

MIL-M-82021B(YD)
 29 December 1984
 SUPERSEDING
 MIL-M-82021A(YD)
 5 November 1974

MILITARY SPECIFICATION

MONORAIL TRACK BEAM SYSTEMS FOR TROLLEY SUSPENDED HOISTS

This specification is approved for use by the Naval Facilities Engineering 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 overhead monorail track beam systems for use with trolley suspended hoist(s) of 1/2 through 10-ton capacity.

* 1.2 Classification. The monorail track beam system shall be one of the following forms, as specified (see 6.2.1).

Form I - For use with electric powered hoists.

Form II - For use with air powered hoists.

Form III - For use with manual powered hoists.

2. APPLICABLE DOCUMENTS

* 2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified (see 6.2.1), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DODISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-S-781 - Strapping, Steel, and Seals.

PPP-B-601 - Boxes, Wood, Cleated-Plywood.

PPP-B-621 - Boxes, Wood, Nailed and Locked-Corner.

PPP-B-636 - Boxes, Shipping, Fiberboard.

PPP-T-60 - Tape: Packaging, Waterproof.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer (Code 156), Naval Construction Battalion Center, Port Hueneme, CA 93043, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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- MIL-P-116 - Preservation, Methods of.
- MIL-V-173 - Varnish, Moisture- and Fungus-Resistant (for treatment of Communications, Electronic, and Associated Equipment).
- MIL-C-3774 - Crates, Wood; Open, 12,000 - and 16,000 Pound Capacity.
- MIL-C-5501 - Cap and Plug, Protective, Dust and Moisture Seal.
- MIL-T-22085 - Tapes, Adhesive, Preservation and Sealing.
- MIL-B-26195 - Boxes, Wood-Cleated, Skidded, Load-Bearing Base.

STANDARDS

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- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking, and Waterproofing; with Appropriate Test Methods.

(Copies of specifications, drawings, and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

* 2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as Department of Defense (DoD) adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

Specifications for Design, Fabrication and Erection of Steel for Buildings of the American Institute of Steel Construction.

(Application for copies should be addressed to the American Institute of Steel Construction, 101 Park Avenue, New York, NY 10017)

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

MH 27.1 - Specifications for Underhung Cranes and Monorail Systems.

(Application for copies should be addressed to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018)

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

B30.11 - Safety code for Underhung Cranes and Monorail Systems.

(Application for copies should be addressed to the American Society of Mechanical Engineers, United Engineering Center, 345 East 47th Street, New York, NY 10017)

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NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

No.70 - National Electrical Code.

(Application for copies should be addressed to the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269)

SOCIETY OF AUTOMOTIVE ENGINEERS, INC. (SAE)

SAE Handbook.

(Application for copies should be addressed to the Society of Automotive Engineers, Inc., 400 Commonwealth Drive, Warrendale, PA 15096)

(Industry association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Description. The monorail track beam system consists of steel track beams, supports, bumper stops, track interlock mechanisms, fasteners, controls, and accessories as required to provide the complete layout indicated on the schematic arrangement drawing(s) (see 6.3).

* 3.2 Standard commercial product. The monorail track beam system shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product. Additional or better features which are not specifically prohibited by this specification but are a part of the manufacturer's commercial product, shall be included in the monorail track beam system being furnished. A standard commercial product is a product which has been sold or is currently being offered for sale on the commercial market through advertisements or manufacturer's catalogs, or brochures, and represents the latest production model.

3.3 Technical data. When specified (see 6.2.1 and 6.2.2), drawings and design data shall be submitted in accordance with the contract data requirements included in the contract.

3.3.1 Drawings submitted for approval. Before commencing fabrication, the contractor shall submit for approval the drawings specified in 3.3.2.1. No drawings will be considered for approval which in the opinion of the contracting officer are contingent upon other features for which the contractor has not submitted drawings for approval.

