

MIL-C-23218C(SH)
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SUPERSEDING
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(See 6.7)

MILITARY SPECIFICATION

CONVEYOR, VERTICAL, TRAY, 100-POUND PACKAGE TRAY CAPACITY

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 powered, tray type, vertical conveyors used for handling packages up to 100 pounds on board Naval ships.

1.2 Classification. Conveyors shall be of the following types, as specified (see 6.2.1):

Type I - Trunk (integral).

Class 100A - for maximum size package of 36 inches wide by 24 inches deep by 36 inches high.

Class 100B - for maximum size package of 24 inches wide by 20 inches deep by 30 inches high.

Type II - Frame.

Class 100C - for maximum size package of 24 inches wide by 20 inches deep by 30 inches high.

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.

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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.

SPECIFICATIONS

FEDERAL

- TT-C-490 - Cleaning Methods for Ferrous Surfaces and Pre-treatments for Organic Coatings.
- TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.
- TT-P-1757 - Primer Coating, Zinc Chromate, Low-Moisture-Sensitivity.
- 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.

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- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-C-2212 - Controllers, Electric Motor A.C. or D.C., and Associated Switching Devices.
- MIL-P-3184 - Packaging of Machinery: Deck and Vehicle Mounted with Associated Equipment and Repair Parts.
- MIL-R-6130 - Rubber, Cellular, Chemically Blown.
- MIL-M-7793 - Meter, Time Totalizing.
- MIL-M-7793/8 - Meter, Time Totalizing, Digital, 115 Volts, 60 or 400 Hz.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).
- MIL-C-15306 - Call-Signal Stations (Type IC/D)(Hand Crank Magneto and Call-Signal).
- MIL-T-15514 - Telephone Equipment, Sound Powered Handsets, Headset-Chest Sets, and Headset-Microphones, Types H-200/U, H-201/U, H-202/U, H-203/U, and H-204/U.
- MIL-B-16392 - Brakes, Magnet, Naval Shipboard.
- MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral-Horsepower, Shipboard Use.
- MIL-R-20092 - Rubber Sheets and Assembled and Molded Shapes, Cellular, Synthetic, Open Cell (Foamed Latex).

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- MIL-I-24137 - Iron Castings, Nodular Graphitic (Ductile Iron) and Nodular Graphitic (Corrosion Resisting, Austenitic, Low Magnetic Permeability) (for Shipboard Application).
- MIL-P-26514 - Polyurethane Foam, Rigid or Flexible, for Packaging.
- MIL-C-81751 - Coating, Metallic-Ceramic.

STANDARDS

FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.

MILITARY

- MIL-STD-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels in Ships of the United States Navy.
- MIL-STD-471 - Maintainability Verification/Demonstration/Evaluation.

2.1.2 Government drawings and publications. The following Government drawings and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues shall be those in effect on the date of the solicitation.

DRAWINGS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

- 803-5959243 - Variable Level Standard Vertical Package Conveyor Schematic Diagram.
- 803-5959244 - Variable Level Standard Vertical Package Conveyor Cabling Diagram and Physical Arrangement.
- 803-5959245 - Variable Level Standard Vertical Package Conveyor Maintenance Panel, Wiring/Assembly and Details.
- 803-5959246 - Variable Level Standard Vertical Package Conveyor Motor Controller Wiring Diagram.
- 803-5959247 - Variable Level Standard Vertical Package Conveyor Motor Controller Assembly and Details.
- 803-5959248 - Variable Level Standard Vertical Package Conveyor Wiring Tables.
- 805-1400066 - Doors, Watertight, Individually Dogged, 26" x 66".

PUBLICATIONS

NAVAL SEA SYSTEMS COMMAND (NAVSEA)

- SG-816-AQ-MMO-010 - Conveyor, Standard Vertical Package (SVPC) 100 Pound Capacity; Description, Operation and Maintenance.

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

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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 non-government documents which is current on the date of the solicitation.

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

B29.4 - Double Pitch Conveyor Roller Chain, Attachments, and Sprockets. (DoD adopted)

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

AMERICAN GEAR MANUFACTURER'S ASSOCIATION (AGMA)

Gear Handbooks, Vols. 420.08, 440.04 and 441.04.

(Application for copies should be addressed to the American Gear Manufacturer's Association, 1330 Massachusetts Avenue, NW, Washington, DC 20005.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

A 47 - Standard Specification for Ferritic Malleable Iron Castings. (DoD adopted)

A 668 - Standard Specification for Steel Forgings, Carbon and Alloy, for General Industrial Use. (DoD adopted)

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. (DoD adopted)

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

(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.

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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 6.3).

3.2 General.

3.2.1 Materials. Materials shall be free from any defects and imperfections that might affect the serviceability or appearance of the finished product. Materials shall be in conformance with the requirements specified herein. Materials not definitely specified herein shall be of a quality to meet the performance requirements specified herein. Where materials other than as covered by the material references are to be used, drawings shall show the complete chemical and physical properties of the material.

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

3.2.3 Cast iron. Cast iron shall not be used except where permitted by referenced specifications. The use of malleable cast iron is limited to ASTM A 47. Nodular graphitic iron castings conforming to MIL-I-24137 may be used for machinery equipment components.

3.2.4 Roller chains. Roller chains, their attachments, and all hardware shall be in accordance with ANSI B29.4.

3.2.5 Chain sprockets. Chain sprockets shall be in accordance with ANSI B29.4.

3.2.6 Component parts. Other component parts of the conveyor shall be lightweight material consistent with stress requirements.

3.2.7 Threaded parts. Keys, collars, caps, fasteners, and other such parts that may work loose shall be fastened securely. Threaded parts shall have threads in accordance with FED-STD-H28. Fasteners shall be of corrosion resistant material or zinc plated for corrosion-resistance in accordance with ASTM B 633 type III, class Fe/Zn 13 or ASTM B 695 class 12, or metallic-ceramic coated in accordance with type I, class 4 of MIL-C-81751.

3.2.8 Lubrication. Means for the lubrication of all metallic surfaces in sliding or rolling contact shall be provided. Lubrication fittings shall be accessible without the disassembly of any components. Cam tracks shall not require lubrication. One lubrication chart shall be provided for each conveyor. The chart shall be located at the conveyor top station, and mounted and secured as a visible reference for maintenance personnel. The chart shall show the

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equipment diagrammatically and shall contain instructions for its care and lubrication, including designation of lubricants (Navy symbol) and frequency of lubrication. The chart shall be of laminated plastic material or of aluminum as used in the metal photo process in accordance with type F or H of MIL-P-15024, and MIL-P-15024/5.

3.2.9 Bearings. Rotating parts shall be mounted on lifetime lubricated antifriction bearings. Bearings shall be selected as recommended by the manufacturer for load ratings greater than the maximum bearing loads applied under the most severe operating conditions specified herein. Bearing load ratings shall be certified by the bearing manufacturer (see 6.2.2). Self lubricating bearings shall be used wherever practicable.

3.2.10 Cam tracks. Cam tracks shall not be of the single side control design. The cam tracks shall serve as guides for the tray assembly guide arm rollers, shall be stainless steel and of the interrupted cam track design. Cam tracks shall provide positive guidance on both sides for tray travel with no binding of tray motion and shall provide a smooth transition of each tray as it travels from its horizontal (load carrying) position to its vertical (idle return) position. Vertical track sections shall be replaceable by bolting or other nonwelded means. Head and tail cam track assemblies shall have fixed (dead) center chain sprocket arrangement.

3.2.11 Carrier chain adjustment. Adjustment shall be provided for automatic or self-tensioning of the tray carrier chains. Manual adjustment shall allow for removal of the tail sprocket without parting the chain. Provision shall be made for disengagement of each section of the carrier chain between trays to permit repairs.

3.2.12 High-impact shock. The conveyor, in the unloaded and secured condition, shall be in accordance with grade B shock of MIL-S-901. Components requiring shock test shall be tested in accordance with the following (see 4.6.6):

- (a) Test specification - MIL-S-901.
- (b) Shockproofness required - grade B.
- (c) Equipment classification - deck-mounted.
- (d) Class of equipment - class I.
- (e) Class of test - medium weight test.
- (f) Type of test - type B.

3.2.13 Welded fabrication. Welds shall be fabricated in accordance with MIL-STD-278. The inspection of rotating machinery welds, class M machinery, shall be in accordance with MIL-STD-278. Materials, used in the fabrication of machinery components, shall be stress relieved in accordance with the conditions established by approved welding procedure qualification tests. The other welds shall be visually inspected for defects and are not required to meet the inspection requirements of MIL-STD-278.

3.2.14 Reliability. The mean-time-between-failure (MTBF) of the conveyor system shall be not less than 255 hours, with a confidence level of 80 percent.

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3.2.15 Maintainability. Conveyors shall be accessible for planned and corrective maintenance. Corrective maintenance requirements shall be accomplished by replacement of parts by ship's personnel. Corrective and planned maintenance tasks shall not exceed the following values:

- (a) Not more than one of 20 simulated planned maintenance tasks shall exceed 2 hours, and no planned maintenance task shall exceed 4 hours.
- (b) Not more than two of 20 corrective tasks shall exceed 5 hours and the MTTR shall not exceed 3 hours.

Maintainability tasks shall be performed in accordance with test method 10 of MIL-STD-471.

3.2.16 Conveyor length. Conveyors in excess of 45 feet total end to end length shall be fabricated in multiple sections. The conveyor vendor shall prepare written procedures and plans for assembling conveyor sections at the installation site (see 6.2.2).

~~3.2.17 Door block. A door-block device shall be provided at each load station equipped with a load-unload device (see 3.2.20) so that the door (see 3.16.3) will not close unless the load-unload device is in the stowed (vertical up) position.~~

3.2.18 Other features. A section of the top shield (guard) shall be hinged for access to the head sprockets for maintenance and repair. The conveyor shall have a rear shield or inner wall separating horizontal tray travel from vertical tray travel. The rear shield shall be strengthened to sustain loadings from packages being thrown against it. Strength and stiffening shall be equivalent to or better than a shield of 12-gauge sheet steel (manufacturer's standard gauge) with 1-1/4 by 1-1/4 inches by 3/16-inch angle stiffeners welded on the rear side, top, and bottom edges with both legs against the shield to form a peak.

3.2.19 Trays. Each tray shall be of a forked finger construction that passes through the alternate finger space of the load-unload device enabling packages to be picked up or discharged rapidly. The tray shall be guided in cam tracks at each side of the conveyor throughout the entire vertical travel, by guide arms equipped with rollers fastened to the sides of the tray. The trays shall rotate from the load (horizontal) position to a vertical position for the idle return portion of the tray operating cycle. The tray guide arms shall be supported by the tray connecting links which shall be connected to the tray carrier chains.

3.2.20 Load-unload devices. Each load station shall be equipped with load-unload devices. There shall be two basic types of load-unload devices: a transitional load-unload device located at the top conveyor level (see 3.2.20.1) and a multi-positional load-unload device (see 3.2.20.2) at all other load levels. Load-unload devices shall:

- (a) Interface with the carrier trays to permit a smooth flow of packages on and off the trays.
- (b) Be located approximately 28 to 34 inches above the load station deck level.

