
- MIL-STD-278 - Welding and Casting Standard.
- MIL-STD-721 - Definitions of Terms for Reliability and Maintain-
ability.
- MIL-STD-740-1 - Airborne Sound Measurements and Acceptance Criteria
of Shipboard Equipment.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking and Water-
proofing; With Appropriate Test Methods.
- MIL-STD-2035 - Nondestructive Testing Acceptance Criteria.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of documents cited in the solicitation (see 6.2).

AMERICAN GEAR MANUFACTURERS ASSOCIATION (AGMA)

- 6010 - Standard for Spur, Helical, Herringbone, and Bevel Enclosed Drives.
- 6034 - Practice for Enclosed Cylindrical Wormgear Speed Reducers and Gearmotors.

(Application for copies should be addressed to the American Gear Manufacturers Association, 1500 King St., Suite 201, Alexandria, VA 22314.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 48 - Standard Specification for Gray Iron Castings.
(DoD adopted)
- A 143 - Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
- A 304 - Standard Specification for Steel Bars, Alloy, Subject to End-Quench Hardenability Requirements. (DoD adopted)
- A 322 - Standard Specification for Steel Bars, Alloy, Standard Grades. (DoD adopted)
- A 576 - Standard Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality. (DoD adopted)
- B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
- D 3951 - Standard Practice for Commercial Packaging.

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(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

STEEL STRUCTURES PAINTING COUNCIL (SSPC)
SP 10 - Near-White Blast Cleaning. (DoD adopted)

(Application for copies should be addressed to the Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.6) in accordance with 4.3.

3.2 Materials. Materials shall possess the properties necessary to withstand vibration, shock, and other conditions specified herein. Materials for use in exposed locations subject to salt water spray shall be free from all defects and imperfections that may affect serviceability or appearance of the hoist.

3.2.1 Metals. Metals used in the construction of the hoists shall be, to the greatest extent possible, selected from the following:

- (a) Steel alloys up to yield strength levels of 130,000 pounds per square inch (lb/in²).
- (b) Aluminum alloys 5456 and 5086, strain hardened to H-116.
- (c) Aluminum alloy castings in accordance with MIL-A-21180.
- (d) Corrosion resisting steel alloys 316 and 316L.
- (e) Stainless steel alloy 17-4PH, heat treated to yield strength of not greater than 130,000 lb/in².
- (f) Nickel-copper alloys.
- (g) Nickel-iron alloys.
- (h) Steel castings in accordance with MIL-C-24707 and MIL-C-24707/1.
- (i) Steel forgings in accordance with MIL-S-24093.

When specified (see 6.2), permission for the use of metals or structural materials other than those listed may be granted.

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3.2.2 Recovered materials. Unless otherwise specified herein, all equipment, material, and articles incorporated in the products covered by this specification shall be new and may be fabricated using materials produced from recovered materials to the maximum extent practicable without jeopardizing the intended use. The term "recovered materials" means materials which have been collected or recovered from solid waste and reprocessed to become a source of raw materials, as opposed to virgin raw materials. None of the above shall be interpreted to mean that the use of used or rebuilt products is allowed under this specification unless otherwise specifically specified.

3.2.3 Prohibited materials.

3.2.3.1 Asbestos. Asbestos in any form shall not be used.

3.2.3.2 Cadmium. Cadmium in any form shall not be used.

3.2.3.3 Beryllium. Beryllium in any form shall not be used.

3.2.3.4 Pressed steel. Pressed steel shall not be used except as specified for a particular application.

3.2.3.5 Magnesium. Magnesium or magnesium based alloys shall not be used. (Does not include steel or aluminum alloys which contain less than 0.5 percent magnesium).

3.2.3.6 Brittle material. Brittle materials shall not be used except as specified for a particular application (see 6.2). Brittle material is defined as material showing less than 10 percent elongation in gauge length for the tensile test specimen.

3.2.3.7 Cast iron. Cast iron in any form shall not be used except where permitted by referenced specifications. The use of cast iron is limited to those alloys conforming to ASTM A 48, class 35 or better. Cast nodular graphitic iron or malleable iron conforming to MIL-C-24707/5 is acceptable for machinery equipment components.

3.2.4 Corrosion protection of metals. Metals susceptible to corrosion attack in a seawater 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.

3.3 Safety.

3.3.1 Safety criteria and consideration. Equipment construction and operational safety shall consider, but not be limited to, the following (see 6.3 and 6.7):

- (a) Avoiding or eliminating identified hazards by design selection or material selection.
- (b) Controlling and minimizing hazards to personnel, equipment and material which cannot be avoided or eliminated.
- (c) Isolating hazardous substances, parts and operations from other activities, areas, personnel and incompatible materials.
- (d) Incorporating fail-safe features so that failures will not cause injury to personnel or damage to equipment.
- (e) Locating equipment parts so that access to them by personnel during operation, maintenance, repair or adjustment shall not require exposure to hazards such as electrical shock, sharp edges, or points.
- (f) Providing warning and caution notes in operations, assembly, maintenance, and repair instructions; and distinctive warnings of hazards on the equipment.

3.4 Construction.

3.4.1 General. Hoist construction shall be in accordance with the requirements specified herein (see 6.3). Components shall have adequate strength to operate satisfactorily in accordance with the requirements specified herein. Parts shall be as light and compact as practicable consistent with the required strength (see tables I, II, and III). Where practicable, rotating shafts shall be supported in anti-friction bearings or bushings or both and shall be enclosed against entry of foreign matter (see 3.4.16). Provisions shall be made for lubricating all rotating and sliding surfaces or they shall be provided with permanent lubrication. Hoists shall operate through a temperature range of minus 40 through 140 degrees Fahrenheit (°F) for not less than 3,000 cycles without a failure. Gears shall be totally enclosed in a readily accessible casing that will permit examination, servicing and cleaning. Nuts, bolts, collars, and lock rings shall be provided to prevent any component working loose. Hoists shall be complete in all respects including operating controls and other equipment necessary for operation. Hoist parts shall be readily accessible for servicing and replacement as required. The hoists shall lift and lower a load within their rated load capacity without jerks, jars, or vibration. Each hoist shall be properly adjusted, balanced, and free from excessive noise during operation. Airborne noise level shall be kept to a minimum (maximum MIL-STD-740-1, grade D). Hoists shall be composed primarily of a frame or housing, a pneumatic motor, if not manually operated, a gear train to the wire rope drum or chain sprocket, a brake, an air valve control, a wire rope drum or a chain sprocket, a load block, a wire rope or chain, a bottom hook, and a top hook or trolley.