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3.3.2 Design evaluation. The design evaluation data shall provide all essential information needed to permit an evaluation of the proposed design. The data shall include, but not be limited to the following:

* 3.3.2.1 Arrangement drawings. The schematic arrangement drawings (see 6.3) shall show all main features of the system, including track layout, clearances, and maximum wheel loads (without impact) of hoist trolleys to be supported, track load concentration when two or more trolley suspended hoists are used, air distribution system, electrical conductor layout, and connections with the electrical power source, as applicable.

* 3.3.2.2 Design calculations. When specified (see 6.2.1), the design calculations shall include material designations, calculations, design loads, stresses, design factors, and deflections as applicable for track beams, switches, live load concentration points, electrification, and supports as applicable.

3.3.2.3 Electrical drawings. Schematic and complete wiring diagrams shall be furnished, identifying all electrical equipment including manufacturer's name, model number, wire types and sizes, as applicable.

3.3.3 Installation drawings. When specified (see 6.2.1 and 6.2.2), installation drawings shall be provided. The drawings shall contain all the information necessary for installation of the monorail track beam system.

3.3.4 Technical manuals. When specified (see 6.2.1 and 6.2.2), complete operating and maintenance instructions and parts list shall be provided with each monorail track beam system.

* 3.4 Materials. Materials shall be as specified herein and in applicable specifications and standards, and other referenced documents. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification. Materials shall be free from defects which adversely affect performance or serviceability of the finished product.

* 3.5 Design and construction. The design and construction of the monorail track beam system shall be in accordance with ANSI MH 27.1 and as specified herein.

3.5.1 Capacity. The capacity of the monorail system shall be not less than the maximum loading condition on the track beam caused by fully loaded hoist(s), as indicated on the schematic arrangement drawing(s).

* 3.5.2 Wind load. Unless otherwise specified (see 6.2.1), wind load for outdoor systems shall be considered to be 20 pounds per square foot on fully exposed surfaces.

* 3.5.3 Switches. The bottom flanges of all switches shall match the track beams in size, shape, and hardness. Switches shall be of the sliding, rotary,

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or crossover type. Tongue type switches are not permitted. Control shall be by means of pull chains or ropes, or by means of electric, pneumatic or hydraulic operated devices, as specified (see 6.2.1).

* 3.5.4 Track beam. Track beams shall be specially rolled or fabricated sections and shall be considered as simple beams in determining capacity.

3.5.4.1 Track beam suspension. Unless otherwise specified (see 6.2.1), suspension shall be of the flexible or rigid type at the manufacturer's option. When specified (see 6.2.1), suspension shall be as specified and as otherwise indicated on the schematic arrangement drawing(s).

* 3.5.4.2 Track deflection. Track shall be designed to limit deflection to not more than $1/450$ of the span for spans of 46 foot -0 inch (14 meters (m)) or less. The deflection ratio for spans in excess of 46 foot -0 inch (14m) shall be reduced so that the actual deflection does not exceed 1-1/4 inch (32 millimeters (mm)). Impact need not be included in calculating deflections. On spans of 16 foot -0 inch (4.9m) the ratio of span to top flange width shall not exceed 60 to 1.

* 3.5.4.3 Couplings. Web type or other suitable couplings shall be provided at all track joints. The maximum gap between ends of the load carrying flange shall not exceed 1/16 inch (2mm).

* 3.5.4.4 Suspension fittings. All necessary clamps, hanger rods, and other fittings from which a track is suspended shall be considered as part of the monorail track system. Track hangers shall support the load resulting from the maximum loading condition. The allowable stress for hanger rods shall be determined from the root area of the rod. In the design of hanger rods, the allowable stress shall not exceed 20 percent of the ultimate strength of the material used.

* 3.5.4.5 Vertical adjustment. Means shall be provided to allow for the vertical adjustment of the track both before and after the system has been put into operation so that track can be erected and maintained level.

* 3.5.4.6 Track bracing. Where the track is suspended from hanger rods, lock nuts or other means shall be provided to prevent the nuts from backing off the rods. The track shall be braced laterally and longitudinally to prevent excessive sway. Where multiple rods are used at a suspension point, consideration shall be given to the unequal load induced in the rods.