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- (c) Provide for attachment of a gravity conveyor (not part of the vertical package conveyor).

3.2.20.1 Loading platform. For the front loading station, the top conveyor level platform shall consist of a series of rollers fitted between two members which are fixed to the head frame. For "over-the-top" loading and unloading, a tilted type slide platform shall be provided by the contractor.

3.2.20.2 Multi-positional load-unload device. The multi-positional load-unload device at the load station designated shall assume the following positions:

- (a) Horizontal (for striking packages up).
- (b) Inclined (30 degrees - for self unloading of packages when striking packages down from an upper level).
- (c) Vertically up (for securing the load station prior to closing the watertight door).
- (d) Rotate outside the conveyor at an angle which does not interfere with positioning of the gravity conveyor (not part of the conveyor) for offloading packages "indexed" from a load station below (see 3.9.3).

3.2.20.3 The multi-positional load-unload devices shall be placed in position without personnel having to climb into the conveyor trunk and shall be as follows:

- (a) With the load-unload device in the horizontal position, a $1 + 1/4$ -inch gap shall be provided between the finger tips of the load-unload device and the carrier tray crossbar (see page 1 of figure 1).
- (b) Stow only in the vertical position (see 3.2.20.2) with a positive, manually operated locking mechanism which can operate from outside the trunk.
- (c) Have positional locking mechanisms which are integral parts of the load-unload mechanism and attaching structure, and shall not employ separable pins or other parts. The locking mechanism shall not require continuous operator actuation when being moved between positions but shall only require operator actuation to move out of an existing locked position to "set" the locking mechanism at a new position.
- (d) The horizontal or inclined positions (see 3.2.20.2) shall not be locked to swing out of the path of an upcoming load in the event that a package is inadvertently left on a carrier tray at a lower level.
- (e) The packages shall be placed on the horizontally positioned load-unload device in order to have the carrier trays pick up the load when running the conveyor in the up direction.
- (f) The carrier trays shall be self-unloaded when the load-unload device is in an inclined position (see 3.2.20.2) when running the conveyor in the down direction.

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- (g) When placed in the horizontal position, a gap shall be provided between the rear shield (see 3.2.19) and the load-unload device fingers of less than 6 inches. Clearance shall be provided to prevent any interference between the fingers and any other parts under all operating modes.
- (h) When placed in all but the vertically up position (for securing the load station prior to closing the watertight door), a door block shall be placed preventing closing the watertight door.
- (i) The interlock switch feature shall be specified (see 3.8.2).

3.3 Performance.

3.3.1 Capacity and speed. The conveyor's rated load shall be 100 pounds for each tray multiplied by the number of trays on one side of a completely assembled conveyor. The conveyors shall accommodate a test (or maximum size) package as specified (see 6.2.1 and table B of figures 1 and 2). Delivery rate shall be 12 trays per minute.

3.3.2 Ship motion.

3.3.2.1 Conveyor alignment. Design and installation of the trunk and conveyor shall result in a structure which shall maintain alignment and shall operate after the ship has been subjected to any of the following ship motion conditions:

- (a) Roll - 45 degrees to either side of the vertical for 6 seconds.
- (b) Pitch - 10 degrees up or down from the ship's normal horizontal plane for 4 seconds.
- (c) Heave acceleration - 0.5 gravity.
- (d) Surge acceleration - 0.3 gravity.

3.3.2.2 Minimum design factors. The following minimum design factors shall apply:

- (a) Vertical acceleration - 2.0 gravity.
- (b) Minimum port-starboard acceleration - 0.8 gravity.
- (c) Minimum forward-aft acceleration - 0.6 gravity.

3.3.2.3 Conveyor operation. The conveyor shall operate with rated load at rated speed under any combination of the following ship motion conditions:

- (a) Roll - from 15 degrees port to 15 degrees starboard and return in a full period of 9 seconds.
- (b) Pitch - from 4 degrees up to 4 degrees down and return in a full period of 6 seconds.

The conveyor shall operate with rated load at rated speed when the ship is permanently listed 15 degrees to one side and trimmed 4 degrees down by the bow or by the stern.

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3.4 Design stress. For rated conditions, the combined stress in any structural and operating part of the conveyor shall not exceed 35 percent of the yield strength of the material used. The combined stress in any structural and operating part of the conveyor except as specified below shall not exceed 70 percent of the yield strength of its material, when the conveyor is subjected to a tray package jam condition, with 150 percent of the conveyor's rated load applied to a single tray. The maximum tray load shall be uniformly distributed over a maximum of four tray fingers. The tray load shall be positioned for conditions of maximum shear and moment on tray fingers and crosstie. The load-unload device shall withstand a conveyor tray jam load equivalent to 150 percent of the conveyor's rated load. The tray jam load shall be uniformly distributed over a maximum of four fingers of the load-unload device and positioned for conditions of maximum shear and moment on the fingers and crosstie of the load-unload device.

3.4.1 Calculations. In design stress calculations, the stress relationships shown in table I shall apply.

TABLE I. Design stress calculations.

| Stress (lb/in ²) | Percent of tensile yield stress |
|------------------------------|---------------------------------|
| Direct shear | 60 |
| Torsional shear | 65 |
| Compression (bearing) | 160 |

3.4.2 Drive and tray carrier chain. Drive and tray carrier chain shall be of roller chain construction with a minimum safety factor of 10 based on the ratio of the ultimate strength to the working load (rated load plus dead load).

3.4.3 Tray. The trays shall be reinforced with box gussets to resist bending with a minimum factor of safety of 5 based on the ratio of the ultimate strength to the working load. The trays shall not be of the open end type.

3.5 Conveyor drive.

3.5.1 Conveyor drive design. The conveyor drive shall have a direct drive from motor to torque limiting device to a non-overhauling speed reducer. A brake shall be mounted on the input shaft extension of the speed reducer. The motor and speed reducer shall be mounted on and doweled to a common bedplate. Flexible couplings may be used to connect the reducer output shafts to the connecting drive shafts.

3.5.2 Torque limiting device. The torque limiting device, consisting of a torque limiter located between the drive motor and speed reducer, shall protect the drive motor in the event of a jam or excessive overload. The torque limiter shall have a minimum adjustment of 115 to 170 percent of the conveyor rated load (see 4.6.4 for dynamic load test). For normal operation, the torque limiter shall be set to slip or disengage at no less than 115 percent and no more than 150 percent of the conveyor rated load.

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3.5.3 Chain sprocket assembly. Chain sprocket assemblies shall be keyed to prevent shifting out of position on the shaft. Friction type hubs shall not be used.

3.5.4 Shafts. Rotating shafts shall be supported in life time lubricated anti-friction bearings. The shaft bearings shall be sealed to keep out dirt and moisture. Head shaft shall be of forged or welded construction. If welded construction is used, welds shall be X-rayed and shall comply with the requirements for welded fabrication (see 3.2.13). Forgings shall be in accordance with class D, supplementary requirements S4 and S6, of ASTM A 668.

3.5.5 Drive chain tensioners. Drive chain tensioning devices shall be provided for adjustment of the chain slack when the drive shaft centers are not adjustable. Chain take-ups shall be located near the drive sprocket and on the outside of the chain.

3.5.6 Speed reducer. The speed reducer shall be of the non-overhauling type. Reduction gearing shall be in accordance with American Gear Manufacturer's Association, Gear Handbook 420.08, 440.04, and 441.04 as specified for conveyor equipment. Gears shall be fully enclosed to operate in a bath of oil and shall be mounted on anti-friction bearings. Gear casing shall be provided with access plates, unless the speed reducer is too small for access to be practical, in order to facilitate inspection, repair, cleaning and removal of gears. A sight gauge showing minimum and maximum oil levels and openings for lubricant fill, drain and breather shall be provided.

3.5.7 Electric brake. The electric brake shall be in accordance with MIL-B-16392 and the following:

- (a) Type - disc, self-adjusting.
- (b) Ambient temperature - 50 degrees Celsius ($^{\circ}\text{C}$).
- (c) Voltage - 440 volts (V), 60 hertz (Hz).
- (d) Enclosure - dripproof.
- (e) Duty - continuous.
- (f) Mounting - reducer mounted.
- (g) Torque - as required.

3.5.8 Electric drive motor. The electric drive motor shall be in accordance with MIL-M-17060 and the following:

- (a) Service - C.
- (b) Ambient temperature - 50°C .
- (c) Voltage - 440 V, 3-phase, 60 Hz.
- (d) Bearings - ball.
- (e) Enclosure - totally enclosed fan-cooled (TEFC).
- (f) Horsepower (hp) - 5 hp (up to 47.5 ft center to distance between top and bottom sprockets), 10 hp (greater than 47.5 ft center to center distance between top and bottom sprockets).
- (g) Speed - constant.
- (h) Duty - continuous.
- (i) Insulation - class B, F, H or N (70°C rise in 50°C ambient) limited insulation classes.
- (j) Type - squirrel cage induction, design B.

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- (k) Temperature rise - class B insulation limits.
- (l) Frame size 213T.

3.6 Motor controller. The motor controller shall be in accordance with MIL-C-2212 (except that only compliance with requirements for grade B shock of MIL-S-901 is necessary) and Drawings 803-5959243, 803-5959245, 803-5959246 and 803-5959247 and the following:

- (a) Ambient temperature - 50°C.
- (b) Enclosure - dripproof.
- (c) Voltage - 440 V, 3-phase, 60 Hz.
- (d) Operation - magnetic.
- (e) Function - motor starting or reversing.
- (f) Type - across the line.
- (g) Protection - low voltage and overload relay.
- (h) Control circuit power "ON-OFF" switch - two position.
- (i) Indicator light (red) - wired to control circuit power "ON-OFF" switch.
- (j) Built-in test equipment (BITE).

The control circuit power "ON-OFF" switch and indicator light shall be installed in the face panel of the controller. Operating control circuits shall be 110 V. The motor controller shall be located external to the trunk in the immediate vicinity of the conveyor machinery space (see 6.2.1).

3.7 Control stations. A control station, in accordance with MIL-C-2212 (except for the RUN-STOP switches), shall be provided at each conveyor load station. Each control station shall be located on or near the conveyor trunk. Control stations for type II conveyors shall be positioned by the installing activity. Control stations shall be equipped with the switches as specified in 3.7.1 through 3.7.5 and shall be configured as shown on figure 3. Control stations shall be equipped with a lockable security cover to prevent unauthorized conveyor operations. The security cover, in the open or closed (secured) position, shall not obstruct the "RUN-STOP" control switch. Control circuitry shall be arranged so that the conveyor can be stopped from any control station and conveyor motion cannot be resumed until the actuated "RUN-STOP" switch is reset to "RUN", and the "UP" or "DOWN" pushbutton switch of the controlling station is actuated. Control station enclosures shall be dripproof.