3.4.1.1 Hoist characteristics. For a specified rated load (see 6.2), lift, weight, headroom, and lifting speed shall be in accordance with tables I, II, and III unless otherwise specified (see 6.2). Envelope dimensions shall be as specified (see 6.2). Headroom is defined as follows: With the wire rope or chain in the fully retracted position and the load hook carrying full load, headroom is the distance between the saddle of the load hook and the following points:

- (a) The bottom of the lug hole on lug suspended hoists.
- (b) The bottom of the beam rail on trolley suspended hoists.
- (c) The saddle of the top hook on hook suspended hoists.

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3.4.1.1.1 Type A hoist, hook-suspension. Unless otherwise specified (see 6.2), type A wire rope and chain hoists shall be in accordance with table I and the requirements specified herein.

TABLE I. Hoist type A, hook suspension.

Rated load (tons) <u>1/</u>	Standard lift <u>2/</u> (feet) (minimum)	Headroom (distance between hooks) <u>3/</u> (inches) (maximum)	Weight of hoist <u>2/</u> (pounds) (maximum)			Lifting speed <u>2/</u> (feet per minute) (minimum)
			Chain hoists		Wire rope hoists	
			Class 1	Class 2	Class 1	
1/4	8	14.5	68	48	275	40
1/2	8	15	68	48	285	30
1	8	18	100	61	375	19
1.5	8	23.5	155	107	435	15
2	8	23.5	233	107	510	10
3	8	32	270	130	550	10
4	8	37	320	138	720	8
5	8	45	413	172	890	8
6	8	45	420	195	1000	8
8	8	49	500	305	1230	6
10	8	54	620	322	1400	4
12	8	54	875	350	--	4
16	8	60	1120	600	--	4
20	8	71	1300	1100	--	4

1/ 2000 pounds per ton.

2/ See 6.2.

3/ Measured from inside the hooks when the load chain is retracted to its shortest length.

3.4.1.1.2 Type B and type C hoists, plain and geared trolley suspension. Unless otherwise specified (see 6.2), type B and type C chain hoists shall be in accordance with the requirements of table II and the requirements specified herein.

TABLE II. Types B and C chain hoists, plain and geared trolley suspensions.

Rated load (tons) 1/	Standard lift 2/ (feet) (minimum)	Lifting speed 2/ (feet per minute) (minimum)	Standard size of I-beam (inches)	Headroom (distance between load hook and underside of I-beam) 3/ (inches) (maximum)	Pull to transverse hoist (pounds) (maximum)		Radius of track curve (inches) (minimum)	Chain hoist weight less track clamp (pounds) 2/ (maximum)			
					Plain trolley type B 4/	Geared trolley type C 5/		Type B		Type C	
								Class 1	Class 2		Class 1
1/4	8	40	5	14.5	15	--	21	137	118	275	--
1/2	8	30	5	15	20	5	21	137	118	275	--
1	8	19	6	18	40	10	21	240	170	284	205
1-1/2	8	15	7	19.5	45	13	36	322	270	335	270
2	8	10	8	19.5	60	15	36	456	328	500	360
3	8	10	10	26.5	65	21	48	560	430	525	480
4	8	8	10	26.5	70	23	66	765	534	900	630
5	8	8	12	32	75	28	66	1080	730	1100	800
6	8	8	12	32	100	35	66	1090	750	1120	800

1/ 2000 pounds per ton.

2/ See 6.2.

3/ Measured from inside of load hook when load chain is retracted to its shortest length.

4/ Direct pull on trolley (along direction of track when moving on straight level track).

5/ Pull on gear trolley hand chain (when moving on straight level track).

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3.4.1.1.3 Type D pneumatic power operated geared trolley hoists. Unless otherwise specified (see 6.2), type D hoists shall be in accordance with table III and the requirements specified herein. Type D hoists shall be equipped with a traversing pneumatic motor and controls for traversing the trolley. The pneumatic motor shall be capable of traversing the loaded hoist along a trolley track configured as specified in 4.6.12.

TABLE III. Type D chain hoist, geared trolley suspension pneumatic powered.

Rated load ^{1/} (tons)	Weight (pounds)(maximum)		Standard lift ^{2/} (feet)		Lifting speed ^{2/} (feet per min) (minimum) ^{3/}		Headroom (distance between load hook and underside of I-beam) (maximum) ^{4/}	
	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2	Class 1	Class 2
1	280	225	12	8	40	30	35	20
2	475	225	12	8	20	15	40	20
3	660	300	12	8	14	10	43	27.5
4	860	365	12	8	12	8	46	30
5	1050	550	12	8	10	8	49	32
10	2000	750	12	8	4	4	66	48

^{1/} 2000 pounds per ton.

^{2/} See 6.2.

^{3/} Minimum lift speed for fully opened control valve.

^{4/} Maximum distance between load hook and underside of I-beam measured from inside of load hook when load chain is retracted to its shortest length.

3.4.1.2 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.

3.4.2 Design load. Design load shall be 200 percent of the hoist rated load for static tests and 150 percent of the hoist rated load for dynamic tests (see 4.6).

3.4.3 Stress. Maximum combined stress in component parts shall be not greater than 35 percent of the tensile yield strength of the material for hoist operation at rated load under 15-degree incline and tilt condition. Combined stresses in component parts shall be not greater than 70 percent of the tensile yield strength of materials when the hoist is subjected to static or dynamic load tests (see 4.6.2).

3.4.4 High-impact shock. When specified (see 6.2), the hoist in the unloaded, not operating condition shall withstand the high-impact shock test for grade A or grade B equipment in accordance with MIL-S-901 (see 4.6.1). Following successful completion of high-impact shock test, the hoist shall be subjected to the following tests (see 4.6):

- Grade A - Static-dynamic overload test.
- Grade A - Plain and geared trolley test.
- Grade A and B - Track clamp test.

3.4.5 Mechanical vibration. An unloaded hoist shall conform to the vibration test requirements of MIL-STD-167-1, type I (see 4.6.14).

3.4.6 Housing. The housing shall be constructed of steel or aluminum alloy for maximum strength and minimum deflection. The housing shall contain the hoist mechanism, including gears, pneumatic motor, wire rope drum or chain sprocket, brake, and pneumatic controls (except when pendant control is specified (see 3.4.12.1)). These components shall be compactly and securely mounted.

3.4.7 Hoist drives. Hoist lift and type D (see 3.4.1.1.3) powered trolley drives shall be powered by a reversible pneumatic motor of enclosed construction that shall operate with air gauge pressures between 80 and 100 lb/in². The pneumatic motor shall have adequate power and starting torque and shall operate without perceptible vibration at any of the hoist loads or speeds within the rated load and speed capacity.

3.4.7.1 Hoist lift. The hoist lift pneumatic drive motor shall be coupled through a gear reducer or drive gear to the load chain sprocket or wire rope drum.

3.4.7.2 Hoist trolley. The hoist trolley pneumatic drive motor shall be coupled through drive gears to the trolley drive wheels, friction wheel, or positive drive sprocket wheel. For positive drive unit, the motor shall be coupled through speed reducer to a chain sprocket used with a 1-inch pitch, single strand, No. 80-1 RC-A standard coller chain welded to the bottom of trolley track.