* 3.5.5 Track switches. Track switches shall maintain alignment of the incoming tracks and switch tracks and with a maximum gap of 3/16 inch (5mm) between adjacent ends of the load carrying flanges. Switches may be operated by pull chains or ropes or by electric, pneumatic or hydraulic operated devices. Guards shall also be provided to prevent a carrier (or trolley) on the moveable track from running off the moveable track when it is not engaged with the incoming track. Means shall be provided to hold the moveable frame during passage of carriers (or trolleys) through the track switch.

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* 3.5.6 Stops. Stops shall be provided at the ends of the carrier and crane travel and as an integral part of the switch to protect the end of an incoming track when the switch track is set against the incoming track and shall resist the impact forces of a fully loaded carrier travelling at a normal walking speed or at 50 percent of the rated full load speed if the carrier is motor propelled.

* 3.5.7 Flange hardness. The minimum hardness of the lower load carrying (tension) flange shall be 195 Brinell.

* 3.5.8 Allowable stress. The allowable stress in the lower load carrying (tension) flange shall be 20 percent of the yield strength of the material used. All structural members and connections shall be designed so that the stresses do not exceed 20 percent of the yield strength of the material used.

* 3.5.8.1 Track capacity computation. In determining the capacity of the track, the load on the load carrying (tension) flange shall be assumed to be at the point central with the wheel tread. Allowable wheel loads shall take into account the stress imposed on the lower load carrying flange when a carrier (trolley) transfers from one track to another. Where track sections are diagonally cut at transfers, the wheel loads shall be limited by the stress imposed on the lower load carrying flange.

* 3.5.8.2 Compression flange stress. The allowable stress in the compression flange shall be determined by the following formula:

$$F = \frac{12 \times 10^6}{ld/A_f}$$

F shall not exceed 0.6 times the yield strength of the material used.

l = Span between track supports in inches (mm) or twice the length of a cantilever not fully stayed at its outer end.

d = Depth of track in inches (mm).

A_f = Area of compression flange in square inches (square millimeters).

This formula is applicable when the compression flange is solid and approximately rectangular in cross-section and its area is not less than that of the tension flange. For other conditions, refer to AISC specifications. The computed stress shall not be greater than 0.6 of the yield strength of the material used.

3.6 Form I - electric systems. Form I systems shall be provided with complete electrification. Leads from control housing(s) to runway or track beam contact conductors, motor controlled switches, limit switches, and fixed control station(s) shall be enclosed in rigid or flexible weather-proof metal conduit. Voltage, frequency, and phase shall be as specified (see 6.2.1). The design for wiring, insulation, allowable voltage drop, contact conductors, control, overcurrent protection, and grounding shall be in accordance with

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NFPA No. 70, as applicable. Power and control voltages shall be in accordance with ANSI MH 27.1. Limit switches shall be provided as necessary to prevent wrong way trolley approach at track beam switches, and to prevent movement of interlocking track beams at transfer points during trolley transition. When specified (see 6.2.1), limit switches shall be provided at dead ends and intermediate stopping points as indicated on the schematic arrangement drawing(s).

3.6.1 Fixed control station(s). When specified (see 6.2.1), fixed control station(s) shall be located to provide an unobstructed view of all hoist(s) motions. The fixed station controls shall not override pendant control stations where used in combination, except for emergency stop and restart.

* 3.6.2 Runway contact conductors. Runway contact conductors shall be the manufacturer's standard product of the semi-enclosed type. Conductors shall be covered with an appropriate dielectric insulation (including end and joint covers) so shaped as to prevent accidental contact with the conductor. When specified (see 6.2.1), the conductor shall be of a special cross section compatible with an existing system to be extended, or as detailed on the schematic arrangement drawing(s).

