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 (See 6.7)

## MILITARY SPECIFICATION

### HOISTS, CHAIN, PNEUMATIC, LOW HEADROOM, TROLLEY TYPE

This specification is approved for use within the Naval Sea Systems Command, Department of the Navy, and is available for use by all Departments and Agencies of the Department of Defense.

#### 1. SCOPE

1.1 Scope. This specification covers pneumatic, trolley type chain hoists with traverse drive, having extreme low headroom and zero load eccentricity. Hoists include a lifting unit, a traversing unit, and a pendant unit.

1.2 Classification. Hoists shall be of the following types or capacities as specified (see 6.2.1).

Type I - 2,000 pound rated load  
 Type II - 4,000 pound rated load  
 Type III - 6,000 pound rated load

#### 2. APPLICABLE DOCUMENTS

##### 2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 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

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## SPECIFICATIONS

## FEDERAL

- TT-E-490 - Enamel, Silicone Alkyd Copolymer, Semigloss (for Exterior and Interior Use).
- UU-P-268 - Paper, Kraft, Wrapping.
- PPP-C-850 - Cushioning Material, Polystyrene, Expanded, Resilient (for Packaging Uses).
- PPP-C-1120 - Cushioning Material, Uncompressed Bound Fiber for Packaging.

## MILITARY

- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-M-3184 - Machinery: Deck and Vehicle Mounted with Associated Equipment and Provisioned (Repair Parts) Stems; Packaging of.
- MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
- MIL-R-6130 - Rubber, Cellular, Chemically Blown.
- MIL-A-8625 - Anodic Coatings, for Aluminum and Aluminum Alloys.
- 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-R-20092 - Rubber or Plastic Sheets and Assembled and Molded Shapes, Synthetic, Foam or Sponge, Open Cell.
- MIL-A-21180 - Aluminum-Alloy Castings, High Strength.
- MIL-T-22361 - Thread Compound; Antiseize, Zinc Dust-Petrolatum.
- MIL-I-24391 - Insulation Tape, Electrical, Plastic, Pressure-Sensitive.
- DOD-G-24508 - Grease, High Performance, Multipurpose. (Metric)
- MIL-P-26514 - Polyurethane Foam, Rigid or Flexible, for Packaging.
- MIL-S-81733 - Sealing and Coating Compound, Corrosion Inhibitive.
- MIL-C-81751 - Coating, Metallic-Ceramic.

## STANDARDS

## MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-721 - Definitions of Terms for Reliability and Maintainability.
- MIL-STD-740-1 - Airborne Sound Measurements and Acceptance Criteria of Shipboard Equipment.
- DOD-STD-2138 - Metal Sprayed Coating Systems for Corrosion Protection Aboard Naval Ships. (Metric)

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(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other 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 shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 775 - Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- B 633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel. (DoD adopted)
- B 695 - Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.

(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)

- Surface Preparation Specification SP-10 - Near White Blast Cleaning.

(Application for copies should be addressed to the Steel Structure Painting Council, 4400 5th Avenue, Pittsburgh, PA 15213.)

OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA)

- OSHA 2206 - OSHA Safety and Health Standards (Part 1910, Title 29 of the Code of Federal Regulations).

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington, DC 20402.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or which distribute the documents. These documents also 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 specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3 and 6.4).

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

3.2.1 Metals. Metals used in the construction of the hoists shall be selected from the following:

- (a) Steel alloys up to yield strength levels of 130 kilopounds per square inch (klb/in<sup>2</sup>).
- (b) Aluminum alloys 5456 and 5086, strain hardened to H-116.
- (c) Aluminum castings in accordance with MIL-A-21180.
- (d) Corrosion resisting steel alloys 316 and 316L.
- (e) Stainless steel alloy 17-4PH, heat treated to maximum yield strength of 130 klb/in<sup>2</sup>.
- (f) Nickel-copper alloys.
- (g) Nickel-iron alloys.

Permission for the use of metals or structural materials other than those listed may be granted by the contracting activity (see 6.5).

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.

### 3.3 Safety.

3.3.1 Safety criteria and consideration. Equipment design and operational procedure developed by the contractor shall consider, but not be limited to, the following:

- (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 design 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 chemical burns, electrical shock, cutting edges, sharp points or toxic atmospheres.
- (f) Providing warning and caution notes in operations, assembly, maintenance, and repair instructions; and distinctive warnings of hazards on the equipment.

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3.3.2 System safety plan. When specified in the contract or order, a system safety plan shall be prepared (see 6.2.2).

3.3.3 System hazard analysis. When specified in the contract or order, a system hazard analysis shall be prepared (see 6.2.2).

3.3.4 Operating hazard analyses. When specified in the contract or order, operating hazard analysis shall be conducted (see 6.2.2).

3.3.5 Safety assessment. When specified in the contract or order, a safety assessment shall be prepared (see 6.2.2).

3.3.6 Data use. Engineering data, procedures and instructions developed from the engineering design shall be used in support of compliance with 3.3.2 through 3.3.5.

3.3.7 System safety precedence. When specified in the contract or order, a safety hazard shall be prepared (see 6.2.2).

### 3.4 Performance and characteristics.

3.4.1 Type I. Performance and characteristics for type I hoist shall be as follows:

- (a) Rated load - 2,000 pounds minimum.
- (b) Lifting speed - 25 feet per minute (ft/min) minimum.
- (c) Lift range - 8 feet minimum, unless otherwise specified (see 6.2.1).
- (d) Weight - 185 pounds maximum, excluding chain and hook.
- (e) Width - 12 inches maximum to either side of trolley center-line.
- (f) Length - 26 inches (not including optional cushion bumpers).
- (g) Height - Distance from underside of track to lifting surface of retracted load hook, minimum practicable but not to exceed 6-1/2 inches; in addition, other hoist projections excluding chain basket shall not extend more than 15 inches below underside of the track. No part of hoist shall extend 4 inches above the bottom of the trolley track.
- (h) Rated air gauge pressure - 90 pounds per square inch (lb/in<sup>2</sup>).
- (i) Air consumption - 90 to 100 standard cubic feet per minute (ft<sup>3</sup>/min) at 90 lb/in<sup>2</sup>.
- (j) Trolley track size - 5- by 3.000-inch by 10 pounds per foot (lb/ft), 5- by 3.284-inch by 14.75 lb/ft, 6- by 3.330-inch by 12.5 lb/ft and 6- by 3.565-inch by 17.25 lb/ft "I" beam.
- (k) Trolley track radius - Trolley hoist shall negotiate "S" curves of 26-inch radius.
- (l) Traversing speed - 10 to 40 ft/min with rated load and air pressure.