3.4.8 Hoist load lifting medium. As specified (see 6.2), link chain, roller chain, or wire rope shall be provided as the hoist load lifting medium. The chain or wire rope shall be of sufficient strength to withstand the tests specified (see 4.6) and shall meet the safety factor specified in 3.4.8.1, 3.4.8.2, or 3.4.8.3.

3.4.8.1 Link chain. When specified (see 6.2), hoist load lifting medium shall be link chain. The link chain shall be manufactured from an alloy steel in accordance with any of the AISI grade designations of ASTM A 304 or A 322, electric or forge welded. Each chain link shall be of uniform size and shape to prevent twisting and shall seat properly in the hoist chain sprocket pockets. The chain shall provide a safety factor of not less than 5 for the hoist rated load based on the ultimate strength of the material. When specified (see 6.2), the chain shall be protected by a zinc coating in accordance with ASTM B 633, type II, class Fe/Zn 13. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A 143. The chain shall be securely attached to the hoist and easily removed.

3.4.8.1.1 Hoist load link chain sprocket. Hoist load chain sprockets shall be provided with chain link pockets accurately shaped to fit the links of the chain, which shall operate freely and smoothly over the hoist load chain sprocket. The hoist load link chain sprocket shaft shall be either integral with or rigidly connected to the load link chain sprocket. Welding of the hoist load link chain sprocket to the shaft is not acceptable.

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3.4.8.2 Roller chain. When specified (see 6.2), hoist load lifting medium shall be roller chain. The 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 not less than 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.

3.4.8.2.1 Hoist load roller chain sprockets. Hoist load roller chain sprocket teeth shall mate with the spacing of the roller chain rollers, which shall operate freely and smoothly over the sprocket. The hoist load roller chain sprocket shall be rigidly connected to the hoist load roller chain shaft. Welding of the hoist load roller chain sprocket to the shaft is not acceptable.

3.4.8.3 Wire rope. When specified (see 6.2), hoist load lifting medium shall be wire rope. Wire rope shall be in accordance with RR-W-410. The wire rope shall provide a safety factor of not less than 5 for the rated load based on the minimum breaking strength of the wire rope.

3.4.8.3.1 Hoist load wire rope drums. Hoist load wire rope drums shall have machined radiused grooves. Wire rope drum grooves shall have a minimum depth equal to 40 percent of the wire rope diameter. Wire rope drums shall be fitted on each end with recessed flanges to prevent wire rope jamming. The wire rope drum diameter shall be not less than 20 times the diameter of the wire rope except that, when extra flexible wire rope is used, the diameter of the drum may be 15 times the diameter of the wire rope. There shall be not less than 1-1/2 full turns of wire rope remaining on the drum with the hook in the lowest elevation of the rated lift. Wire rope drums shall have a rope winding guide and shall be protected on both top and sides. The wire rope shall be securely attached to the wire rope drums.

3.4.8.4 Hoist load chain stowage. Hoist construction shall include means for stowing the full length of load chain in chain reels, bags, or baskets as specified (see 6.2), when the hook is in the up position. The chain reels shall provide for stowage of chain for 8 feet of lift. The bags or baskets shall be used for stowage of chain for lifts greater than 8 feet and shall be located to prevent interference with the low headroom features of the hoist (see 3.4.1.1). The chain reels shall maintain a constant tension force to prevent chain slack between the load sprocket and the chain stowage. Load sprocket and load chain stowage shall provide a constant chain feed without binding or jamming in the chain guide, stowage, or hoist frame.

3.4.8.5 Chain guides. Enclosed chain guides shall ensure the hoist load roller or link chain enters the sprocket in the proper position to prevent misalignment of the hoist load chain and sprocket. The guides, if bolted on, shall not loosen under vibration.

3.4.9 Hooks. The hoist load and hoist suspension hooks shall be of drop forged heat-treated steel that shall withstand the test loads specified in 4.6.2. Hoist load and hoist suspension hooks shall be as shown on figure 1, as specified (see 6.2), and shall be fitted with a swivel and a safety device except type I, fixed eye, regular hook. The safety device shall consist of a spring latch or

swivel type closure to bridge the hook throat opening and shall be an integral part of the hoist hook. Spring latch type closures shall be hinged at the neck of the hook with the other end resting inside the tip of the hook. The swivel shall permit 360-degree rotation of the hoist load hook with full load without twisting the attached wire rope, link or roller chain. Hoist load and suspension hook throat openings shall be in accordance with the dimensions shown in table IV. The hook throat safety device of the suspension or upper hook shall withstand a pull against the hook throat safety device as specified (see 4.6.11). Hooks shall be clearly marked with manufacturer identification and allowable hook load or allowable hook load designator.

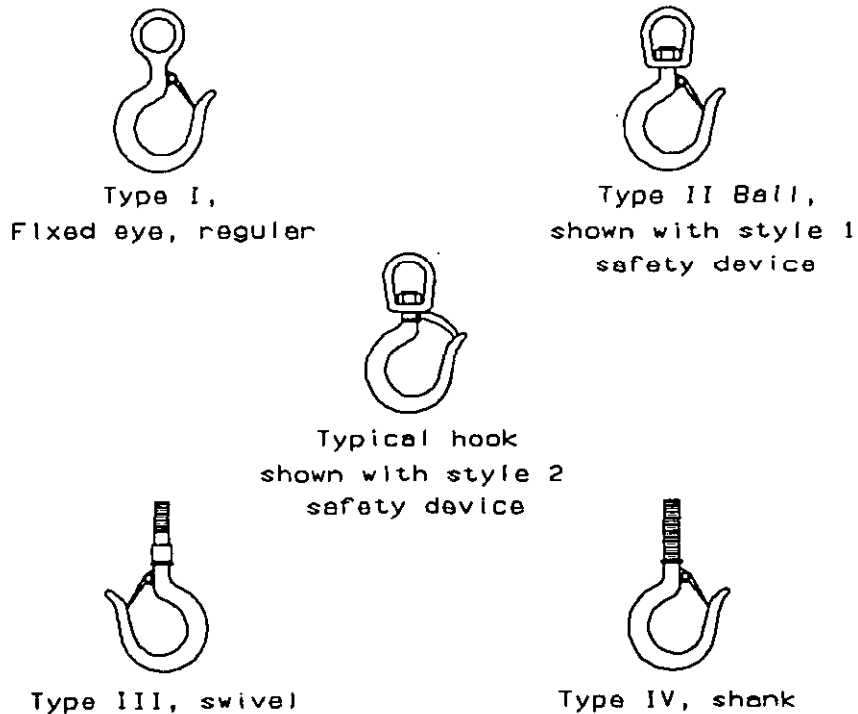


FIGURE 1. Illustrating types of hoist hooks (shown with safety devices, style 1 and style 2).