3.7.1 "RUN-STOP" pushbutton switch. The "RUN-STOP" pushbutton switches shall be of the push-pull type with a mushroom head. The switches shall be of the maintained contact type, and shall be interlocked to prevent conveyor operation unless all "RUN-STOP" switches are in "RUN" position. The "RUN-STOP" switch shall be wired to the control circuit power "ON-OFF" switch at the motor controller.

3.7.2 "UP-DOWN" pushbutton switch. The "UP-DOWN" pushbutton switches shall be of the momentary contact type with a holding circuit. Interlocks shall be provided to prevent movement of the conveyor when the "UP" or "DOWN" pushbutton is activated unless all "RUN-STOP" switches and all "EMERGENCY STOP" switches are in the pulled out position.

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3.7.3 "INDEX-CONTINUOUS" selector switch. Unless otherwise specified (see 6.2.1), a two position "INDEX-CONTINUOUS" selector switch shall be provided at the control station located one deck below the highest level served.

- (a) With the selector switch set at the "INDEX" position, the conveyor shall index (move) the next carrier tray to the height of the load-unload device at the unload station.
- (b) With the selector switch set at the "CONTINUOUS" position, the conveyor shall run continuously in either the "UP" or "DOWN" direction.

3.7.4 Proximity switch. A proximity switch shall be provided to sense the passing carrier trays for the indexing function. As a carrier tray passes, the proximity switch shall activate a time delay relay to cause a timed stopping action of the conveyor.

3.7.5 Remote "EMERGENCY STOP" switch. A push-pull, maintained contact type "EMERGENCY STOP" pushbutton switch with a mushroom head shall be provided at each load station. The switch shall be remotely mounted for use by a safety observer. Depressing the remote "EMERGENCY STOP" pushbutton at any station shall stop the conveyor. The switches shall all be reset (pulled out) before restarting the conveyor.

3.8 Safety devices.

3.8.1 Overtravel limit devices. The conveyor shall have an overtravel limit device installed at the top and bottom load stations. Upon detecting an overtravel condition, the overtravel limit device shall cause the conveyor to stop. Removal of the package actuating the overtravel device and subsequent pushing of an "UP" or "DOWN" pushbutton shall cause the conveyor to resume operation. Each device shall be capable of detecting a 12- by 12- by 6-inch high or larger package located anywhere on a conveyor tray. Each device shall provide for minimal maintenance, for ease of disassembly, and accessibility where adjustments are required.

3.8.1.1 Lower limit device. The lower overtravel limit device shall be of lightweight construction and of forked finger design to permit passage of empty conveyor trays. The device shall be hinged to permit rotation with sufficient vertical movement to prevent a solid jam condition when impinged by a moving package. The device shall be interlocked with the control circuit to stop the conveyor if a package having a minimum weight of 15 pounds, on a downward moving tray, is carried past the bottom load station. The control circuitry shall permit conveyor operation in the upward (opposite) direction to release a package jam.

3.8.1.2 Upper limit device. The upper overtravel limit device shall be of the photo-electric eye type. For a top front unloading conveyor, the photo-electric eye shall be interlocked with the control circuit to stop the conveyor if the upward moving package is not removed at the top front unload station. For a top rear unloading conveyor, the photo-electric eye shall be interlocked with the control circuit to stop the conveyor before a jam occurs if the top rear unload station is closed, but to allow the conveyor to run if the top rear unload station is operational. The control circuitry shall permit conveyor operation in the downward (opposite) direction to release a package jam.

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3.8.2 Interlock switch (load-unload device). An interlock switch shall be provided at each load-unload device (see 3.2.20.3) to prevent downward operation of the conveyor when the load-unload device is in the load position.

3.8.3 Audible warning device. An audible warning device shall be provided in accordance with Drawings 803-5959243 and 803-5959244. A time-delay relay of 3 to 3-1/2 seconds shall be provided in the conveyor "UP" and "DOWN" control circuitry. The audible warning device shall be integrated into the conveyor control circuitry to energize the audible warning devices at load stations that have the trunk door open and prior to movement of the conveyor. The audible warning shall continue for the 3 to 3-1/2 second duration. The audible warning shall stop when the conveyor starts moving. The audible warning device shall be vibratory horn type with sound level of 100 plus or minus 3 decibels (dB).

3.8.4 Door interlock switch system. A door interlock switch system in accordance with Drawing 803-5959243 shall be provided. For type II conveyor, the door interlock limit switches shall be positioned on the existing trunk by the installing activity. The opening of any two doors shall allow operation in either direction; opening of a third door shall prevent operation of the conveyor.

3.8.5 Cleanout door interlock switch. The base cleanout door (see 3.16.4) shall be interlocked such that opening the cleanout door prevents conveyor operation. In the event that a cleanout door is on the existing type I, an interlock switch shall be provided for positioning by the installing activity to prevent conveyor operation when the cleanout door is open.

3.8.6 Motor current overload protection. The motor controller in accordance with Drawings 803-5959246 and 803-5959247 shall be equipped with overload protection devices which will open the motor circuit in the event of conveyor overload.

3.8.6.1 Electronic current overload protection. The motor controller shall be equipped with an electronic overload device which will open the motor circuit in the event of motor current overload. The device shall be self-resetting. The current trip point shall be stable within plus or minus 5 percent in the operating temperature range of 80 to 150 degrees Fahrenheit (°F) and shall be set at 110 percent of normal conveyor motor current under heaviest rated loading. It shall by-pass the power surge of current and torque normally associated with starting the motor, but shall operate instantly in the event of conveyor overloads.

3.8.6.2 Thermal overload protection. The motor controller shall be equipped with a motor current thermal overload meeting the requirements of MIL-C-2212. The heat ratings shall be of 100 percent of normal motor current under the heaviest rated loading and shall sense two of the three motor phases.

3.8.7 Jam limit device (over-the-door). Each intermediate and bottom load station shall be provided with a jam limit safety device. The device shall be located on the conveyor trunk at the top of the trunk door opening and in line with the vertical face of the conveyor trunk frame. For the type II conveyor, the device shall be located on the conveyor frame near the top of the existing trunk door opening and in line with the vertical face of the

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vertical frame. The safety device shall be of the guided tension cable design and shall detect a package that extends past the edge of the tray and trips the conveyor circuit to stop the conveyor before damage occurs to the package or to any part of the conveyor. The jam limit device, when released of the package jam, shall reset to provide the jam limit protection and to permit operation of the conveyor.

3.8.8 Conveyor lighting system. A fluorescent light fixture shall be mounted on the inside of the conveyor trunk at each load station. The fixture shall be located clear of the handling area and any moving parts of the conveyor and in a position to adequately illuminate the trunk for safe package handling. The light fixtures shall be controlled by limit switches provided for the trunk type conveyor at each load station, which automatically cause the light at that load station to go on when the existing trunk door is opened and to go off when the existing trunk door is closed. The lighting system shall be independent of the conveyor circuitry and in accordance with Drawing 803-5959243. For the type II conveyor, the light switches shall be provided for positioning on the existing trunk by the installing activity.

3.8.9 Warning plate. A 5- by 9-inch warning plate shall be installed adjacent to each trunk door so as to be visible prior to and during conveyor operation. The warning plate shall be in accordance with type H of MIL-P-15024, and MIL-P-15024/5, and shall be inscribed as follows:

"WARNING

KEEP CLEAR OF TRUNK
OPENING DURING
CONVEYOR OPERATION"

3.8.10 Operating instruction chart. An operating instruction chart shall be provided at each control station of the conveyor. The chart shall include specific operating and safety instructions and the two-man rule for vertical package conveyors (see figure 4). Charts shall be of laminated plastic material or of aluminum as used in the metal photo process in accordance with type F or H of MIL-P-15024 and MIL-P-15024/5. The chart shall be installed in the immediate vicinity of the existing trunk opening as a visible reference for operating personnel. For the type II conveyor, an operating instruction chart shall be provided for positioning by the installing activity at each control station of the conveyor.

3.8.11 Safety shield. A 1/2-inch thick polycarbonate plastic shield with mar-resistant coating (manufactured by Lexan Plastic of Philadelphia, or equal) shall be provided in the space above the stowed load-unload device to prevent personnel from inadvertently placing their head inside the conveyor when the door is open. The shield shall be attached to the top of the door frame and shall swing outward if impacted from inside the conveyor by a moving package with a minimum weight of 15 pounds. The shield shall be provided a positive stop to prevent inward swing past the vertical. For the type II conveyor, a 1/2-inch thick polycarbonate plastic shield with mar-resistant coating (manufactured by Lexan Plastic of Philadelphia, or equal) shall be provided for installation by the installing activity in the space above each load-unload device.

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3.9 Identification plate. An identification plate shall be attached to the part of the conveyor which will not be renewed during its normal service life. The plate shall be located where it will be readily visible. Each identification plate shall be in accordance with MIL-P-15024 and MIL-P-15024/5. The plate shall be made of brass, nickel-copper alloy, corrosion-resistant steel, or anodized aluminum. Markings shall be permanent and durable to last the anticipated life of the conveyor. Etchings, engravings, or stampings shall be not less than 0.003-inch deep. Characters on cast plates shall be raised to at least 0.03-inch. Engraved or stamped markings shall be filled with black paint enamel or lacquer. Fasteners used to secure the plate shall be corrosion-resistant.

3.9.1 Identification plate markings. Identification plates for the conveyor shall include the following information:

- (a) Item name (vertical conveyor, tray type).
- (b) Design characteristics - conveyor weight, tray capacity, rated load, motor horsepower, motor revolutions per minute (r/min), shock grade (grade B).
- (c) MIL-C-23218, including revision and date.
- (d) Manufacturer's name, model, and serial number.
- (e) Contract or order number.

3.10 Painting. Structural parts and exposed surfaces, except chains, lubrication fittings, cam tracks, and surfaces in rolling or sliding contact shall be cleaned and pretreated. Surface cleaning shall be in accordance with the applicable method of TT-C-490. Pretreatment coating shall be in accordance with type III of TT-C-490. The pretreated surface shall be primed with either one coat of TT-P-645, 0.001-inch minimum dry film thickness (DFT) or one coat of TT-P-1757 primer, 0.0006-inch minimum DFT. Finish coat shall be type I, II, or III, class 2 of MIL-E-15090, 0.001-inch minimum DFT.

3.11 Elapsed time meter. An elapsed time meter, of the non-resettable type, graduated in hours up to 9999.9 hours shall be provided in accordance with MIL-M-7793 and MIL-M-7793/8 and integrated in the conveyor drive motor electrical circuit to monitor the actual operating time of the conveyor. The elapsed time meter shall be mounted on the motor controller enclosure door so that the meter may be viewed with the enclosure door closed.

3.12 Noise. The noise level emanating from conveyor operation shall not exceed 75 decibel amperes (dBA) when measured at the control station.

3.13 Communication system. A two-way sound powered telephone system between conveyor load stations shall be provided (see Drawing 803-5959244). The call signal stations shall be in accordance with MIL-C-15306 and one station shall be located above each conveyor control station assembly. Each call signal station shall have a hard wired handset and a jack to accommodate a portable head-chest set. The telephone handsets shall be in accordance with type H-203U of MIL-T-15514. Two head-chest sets in accordance with type H-200U of MIL-T-15514 shall be provided. The communication system shall not be integrated with any other shipboard circuits, but shall be solely for conveyor use.