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3.4.2 Type II. Performance and characteristics for type II hoist shall be as follows:

- (a) Rated load - 4,000 pounds.
- (b) Lifting speed - 5 to 16 ft/min, minimum.
- (c) Lift range - 8 feet minimum, unless otherwise specified (see 6.2.1).
- (d) Weight - 185 pounds maximum for hoist unit, excluding chain and hook. Cumulative weight of hoist, trolley and hoist tractor units may total a maximum of 225 pounds with 8 feet of lift chain and hook, if readily disconnected.
- (e) Width - 12 inches maximum to either side of trolley center-line.
- (f) Length - 26 inches.
- (g) Height - Distance from underside of track to lifting surface of retracted load hook, minimum practicable but not to exceed 6-1/2 inches; in addition, other hoist projections excluding chain basket shall not extend more than 15 inches below underside of the track. No part of hoist shall extend 4 inches above the bottom of the trolley track.
- (h) Rated air gauge pressure - 90 lb/in<sup>2</sup>.
- (i) Air consumption - 90 to 100 ft<sup>3</sup>/min at 90 lb/in<sup>2</sup>.
- (j) Trolley track size - 5- by 3.000-inch by 10 lb/ft, 5- by 3.284-inch by 14.75 lb/ft, 6- by 3.330-inch by 12.5 lb/ft, 6- by 3.565-inch by 17.25 lb/ft and 8- by 4.000-inch by 18.4 lb/ft "I" beam.
- (k) Trolley track radius - Trolley hoist shall negotiate "S" curves of 26-inch radius.
- (l) Traversing speed - 10 to 40 ft/min with rated load and air pressure.

3.4.3 Type III. Performance and characteristics for type III hoist shall be as follows:

- (a) Rated load - 6,000 pounds minimum.
- (b) Lifting speed - 10 ft/min, minimum.
- (c) Lift range - 8 feet minimum unless otherwise specified (see 6.2.1).
- (d) Weight - 285 pounds maximum, excluding chain and hook.
- (e) Width - 12-1/2 inches maximum to either side of trolley center-line.
- (f) Length - 31 inches (including optional cushion bumpers).
- (g) Height - Distance from underside of track to lifting surface of retracted load hook, minimum practicable, but not to exceed 9-1/2 inches; in addition, other hoist projections excluding chain basket shall not extend more than 15 inches below underside of the track. No part of hoist shall extend 4 inches above the bottom of the trolley track.
- (h) Rated air gauge pressure - 90 lb/in<sup>2</sup>.
- (i) Air consumption - 90 to 100 standard ft<sup>3</sup>/min at 90 lb/in<sup>2</sup>.
- (j) Trolley track size - 8- by 4.000-inch by 18.4 lb/ft "I" beam, adaptable to 6- by 3.330-inch by 12.5 lb/ft and 6- by 3.565-inch by 17.25 lb/ft "I" beam.
- (k) Trolley track radius - Trolley hoist shall negotiate "S" curves of 36-inch radius.
- (l) Traversing speed - 35 ft/min minimum with rated load and air pressure on the level and 10 ft/min on 10-degree incline.

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3.5 Incline consideration. Hoisting and traversing brakes shall be provided which shall hold the rated load on an incline of plus or minus 15 degrees with the horizontal in any direction. The hoist shall operate on a plus or minus 10-degree incline with the horizontal in any direction, with rated load, at reduced speed, through the full lift range.

3.6 Construction. Hoist shall be in accordance with the requirements specified herein. Components shall have adequate strength to operate satisfactorily under the requirements specified. Parts shall be as light and compact as practicable, yet consistent with the required strength and stiffness. Rotating shafts shall be supported in antifriction, lubricated or self-lubricated bushings or bearings. Shaft bushings and bearings shall be enclosed against entry of dirt, dust or foreign material. Rotating and sliding surfaces shall be lubricated. Hoist shall operate at temperatures of 0 through 130 degrees Fahrenheit ( $^{\circ}$ F) for a minimum of 3,000 cycles without a failure. Hoist construction shall permit chain replacement by the use of simple hand tools. Gears shall be enclosed against dirt, dust and water spray in a casing which permits ready access for inspection and cleaning. Positive means shall be provided to prevent any component working loose. Hoist shall be complete in all respects including operating controls and other equipment that may be necessary for operation. For hoists requiring repair parts, all wear parts shall be readily accessible for replacement. No part of the hoist shall protrude below the motor except the pendant controls, chain bag, chain, load hook or shackle when applicable. Hoists to be used for nuclear lifting shall have a safety factor of 5 or greater for all hoist lifting components. Hoists to be used for nuclear lifting shall be ordered as such (see 6.2.1).

3.7 Stress. Hoist mechanical components shall use the loading factors specified in 3.7.1. Combined stresses of mechanical components of the hoist, hoist tractor and trolley shall not exceed 35 percent of the yield strength of the material used, when operating with rated load under 10-degree incline condition (see 3.5). Maximum combined stresses in structural and mechanical components under 15-degree incline condition (see 3.5) shall not exceed 70 percent of the yield strength of the material used when the hoist or hoist tractor is subjected to maximum torque or braking conditions.

3.7.1 Loading factor. Hoist components shall incorporate the following loading factors:

- (a) Dynamic loading based on inertial forces - 1.5 times rated load.
- (b) Static loading based on inertial forces - 2.0 times rated load.

3.7.2 High impact shock. When specified (see 6.2.1), 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 providing no damage to trolley hoist or brake results and brake holds hoist to rail after shock. Drift shall be not greater than 1 inch. Motor shall be bolted to the frame.