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TABLE IV. Hook throat openings.

<u>Hoist rated load</u> (pounds)	<u>Hook throat opening</u> (inches) (minimum)
1,000	0.750
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

3.4.9.1 Hook finish. When specified (see 6.2), hooks shall be zinc plated. Zinc plating shall be in accordance with ASTM B 633, type II, class Fe/Zn 13. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A 143. The hook throat safety device shall be constructed of non-corrosive material or treated for corrosion resistance.

3.4.10 Range of load hook.

3.4.10.1 Chain hoists. Link and roller chain hoists shall pick up a load with the load hook anywhere within a radius of 2 feet perpendicular to the load chain sprocket centerline and 7 feet below the load sprocket without jamming or jumping the pockets or teeth of the load sprocket.

3.4.10.2 Wire rope hoists. Wire rope hoists shall pick up a load with the load hook anywhere within a radius of 2 feet perpendicular to the wire rope drum centerline at the point the wire rope reeves on the wire rope drum, and 7 feet below the load wire rope drum without jamming or jumping the wire rope drum.

3.4.11 Load blocks.

3.4.11.1 Wire rope load block. The wire rope load block shall have a housing and a load sheave with rounded corners and a hook as specified in 3.4.9. The wire rope load block housing shall enclose the load sheave as a protection to the operator. The wire rope load sheave shall be mounted on a steel axle and means shall be provided for ample lubrication of the wire rope load sheave and axle at all times. The wire rope load block shall prevent the wire rope from jamming during normal operations.

3.4.11.2 Chain load block. The chain load block shall be as specified in 3.4.11.1, except constructed for use with link or roller chain instead of wire rope. The chain load block shall prevent the load chain from jamming during normal operation.

3.4.12 Controls. The hoist pneumatic motor shall be valve-controlled either by an operating lever actuated by hand ropes or chains of suitable length properly attached to the hoist or controlled by a pendant control unit. The speed of the motor shall be regulated by the valve opening. The valve shall be fitted with a self-centering device which automatically restores the valve to the closed position when the hand rope or chain is released. The controls shall vertically position a load within plus or minus 0.250 inch.

3.4.12.1 Pendant control. When specified (see 6.2), a pendant control unit shall be provided in lieu of a hand rope or chain control. Thumb operated controls shall be on a hand-held control unit suspended on a pendant of specified length (see 6.2) to allow easy operation of the hoist for the required lift range, and shall support a 200-pound load. Controls shall permit easy selection of speeds from minimum to maximum speeds when handling rated load and also to meter air supply to the motors, for vernier positioning of the load in very limited space. "UP" and "DOWN" controls shall be labeled as such. Traversing controls shall be color coded and indicate with an arrow the direction of travel and be affixed to the hoist so as to be visible from operating positions on either side of the hoist.

3.4.13 Air supply requirements. The air supply line shall connect to the hoist and not to the pendant control.

3.4.13.1 Air supply characteristics. The hoist must be capable of operating with an air supply having the following characteristics:

- (a) A moisture content of not greater than 0.002 lbs of water per pound of dry air at 60 degrees fahrenheit and 90 lbs/in² absolute.
- (b) Solid particle contamination limited to 25 micrometers.
- (c) Not less than one drop of atomized lubrication for every 10 cubic feet per minute (cfm) of air.

3.4.14 Hoist brake. The hoist brake shall be spring loaded, of the automatic operating type which shall stop hoist motion when the pneumatic pressure is reduced below the safe motor operating pressure. The hoist brake shall be self-adjusting or readily accessible for easy adjustment to compensate for wear of the brake lining. The hoist brake shall hold the test loads required from a stopped position and shall stop and hold rated loads without slipping (see 4.6.2). The brake shall be equipped with a manual release for use in the event of a loss of air pressure. Manual release mechanisms shall be arranged so that they can be operated without endangering the operator.

3.4.15 Gears. Gears shall be spur, helical, or worm and wheel type manufactured in accordance with AGMA 6010 and 6034.

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3.4.16 Bearings. Bearings shall be sealed or shielded anti-friction bearings which have a service life of not less than 10,000 hours. Bearings shall have load ratings greater than the maximum bearing loads required for the hoists under the operating conditions specified herein. If bearings are not permanently lubricated as specified, they shall be provided with fittings to permit lubrication. When anti-friction bearings cannot be used to support rotating shafts, bearings or other means shall meet design requirements of anti-friction bearings.

3.4.17 Lubrication. Means shall be provided for the lubrication of all moving parts of the hoist and trolley. Where practical, points requiring lubrication shall be permanently lubricated. If permanent lubrication cannot be achieved, fittings shall be installed that shall be readily accessible. Lubrication shall be in accordance with DOD-C-24508 and MIL-L-17331 or manufacturers specifications provided lubricant is readily available and free of ozone depleting chemicals (ODC).

3.4.18 Limit stops. Upper and lower limit stops shall be installed to automatically stop the hoist in the maximum lifting or lowering positions to prevent the load hook from overtravel.

3.4.19 Manual operation. When specified (see 6.2), means such as hand-chain wheel or hand-crank shall be installed on the hoist for raising, lowering, traversing, and track clamp operation.

3.4.19.1 Manual operation hand chain wheels. When manual operation hand chain wheels are used, they shall be made of material compatible with the hand chain used and shall have pockets shaped to fit the links of the hand chain as specified (see 6.2). The hand chain wheels shall be equipped with a chain guide that shall permit operation of the hand chain from an angle of 10 degrees out from either side of the hand chain wheel without slipping or jumping off the hand chain wheel.

3.4.19.2 Manual operation hand chain. Chain for manual operation chain wheels shall be link chain manufactured from electric or forge welded carbon steel in accordance with ASTM A 576 or alloy steel in accordance with any of the AISI grade designations of ASTM A 304 or A 322. Unless otherwise specified (see 6.2), hand chains shall be endless link chain and shall have a deck clearance of not less than 2 feet. Hand chains shall have a breaking strength of not less than three times the maximum pull required to lift the maximum rated load. Each chain link shall be of uniform size and shape to prevent twisting and shall seat properly in the hoist chain sprocket. Enclosed chain guides shall be provided and shall prevent the chain from jumping the sprocket. When specified (see 6.2), the chain shall be protected by a zinc coating in accordance with ASTM B 633, type II, class Fe/Zn 13. The safeguarding against and procedure for detecting embrittlement of zinc coating shall be in accordance with ASTM A 143.

3.4.19.3 Release mechanism. A release mechanism shall be installed to allow manual lowering in the event of a loss of pneumatic power. An interlock shall be installed to prevent pneumatic operation of the hoist during manual operation.