3.7 Form II = air powered systems. When specified (see 6.2.1), form II systems shall be provided with a compressed air distribution system designed to supply air at not less than 100 pounds per square inch, to all air powered hoist(s) and trolley(s), as shown on the schematic arrangement drawing(s), when all hoists are located at the most remote point(s) from the air supply connection. The air supply connection shall have a shutoff valve, and a filter and air dryer, with ample capacity for the demand rate of air flow when all hoists are in simultaneous maximum load operation. The hose distribution system shall be reel, wheeled carrier, or supported coil type, or as otherwise indicated on the schematic arrangement drawing(s). Air hose sag shall be kept to a minimum. At no time however, shall the sag cause interference with the load being handled, fixed and portable equipment in the area, or personnel.

3.8 Trolley suspended hoist(s). When specified (see 6.2.1), the system shall be provided with trolley suspended hoist(s) of the type(s), capacities, and operating characteristics specified, and as otherwise indicated on the schematic arrangement drawing(s).

* 3.9 Treatment and painting. Unless otherwise specified (see 6.2.1), the monorail track beam system shall be treated and painted in accordance with the manufacturer's standard practice. All surfaces of the monorail track beam system other than corrosion resisting steel shall be protected against corrosion and present a neat appearance.

* 3.10 Identification marking. Identification shall be permanently and legibly marked directly on the monorail track beam system or on a corrosion-resisting metal plate securely attached to the monorail track beam

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system at the source of manufacture. Identification shall include the manufacturer's model and serial number, name and trademark to be readily identifiable to the manufacturer.

* 3.11 Construction. The equipment shall be designed and constructed to facilitate field maintenance. All adjustments and replaceable accessories shall be readily accessible. Conditions which can be hazardous to personnel or deleterious to equipment shall not be permitted.

3.12 Dissimilar metals. Intimate contact which can be expected to cause galvanic corrosion shall be avoided. When such contact cannot be avoided, an interposing insulating material shall be provided to minimize the corrosive effect.

3.13 Fungus resistance. When specified (see 6.2.1), electrical components and circuit elements, including terminal and circuit connections, shall be coated with varnish conforming to MIL-V-173, except that:

- a. Components and elements inherently inert to fungi or in hermetically sealed enclosures need not be coated.
- b. Current-carrying contact surfaces, such as relay contact points, shall not be coated.

3.14 Field erection. When specified (see 6.2.1), the complete system shall be field erected, aligned, painted, adjusted, and connected to the power source ready for testing in accordance with 4.4.2.

3.15 Supervisory erector services. When specified (see 6.2.1), the monorail system contractor shall provide the services of a supervisor who shall be responsible for directing the unpacking and erection of the equipment. The supervisor shall also witness, and assist in performance of, quality assurance tests.

3.16 Steel fabrication. The steel used in fabrication shall be free from kinks, sharp bends, and other conditions which would be deleterious to the finished product. Manufacturing processes shall not reduce the strength of the steel to a value less than intended by the design. Manufacturing processing processes shall be done neatly and accurately. All bends shall be made by controlled means to insure uniformity of size and shape.

* 3.16.1 Bolted connections. Boltholes shall be accurately punched or drilled and shall have the burrs removed. Washers or lockwashers shall be provided in accordance with good commercial practice, and all bolts, nuts, and screws shall be tight.

* 3.16.2 Riveted connections. Rivet holes shall be accurately punched or drilled and shall have the burrs removed. Rivets shall be driven with pressure tools and shall completely fill the holes. Rivet heads, when not countersunk or flattened, shall be of approved shape and of uniform size for the same diameter rivet. Rivet heads shall be full, neatly made, concentric with the rivet holes, and in full contact with the surface of the member.

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* 3.16.3 Welding. Welding procedures shall be in accordance with a nationally recognized welding code. The surface of parts to be welded shall be free from rust, scale, paint, grease, or other foreign matter. Welds shall be of sufficient size and shape to resist the forces imposed at rated load. Welds shall transmit stress without permanent deformation or failure when the parts connected by the weld are subjected to proof or service loadings.

3.17 Castings. All castings shall be sound and free from patching, misplaced coring, warping, or any other defect which reduce the casting's ability to perform its intended function.