3.7.3 Mechanical vibration. An unloaded hoist shall conform to the vibration test requirements of MIL-STD-167-1, type I (see 4.6.2).



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3.8 Frame or housing. The frame or housing shall contain the hoist mechanisms including gears, sprockets, load chain stowage, spring reel for chain drum or magazine, hoist and trolley brakes, protection of pneumatic controls and piping, air motors and other operating components. Hoist or frame side tilt shall be kept to a minimum when operating on the trolley rail. In case of any inclination of rail or effects of ship motion, no part of the hoist shall project above the top flange of the trolley rail. Means shall be provided to afford protection from damage due to bumping of two or more adjacent hoists or hoists on the same track. This protection may be provided through use of bumpers or inherent frame or housing features.

3.9 Hoist drives. Hoist lift and hoist traverse units shall be driven by reversible air motors of enclosed construction type, constructed to operate with air gauge pressure up to 100 lb/in<sup>2</sup>. Motor brakes shall be furnished to prevent lowering the load or traversing the hoist unless the brakes are intentionally and manually released and pneumatic or manual power is applied.

3.9.1 Hoist lift drive. The hoist lift drive motor shall be coupled through a speed reducer or drive gear to the load chain sprocket.

3.9.2 Hoist traverse unit drive. The hoist traverse drive unit shall have positive traction. The motor shall be coupled through a speed reducer to a chain sprocket for use on a 1-inch pitch single strand No. 80-1-RC-A standard roller chain welded to the bottom of the trolley track as shown on figure 1, or as specified (see 6.2.1).

3.10 Load chain. Hoist shall be double purchased. Load chain shall be carbon or alloy steel and shall be corrosion-resistant finished as specified in 3.10.1. Load chain shall be of sufficient hardness and strength to withstand the applicable tests specified in 4.6.3. Load chain shall be of the link chain type. Chain links shall be electric or forge welded. Each link 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. The ends of the load chain shall be securely attached to the hoist or provided with a means to prevent end of chain passing through hoist and shall be of a configuration which will permit ready removal of the chain. Load chain shall provide a safety factor of at least five. This factor of safety shall be the ratio of chain breaking strength to the rated load or 2,000 pounds for type I hoist, 4,000 pounds for type II hoist and 6,000 pounds for type III hoist. A stripper shall be provided to free chain from sheave pockets on both sides of sheave.

3.10.1 Load chain finish. Link load chain shall be protected to resist corrosion by electrodeposited zinc. Zinc coating shall conform to ASTM B 633, type II, class Fe/Zn 13 or ASTM B 695, type I, class 25, coating requirements. Processing shall be such that there is no impairment in free movement of any chain link after plating.

3.10.2 Load chain stowage. Hoist construction shall include means for stowing the full length of load chain in chain reels, bags or baskets (see 6.2.1) 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. The chain reels shall maintain a relatively



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constant tension force to prevent chain slack between the load sprocket and the chain stowage. Construction of load sprocket and load chain stowage shall provide a constant chain feed without binding or jamming in the chain guide, stowage or hoist frame.

3.10.3 Load chain wheel, sprocket, and shaft. Load chain wheels or sprockets shall be provided with pockets, accurately shaped to fit the links of the load chain. The load shaft may be integral with or rigidly connected to the load chain wheel. Welding of the wheel to the shaft will not be permitted.

3.10.4 Chain guides. Chain guides which enclose the chain as necessary to ensure proper load sprocket action shall be provided. The function of the chain guides shall be to guide the load chain over the load sprocket at a uniform angle to prevent fouling and jamming of the load chain.

3.11 Hoist lift limit stops. Upper and lower lift limit stops shall be provided.

3.12 Load attachments.

3.12.1 Load hook. Load hook shall be of forged steel and shall withstand the tests specified in 4.6.3. A safety guard shall be hinged at the neck of the hook and rest on the tip. Hook shall have a thrust bearing and be free to rotate 360 degrees without binding under full load conditions.

3.12.2 Shackle. When required (see 6.2.1), a shackle with self-locking pin shall be substituted for the load hook to conserve head room. Shackle opening shall be 1-1/16 inches wide by 1 inch clear opening above upper edge of pin. Shackle shall be provided with thrust bearing and be free to rotate 360 degrees without binding under full load conditions.

3.13 Range of load hook. The hoist shall lift rated loads from any point within a 19-inch radius from an imaginary perpendicular under the chain sprockets to a horizontal plane 7 feet below the trolley track. The hoist shall lift rated loads at this offset range without binding or jamming of the load chain in the sprocket guide.

3.14 Bearings. Rotating parts shall be mounted on antifriction bearings to suit the intended use, and shall have a minimum service life of 10,000 hours. Bearings shall be selected by the hoist manufacturer with load ratings, including applicable safety factors, greater than the maximum bearing loads under extreme operating conditions specified herein. Exposed bearings shall be sealed or shielded. Bearings shall be of the permanently lubricated type, where practicable, or provided with fittings to add lubrication when required.

3.15 Trolley. The trolley hoist shall have not less than four wheels. Wheels shall have a lateral positioning feature enabling the trolley to operate with a minimum clearance of 3/8 inch between the wheels and the web of the largest "I" beam rail (see figure 2). Wheels shall be of ferrous material. The trolley shall operate on 8- by 4.000-inch by 18.4 lb/ft, 6- by 3.330-inch by 12.5 lb/ft, 6- by 3.565-inch by 17.25 lb/ft, 5- by 3.284-inch by 14.75 lb/ft and 5- by 3.000-inch by 10 lb/ft "I" beam as specified in 3.4.1

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through 3.4.3. Flange widths are nominal and are subject to plus or minus 1/8 inch mill tolerance. Zero load eccentricity of the hoist shall be maintained when the wheels are positioned for each size rail.