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3.14 Built-in-test-equipment (BITE) panel. A BITE panel shall be provided and located on the back of the motor controller door. The BITE shall consist of condition lamps, condition toggle switches and a lamp test pushbutton. The BITE shall be in accordance with Drawing 803-5959245.

3.15 Technical data. The contractor shall prepare technical data in accordance with the data ordering documents included in the contract or order (see 6.2.2), and as specified in 3.12.1 through 3.14.

3.15.1 Drawings. Drawings shall be prepared in accordance with the data ordering document (see 6.2.2).

3.15.2 Technical manuals. Technical manual inserts to supplement the basic technical manual SG-816-AQ-MMO-010/SVPC operations and maintenance instructions standard vertical package conveyor (100 pounds) shall be prepared in accordance with the data ordering document (see 6.2.2).

3.15.3 Calculations. Calculations shall be prepared in accordance with the data ordering document (see 6.2.2) and shall include the following:

- (a) The conveyor center of gravity location, conveyor weight and stress analysis for conveyor trunk, tray assemblies and all other items where stress criteria have been set forth by this specification.
- (b) Motor brake torque requirement.

3.16 Type I. Each conveyor shall be a complete unit, including trunk, doors, guards, cam tracks, trays, load-unload devices, sprocket assemblies, chains, chain tensioners, mechanical and electrical drive equipment, operating switches, interlock switches, overtravel protection devices, overload and jam protection devices, safety and warning devices, associated electrical operating control, overload and safety circuitry, electrical overload protection, a lighting system, a communication system, charts and label plates. The electrical control systems for the conveyor shall be in accordance with Drawings 803-5959243 and 803-5959244. The conveyor shall comply with the dimensions on figure 1.

3.16.1 Construction. Type I conveyor shall consist of a compact structure supported at the base and all immediate deck levels. The support in these areas is provided by ship's structure as shown on page 1 of figure 1. Deck collars shall be so positioned as to mate with existing deck. The conveyor shall have a configuration similar to conveyor 1 or conveyor 2 shown on figure 1 as specified (see 6.2.1). Pertinent dimensions are shown on figure 1, except as otherwise modified by the contracting activity. The conveyor shall serve the deck levels specified (see 6.2.1). Dimensions a, b, e, f, and j shall be as specified in table B of figure 1. Tray spacing shall be 60 inches. The number of trays (see table A of figure 1) shall be as specified (see 6.2.1). The machinery arrangement shall be right-hand or left-hand side-mounted horizontal drive, back-mounted vertical drive, or over-the-top drive (see figure 1) as specified (see 6.2.1).

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3.16.2 Structure. Type I conveyor shall be of 1/4-inch thick (minimum) steel construction. Where one or more sides of the conveyor trunk form a part of a structural bulkhead, that side shall extend beyond the nominal trunk boundary sufficiently to permit welding the trunk into the bulkhead without distorting the conveyor assembly. The trunk plating thickness in way of the bulkheads shall be at least equal to the thickness of the bulkhead. The corners of the conveyor trunk shall be rounded or if square, shall be fitted with radius corner insert plates in way of deck penetrations (see page 1 of figure 1). When bulkhead stiffeners are located within the trunk, the trunk cross-section dimensions may be increased accordingly. The degree of tightness of the trunk shall be equal to or greater than the degree of tightness of the contiguous compartments on the ship and in no case shall the degree of tightness be less than watertight. The complete conveyor assembly shall be provided lifting attachments to permit handling the unit in a vertical attitude.

3.16.3 Trunk doors. Trunk openings at deck levels served shall be equipped with securable doors of steel construction that are hinged right hand or left hand, as specified (see 6.2.1), so as to permit the most accessible arrangement without hindering the movement of stores at the deck levels being served. The clear opening of the doors shall be as recommended by the conveyor manufacturer for unhindered movement of packages but not less than 42 inches wide by 60 inches high. The sill heights of the door openings shall be as recommended by the manufacturer to suit the load-unload device level as specified in 3.2.20.1. The degree of tightness of the doors shall be equal to or greater than the degree of tightness of the contiguous compartments on the ship and in no case shall the degree of tightness be less than watertight (Drawing 805-1400066 shall be used for guidance). Additional stiffeners and dogs shall be provided as necessary to insure tightness. Doors shall also be provided with door blocks as described (see 3.2.17). A means of padlocking each door shall be provided.

3.16.4 Base cleanout door. A cleanout door, with a minimum size of 24 inches wide by 16 inches high, shall be provided at the base of the structure to provide means of keeping the conveyor interior clear of debris. The degree of tightness of the cleanout door shall be equal to or greater than the degree of tightness of the contiguous compartment on the ship and in no case shall the degree of tightness be less than watertight.

3.17 Type II. Type II conveyors shall be a complete unit, including frame, mounting supports, guards, cam tracks, trays, load-unload devices, sprocket assemblies, chains, chain tensioners, mechanical and electrical drive equipment, operating switches, interlock switches, overtravel protection devices, overload and jam protection devices, safety and warning devices, associated electrical operating control, overload and safety circuitry, electrical overload protection, a lighting system, a communication system, charts and label plates. The electrical control systems for the conveyor shall be in accordance with Drawings 803-5959243 and 803-5959244.

3.17.1 Construction. Type II conveyor shall consist of a compact structure supported at the base and all levels. The support in these areas is provided by ship's structure as shown on page 1 of figure 2. No collars on frame type. The conveyor shall have a configuration similar to conveyor 1 or conveyor 2 on figure 2 as specified (see 6.2.1). Pertinent dimensions are shown on figure 2, except otherwise modified by the contracting activity. The conveyor shall serve

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the deck levels specified (see 6.2.1). Dimensions a, b, e, f, and j shall be as specified in table B of figure 2. Tray spacing shall be 60 inches. The number of trays (see table A of figure 2) shall be as specified (see 6.2.1). The machinery arrangement shall be right-hand or left-hand side-mounted horizontal drive, back-mounted vertical drive, or over-the-top drive (see figure 2) as specified (see 6.2.1).

3.17.2 Structure. Type II conveyor shall be of the truss type and shall be of steel construction. Flanges shall be provided at locations suitable for lateral support. These flanges shall not be more than 10 feet apart. The complete conveyor assembly shall be provided with lifting attachments to permit handling the unit in a vertical position.

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.

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. One sample of type I and type II shall be subjected to examination and tests of 4.5 and 4.6, as specified (see 6.2.1).

4.3.1 First article test report. The contractor shall provide first article test reports in accordance with the data ordering document (see 6.2.2).

4.4 Quality conformance inspection. Each conveyor shall be subjected to examination and tests of 4.5 and 4.6.1 through 4.6.10 and 4.6.14.

4.5 Examination. Each conveyor shall be inspected for defects listed in table II. One or more defects shall be cause for rejection.

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TABLE II. Classification of defects.

| Category | Defect |
|----------|---|
| Major | |
| 101 | Use of cast iron parts. |
| 102 | Cam track material not as specified. |
| 103 | Roller chain and attachments material and design not as specified. |
| 104 | Chain sprockets design not as specified. |
| 105 | Electrical system not in accordance with drawings. |
| 106 | Conveyor size does not comply with figure 1. |
| 107 | Operating noise level exceeds specified limit. |
| 108 | Keys, collars, caps, fasteners and other parts not positively fastened. |
| 109 | Lubrication fittings not provided and access to machinery not as specified. |
| 110 | Proper bearing certification not available. |
| 111 | Cam tracks do not provide positive control and guidance of tray travel; head and tail cam track assemblies not of the fixed center design specified; track sections fastening not as specified. |
| 112 | Tray carrier chain tensioner not provided or not as specified. |
| 113 | Welded fabrication, welder qualifications and inspections not as specified. |
| 114 | Conveyor configuration not as specified. |
| 115 | Conveyor not constructed as specified. |
| 116 | Trunk door of type I conveyor not as specified. |
| 117 | Door block not provided or not as specified. |
| 118 | Base cleanout door not provided or not as specified. |
| 119 | Guards not provided or not as specified. |
| 120 | Access to conveyor head sprockets not as specified; conveyor rear package shield not as specified. |
| 121 | Tray design not as specified. |
| 122 | Load-unload device not provided or not as specified. |
| 123 | Conveyor capacity and speed not as specified. |
| 124 | Design calculations do not include loading effect due to ship motion. |
| 125 | Design criteria for yield strength of conveyor not as specified. |
| 126 | Stress relationship for stress analysis not as specified. |
| 127 | Drive and tray carrier chain safety factor and construction not as specified. |
| 128 | Conveyor drive and arrangement not as specified. |
| 129 | Torque limiting device not as specified. |
| 130 | Chain sprocket assembly not as specified. |
| 131 | Support bearings for rotating shafts not as specified. |
| 132 | Drive chain tensioner not provided for installation or not as specified. |
| 133 | Speed reducer not as specified. |
| 134 | Electric brake not as specified. |
| 135 | Electric drive motor not as specified. |
| 136 | Motor controller not as specified. |
| 137 | Control stations not as specified. |
| 138 | "RUN-STOP" pushbutton switches not as specified. |
| 139 | "UP-DOWN" pushbutton switches not as specified. |

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TABLE II. Classification of defects. - Continued

| Category | Defect |
|----------|--|
| Major | |
| 140 | "INDEX-CONTINUOUS" selector switch not as specified. |
| 141 | Proximity switch not as specified. |
| 142 | Remote "EMERGENCY STOP" switch not provided or not as specified. |
| 143 | Overtravel limit devices not provided or not as specified. |
| 144 | Interlock switch not provided or not as specified. |
| 145 | Audible warning device not provided or not as specified. |
| 146 | Door interlocks switch system not as specified. |
| 147 | Cleanout door interlock switch not as specified. |
| 148 | Electronic current overload devices not provided or not as specified. |
| 149 | Jam limit device not provided or not as specified. |
| 150 | Trunk lighting system not provided or not as specified. |
| 151 | Warning plates not provided or not as specified. |
| 152 | Operating instruction chart not provided or not as specified. |
| 153 | Safety shield not provided or not as specified. |
| 154 | Identification plate not provided or not as specified. |
| 155 | Identification plate marking not as specified. |
| 156 | Paint not as specified. |
| 157 | Elapsed time meter not as specified. |
| 158 | Technical data not provided or not as specified. |
| 159 | Communication system not provided or not as specified. |
| 160 | Drive assembly mounting and location differs from approved shock tested unit, and certification to grade "B" shock not provided. |
| 161 | Loading platform not provided or not as specified. |
| 162 | Lubrication chart not provided or not as specified. |
| 163 | Built-in Test Equipment (BITE) not provided or not as specified. |

4.6 Performance tests. Each conveyor shall be subjected to the tests specified in 4.6.1 through 4.6.5 and 4.6.9. Tests and demonstrations in 4.6.6, 4.6.7, and 4.6.8 shall be accomplished on the first unit manufactured by a contractor. For subsequent units, a certificate of compliance shall be prepared for evidence of successful accomplishment of tests and demonstrations in 4.6.6, 4.6.7, and 4.6.8 (see 6.2.2).