3.18 Lubrication. Unless otherwise specified (see 6.2.1), means for lubrication shall be in accordance with the manufacturer's standard practice. The lubricating points shall be easily visible and accessible. Hydraulic fittings shall be in accordance with SAE J534. Where use of high pressure lubricating equipment, 1000 pound-force per square inch or higher, will damage grease seals or other parts, a suitable warning shall be affixed to the equipment in a conspicuous location.

* 3.19 Workmanship. Workmanship shall be in accordance with the best standard practices of the monorail track beam industry. Monorail track beam system(s), when required in the contract as indicated on schematic arrangement drawing(s), shall be consistent with the location where installed, and acceptable to the contracting officer.

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 specified herein. Except as otherwise specified in the contract or purchase, 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.

* 4.1.1 Components and material inspection. Components and materials shall be inspected in accordance with all requirements specified herein and in applicable referenced documents.

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

- a. Quality conformance inspection (see 4.2.1).
- b. Packaging inspection (see 4.5).

* 4.2.1 Quality conformance inspection. The quality conformance inspection shall include the examination of 4.3 and the tests of 4.4.1 and 4.4.2.

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4.3 Examination. Each monorail system shall be examined for compliance with the requirements specified in section 3 of this specification. Any redesign or modification of the contractor's standard product to comply with specified requirements, or any necessary redesign or modification following failure to meet specified requirements shall receive particular attention for adequacy and suitability. This element of inspection shall encompass all visual examinations and dimensional measurements. Noncompliance with any specified requirements or presence of one or more defects preventing or lessening maximum efficiency shall constitute cause for rejection.

* 4.4 Tests. Each production unit shall receive the tests of 4.4.1 and 4.4.2, and 4.4.3, as applicable.

4.4.1 Shop tests. All track beams, conductor bars, structural supports, and associated items shall be precisely measured during fabrication to verify conformance to the preproduction design drawings specified in 3.3.1, and to insure proper fit when assembled. When furnished trolley suspended hoists and trolley(s) shall be functionally tested as applicable to their type and operating characteristics. Structural members shall be tested during fabrication to insure conformance to design requirements. Tests shall be performed in accordance with the manufacturer's commercial testing procedures.

4.4.2 Tests after erection. When the system is field erected (see 3.16), the system shall be tested in accordance with the test requirements and recommendations of ASME B30.11. The manufacturer's standard testing procedure may be followed provided it does not conflict with requirements and recommendations of ASME B30.11. The tests shall be performed under the direction of the contracting officer's representative.

* 4.5 Packaging inspection. The preservation, packing, and marking of the item shall be inspected to verify conformance to the requirements of section 5.

5. PACKAGING

* 5.1 Preservation. Preservation shall be level B or C as specified (see 6.2.1).

5.1.1 Level B.

* 5.1.1.1 Method of preservation. Cleaning processes, drying procedures, preservatives, and methods of preservation specified in the following paragraphs are listed in MIL-P-116 and shall conform to the requirements of MIL-P-116 and any applicable specifications.

* 5.1.1.2 Cleaning and drying. Prior to the application of preservative compounds or paint, surfaces shall be cleaned by process C-1 and dried by any applicable procedure of MIL-P-116.