3.16 Brakes. The lifting and traversing power units shall be equipped with brakes coupled to the respective drive transmission. The brakes shall be spring loaded automatic operating type constructed to actuate upon reduction of air pressure below the safe motor operating pressure. The brakes shall be equipped with a manual release for emergency operation. Manual release mechanisms shall be arranged so they can be operated without endangering the operator. Brakes shall hold the test loads without slipping from a stopped position and rated load on the hoist as specified in 3.5. Provisions shall be made to facilitate adjusting the brakes. If more than one hoist power unit is used, a load brake is required on each power unit, and provision shall be made to assure that brakes will operate simultaneously.

3.17 Pendant unit. Controls shall be on a thumb operated manifold suspended on a pendant of sufficient length to allow easy operation of the hoist for the required lift range (see 6.2.1), 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 motors, for vernier positioning of load vertically and horizontally as required by 4.6.3.3 in very limited space. "UP" and "DOWN" controls shall be labeled as such. Traversing controls shall be color-coded to indicate direction of travel, and corresponding colored arrows shall be affixed to the hoist and shall be visible from operating positions on each side of the hoist.

3.17.1 Shuttle valve. Shuttle valves or similar devices shall be provided so that at brake release pressure the motor shall resist back driving by rated load. The brake-release to drive time-lag shall not result in any perceptible slippage of lift or traverse motion.

3.18 Manual operation. Means shall be provided for manual lowering and traversing operation in the event of loss of air supply. A separate crank or similar means shall be provided for manual operation. The centerline of the hand crank shall be not less than 2 inches below the bottom of the "I" beam rail during manual operation. Force required on a crank to lower rated load shall not exceed 40 pounds. The load shall not lower unless the brakes are intentionally and manually released and the load is manually released. When specified (see 6.2.1) a manual brake release mechanism to lower the load in the event of a loss of air supply shall be provided in place of 3.18. The manual release mechanism shall be arranged so that it can be operated without endangering the operator. Means shall be provided so that power operation shall not be possible when the hand crank or similar means is engaged.

3.19 Airborne noise. The hoist shall not exceed the octave band sound pressure levels specified in 4.6.4.

3.20 Air supply inlet. Air supply line shall connect to hoist (not to pendant control).

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3.21 Repair and maintenance. Means shall be provided for adjustment, service and replacement of all operating components of the trolley hoist. Parts and assemblies subject to possible periodic maintenance or overhaul shall be maintainable as specified in 3.27.2. Adjustment means for brake setting and air control valves shall be easily available. There shall be no interference to the servicing or draining of oils and lubricants if applicable to or from any assembly or component by frame members or other obstructions. Grease seals shall be provided to prevent leakage of oil and grease.

3.22 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.

3.23 Service life. Moving parts, except bearings, shall have a minimum life in rated service of 10,000 hours and shall operate for at least 1,200 hours without adjustment or replacement of parts. Periodic adjustment of brakes due to lining or friction of disc wear is excepted.

3.24 Identification and instruction plates.

3.24.1 Identification plates. Identification plates shall be provided in a prominent position on the side plate of hoist and control unit. Identification plates shall be corrosion-resisting steel or aluminum alloy in accordance with MIL-P-15024 and MIL-P-15024/5, types A, B, C, or H.

3.24.2 Instruction and caution plates. Operating instructions on the control pendant shall be clearly inscribed. Instruction and caution plates shall be of corrosion-resisting steel or aluminum alloy in accordance with MIL-P-15024 and MIL-P-15024/5, types A, B, C, or H.

3.25 Lubrication. Means shall be provided for lubrication of all moving parts of the hoist. Lubrication fittings shall be immediately accessible, except for removal of housing covers for internal lubrication points. Where practicable, points requiring lubrication shall be life lubricated. Bearing lubrication and protection shall conform to 3.14. Grease and oil lubrication requirements shall be in accordance with DOD-G-24508 and MIL-L-17331, respectively.

3.26 Coating. Coating is required for all surfaces and parts of the hoists, except as noted herein. Coatings shall not be applied to hook chains, corrosion resisting steel, stainless, nickel-copper or nickel-iron alloy surfaces. Coatings shall not be applied to bearing surfaces where machined tolerances are required to be maintained. Metal sprayed coating systems shall not be applied to high strength (yield strength greater than 120 klb/in<sup>2</sup>) steel alloy.

3.26.1 Exposed steel alloy surfaces. Exposed steel alloy surfaces, except as noted, shall be coated with a type II metal spray coating system in accordance with DOD-STD-2138. Exposed steel alloy surfaces, for which metal sprayed coating is prohibited, shall be abrasive blasted to a SSPC SP-10 "near white" metal surface finish of 0.002 to 0.003 inch profile height and powder epoxy coated in accordance with ASTM A 775.

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3.26.2 Exposed aluminum alloy surfaces. Exposed aluminum alloy surfaces shall be abrasive blasted using aluminum oxide grit to a SSPC SP-10 "near white" finish of 0.002 to 0.003 inch profile height and chromate conversion coated in accordance with MIL-C-5541. The chromate conversion coated surface shall be powder epoxy coated in accordance with ASTM A 775.

3.26.3 Non-exposed steel alloy surfaces. Non-exposed steel alloy surfaces shall be ceramic-metallic coated in accordance with MIL-C-81751. Interior surfaces of exposed steel surfaces, such as interior of a housing, shall be coated in the same manner as the exterior surface in accordance with DOD-STD-2138.

3.26.4 Non-exposed aluminum alloy surface. Non-exposed aluminum alloy surfaces shall be anodized and sealed in accordance with MIL-A-8625. If the surface is the interior side of an exposed surface, the exposed surface coating system shall be used on both exposed and non-exposed surfaces in accordance with ASTM A 775.

3.26.5 Dissimilar metal interfaces. Where it is necessary to use two dissimilar metal surfaces, the surfaces shall be protected with not less than 0.008 inch of vinyl tape in accordance with MIL-I-24391 and polysulfide sealant in accordance with MIL-S-81733. Paint coatings are not considered adequate as a dielectric barrier between dissimilar metal surfaces.

3.26.6 Bearing surfaces. Sliding, rotating, and bearing surfaces which are required to be left uncoated because of machined tolerances shall not be dissimilar metals and shall have provision for drainage and lubrication.