4.6.1 Electrical controls test. Electrical control assembly procedure shall be as follows:

- (a) De-energize and tag out 440 volts alternating current (Vac). Switch master control switch to ON position. Ensure communication system between all decks is operating properly. Use installed sound powered phones at each level to conduct ensuing tests.
- (b) At motor controller connect the neon test lamp assembly (see figure 5) across L1 and L2 of the control relay (1K11), (see Drawing 803-5959243) and perform the following at the lowest level.

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- (c) Ensure both cleanout doors (if applicable) are secured and the jam limit cable is free and not actuating jam limit switch; that the push-off pull-on "RUN-STOP" switch is closed (pulled out); that the remote emergency stop is closed (pulled-out). For all other load stations, ensure the jam limit cable is free and not actuating the jam limit switch (except the uppermost level), that the push-off pull-on "RUN-STOP" switch is closed (pulled out); that the remote emergency stop is closed (pulled out).
- (d) Re-energize 400 Vac power, clear tags and switch master control switch to ON position and observe at the motor controller that the neon test lamp is extinguished.
- (e) Open conveyor uppermost and lowest load station doors and at motor controller observe that the neon test lamp is lighted.
- (f) Open either lowest load station cleanout door (if applicable) and observe neon test lamp extinguishes. Secure lowest load station cleanout door and open the other lowest load station cleanout door observing that the neon test lamp initially lights and subsequently extinguishes. Secure lowest load station cleanout door.
- (g) Perform the following steps at the lowest load station:
 - (1) Actuate the jam limit switch. At motor controller observe that the neon test lamp extinguishes (repeat minimum of two times).
 - (2) Depress remote emergency stop switch, observe at motor controller that the neon test lamp extinguishes.
 - (3) Pull out remote emergency stop switch; observe at motor controller that the neon test lamp lights.
 - (4) Depress "RUN-STOP" switch; observe at motor controller that the neon test lamp extinguishes.
 - (5) Pull out "RUN-STOP" switch to closed position (pulled out); observe at motor controller that the neon test lamp lights.
 - (6) Close door and observe at motor controller that the neon test lamp extinguishes.
- (h) Perform the following steps and repeat the test at all other load stations.
 - (1) Open conveyor door at the next level up from the lowest load station; at the motor controller observe that the neon test lamp lights.
 - (2) Actuate the jam limit switch. At motor controller observe that the neon test lamp extinguishes (repeat minimum of two times).
 - (3) Depress remote emergency stop switch; observe at motor controller that the neon test lamp extinguishes.
 - (4) Pull out remote emergency stop switch; observe at motor controller that the neon test lamp lights.
 - (5) Depress "RUN-STOP" switch; observe at motor controller that the neon test lamp extinguishes.
 - (6) Pull out "RUN-STOP" switch to closed position (pulled out); observe at motor controller that the neon test lamp lights.

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- (7) Close door and observe at motor controller that the neon test lamp extinguishes. Move up to next load station.
- (i) After completing test at indexing station, open indexing load station door and perform the following steps at the uppermost load station.
 - (1) Depress remote emergency stop switch; observe at motor controller that the neon test lamp extinguishes.
 - (2) Pull out remote emergency stop switch, observe at motor controller that the neon test lamp lights.
 - (3) Depress "RUN-STOP" switch; observe at motor controller that the neon test lamp extinguishes.
 - (4) Pull out "RUN-STOP" switch to close position (pulled out); observe at motor controller that the neon test lamp lights.
 - (5) Momentarily close and then open the uppermost load station door; observe at motor controller that the neon test lamp extinguishes upon door closure and then lights when door is opened.

4.6.2 Down overtravel assembly. The down overtravel assembly shall be performed as follows:

- (a) At the indexing deck, place load-unload device in horizontal position and momentarily depress the DOWN pushbutton; no conveyor motion shall be detected. Rig the load-unload device to the strikedown (30 degrees) position and depress and release the DOWN pushbutton. Observe that the horn sounds for 2.5 seconds prior to any movement of conveyor (use stopwatch to verify time). If horn does not sound for 2.5 seconds, re-adjust delay relay. After horn stops, conveyor motion shall start.
- (b) Push in the "RUN-STOP" to STOP position then back to RUN position, observe that conveyor movement stops. Position load-unload device in strikeup (horizontal) position and momentarily depress DOWN pushbutton; no movement of conveyor shall be detected. Momentarily depress the UP pushbutton; the conveyor shall be operating in the strikeup direction. Observe that the horn sounds for 2.5 seconds prior to any movement of conveyor (use stopwatch to verify time). If horn does not sound for 2.5 seconds, re-adjust delay relay.
- (c) Push in the "RUN-STOP" switch to STOP position then back to RUN position. Observe that conveyor movement stops. Place the "INDEX-CONTINUOUS" switch in INDEX position and momentarily depress the DOWN pushbutton. Observe that conveyor does not move. Close uppermost and open lowest conveyor door.
- (d) Momentarily depress the UP pushbutton. Observe that the conveyor indexes the next carrier tray upward to the height of the load (horizontal) position of the load-unload device at the indexing load station. If the conveyor does not stop, or if it stops too late (moving tray rotates too far over the uppermost load station), a problem in the proximity switch or associated circuitry is indicated and corrective action shall be taken prior to further testing.

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- (e) Place load-unload device at indexing load station in the stowed position. At index load station, return "INDEX-CONTINUOUS" switch to CONTINUOUS RUN and close door. Open door at uppermost load station. At lowest load station, depress DOWN pushbutton and with down overtravel test assembly (see figure 6), depress the down overtravel mechanism and observe that conveyor movement stops. If conveyor does not stop, stop conveyor, remove overtravel test assembly and correct the problem prior to further testing.
- (f) Position load-unload device in strikeup (horizontal) position and momentarily depress DOWN pushbutton; no movement of conveyor shall be detected at the lowest load station. Close uppermost load station door and open indexing load station door and switch load-unload device out of conveyor.
- (g) Place an empty cardboard carton with a minimum outside dimension of 24 by 20 by 30 inches on loader tray at the lowest load station. Momentarily depress UP pushbutton observing conveyor to move in strikeup mode picking up empty pasteboard carton on loader tray fingers. Conveyor shall run until box reaches the uppermost load station of the conveyor located at the uppermost load station. When the boxes reach the uppermost load station the conveyor shall shut down. If the conveyor continues to run and destroys the cardboard carton there is a problem with the photoelectric circuit and this shall be corrected prior to further testing.
- (h) When conveyor shuts down, close indexing load station conveyor door and proceed to uppermost load station. Open door at uppermost load station and remove cardboard carton. Rig load-unload device at the lowest load station in the strikedown (30 degrees) position. Momentarily depress the DOWN pushbutton and observe that horn sounds for approximately 2.5 seconds, followed by conveyor motion. If the conveyor fails to re-start, this is an indication that the timing relay may be maladjusted such that the proximity switch is still under the influence of a tray finger. Re-timing of the relay may be required.
- (i) Push in "RUN-STOP" to STOP position then back to RUN position. Observe that conveyor movement stops. Return lowest load station loader-unloader device to vertical (stowed) position and close and secure the door at the lowest level. Secure the conveyor.

4.6.3 Static load test (200 percent of working load). Static load test shall be performed as follows:

- (a) Remove the cover from around the torque limiter at the uppermost level. Loosen the set screws on the adjustment nut. Tighten the nut as far as it will go. Re-tighten the set screws.
- (b) Man the lowest and the uppermost load station of the conveyor with a supervisor, handlers and safety observer, and at the indexing station a handler. Open lowest and uppermost load stations doors. Set the lowest level load-unload device to the stowed (vertical) position. Attach gravity conveyors as

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- necessary at the uppermost load station. Prepare to load at uppermost load station. Mark with tape the first tray to be loaded at the lowest level station and the tray that will be loaded at the indexing load station when all trays are loaded.
- (c) At the uppermost load station, push the first test weight onto the load-unload device and, after personnel are clear of conveyor opening (using procedures previously described for starting and stopping the conveyor), run the conveyor down until the next tray is in position and stop the conveyor.
 - (d) Repeat step (c) until a test weight is loaded on all trays except the first, indexing and the last tray. Stop the conveyor so that the first tray is 1 inch above the load-unload device at the lowest level. At the lowest level station set the load-unload device to the load (horizontal) position. Load a test weight onto the tray at this station. At the indexing load station, open the door, set the load-unload device to the load (horizontal) position. Load a test weight onto the tray at this station. At the uppermost load station, load the remaining test weight.
 - (e) Hold the load for 10 minutes. Check for any damage or permanent deformation to the structure. At the lowest load station, check for any downward movement of carrier trays by measuring the distance between the top of the carrier tray and the top of the load-unload device after the last test weights have been loaded on the trays. Measure this same distance after 10 minutes.
 - (f) Remove the test weights from the lowest indexing and top load stations. Set the indexing load station load-unload device to the stow position and close the door. Set the lowest load-unload device to stowed (vertical) position. The handler at this station now goes up to the uppermost load station. At the uppermost level momentarily depress the UP pushbutton and run the conveyor up until all the test weights are unloaded. Unload the test weights from the gravity conveyor and clear them from the test area.
 - (g) Inspect conveyor and supporting structure for any signs of stress or deformation. Run conveyor down until marked tray is at lowest load station. Repeat steps (b) through (f) to test remaining trays.

4.6.4 Dynamic load test (150 percent of working load per tray). Dynamic load test shall be performed as follows:

- (a) Set the lowest load station load-unload device to the unload (30 degrees) position and the uppermost level load-unload device to the load position. Attach gravity conveyors as necessary at both stations. Stage test weights at the uppermost load station. Position these test weights on the gravity conveyor at the uppermost load station.
- (b) At the uppermost load station, momentarily depress the DOWN pushbutton. Load a test weight on each carrier tray as it passes until all active trays are loaded. At the uppermost load station, depress the "RUN-STOP" switch to the STOP position to stop the conveyor and position the remaining test weights on the gravity conveyor.

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- (c) The uppermost load station supervisor shall communicate by sound powered phones to the lowest load station supervisor that one full cycle dynamic load test is about to commence. At the uppermost load station, momentarily depress the DOWN pushbutton. Load a test weight on each carrier tray as it passes. As weights are delivered at the lowest level temporarily store them on the gravity conveyor. Check for any objectionable noise or vibration in any part or excessive heating of mechanical and electrical components during operation.
- (d) At the uppermost load station, depress the "RUN-STOP" switch to the STOP position to stop the conveyor when the last test weight is picked up and is clear of the load-unload device. Change the load-unload device at the uppermost load station to unload and lowest load station to load. Remove and replace any test weights as required. Disconnect and reconnect the gravity conveyors as required.
- (e) At the lowest load station momentarily depress the UP pushbutton. Load test weights on each tray as it passes. As test weights are delivered to the gravity conveyor at the uppermost load station remove and store the test weights there. Check for any objectionable noise or vibration or for excessive heating of electrical and mechanical components. Change the load-unload device at the uppermost load station to unload and lowest load station to load. Remove and replace any test weights as required. Disconnect and reconnect the gravity conveyors as required.
- (f) Repeat steps (c) through (e) two more times. Unload the test weights from the gravity conveyor. After the last test weight is unloaded onto the gravity conveyor at the uppermost load station, stop the conveyor. Unload the test weights from the gravity conveyor and clear them from the test area.