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- * 5.1.1.3 Disassembly. Disassembly shall be the minimum necessary to protect parts subject to damage or loss, and to accomplish reduction in cube. Removed bolts, nuts, pins, screws, and washers shall be reinstalled in mating parts and secured to prevent their loss.
- * 5.1.1.4 Matchmarking. Parts removed and mating parts on the equipment and attachments shall be matchmarked to facilitate reassembly. Parts and accessories removed, and mating parts on the equipment, shall be identified with weatherproof tags attached to matching parts and locations. Markings shall be applied to the tags with waterproof material.
- * 5.1.1.5 Unfinished surfaces. Unfinished exterior metal surfaces shall be coated with type P-1 preservative.
- * 5.1.1.6 Electric motors and controls. All openings in electric motors and any openings in electric controls not detached from the monorail track beam system shall be sealed with tape conforming to MIL-T-22085, type II or PPP-T-60, type IV. Detached electrical controls shall be preserved in accordance with MIL-P-116.
- * 5.1.1.7 Enclosed gears. Enclosed gears shall be filled to the operating level with the approved lubricant required for operation. Gear mechanism shall be operated to insure coating of all interior surfaces with preservative. The gear housing shall be identified with a weatherproof tag to indicate, "This housing is filled to the operating level with lubricant required for operation. Do not drain until first required lubrication change." Markings shall be applied to the tags with a waterproof material. The tags shall be attached in a conspicuous location.
- * 5.1.1.8 Air motors. Interior surfaces of air motors shall be coated with type P-10 preservatives. The preservative shall be applied through the lubricating system, or by feeding the preservative into the inlet while operating the motor, until the preservative appears at the exhaust ports. Air inlets and outlets shall be closed with caps or plugs as applicable conforming to MIL-C-5501 or by sealing the ports with waterproof tape.
- * 5.1.1.9 Electrical components. Openings in sockets, coupling plugs, and switches shall be sealed with tape conforming to MIL-T-22085, type II or PPP-T-60, type IV.
- * 5.1.1.10 Technical publications. Technical publications for each monorail track beam system shall be preserved in accordance with MIL-P-116, IC-1 or IC-3.
- * 5.1.1.11 Consolidation. Small components and publications for each monorail track beam system shall be consolidated in containers conforming to PPP-B-636, class weather-resistant. Contents shall be cushioned, blocked, and braced to prevent movement in accordance with MIL-STD-1186.

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* 5.1.2 Level C. The monorail track beam system shall be preserved in accordance with the contractor's standard practice in a manner to prevent deterioration and damage. The equipment shall be lubricated for operational service as required in the operator's manual.

* 5.2 Packing. Packing shall be level B or C as specified (see 6.2.1).

5.2.1 Level B.

* 5.2.1.1 Bundled components. Structural frame members for one complete monorail track beam system suitable for bundling shall be bundled into secured lifts not to exceed 4,000 pounds. The components shall be nested, arranged, and the bundles secured girthwise with strapping in accordance with QQ-S-781, class 1, type I, finish B, or bolting in combination with suitable wood blocking or battens as required to form compact nonshifting bundles. A minimum of three (3) straps shall be provided - a center strap with two end straps. Strapping shall be spaced not to exceed 56 inches on center with intermediate straps provided depending upon the length of the lift. The center strap shall be spaced not to exceed one (1) inch from the center of the lift. The end straps shall be placed at the same distance (+1 inch) from either end of a lift and shall not be more than 18 inches from each end of the lift. End straps shall be at the same distance from the ends for all lifts of the same length. Intermediate straps shall be equally spaced for all lifts. Edge protectors of metal or pressed fiberboard shall be used where strapping bears on sharp metal edges. The strapping shall be stapled to any wood blocking or battens provided. The bundles shall have skids with a minimum clearance of 3 inches to provide handling by fork lift trucks.

* 5.2.1.2 Boxed or crated components. Disassembled components, components which are not structural frame members, and consolidation containers shall be packed in a box conforming to PPB-B-601, domestic type; PPP-B-621, Class 1; or, MIL-B-26195, type I, style and class optional, with plywood superstructure and rubbing strips. Small components exceeding the weight limitation of the boxes shall be packed in a crate conforming to MIL-C-3774, type I or type II, style A. Anchoring, cushioning, blocking, and bracing of the contents shall be in accordance with the applicable box or crate specification and MIL-STD-1186. In addition, for items packed in a crate, contents shall be waterproofed with a full shroud in accordance with the crate specification.

* 5.2.2 Level C. The monorail track beam system shall be prepared for shipment in a manner which will insure arrival at destination in a satisfactory condition. Preparation for delivery shall comply with applicable carrier rules and regulations.

* 5.3 Marking. Marking shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. Monorail track beam systems have extensive and varied uses in assembly lines, storage warehouses, loading zones, repair and maintenance shops where work areas cannot tolerate post or structural

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obstructions, and may have many specialized material handling applications. The track beam system may be extended over wide areas, both indoor and outdoor, and is not limited to one level of operation. Trolley suspended hoists of one or more duty classes may be used on the same monorail track beam system for applicable service (see 3.5.2).