3.4.20 Trolley suspension hoists types B, C, and D.

3.4.20.1 Trolley wheels. Trolleys shall be constructed with not less than four wheels. Trolley wheels shall be of ferrous material. Trolley wheels shall have treads hardened to not less than 285 Brinell hardness number (Bhn). Trolleys up to and including 3-ton capacity shall have wheels of solid or pressed steel with treads hardened to a depth of not less than 0.020 inch. For trolleys over 3-ton capacity, wheels shall be forged or solid with treads hardened to a depth of not less than 0.063 inch. Trolley wheels shall be concentric within 0.030 inch and cast wheels shall have machine treads. Where the trolley wheel mounting arrangement is such that the wheels are not canted to the flange of the I-beam type trolley track (tapered treads), wheel treads shall be convex shape to minimize wear. The operating device for geared trolleys shall be either a manual chain wheel equipped with an endless chain of material and length (see 6.2) as specified in 3.4.19, or a pneumatic motor-powered drive system as specified in 3.4.7. Unless otherwise specified (see 6.2), trolley wheel spacing shall be suitable for use on applicable standard I-beam flange sizes.

3.4.20.2 Trolley wheel bearings and axles. Trolley wheels shall be equipped with bearings as specified in 3.4.16. The wheel bearings shall be protected from foreign materials. Trolley wheel axles shall be made from alloy steel.

3.4.20.3 Trolley wheel gear and drive pinion. The trolley wheel gear and drive pinion shall be made of steel or malleable iron.

3.4.20.4 Trolley brake. The trolley power unit shall be equipped with a brake coupled to the drive transmission. The brake shall be of the spring loaded automatic operating type that shall actuate upon reduction of pneumatic pressure below the safe motor operating pressure. The brake shall be equipped with a manual release for emergency operation. The manual release mechanism shall be arranged so that it can be operated without endangering the operator. The brake shall hold the test loads without slipping from a stopped position with rated load on the hoist as specified (see 4.6.12). The brake shall be adjustable.

3.4.20.5 Trolley equalizers. Means shall be provided for distributing the hoist load equally into the trolley side frame (sideplates).

3.4.20.6 Trolley hoist track clamps. When specified (see 6.2), the trolley of fully loaded trolley suspension hoists shall be locked to the track by quick-acting track clamps. The clamps shall be adjustable for wear and function equally well 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 operating device for track clamps shall be either a chain wheel equipped with an endless chain of material and length as specified in 3.4.19, a lever, or a drum and lanyard. The hand pull required to set or release the trolley track clamp shall be not greater than 80 pounds. The chain or lanyard drop from the trolley support beam shall be approximately 2 feet less than the specified lift of the hoist (see tables II and III). Track clamps shall show no sign of slipping or of permanent deformation when tested as specified (see 4.6.6).

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3.4.20.7 Trolley for curved track. Unless otherwise specified (see 6.2), trolley wheels shall be spaced to negotiate curved track at the radii as specified (see table II).

3.4.20.8 Trolley wheel preventer bars. Trolley wheel flanges shall be prevented from riding up onto the supporting beam by means of preventer bars.

3.4.21 Painting. When specified (see 6.2), exposed surfaces, except hooks, chains, and other wear surfaces shall be cleaned, pretreated, and finish coated in accordance with method I as specified in 3.4.21.1. Method II (see 3.4.21.2) may be used if method I is not specified.

3.4.21.1 Method I. Exposed surfaces, except hooks, chains, and other wear surfaces, shall be painted as specified herein. Before assembly, surfaces requiring painting shall be cleaned in accordance with SSPC SP 10. Steel surfaces, except for corrosion resisting steel, shall be coated with an inorganic zinc primer conforming to DOD-P-24648, applied at 3 to 5 mils dry film thickness (DFT). Prior to overcoating, residual deposits shall be removed by the manufacturer's recommended cleaning procedure. A coat of formula 150 which has been thinned with 1 pint of thinner per gallon, shall be applied, in accordance with MIL-P-24441 and MIL-P-24441/1, at a wet film thickness of 3 mils. This shall be followed by a full coat of formula 151, in accordance with MIL-P-24441/2, applied at 2 to 4 mils DFT, and two coats of silicone alkyd enamel, in accordance with MIL-E-24635, applied at 1 to 2 mils DFT per coat. The first coat of enamel shall be applied when the formula 151 is in the tack stage. Other metals that are not inherently corrosion resistant, in accordance with MIL-E-917, shall be processed (treated, plated, or painted) in accordance with MIL-E-917 to provide corrosion resistance.

3.4.21.2 Method II. Method II surface preparation and finish shall be contractor's standard commercial procedures. Paints and coatings shall be lead and chromate free.

3.5 Identification. An identification plate shall be installed in a prominent location on each hoist in accordance with MIL-P-15024 and MIL-P-15024/5. The plate shall identify the following:

- (a) Weight and shock (grade), as applicable.
- (b) Rated load and hoisting speed.
- (c) Manufacturer's name and part, serial, or model number.
- (d) Military specification (MIL-H-2813).
- (e) Class and type.
- (f) Contract order number.
- (g) Date of manufacture.
- (h) National Stock Number (NSN) (if established).

3.6 Operating instructions. Operating instructions manual shall be placed in a waterproof envelope marked "Operating Instructions". The envelope shall be attached securely to the hoist.

3.7 Availability, reliability, and maintainability. The minimum acceptable inherent availability (Ai) of the hoist shall be 0.90. Reliability and maintainability terms shall be in accordance with MIL-STD-721.

3.7.1 Reliability. The hoist shall operate for an average period of 3,000 continuous cycles without failure (this value of 3,000 mean cycles between failure (MCBF) is equivalent to 90 days of normal ship's operation without hoist failure) (see 6.3).

3.7.2 Maintainability. Routine corrective maintenance at the organizational level shall be accomplished by replacing complete assemblies and subassemblies. Mean time to repair (MTTR) for the hoist shall be 4 hours. Not less than 95 percent of all corrective maintenance actions shall require not greater than 10 hours to complete (see 6.3).

3.8 Workmanship. The hoist shall withstand any operational requirements specified herein without permanent deformation, malfunction or component failure caused by improper workmanship. Parts of the hoist, before and after painting, shall be clean and free of all harmful extraneous material. Edges and surfaces exposed to operating personnel shall be smooth and round to the extent that a hazardous surface does not exist. Bolted connections shall use standard bolts and self-locking nuts. Threads shall have full thread engagement.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.4).

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4.3 First article inspection. First article inspection shall consist of the examination and tests specified in 4.5 and 4.6 (see 6.3). One first article sample successfully examined and tested for acceptability of operating characteristics as specified in 4.5 and 4.6 shall serve as a manufacturing standard and be used as a guide in the inspection of production hoists produced under the contract. If required (see 6.2), one other first article model shall be tested in accordance with MIL-S-901 (see 3.4.4).

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the examination and tests of 4.5 and 4.6 (see 6.3).