4.6.5 Working load test (100 percent of working load). The working load test shall be performed as follows:

- (a) Set the lowest load station load-unload device to the unload (30 degrees) position and the uppermost load station load-unload device to the load position. Disconnect and reconnect the gravity conveyor as required. Stage test weights at the uppermost load station. Position these test weights on the gravity conveyor at the uppermost level.
- (b) At the uppermost load station momentarily depress the DOWN pushbutton. Load a test weight on each carrier tray as it passes until all active trays are loaded. At the uppermost load station stop the conveyor. Reset to the run condition and position the remaining test weights on the gravity conveyor.
- (c) The uppermost load station supervisor shall communicate by sound powered phones to the lowest load station supervisor that one full cycle of the rated load test is about to commence. At the uppermost load station momentarily depress the DOWN pushbutton. Load a test weight on each carrier tray as it passes. As weights are delivered at the lowest load station temporarily store them on the gravity conveyor. Check for smoothness of operation, excessive noise or vibration, overheating and satisfactory operation of the brake during operation.

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- (d) At the uppermost level stop the conveyor when the last test weight is picked up and is clear of the load-unload device. Change load-unload devices at the uppermost load station to unload and lowest load station to load. Remove and replace any test weights as required. Disconnect and reconnect the gravity conveyors as required.
- (e) At the lowest load station momentarily depress the UP pushbutton. As test weights are delivered to the gravity conveyor at the uppermost level, remove and store the test weights there. At the lowest load station stop the conveyor after the last test weight is loaded. Check for smoothness of operation, excessive noise or vibration, overheating and satisfactory operation of the brake during operation.
- (f) Change load-unload devices at the uppermost load station to load and lowest load station to unload. Remove and replace any test weights as required. Disconnect and reconnect the gravity conveyors as required. Repeat steps (c) through (e) two more times. At the uppermost load station momentarily depress the UP pushbutton. After the last test weight is unloaded onto the gravity conveyor at the uppermost load station, stop the conveyor. Unload the test weights from the gravity conveyor and clear them from the test area.
- (g) Reset the torque limiter and instantaneous overload device per the instructions in the appropriate technical manual.

4.6.6 High impact shock test. Shock tests shall be performed in accordance with the requirements of 3.2.12. The conveyor drive assembly and mounting bracket shall be secured to a test fixture attached to the anvil table of the medium weight shock machine and shock tested. Operation of any component parts or parts coming adrift or creating a hazard during the test shall constitute a failure of the shock test. Failure of the shock test shall be cause for rejection.

4.6.7 Reliability demonstration. A reliability test program shall be conducted on the conveyor system under simulated shipboard environmental conditions. The conveyor shall be operated at the rate of 12 trays per minute. An 80 percent confidence level for a design of 255 hours MTBF shall be demonstrated (see 3.2.14). Each test cycle shall consist of equal periods of alternately operating the conveyors in the strikeup and strikedown directions. Each period shall consist of 1/2 hour of continuous operation. The conveyor shall be jammed deliberately every hour on the hour until 150 jams have been accumulated. The severest jam conditions shall be demonstrated first in order to minimize wasted test time should failure occur requiring redesign and retest. During jam demonstration, the overtravel limit device (see 3.8.1), the instantaneous electronic current overload devices (see 3.8.6.1), and the jam limit device (over-the-door) (see 3.8.7) shall be disconnected and jumpered and the torque limiting device shall be set to allow a force against the tray equal to 150 percent of rated load. Jams shall be simulated in accordance with the following schedule using test size packages (see table B of figure 1) of 100 pounds each.

- (a) During strike-down operation:
 - (1) A loaded tray shall be jammed by a package not completely removed from the trunk by the load-unload device.
 - (2) A loaded tray shall be jammed by a package or packages placed at the bottom of the trunk.

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(b) During strike-up operation:

- (1) A loaded tray shall be jammed by a package not completely removed from the trunk at the main loading station.
- (2) A loaded tray shall be jammed at the upper coaming of a door by a package extending over the end of a tray.

4.6.7.1 Criteria. Failure of the conveyor system shall be defined as any of the following events:

- (a) Failure of the conveyor to perform in accordance with performance requirements of this specification (see 3.3).
- (b) Permanent deformation of any load bearing or structural part of the conveyor as a result of normal operation or which occurs as a result of load jam.
- (c) Failure of the conveyor to be returned to operation within 15 minutes after the occurrence of a load jam.

Time of conveyor stoppages during test sequences, due to safety device actuation or conveyor failure, shall be recorded and explanations provided.

4.6.8 Maintainability demonstration. A maintainability demonstration test program shall be conducted on the conveyor system in accordance with the requirements of 3.2.15. The maintenance tasks to be performed shall consist of the replacement of parts listed in table III in accordance with test method 10 of MIL-STD-471. Maintenance tasks to be demonstrated will be selected by NAVSEA. Corrective maintenance tasks may be simulated as an alternative to deliberately introducing defective components into the system. MTTR shall be determined through a simple average of total corrective maintenance time divided by the total number of maintenance actions.

TABLE III. List of replacement parts for maintainability demonstration.

| | |
|----------------------------------|--|
| 1. Switch, proximity | 12. Switch, selector, two position |
| 2. Relay, control | 13. Seal, oil worm speed reducer |
| 3. Relay, timing | 14. Seal, input shaft speed reducer |
| 4. Relay, double timing | 15. Lining, friction, electric brake |
| 5. Transformer, control | 16. Reflector, photo-electric |
| 6. Contactor, reverse | 17. Relay, time delay, photo-electric |
| 7. Relay, instantaneous overload | 18. Spring, helical, compression, electric brake |
| 8. Coil, set thermal overload | 19. Spring, electric brake |
| 9. Fuse, control circuit | 20. Seal, electric brake |
| 10. Assembly, control station | 21. Coil, electric brake |
| 11. Switch, limit | |

4.6.9 Trunk and base cleanout doors. Each conveyor trunk door and the base cleanout door shall be chalk tested to assure that there is continuous contact between the knife edge and the gasket.

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

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5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition. For the extent of applicability of the packaging requirements of referenced documents listed in section 2, see 6.6.)

5.1 Preservation and packaging, packing and marking. Conveyors, accessories, and software shall be preserved, packaged level A and C; packed level A, B or C and marked in accordance with MIL-P-3184. The level of preservation and packaging and packing shall be as specified in the contract or order (see 6.2.1). Detached accessories shall be preserved and packaged and marked to the levels specified for the conveyor.

5.2 Cushioning, dunnage, and wrapping materials.

5.2.1 Level A preservation and packaging and levels A and B packing. Use of all types of loose-fill materials for packaging and packing applications such as cushioning, filler or dunnage is prohibited for materials destined for ship-board installation and stowage.

5.2.2 Level C preservation and packaging and packing. When loose fill type materials are used for packaging and packing applications such as cushioning, filler and dunnage, all containers (unit, intermediate and shipping) shall be marked or labelled with the following information:

"CAUTION

Contents cushioned, etc., with loose-fill material. Not to be taken aboard ship. Remove and discard loose-fill material before ship-board stowage. If required, recushion with cellulosic material, bound fiber, fiberboard or transparent flexible cellular material."

5.2.3 Cushioning, filler, dunnage and wrapping materials selected shall incorporate properties and characteristics for resistance to fire. Examples are as follows:

| | |
|-------------|--|
| UUU-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 |
| MIL-R-6130 | - Cellular rubber, grade A |
| MIL-R-20092 | - Cellular rubber, class 1 or 5 |
| MIL-P-26514 | - Polyurethane foam (rigid or flexible) |

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6. NOTES

6.1 Intended use. The conveyors are to be used in the following applications:

- Class 100A - for all new construction of U.S. Navy ships and for replacement of existing 100-pound and 175-pound vertical conveyors (frame or integral trunk type).
- Class 100B - for replacement of existing 85-pound vertical conveyors (frame or integral trunk type).
- Class 100C - for replacement of existing 85 or 100-pound vertical conveyors (frame type).

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following items:

- (a) Title, number, and date of this specification.
- (b) Type required (see 1.2).
- (c) Whether first article is required (see 3.1).
- (d) Whether conveyor configuration is similar to conveyor 1 or conveyor 2 on figure 1 (see 3.16.1).
- (e) Levels conveyor shall serve (see 3.16.1).
- (f) Number of trays required (see 3.16.1).
- (g) Whether machinery arrangement is right-hand side-mounted horizontal drive, left-hand side-mounted horizontal drive, back-mounted vertical drive, or over-the-top drive (see 3.16.1).
- (h) Specify location of door hinges (right or left hand) (see 3.16.3).
- (i) Whether conveyor configuration is similar to conveyor 1 or conveyor 2 on figure 2 (see 3.17).
- (j) Levels conveyor shall serve (see 3.17).
- (k) Number of trays required (see 3.17).
- (l) Whether machinery arrangement is right-hand side-mounted horizontal drive, left-hand side-mounted horizontal drive, back-mounted vertical drive, or over-the-top drive (see 3.17).
- (m) Maximum package size (see figures 1 and 2).
- (n) Load capacity and speed (see 3.3.1).
- (o) Specify deck level for location of motor controller (see 3.6).
- (p) Specify deck levels for "INDEX-CONTINUOUS" selector switch, if other than second deck (see 3.7.3).
- (q) Level of preservation and packaging and packing required (see 5.1).
- (r) One first article sample (see 4.3).

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.

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| <u>Paragraph no.</u> | <u>Data requirement title</u> | <u>Applicable DID no.</u> | <u>Option</u> |
|----------------------|--|---------------------------|--|
| 3.2.9 and 4.6 | Certificate of compliance | DI-E-2121 | ---- |
| 3.2.16 | Real property facilities- erection drawings | DI-E-30579 | ---- |
| 3.15.1 | Drawings, engineering and associated lists | DI-E-7031 | Level 3 Design activity designation contractor Drawing number - contractor Delivery of hard copy - contracting activity |
| 3.15.2 | Manual, technical, standard | DI-M-2044 | MIL-M-15071, type I |
| 3.15.3 | Diagrams, calculations and stress | UDI-E-23253 | ---- |
| 4.3.1 | First article inspection report | DI-T-4902 | ---- |

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5000.19L, Vol. II, AMSDL. 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 First article inspection. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection as 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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6.4 Drawings. The drawings shall contain the data necessary for fabrication and assembly of the conveyor, installation related information, data regarding operation, maintenance, repair and parts support information for the electrical and mechanical aspects of the equipment. Data shall also be provided that describes the lifting and handling of an integral conveyor trunk and both sections of a two section conveyor trunk. Detailed methods for assembly, alignment and joint closure must also be furnished.