3.26.7 Fasteners. Fasteners (nuts, bolts, washers, clips, hinges, and so forth) shall be ceramic-metallic coated steel alloy in accordance with MIL-C-81751. Alternatively, fasteners may be manufactured from corrosion resistant steel 316 or 316L. Fasteners shall be installed using polysulfide sealant in accordance with MIL-S-81733, unless frequent removal is required. Fasteners which will frequently be removed for maintenance shall be installed using antiseize thread compound, in accordance with MIL-T-22361.

3.26.8 Topcoats. Final color topcoats applied to exposed surfaces shall be in accordance with TT-E-490, haze grey, and shall be applied as a final color topcoat to all uncoated exposed surfaces or surfaces of a dissimilar color.

3.27 Availability, reliability and maintainability. The minimum acceptable inherent availability ( $A_i$ ) of the hoist shall be 0.90. This requirement establishes threshold values for reliability, maintainability and supportability of the hoist. Reliability and maintainability terms shall be in accordance with MIL-STD-721.

3.27.1 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 ships operation without hoist failure.

3.27.1.1 Reliability program plan. When specified in the contract or order, a reliability program plan shall be prepared (see 6.2.2).

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3.27.1.2 Failure mode and effects analysis (FMEA) report. When specified in the contract or order, a FMEA shall be prepared (see 6.2.2).

3.27.1.3 Reliability prediction report. When specified in the contract or order, a reliability prediction report shall be prepared (see 6.2.2).

3.27.1.4 Reliability status report. When specified in the contract or order, a reliability status report shall be prepared (see 6.2.2).

3.27.2 Maintainability. Routine corrective maintenance at the organizational level shall be accomplished by replacing complete assemblies and sub-assemblies. Mean time to repair (MTTR) for the hoist shall be 4 hours. At least 95 percent of all corrective maintenance actions shall require not more than 10 hours to complete.

3.27.2.1 Maintainability program plan. When specified in the contract or order, a maintainability program plan shall be prepared (see 6.2.2).

3.27.2.2 Maintainability prediction report. When specified in the contract or order, a maintainability prediction report shall be prepared (see 6.2.2).

3.27.2.3 Maintainability status report. When specified in the contract or order, a maintainability status report shall be prepared (see 6.2.2).

3.28 Weight. Weight of hoist shall be kept to a minimum. At delivery, the net weight and also the operating weight with fluids, where applicable, shall be indicated.

3.29 Workmanship. The hoist shall withstand any operation specified herein without permanent deformation, breakage, malfunction or component interference caused by improper workmanship. Parts of the hoist, before and after painting, shall be clean and free of sand, rust, dirt, fins, pits, sprues, scales and other harmful extraneous material. Edges and surfaces exposed to operating and maintenance personnel shall be smooth and rounded so that a hazardous surface does not exist. Bolted connections shall use standard bolts and nuts, self-locking nuts are acceptable. 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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of 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).

4.3 First article inspection. First article inspection shall consist of the examination and tests specified in 4.5 and 4.6. 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 6.2.1), one other first article model shall be tested in accordance with MIL-S-901 (see 3.7.2). When specified in the contract or order, first article inspection and test reports shall be prepared (see 6.2.2).

4.4 Quality conformance inspection. Quality conformance inspection shall be performed on samples selected in accordance with 4.4.2 and 4.4.3. This inspection shall include the examination of 4.5 and the tests of 4.6.

4.4.1 Inspection lot. Units of the same size, type, and class offered to the Government at one time shall be considered a lot for purposes of inspection. The sample unit shall be one complete hoist unit.

4.4.2 Sampling for visual examination. A random sample of hoist units shall be selected from each lot offered to the Government in accordance with MIL-STD-105, at inspection level II. In terms of defects per 100 units, the acceptable quality level (AQL) shall be 2.5 for major defects and 4.0 for minor defects.

4.4.3 Sampling for tests. A random sample of hoist units shall be selected from each lot offered to the Government in accordance with MIL-STD-105, at inspection level S-4.

4.5 Visual examination. Sample hoists shall be visually examined in accordance with table I.



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TABLE I. Classification of visual defects.

Category	Defect
Major	
101	Hoist clearance, underside of track to inside of load hook, not as specified (see 3.4).
102	Gear casing does not protect against dirt, dust and water spray or permit ready access (see 3.6).
103	Chain links not uniform size (see 3.10).
104	Hoist lift range not as specified (see 3.4.1, 3.4.2 and 3.4.3).
105	Load chain not securely attached to hoist or not easily removed as specified (see 3.10).
106	Hoist hooks not equipped with safety guard, or safety guard not as specified (see 3.12.1).
107	Load chain reel or basket does not store full length of chain (see 3.10.2).
108	Chain reel does not maintain tension on chain as specified (see 3.10.2).
109	Pendant unit not marked or supported as specified (see 3.17).
110	Hoist components damaged or missing.
Minor	
201	Hoist weight not as specified (see 3.4).
202	Hoist length and width dimensions not as specified (see 3.4).
203	Chain guides do not completely enclose the chain as specified (see 3.10.4).
204	Trolley wheels mounting arrangement not as specified (see 3.15).
205	Lubrication fittings missing or damaged (see 3.25).
206	Air supply line not connected to hoist as specified (see 3.20).
207	Shackle not present, if specified (see 3.12.2).
208	Lubrication of moving parts inadequate (see 3.25).
209	Coating not as specified (see 3.26).
210	Hoist identification plate missing or inadequately attached (see 3.24.1).

4.6 Tests.

4.6.1 High impact shock tests. If specified (see 6.2.1), high impact shock tests shall be conducted in accordance with MIL-S-901, grade A, and 3.7.2. Testing shall be conducted on one complete unloaded hoist. When specified in the contract or order, a test report shall be prepared (see 6.2.2). Hoists shall be marked to indicate that they are or are not high impact shock qualified. Where an identical hoist conforming to the requirements of this specification has been successfully shock tested in accordance with 3.7.2, the test report may be submitted to the contracting activity as fulfillment of the shock test requirements.

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4.6.2 Mechanical vibration. Hoist shall be tested in accordance with MIL-STD-167-1, type I. When specified in the contract or order, a test report shall be prepared (see 6.2.2).