4.4.1 Inspection lot. For the purpose of quality conformance inspection and test sampling, a lot is defined as all the units of the same size, type, and class, produced in one facility, using the same production processes and materials, and being offered for delivery at one time. The sample unit shall be one complete hoist unit.

4.4.2 Sampling for visual examination and testing. As a minimum, the contractor shall select a sample quantity of completed hoists for each lot in accordance with table V and VI and inspect them in accordance with 4.5 and 4.6. If one or more defects are found in any sample, the entire lot represented by the sample shall be rejected. If a lot is rejected, the contractor has the option of screening 100 percent of the rejected lot for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with the sampling plan provided herein. The contractor should maintain for a period of 3 years after contract completion all records of inspections, tests or any resulting rejections.

TABLE V. Sampling for visual examination.

Lot size	Sample size	
	Major defects	Minor defects
2 to 25	5	3
26 to 50	5	5
51 to 90	7	6
91 to 150	11	7
151 to 280	13	10
281 to 500	16	11
501 to 1200	19	15
1201 to 3200	23	18
3201 to 10,000	29	32

TABLE VI. Sampling for tests.

Lot size	Sample size
2 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1200	19
1201 to 3200	23
3201 to 10,000	29

4.4.3 Casting inspection for class 1 hoists. Steel castings for load-bearing parts of class 1 hoists shall be radiographed to ensure sound castings for the intended service, and in addition shall be subjected to magnetic particle or liquid penetrant inspection. The acceptability of castings subject to radiographic examination shall be based upon the radiographic standards for castings in accordance with MIL-STD-278 for criticality level 1. The acceptability of castings subject to surface inspection shall be in accordance with MIL-STD-2035.

4.5 Examination. Sample hoist units selected as specified in 4.4.2 shall be visually examined to verify conformance to the non-operational requirements of this specification. Defects shall be classified and numbered as specified in table VII.

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TABLE VII. Classification of visual defects.

Major	Defects
101	Gear casing does not protect against foreign matter or permit ready access (see 3.4.1).
102	Hoist clearance, underside of track to inside of load hook, not as specified (see 3.4.1.1).
103	Load chain or wire rope not securely attached to hoist as specified (see 3.4.8).
104	Chain links not uniform size (see 3.4.8.1 and 3.4.8.2).
105	Load chain reel or basket does not store full length of chain (see 3.4.8.4).
106	Chain reel does not maintain tension on chain as specified (see 3.4.8.4).
107	Hook throat opening not as specified (see 3.4.9).
108	Hoist hooks not equipped with safety guard, or safety guard not as specified (see 3.4.9).
109	Hoist lift range not as specified (see 3.4.10).
110	Pendant unit not marked or supported as specified (see 3.4.12.1).
111	Hoist components damaged or missing.
112	Lubrication fittings missing (see 3.4.17).
113	Lubrication of moving parts inadequate (see 3.4.17).
114	Trolley wheel mounting arrangement not as specified (see 3.4.20.1).
115	Trolley wheel treads not as specified (see 3.4.20.1).
116	Trolley hoist not equipped with track clamps, when specified (see 3.4.20.6).
117	Trolley track clamps do not function as specified (see 3.4.20.6).
118	Trolley wheel preventer bars missing or do not prevent trolley wheel flanges from riding up onto the supporting track (see 3.4.20.8).
119	Hoist lift height not as specified (see tables I through III).
Minor	
201	Hoist weight not as specified (see 3.4.1.1.1, 3.4.1.1.2 and 3.4.1.1.3).
202	Hoists, hook suspension, hoist fully retracted, distance between hooks not as specified (see 3.4.1.1.1).
203	Chain finish not as specified (see 3.4.8.1 and 3.4.19.2).
204	Hoists not equipped with chain container when specified (see 3.4.8.4).
205	Hook finish not as specified (see 3.4.9.1).
206	Pneumatic supply line not connected to hoist as specified (see 3.4.13).
207	Lubrication fittings damaged (see 3.4.17).
208	Paint coating not as specified (see 3.4.21).
209	Trolley wheels, concentricity not as specified (see 3.4.20.1).
210	Trolley wheel bearings not protected to exclude foreign matter (see 3.4.20.2).
211	Trolley wheel gear and drive pinion not as specified (see 3.4.20.3).
212	Trolley frame (sideplates) not connected by an equalizing pin (see 3.4.20.5).
213	Paint not as specified, paint surface broken (see 3.4.21).
214	Hoist identification plate missing or inadequately attached (see 3.5).

4.6 Tests. Sample units selected as specified in 4.4.3 shall be tested as specified in 4.6.1 through 4.6.14.

4.6.1 High impact shock tests. High impact shock tests shall be conducted in accordance with MIL-S-901, for grade A or grade B equipments (see 6.3). Testing shall be conducted on one complete unloaded hoist of each type and class.

4.6.2 Load tests. The hoist shall be subjected to load tests as specified in 4.6.2.1 and 4.6.2.2.

4.6.2.1 Static load test. The sample hoist shall support a static load of twice the maximum rated load for a period of 10 minutes. 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 foot provided the contractor demonstrates that the entire length of chain supports 200 percent of rated load. The suspended test load shall be held by the hoist brake for 10 minutes.

4.6.2.2 Dynamic load test. The hoist shall be loaded to 150 percent of rated load and operated by hoisting and lowering the test load through the full operating range for 10 cycles. Trolley-type hoists shall be operated back and forth over a section of track, 8 or more feet in length, with the 150 percent load for 10 cycles. The hoist and trolley shall operate satisfactorily and the brake shall exhibit no sign of slippage.

4.6.3 Operating tests. The hoist shall be tested to determine that it is *satisfactory for operation* with the rated load as follows:

- (a) Hoisting rated speed test. The hoist shall be operated for approximately 90 percent of lift height to verify conformance to the hoisting rated speed requirements.
- (b) Lowering rated speed test. The hoist load hook shall be lowered at maximum speed to determine conformance to the lowering rated speed requirements.
- (c) Hoisting travel limit test. The hoist shall be operated in the hoisting and lowering directions so as to engage the limit stops to demonstrate hoist ability to prevent load hook over-travel.
- (d) Load positioning sensitivity test. The hoist capability of accurately positioning a load shall be demonstrated. The test shall be conducted by establishing a reference height (approximately 12 inches above deck) and then jogging the rated load to a position plus or minus 0.250 inch above and below the reference height. This test shall be repeated not less than six times.
- (e) Performance test. The hoist shall be continuously operated at maximum lifting and lowering speeds through approximately 90 percent of the design lift height for not less than 30 minutes. During this test, the hoist shall operate satisfactorily without any indication of malfunction.

4.6.4 Manual operation test. The hoist shall traverse (where applicable) and lift and lower through the full hoisting range with rated load, or lower only when manual brake release only is specified (see 3.4.19 and 3.4.20). While the hoist is being manually operated, the interlock shall prevent pneumatic operation.