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

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

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

6.7 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 3910-N074)

MIL-C-23218C(SH)

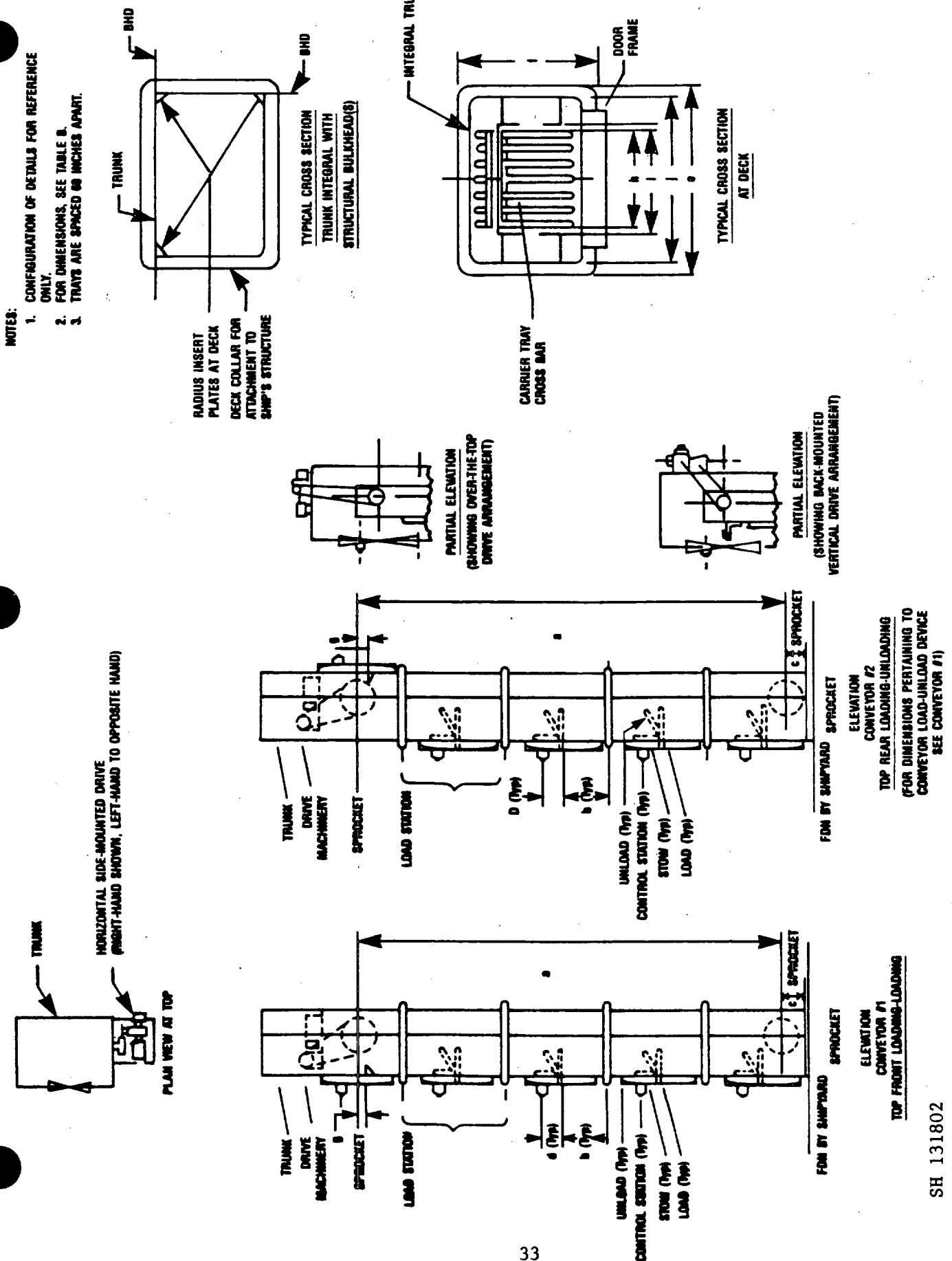


FIGURE 1. General arrangement trunk type conveyor (page 1 of 2 pages).

SH 131802

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TABLE A
For trunk type conveyor

| No. of trays required at 60-inch spacing | Distance between CL of sprockets | No. of trays required at 60-inch spacing | Distance between CL of sprockets |
|--|-------------------------------------|--|-------------------------------------|
| 6 | 12 ft - 6 inch | 22 | 52-6 |
| 7 | 15-0 | 23 | 55-0 |
| 8 | 17-6 | 24 | 57-6 |
| 9 | 20-0 | 25 | 60-0 |
| 10 | 22-6 | 26 | 62-6 |
| 11 | 25-0 | 27 | 65-0 |
| 12 | 27-6 | 28 | 67-6 |
| 13 | 30-0 | 29 | 70-0 |
| 14 | 32-6 | 30 | 72-6 |
| 15 | 35-0 | 31 | 75-0 |
| 16 | 37-6 | 32 | 77-6 |
| 17 | 40-0 | 33 | 80-0 |
| 18 | 42-6 | 34 | 82-6 |
| 19 | 45-0 | 35 | 85-0 |
| 20 | 47-6 | 36 | 87-6 |
| 21 | 50-0 | 37 | 90-0 |

TABLE B
For trunk type conveyor

| Dimension | Size 100A conveyor | Size 100B conveyor |
|-----------|--|--|
| | Maximum size (test size) package 36"W x 24"D x 36"H | Maximum size (test size) package 24"W x 20"D x 30"H |
| a | See ordering data | See ordering data |
| b | 28 to 34 inches | 29 to 34 inches |
| c | 23 to 29-1/2 inches | 23 to 29-1/2 inches |
| d | 14 inches | 14 inches |
| e | 69 inches | 51-1/4 inches |
| f | 48-1/2 inches | 37-13/16 inches |
| g | 1-3/4 inches minimum | 1-3/4 inches minimum |
| h | 37 inches | 29-1/4 inches |
| i | 40-1/4 inches | 32-1/2 inches |
| j | 60-1/2 inches | 42-3/4 inches |

FIGURE 1. General arrangement trunk type conveyor. - Continued

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- NOTES:
1. CONFIGURATION OF DETAILS FOR REFERENCE ONLY.
 2. FOR DIMENSIONS, SEE TABLE B.
 3. TRAYS ARE SPACED 60 INCHES APART.

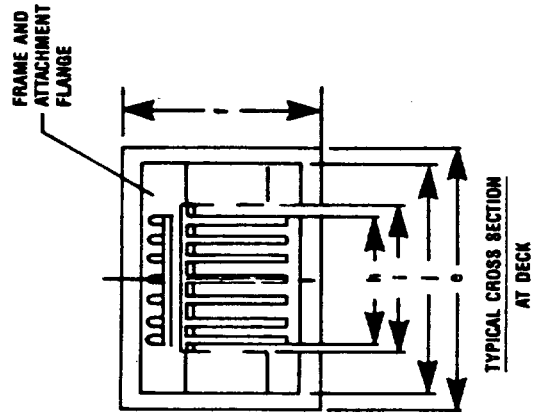
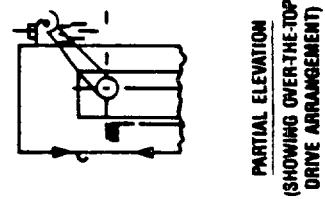
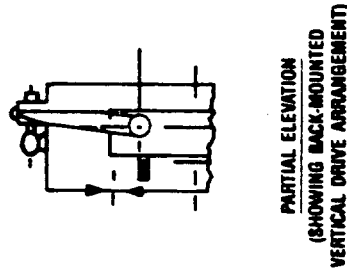
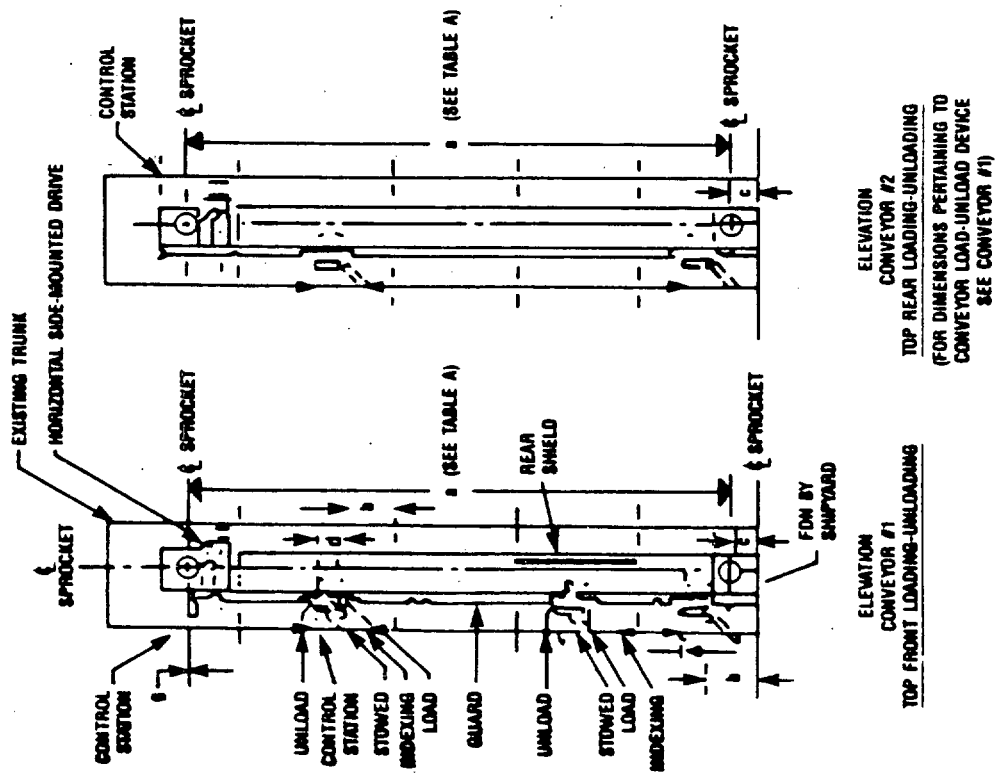
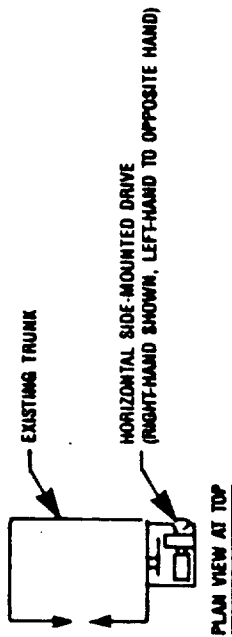


FIGURE 2. General arrangement of vertical frame type conveyor (page 1 of 2 pages).