4.6.3 Operating and load tests. Tests specified in 4.6.3.1 through 4.6.3.8 shall be conducted, during which the hoists shall operate smoothly without jerks, jars or excessive vibration. In no case shall a load hook slip during operation or from a stopped position.

4.6.3.1 Static overload test. With the hoist mounted on a section of rail, a test load of two times the rated load shall be suspended from the load hook for a period of 10 minutes. There shall be no permanent deformation of any portion of the hoist frame, load support or evidence of chain failure. The hoist shall not be deformed or otherwise affected in any way causing degradation of any operating function as a result of this test. At the end of the test period, the load shall be slowly swiveled 360 degrees at least twice in each direction, alternately, without any binding or malfunction.

4.6.3.2 Dynamic overload test. With the hoist mounted on a section of rail, a test load of 1-1/2 times the rated load shall be lifted and lowered through the full hoisting range at least four times in each direction with the hoist alternately tilted on a 10-degree incline to either side of the rail at maximum speed or highest speed capable (if less than maximum rated speed). The load shall be stopped twice during each lowering cycle, once at mid-point and once near the lower limit. There shall be no binding of the drive or jamming of the load chain in the guides, and no degradation of any operating function specified herein, except that maximum speed requirements shall not apply.

4.6.3.3 Hoisting controls sensitivity test. At maximum rated load, the load hook shall be moved vertically to within 1/8 inch of a desired position. From this position, the load hook shall be moved approximately 1/2 inch up and stopped. The load hook shall be returned to within 1/8 inch of the original desired position. The load hook shall then be moved approximately 1/2 inch down, stopped, and then returned to within 1/8 inch of the original position. The load hook shall then be moved horizontally to within 1/4 inch of a desired position. From this position, the load hook shall be traversed approximately 1 inch and stopped. The load hook shall then be returned to within 1/4 inch of the desired position. The load hook shall then be traversed approximately 1 inch in the opposite direction, stopped, and then returned to within 1/4 inch of the original position. Repeat the above at least three times to demonstrate repetitive locating capability within these limits.

4.6.3.4 Traversing brake test. Traversing brakes shall be tested by subjecting the stopped hoist to a 1,560-pound pull which shall be exerted in each direction parallel to the trolley rail. Brakes shall keep the loaded hoist stationary on straight rails with the load applied in each direction alternately. The hoist shall then be traversed in both directions on straight sections of rail with rated load suspended from the hook. During this traversing, the hoist shall safely be stopped from maximum speed at least five times, with no evidence of sliding. Satisfactory operation of the brakes shall be determined for either 6-inch or 8-inch "I" beam rails. Hoist shall traverse at rated speed with rated load suspended from the hook.

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4.6.3.5 Inclined hoist test. The load hook carrying rated load shall be raised and lowered with the hoist alternately on plus or minus 10 degrees incline parallel to the rail and with the hoist tilted 10 degrees to either side of the rail. There shall be no traverse movement along the rail, no binding of the drive or jamming of the load chain in the guides and no degradation of any operating function specified herein. After this test, the hoist shall be operated on a horizontal track without evidence of binding or inability to perform the required functions. With the hoist mounted on a 15-degree incline rail, a rated load shall be suspended from the load hook for a period of 2 minutes without any hoist movement along the rail. Hoist shall be traversed at reduced speed up 10-degree incline with rated load suspended from the load hook through the full lift range.

4.6.3.6 Load hook range test. The hoist shall lift a rated load, placed in such a geometric configuration that the angle of load chain to load chain sprocket would be the same angle resulting from picking up a load in a radius of 19 inches of a horizontal plane at 7 feet below the trolley track. The load shall be lifted at least four times with the load being placed, for each lift, in progressive 90-degree positions of a projected plane described above. In each case, the hoist shall successfully pick up the load, without jamming, binding or fouling of the load chain or any component of the drive assembly.

4.6.3.7 Manual operation test. With the loaded hoist set up for manual operation, the load hook shall be raised and lowered the entire hook range. During manual operation, it shall be demonstrated that the operator can safely control the load speed at all times. It shall also be demonstrated that operating personnel will not be endangered if power is suddenly restored during manual operation. When only a manual brake release is specified (see 6.2.1), operation of lowering shall be demonstrated without air supply.

4.6.3.8 Cycling tests. With the hoist installed on a suitable rail, the hoist shall be operated through 50 continuous operating cycles. During the test, the hoist shall lift and traverse maximum rated load. Load shall be accelerated to the maximum rated speed specified in 3.4.1, 3.4.2 and 3.4.3. A cycle shall consist of raising the load for a 10-second period, stopping, and traversing for a 10-second period; stopping and retraversing for a 10-second period; stopping and finally lowering for a 10-second period to return to the original starting point, followed by a 40-second rest period, after which the test shall be repeated. During each 10-second operating period, the load shall be smoothly accelerated from the stopped position to maximum speed and back to the stopped position.

4.6.4 Airborne noise test. Airborne noise tests shall be in accordance with MIL-STD-740-1 and shall not exceed the octave band sound pressure levels specified in table II. Measurements shall be made in octave band sound pressure levels. When specified in the contract or order, a report shall be prepared (see 6.2.2). In the event that measured noise levels in any one octave band exceed the noise levels specified in table II, the following shall be accomplished.

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- (a) Perform diagnostic narrow band noise measurements at the location and in the direction any one octave band exceeds the specified noise acceptance levels. Narrow band measurements shall be made using instruments equivalent to those specified in MIL-STD-740-1.
- (b) When specified in the contract or order, a shop noise test report shall be prepared (see 6.2.2).

TABLE II. Airborne noise acceptance level for ship equipment and machinery.

Airborne noise grade D	Octave band center frequency, Hz								
	32	63	125	250	500	1000	2000	4000	8000
	91	88	85	82	79	76	73	70	67

Decibels re: 20 micropascals ( $\mu\text{Pa}$ ) (see NOTE)

NOTE: 20  $\mu\text{Pa}$  = 0.0002 dyne per square centimeter ( $\text{dyne}/\text{cm}^2$ ).