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4.6.5 Geared trolley traverse test. On type C geared trolley hoists, a pull of not greater than 1 pound per 200 pounds of total hoist load exerted on the hand chain shall initiate hoist movement and a pull of not greater than 1 pound per 300 pounds of total hoist load shall sustain hoist and trolley movement.

4.6.6 Track clamp test. Track clamps on type B and C hoists shall be tested by subjecting the loaded hoist to a pull equal to one-third of the rated load of the hoist. The pull shall be exerted in both directions parallel to the trolley track. The clamps shall hold the loaded hoist from moving in either direction when the trolley track is in a horizontal position.

4.6.7 Fleet angle test (type B, C, and D hoists). The hoist shall pick up a load with the hook attached to the load 2 feet out from an imaginary perpendicular 7 feet below the hoist. This test shall be completed without the chain jamming or jumping the pockets of the load sprocket. For wire rope hoists, this test shall be completed without the rope jumping the grooves on the cable drum. This test shall be conducted four times, once forward, once aft, and once on each side of the hoist.

4.6.8 Plain trolley test. The pull required to move the rated capacity loaded plain trolley suspension hoist along a straight portion of track shall be determined by attaching a wire rope or cord to the trolley so that the pull is exerted parallel to the track and reeved over a sheave suspended from the track not less than 5 feet from the trolley. The required pull shall be measured by means of either weights or a spring balance attached to the wire rope or cord. Failure to conform to the requirements for maximum pull to traverse the hoist (see table II) shall constitute failure of this test.

4.6.9 Geared trolley test. The pull required on the type C geared trolley suspension hoist hand chain to move a hoist supporting its rated load along a straight horizontal portion of track shall be determined by attaching weights of a spring balance to the hand chain. Failure to conform to the requirements for maximum pull to traverse the hoist shall constitute failure of this test.

4.6.10 Hand operation. The hoist and the trolley of types B and C shall be operated by hand on straight and curved horizontal track with rated load. A pull of not greater than 1 pound (5 pounds for type B) per 200 pounds of hoist load shall be required to initiate trolley movement and not greater than the pull to traverse hoist value (see table II) shall be required to sustain trolley movement.

4.6.11 Mounting hook test (type A hoist). The ability of the safety gate of the mounting hook as specified (see 3.4.9) to hold a load equal to the rated load of the hoist shall be tested as follows: A test load shall be attached to the closed and latched safety device in four directions. The load shall be applied to the safety device at a point measured from the hook tip along the safety device a distance equal to one-third of the throat opening as shown in table IV. The load shall first be applied alternately to opposite sides of the safety device along the sides of the safety device at 90 degrees to the safety device in a plane perpendicular to the hook plane. The test load shall be 75 pounds for safety hoist hooks with safe working loads between 1,200 and 4,000 pounds inclusive; 150

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pounds for safe working loads between 4,000 and 10,000 pounds inclusive; and 200 pounds for safe working loads greater than 10,000 pounds. The safety device shall suffer no permanent deformation due to the test load applications and shall be functional upon completion of testing.

4.6.12 Trolley tests (type D hoist). Powered trolley hoists shall be subjected to the following tests:

- (a) Traversing rated speed test. The power-operated trolley shall traverse the hoist with rated load along a horizontal trolley track to demonstrate conformance to the traversing rated speed as specified.
- (b) Trolley drive test (rolling conditions). The trolley shall traverse the loaded hoist on a horizontal trolley track inclined at an angle of 10 degrees to either side to demonstrate satisfactory operation. The trolley will not be required to operate at a specified speed but shall move along steadily.
- (c) Trolley brake test. With the hoist fully loaded and the trolley on a trolley track inclined at an angle of 15 degrees and tilted at an angle of 15 degrees, the trolley shall maintain its position on the track when stopped by means of the braking arrangement as specified in 3.4.20.4.

4.6.13 Endurance test (all types). One sample hoist of each class and type shall be subjected to 3,000 cycles of continuous operation. A cycle of operation is defined as hoisting and lowering a rated load through the full hoisting range at the specified hoisting and lowering speeds (see 4.6.3). In the event a failure occurs during this test, the contractor shall investigate the cause and initiate a design study to identify a design change. Upon review and approval of the proposed corrections by the contracting activity, the test unit and all remaining units shall be modified and the endurance test repeated. After completion of the endurance tests, the gears, chain, bearings, chain sprockets, brakes, and other wearing parts shall be examined for excessive wear. Excessive wear is defined as that which is sufficient to impair safe operation of the hoist. Life-lubricated bearings requiring lubrication, load-brake lining reduced in excess of 50 percent of useful life, reduction of bar diameter of link chain in excess of 10 percent shall be considered excessive wear. The tests specified in 4.6.2.1 and 4.6.2.2 shall be repeated to demonstrate safe operation.

4.6.14 Mechanical vibration. The hoist shall be tested in accordance with MIL-STD-167-1, type I (see 6.3).

4.7 Inspection of packaging. Sample packs, and the inspection of the preservation, packing and marking for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.5 and 6.9.)

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5.1 Preservation. Level of preservation shall be as specified (see 6.2).

5.1.1 Level A. Cleaning, preservation and packaging of all components shall be in accordance with MIL-P-116, as applicable. Unpainted external metal surfaces and component parts shall be preserved by method I, using type P-1 or P-2 preservative compound. Type P-1 shall be applied to surfaces where its removal is not required to put the equipment in service or where removal by solvent can be accomplished without damage to the surface or adjacent surfaces. Internal metal surfaces shall be coated with type P-10 preservative. Anti-friction bearings shall be service lubricated. No cleaning solution, lubricant or preservative shall be applied to self-lubricating bearings.

5.1.2 Level C. Level C preservative shall be in accordance with ASTM D 3951.

5.2 Packing. Level of packing shall be as specified (see 6.2).

5.2.1 Level A. Unless otherwise specified in the contract or order, hoists and trolleys shall be packed in wood-cleated plywood, nailed wood boxes or crates conforming to PPP-B-601 (overseas type), PPP-B-621, or MIL-C-104, respectively. Crates shall be used for gross weights exceeding 500 pounds. Boxes shall be modified by the addition of 2- by 4-inch (nominal) skids for gross weights exceeding 200 pounds. Boxes shall be lined with sealed case liners conforming to MIL-L-10547 or the equipment within the containers shall be shrouded with barrier material conforming to PPP-B-1055.

5.2.2 Level B. The hoists and trolleys shall be packed in wood-cleated plywood, nailed wood boxes, or crates conforming to PPP-B-601 (domestic type), NN-B-621 and MIL-C-104, respectively. Crates shall be used for gross weights exceeding 500 pounds. Boxes shall be modified by the addition of 2- by 4-inch skids for gross weights exceeding 200 pounds.