SH 1320149

MIL-C-23218C(SH)

TABLE A
For frame type conveyor

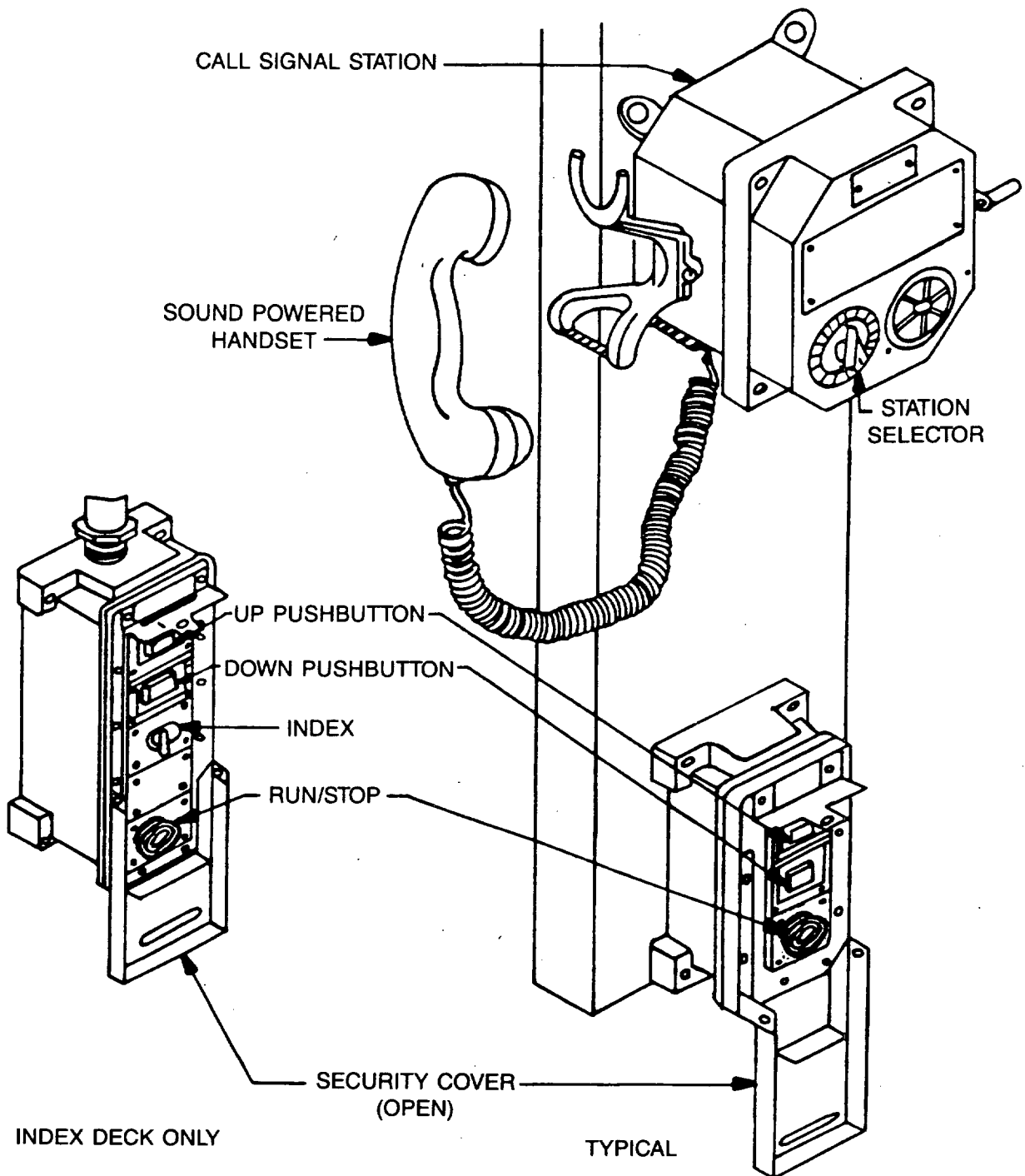
| No. of trays required at 60-inch spacing | Distance between CL of sprockets | No. of trays required at 60-inch spacing | Distance between CL of sprockets |
|--|-------------------------------------|--|-------------------------------------|
| 6 | 12 ft - 6 inch | 22 | 52-6 |
| 7 | 15-0 | 23 | 55-0 |
| 8 | 17-6 | 24 | 57-6 |
| 9 | 20-0 | 25 | 60-0 |
| 10 | 22-6 | 26 | 62-6 |
| 11 | 25-0 | 27 | 65-0 |
| 12 | 27-6 | 28 | 67-6 |
| 13 | 30-0 | 29 | 70-0 |
| 14 | 32-6 | 30 | 72-6 |
| 15 | 35-0 | 31 | 75-0 |
| 16 | 37-6 | 32 | 77-6 |
| 17 | 40-0 | 33 | 80-0 |
| 18 | 42-6 | 34 | 82-6 |
| 19 | 45-0 | 35 | 85-0 |
| 20 | 47-6 | 36 | 87-6 |
| 21 | 50-0 | 37 | 90-0 |

TABLE B
For frame type conveyor

| Dimension | Size 100C conveyor |
|-----------|--|
| | Maximum size (test size) package 24"W x 20"D x 30"H |
| a | See ordering data |
| b | 29 to 34 inches |
| c | 23 to 29-1/2 inches |
| d | 14 inches |
| e | 48-3/8 inches |
| f | 33 inches |
| g | 1-3/4 inches minimum |
| h | 29-1/4 inches |
| i | 32-1/2 inches |
| j | 42-3/4 inches |

FIGURE 2. General arrangement of vertical frame type conveyor. - Continued

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SH 131803

FIGURE 3. Control station.

MIL-C-23218C(SH)

| <u>Team member</u> | <u>Responsibilities</u> | <u>Functions</u> | <u>Prohibited functions</u> |
|--------------------|---|---|---|
| | <u>Will:</u> | <u>Will:</u> | <u>Will not:</u> |
| 1. Supervisor | <ol style="list-style-type: none"> 1. Coordinate safe handling of packages on the level being served. 2. Coordinate movement of packages between the levels being served. 3. Operate the conveyor. 4. Explain safe handling procedures to Safety Observer and Handlers. | <ol style="list-style-type: none"> 1. Start the conveyor. 2. Stop the conveyor under normal or unsafe (emergency) conditions. 3. Assign specific functions and explain safe handling procedures to each Safety Observer and Handlers at the level being served. 4. Maintain communication through the existing communication system with the Supervisor on the other level being served to coordinate movement of packages. 5. Act as a Handler for a strikedown or strikedown cycle of less than 10 packages. | <ol style="list-style-type: none"> 1. Act as the Safety Observer or perform the functions of the Safety Observer. 2. Perform other functions that detract from his role as Supervisor. 3. Act as a Handler for a strikeup or strikedown cycle of 10 or more packages. 4. Use the conveyor trunk as a communications "voice tube." |
| 2. Safety Observer | <ol style="list-style-type: none"> 1. Observe all handling functions at the level being served. 2. React to any unsafe operating condition at the level being served by stopping the conveyor. 3. Be responsible for the safety of all personnel at the level being served. 4. Not allow unsafe operating conditions to exist. 5. Know the role of all SVPC personnel at the level being served. | <ol style="list-style-type: none"> 1. Stop the conveyor if any unsafe or emergency operating condition occurs or exists at the level being served. 2. Stop the conveyor under normal operating conditions. 3. Act as the Supervisor or perform the functions of a Supervisor. 4. Act as the Handler or perform the functions of a Handler. 5. Perform other functions that detract from his role as Safety Observer. 6. Use the conveyor trunk as a communications "voice tube". | |

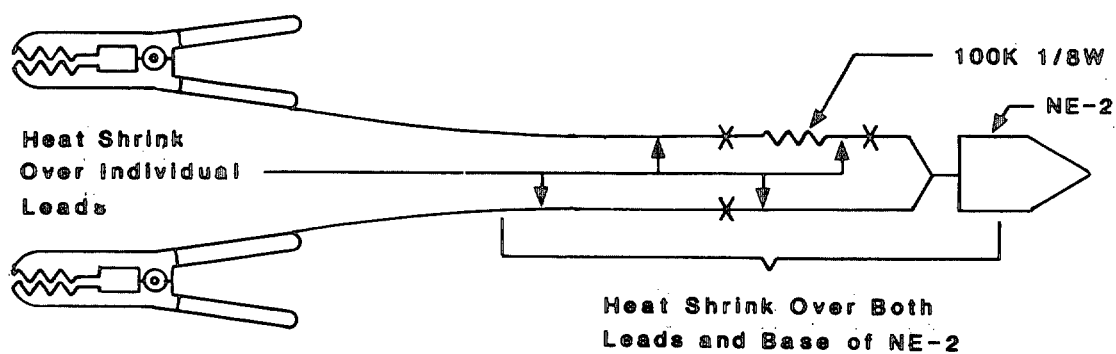
FIGURE 4. Two-man-rule for vertical package conveyors.

MIL-C-23218C(SH)

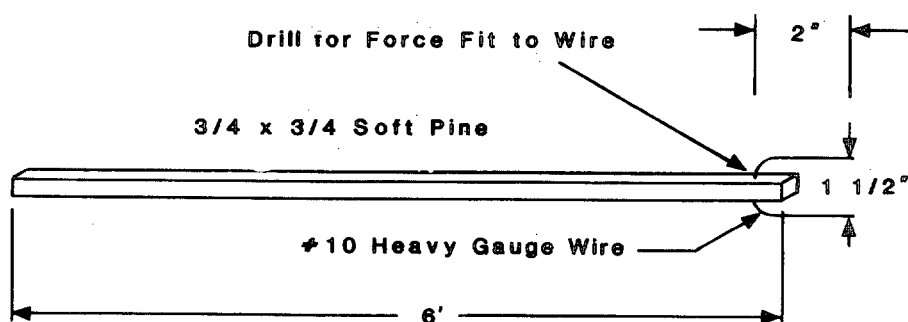
| <u>Team member</u> | <u>Responsibilities</u> | <u>Functions</u> | <u>Prohibited functions</u> |
|--------------------|---|--|---|
| | <u>Will:</u> | <u>Will:</u> | <u>Will not:</u> |
| 3. Handlers | 1. Load or unload packages in a safe manner from the conveyor during a strike-up or strikedown cycle. | 1. Load packages on the conveyors at the level being served. 2. Unload packages from the conveyor at the level being served. 3. Use gravity conveyors during strike cycles to the greatest extent possible. 4. Stop the conveyor if any unsafe or emergency operating condition occurs or exists. | 1. Start the conveyor. 2. Stop the conveyor under normal operating conditions. 3. Act as a Supervisor or perform the functions of a Supervisor. 4. Act as a Safety Observer. 5. Perform other functions that detract from the role as a Handler. 6. Maintain communication between the levels being served. 7. Use the conveyor trunk as a communications "voice tube". |

FIGURE 4. Two-man-rule for vertical package conveyors. - Continued

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SH 13202324

FIGURE 5. Neon test lamp assembly.

SH 13202325

FIGURE 6. Down overtravel test assembly.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL*(See Instructions – Reverse Side)*1. DOCUMENT NUMBER
MIL-C-23218C(SH)2. DOCUMENT TITLE
CONVEYOR, VERTICAL, TRAY, 100-POUND PACKAGE
TRAY CAPACITY

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐ VENDOR☐ USER☐ MANUFACTURER☐ OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

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)

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

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

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