* 6.2 Ordering data.

* 6.2.1 Acquisition Requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Form of monorail track beam system required as specified (see 1.2, 3.6, and 3.7).
- c. When specifications and standards shall be other than as specified (see 2.1.1).
- d. When drawings and design data are required (see 3.3).
- e. When design calculations are required (see 3.3.2.2).
- f. When installation drawings are required (see 3.3.3).
- g. When technical manuals are required (see 3.3.4).
- h. When wind loads for outdoor systems shall be other than as specified (see 3.5.2).
- i. Whether switch controls shall be operated by chains or ropes (see 3.5.3).
- j. When electric, pneumatic or hydraulic operated switches controlled by pendant or fixed operating stations are required (see 3.5.3).
- k. When track beam suspension shall be other than as specified (see 3.5.4.1).
- l. Voltage, frequency and phase of electric current required (see 3.6).
- m. When limit switches shall be provided at dead ends and intermediate points (see 3.6).
- n. When fixed control stations are required (see 3.6.1).
- o. Type of runway contact conductor required (see 3.6.2).
- p. When compressed air distribution system is required (see 3.7).
- q. When trolley suspended hoist(s) is (are) required (see 3.8).
- r. When the monorail system shall be treated and painted in accordance with other than the manufacturer's standard practices (see 3.9).
- s. When fungus proofing is required (see 3.13).
- t. When the system shall be erected by the contractor at the designated site (see 3.14).
- u. When the contractor supervisory erector services are required (see 3.15).
- v. When lubrication is to be other than as specified (see 3.18).
- w. Level of preservation and level of packing required (see 5.1 and 5.2).

* 6.2.2 Data requirements. When this specification is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirements List (CDRL), the data requirements will be developed as specified by an approved DD Form 1664, Data Item Description (DID) and delivered in accordance with the approved CDRL incorporated into the contract. When the provisions or

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paragraph 52.227-7031 of the Federal Acquisition Regulations 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 is cited in the following paragraphs:

<u>Paragraph No.</u>	<u>Data requirements title</u>	<u>Applicable DID No.</u>	<u>Option</u>
3.3	Drawings, Engineering and Associated Lists	DI-E-7031	
3.3.3	Engineering Drawings, Installation	DI-E-3148C	
3.3.4	Manuals, Technical, Modified Commercial	DI-M-24006E	

(DID's related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, Acquisition Management Systems and Data Requirements Control List. Copies of DID's 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)

6.3 Schematic arrangement drawing(s). In addition to the ordering data specified in 6.2, the procurement document should include schematic arrangement drawing(s) as necessary, and necessary design data, indicating complete requirements concerning, but not limited to, the following physical and functional characteristics, as required:

- a. Location and orientation of the building and the area in which the system will be installed, including dimensioned plans of the track beam layout, location and load limits of supports, and the clearance(s), elevation(s), slope(s), bumper stops, switches, transfer point(s), and curve radii of the track beam(s), and details of any existing construction to be extended.
- b. Gross capacity loads, speeds, frequency of travel of all hoist trolleys which will operate on the monorail track beam(s), and the maximum live load concentration points.
- c. Electrification and air supply details for form I and II systems, and the details of fixed control stations and track interlock controls.
- d. Capacities, ranges, service classes, and operating characteristics of electric and air motor powered hoists and trolleys, as required.

6.4 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and the relationship to the last previous issue.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-M-82021B(YD)	2. DOCUMENT TITLE MONORAIL TRACK BEAM SYSTEMS FOR TROLLEY SUSPENDED HOISTS		
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
5. PROBLEM AREAS			
a. Paragraph Number and Wording:			
b. Recommended Wording:			
c. Reason/Rationale for Recommendation:			
6. REMARKS			
7a. NAME OF SUBMITTER (Last, First, MI) - Optional		b. WORK TELEPHONE NUMBER (Include Area Code) - Optional	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	