4.6.5 Life test. If specified (see 6.2.1), one first article sample hoist (see 4.3), shall be run through 500 consecutive cycles (see 4.6.3.8), free of malfunction. Operation time, cycle counts, description of preventive maintenance action and description of malfunctions and resulting repair actions shall be logged. When specified in the contract or order, test reports shall be prepared (see 6.2.2).

4.7 Inspection of packaging. Sample packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment 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.)

5.1 Preservation-packaging, packing and marking. The equipment and accessories shall be preserved-packaged level A or C, packed level A, B or C as specified (see 6.2.1), and marked in accordance with MIL-M-3184, and as specified herein.

5.2 Cushioning and wrapping materials. Use of excelsior, newspaper, shredded paper (all types, including wax paper) and similar hygroscopic or non-neutral materials and all types of loose-fill materials for applications such as cushioning, filler, stuffing and dunnage for materials destined for shipboard stowage and use is prohibited, except that vermiculite is approved for packaging applications of liquid (chemical, petroleum, and so forth)

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products. Cushioning and wrapping materials selected shall incorporate properties and characteristics for resistance to fire. Examples are as follows:

- UU-P-268 - Paper, kraft wrapping, type II, grade C or D.
- PPP-C-850 - Polystyrene, expanded, grade SE, type I or II only.
- PPP-C-1120 - Bound fiber, uncompressed type III or IV, class C.
- MIL-R-6130 - Cellular rubber, grade A.
- MIL-R-20092 - Cellular rubber, class 1 or 4.
- MIL-P-26514 - Polyurethane foam (rigid or flexible).

5.3 Asbestos and asbestiform materials. Items containing asbestos and asbestiform-like materials shall be packaged individually, in sets or quantity as required (see 6.2.1) for use in a sealed impermeable container. Flexible containers shall be heat-sealed; rigid containers shall be enclosed in a flexible container and heat-sealed. All containers, interior and exterior, in addition to the markings required in accordance with the Occupational Safety and Health Administration (OSHA) Rules and Regulations, shall be marked as follows:

"CAUTION  
CONTAINS ASBESTOS FIBERS  
AVOID CREATING DUST  
BREATHING ASBESTOS DUST MAY CAUSE  
SERIOUS BODILY HARM".

5.3.1 Talc and talcum. Talc and talcum used in the packaging process of items shall be free of asbestos and asbestiform-like materials.

## 6. NOTES

6.1 Intended use. The pneumatic trolley type chain hoists with traverse drive covered by this specification are intended for use in areas with low headroom and load eccentricity.

### 6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number and date of this specification.
- (b) Type required (see 1.2).
- (c) When first article is required (see 3.1).
- (d) Length of lift (range) required (see 3.4.1, 3.4.2, 3.4.3, 3.17).
- (e) If nuclear lifting is to be performed with the hoist (see 3.6).
- (f) If construction for high impact shock is required (see 3.7.2, 4.3, 4.6.1.1).
- (g) When chain other than 1-inch pitch is required (3.9.2).
- (h) Whether chain reel or chain, bags or baskets are required (see 3.10.2).
- (i) If shackle is required (see 3.12.2).
- (j) If only manual brake release is required (see 3.18 and 4.6.3.7).
- (k) When reliability program plan is required (see 3.27.1.1).
- (l) When failure mode and effects analysis is required (see 3.27.1.2).

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- (m) When reliability prediction report is required (see 3.27.1.3).
- (n) When reliability status report is required (see 3.27.1.4).
- (o) When maintainability program plan is required (see 3.27.2.1).
- (p) When maintainability prediction report is required (see 3.27.2.2).
- (q) When maintainability status report is required (see 3.27.2.3).
- (r) If one other first article model is required (see 4.3).
- (s) If high impact shock tests are required (see 4.6.1).
- (t) If life test is required (see 4.6.5).
- (u) Levels of preservation-packaging and packing required (see 5.1).
- (v) Sets or quantity required of items containing asbestos and asbestiform-like materials (see 5.3).

6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD FAR Supplement, Part 27, Sub-Part 27.410-6 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraphs.

<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
3.3.2 and 3.3.7	System safety program plan	DI-SAFT-80100	Applicable Naval activity report
3.3.3 and 3.3.4	System safety hazard analysis report	DI-SAFT-80101	
3.3.5	Safety assessment report	DI-SAFT-80102	
3.27.1.1	Reliability program plan	DI-R-7079	
3.27.1.2	Failure mode, effects, and criticality analysis report	DI-R-7085	
3.27.1.3	Reliability predictions report	DI-R-7082	
3.27.1.4	Reliability status report	DI-R-7080	
	Report, reliability and maintainability data	UDI-R-23096	
	Report, reliability and maintainability test plan	UDI-R-21135	
	Report, reliability and maintainability program	UDI-R-21131	
3.27.2.1	Maintainability program plan	DI-R-7103	
3.27.2.2	Maintainability pre- dictions report	DI-R-7108	
3.27.2.3	Maintainability status report	DI-R-7104	



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<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
4.3	First article inspection report	DI-T-4902	
4.3	Report, first article test	UDI-T-23790	
4.6.1	Reports, equipment shock test	UDI-T-23753	
4.6.2	Report, vibration testing	UDI-T-23762	
4.6.4	Report, component shop noise tests	UDI-T-23764	
4.6.4(b)	Summary, shop noise test results	UDI-T-23760	
4.6.5	Reports, test	DI-T-2072	

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010.12-L., ANSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 Technical manuals. The requirement for technical manuals should be considered when this specification is cited on a contract. If technical manuals are required, a contract exhibit must be prepared to fully describe statement of work criteria and delivery instructions, and cite the applicable technical manual specification. The technical manuals must be acquired by separate Contract Line Item Number (CLIN) in the contract.

6.4 First article. When a first article inspection is required, the item should be a first article sample. The first article should consist of one unit. The contracting officer should 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.