5.2.3 Level A and B shipments. Blocking and bracing shall be in accordance with MIL-STD-1186.

5.2.4 Level C. The hoist and trolleys shall be packed in a manner to ensure carrier acceptance and safe delivery at destination. Containers shall be in accordance with Consolidated Freight Classification Rules or other carrier regulations as applicable to the mode of transportation.

5.3 Marking. Unless otherwise specified (see 6.2), interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Hoists covered by this specification are intended for general material handling by all Military activities.

6.2 Acquisition requirements. Acquisition documents must specify the following:

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- (a) Title, number, and date of this specification.
- (b) Type and class of hoist required (see 1.2).
- (c) Issue of DODISS to be cited in the solicitation, and if required, the specific issue to the individual documents referenced (see 2.1.1 and 2.2).
- (d) When first article inspection is required (see 3.1).
- (e) If the use of metals or structural materials other than those listed in 3.2 is permitted (see 3.2.1).
- (f) Application where brittle materials may be used (see 3.2.3.6).
- (g) Rated load required (see 3.4.1.1).
- (h) If hoist characteristics are to be other than those specified in tables I, II, or III (see 3.4.1.1).
- (i) Envelope dimensions required (see 3.4.1.1).
- (j) If high impact shock test is required (see 3.4.4).
- (k) Type of lifting medium (wire rope or chain) required (see 3.4.8).
- (l) If chain plating is required (see 3.4.8.1 and 3.4.19.2).
- (m) If chain basket, bag, or reel is required (see 3.4.8.4).
- (n) Type of load hook required (see 3.4.9).
- (o) If hook plating is required (see 3.4.9.1).
- (p) If pendant control is required (see 3.4.12.1).
- (q) Length of air valve control pendant (see 3.4.12.1).
- (r) Type of manual operation required (see 3.4.19 and 3.4.20.1) as follows:
 - (1) Releasing of brakes.
 - (2) Raising or lowering of hook.
 - (3) Traversing.
- (s) Drop length of hand chain required for the following:
 - (1) Manual operation of hoist (see 3.4.19.2).
 - (2) Operation of geared trolley (see 3.4.20.1).
 - (3) Operation of trolley track clamp (see 3.4.20.6).
- (t) Size of I-beam support for trolley hoist, including nominal width of beam flange (see 3.4.20.1).
- (u) If track clamps are required (see 3.4.20.6).
- (v) If trolley wheels are not to be spaced to negotiate curved track (see 3.4.20.7).
- (w) Painting requirements. Painting Method I should be specified for hoists subject to severe environments, such as salt water spray (see 3.4.21).
- (x) If more than one first article sample is required (see 4.3).
- (y) Level of preservation, packing, and marking required (see 5.1, 5.2, and 5.3).

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6.3 Consideration of data requirements. The following data requirements should be considered when this specification is applied on a contract. The applicable Data Item Descriptions (DID's) should be reviewed in conjunction with the specific acquisition to ensure that only essential data are requested/provided and that the DID's are tailored to reflect the requirements of the specific acquisition. To ensure correct contractual application of the data requirements, a Contract Data Requirements List (DD Form 1423) must be prepared to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirements for a DD Form 1423.

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.3.1	DI-SAFT-80100	System safety program plan	----
3.3.1	DI-SAFT-80101	System safety hazard analysis report	----
3.3.1	DI-SAFT-80102	Safety assessment report	----
3.4.1	DI-DRPR-81000	Product drawings and associated lists	----
3.7.1	DI-R-7079	Reliability program plan	----
3.7.1	DI-R-7085	Failure mode, effects, and criticality analysis report	----
3.7.1	DI-R-7095	Reliability prediction and documentation of supporting data	----
3.7.1	DI-R-7080	Reliability status report	----
3.7.2	DI-MNTY-80822	Maintainability program plan	----
3.7.2	DI-MNTY-80823	Maintainability status report	----
4.3 and 4.4	DI-NDTI-80809	Test/inspection reports	----
4.4	DI-MISC-80678	Certification/data report	10.3.1 does not apply
4.4	DI-QCIC-81110	Inspection and test plan	----
4.6.1	DI-ENVR-80708	Shock test report	----
4.6.14	UDI-T-23762	Report, vibration testing	----

The above DID's were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control Lists (AMSDL), must be researched to ensure that only current, cleared DID's are cited on the DD Form 1423.

6.4 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards which have been cleared and listed in DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL) must be listed on a separate Contract Data Requirements List (CDRL) (DD Form 1423), which is included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

6.5 Provisioning. Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

6.5.1 When ordering spare parts or repair parts for the equipment covered by this specification, the contract should state that such spare parts and repair parts should meet the same requirements and quality assurance provisions as the parts used in the manufacture of the equipment. Packaging for such parts should also be specified.

6.6 First article. When a first article inspection is required, the contracting officer should provide specific guidance to offerors whether the items should be a preproduction sample, a first article sample, a first production item, a sample selected from the first # production items, a standard production item from the contractor's current inventory (see 3.1), and the number of items to be tested as specified in 4.3. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.7 Safety. Operating and support analyses should be in accordance with MIL-STD-882, task 205, and documented using DI-SAFT-80101. Safety assessment should be in accordance with MIL-STD-882, task 209, and documented using DI-SAFT-80102 (see 3.3.1).

6.8 Shock tests. When an identical hoist conforming to the requirements of this specification has been successfully shock tested, the test report may be submitted to the contracting activity as fulfillment of the requirements for high impact shock test.

6.9 Sub-contracted material and parts. The packaging requirements of referenced documents listed in section 2 do not apply when material and parts are acquired by the contractor for incorporation into the equipment and lose their separate identity when the equipment is shipped.

6.10 Subject term (key word) listing.

- Geared trolley suspension
- Hand chain
- Hook suspension
- Load chain
- Plain trolley suspension
- Roller chain

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6.11 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - ME
Navy - SH
Air Force - 84

Preparing activity:

Navy - SH
(Project 3950-0300)

Review activities:

Army - GL
DLA - CS

User activity:

Navy - AS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
MIL-H-2813B2. DOCUMENT DATE (YYMMDD)
1994 AUGUST 173. DOCUMENT TITLE
HOISTS, CHAIN AND WIRE ROPE, PNEUMATIC

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)

b. ORGANIZATION

c. ADDRESS (Include Zip Code)

d. TELEPHONE (Include Area Code)
(1) Commercial
(2) AUTOVON
(If applicable)7. DATE SUBMITTED
(YYMMDD)

8. PREPARING ACTIVITY

a. NAME
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(1) Commercial (2) AUTOVON
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ATTN: SEA 03R42, 2531 JEFFERSON DAVIS HWY
ARLINGTON, VA 22242-5160IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT:
Defense Quality and Standardization Office
5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466
Telephone (703) 756-2340 AUTOVON 289-2340