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6.5 Non-specification materials. If metals or structural materials, other than those listed in 3.2.1 are used in a manufacturing run, the following documentation should be supplied to the contracting activity and noted in parts lists and drawings:

- (a) Part name.
- (b) Part number.
- (c) Hoist serial number.
- (d) Hoist model number.
- (e) Material used.
- (f) Physical characteristics.
- (g) Heat treatment.
- (h) Precautions applicable to failure modes.
- (i) Applicable maintenance requirements.

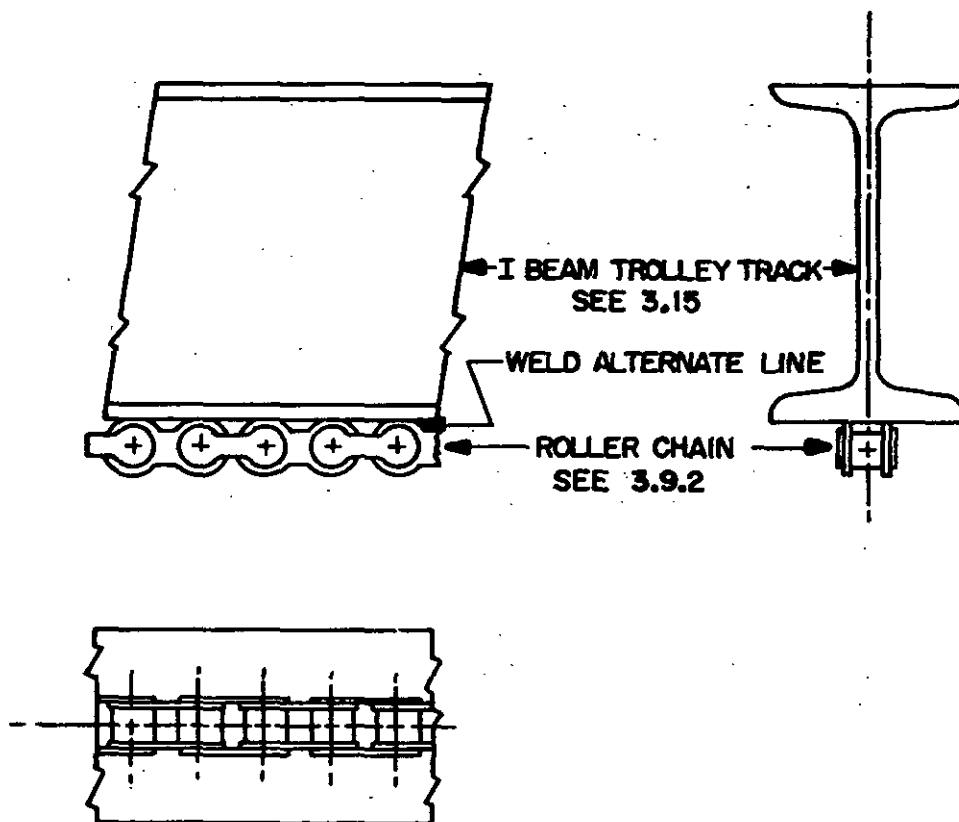
6.6 Subject term (key word) listing.

Airborne noise  
Load hook  
Pendant unit  
Reliability and maintainability  
Shackle  
Shuttle valve

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

Preparing activity:  
Navy - SH  
(Project 3950-N248)

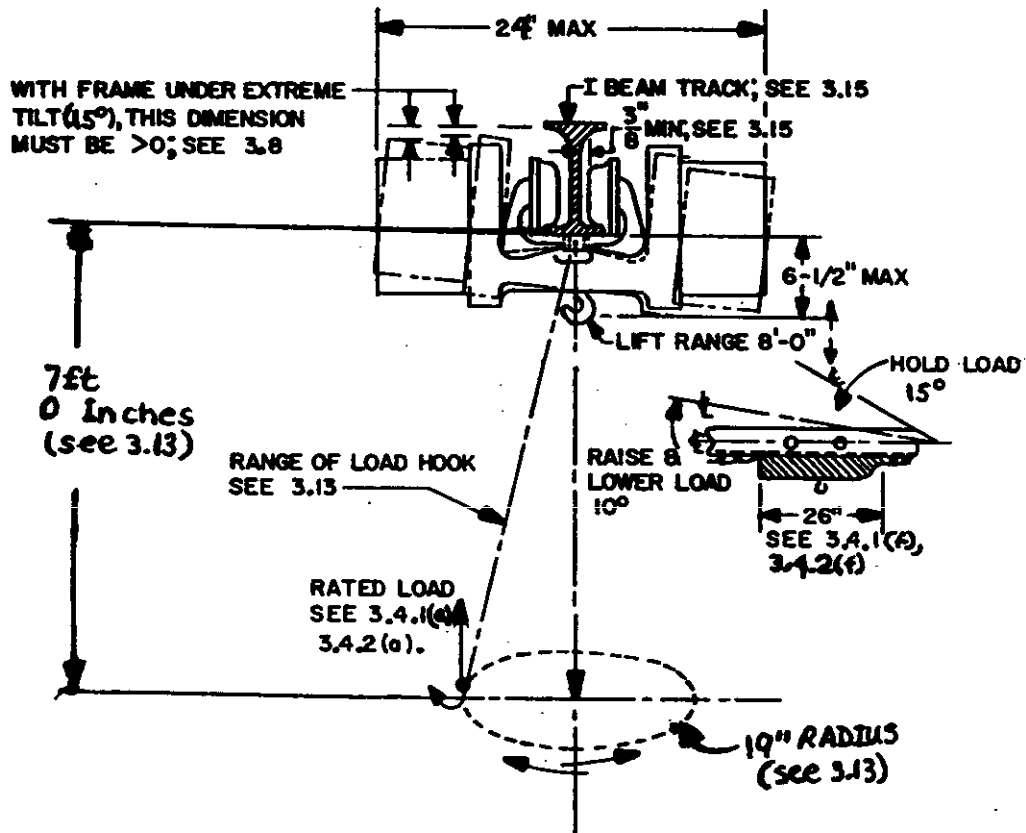
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FIGURE 1. Sketch of trolley track.

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FIGURE 2. General requirements for type I and type II hoist.

