

MIL-D-24151(SHIPS)
15 November 1965

MILITARY SPECIFICATION
DOORS, CURTAIN, ROLLING, STEEL, PLASTERS,
AND THEIR OPERATING EQUIPMENT

1. SCOPE

1.1 This specification covers rolling curtain doors, electrically operated with auxiliary manual operation and manually operated only, for shipboard use.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS**FEDERAL**

- FF-B-171 - Bearings, Ball, Annular (General Purpose).
- FF-S-85 - Screw, Cap, Slotted-and Hexagon-Head.
- FF-S-86 - Screw, Cap, Socket-Head.
- FF-S-92 - Screws, Machine: Slotted, Cross-Recessed or Hexagon Head.
- QQ-B-726 - Bronze, Manganese and Aluminum-Manganese Castings.
- QQ-S-633 - Steel Bars, Carbon, Cold Finished and Hot Rolled, (General Purpose).
- QQ-S-763 - Steel Bars, Shapes, and Forgings, Corrosion-Resisting.
- QQ-W-428 - Wire, Steel, High Carbon, Round, Uncoated for Mechanical Springs, (General Purpose).
- WW-P-441 - Pipe; Wrought Iron, (Welded, Black or Zinc-Coated).

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- MIL-B-857 - Bolts, Nuts, and Studs.
- MIL-S-867 - Steel Castings, Corrosion Resisting Austenitic.
- MIL-S-890 - Steel: Forgings and Bars for Hulls, Engines, and Ordnance (Heat-Treated).
- MIL-R-900 - Rubber Sheets; and Cut, Molded and Extruded Special Shaped Sections—Synthetic, Medium Soft, Low Temperature, Gasket Application.
- MIL-H-904 - Hoists, Chain and Wire Rope, Hand Operated.
- MIL-D-963 - Drawings, Electrical, Hull and Mechanical Equipment for Naval Shipboard Use.
- MIL-P-1144 - Pipe, Stainless Steel, (Corrosion-Resistant), Seamless or Welded.
- MIL-C-2174 - Controllers, Direct-Current, Naval Shipboard.
- MIL-C-2212 - Controllers, Alternating-Current, Naval Shipboard.
- MIL-F-3541 - Fittings, Lubrication.
- MIL-M-15071 - Manuals, Equipment and Systems.
- MIL-S-15083 - Steel Castings.
- MIL-S-16113 - Steel Plate, Hull and Ordnance, Structural, Black (Uncoated) and Zinc-Coated (Galvanized).
- MIL-T-16343 - Tubing, Steel, Carbon, Structural.
- MIL-B-16392 - Brakes, Magnet, Naval Shipboard.
- MIL-B-16540 - Bronze, Phosphor: Castings.
- MIL-G-16566 - Guns, Lubricating, Pressure, Hand-Operated.
- MIL-S-16974 - Steel Bars, Billets, Blooms and Slabs; Carbon and Alloy (For Reforging or Other Operations before Heat Treatment).
- MIL-M-17060 - Motors, Alternating Current, Integral Horsepower (Shipboard Use).
- MIL-M-17413 - Motors, Direct Current, Integral H. P., Naval Shipboard.
- MIL-A-17472 - Asbestos Sheet, Compressed (Gasket Material).
- MIL-Z-17871 - Zinc-Coating (Hot-Dip Galvanizing).
- MIL-S-20166 - Steel: Bars and Shapes (For Hull Construction) (Including Material for Drop and Miscellaneous Forgings).
- MIL-S-46033 - Steel Bars, Carbon and Alloy, Round, Square, and Flat (For Springs).

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STANDARDS

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MIL-STD-278 - Welding and Allied Processes for Machinery for Ships of the United States Navy.

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

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

OFFICIAL CLASSIFICATION COMMITTEE

Uniform Freight Classification Ratings, Rules and Regulations

(Application for copies should be addressed to the Official Classification Committee, 1 Park Avenue at 33rd St., New York, N. Y. 10016.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A4-64 - Medium-Carbon Steel Joint Bars.
- A42-63 - Wrought Iron Plates.
- A162-63 - Uncoated Wrought Iron Sheets.
- A163-63 - Zinc-Coated (Galvanized) Wrought Iron Sheets.
- A207-63T - Rolled Wrought Iron Shapes and Bars.

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

3. REQUIREMENTS

3.1 Rolling curtain doors shall be fitted with one of the following types of operating gears, together with the following appurtenances as necessary to meet service needs:

- (a) Electrically operated with auxiliary manual operation where two or more pilasters are required.
- (b) Manually operated only where not more than one pilaster is required.
 - (1) Hand crank, shaft and gear operation.
 - (2) Hand chain, sprocket and gear train operation.
- (c) Pilasters (located between curtains) with guides for windlock end buttons and complete with trolley, guide rollers in deck track or portable cable guide.
- (d) Motor power transmission:
 - (1) Motor shaft through epicyclic reduction gear.
 - (2) Integral close coupled motor reducers, and shaft drive.

3.2 Materials. - Unless otherwise approved by the bureau or agency concerned, materials shall be in accordance with the specifications in 2.1. Materials not specified hereinafter, or not specified to be in accordance with the specifications in 2.1, shall be of the best quality suitable for the purpose intended. Unless approved by the bureau or agency concerned, cast iron, semi-steel, or malleable iron shall not be used.

3.2.1 Bedplates shall be of cast steel, or medium steel, of welded construction.

3.2.2 Unless otherwise specified in the contract or order, gears shall be of heat treated, high grade steel.

3.2.3 Welded steel construction may be used in lieu of castings.

3.2.4 Steel castings that are to be welded to steel castings, or wrought steel, shall be in accordance with MIL-STD-278.

3.2.5 Forged steel that is to be welded shall be in accordance with MIL-STD-278.

3.2.6 Set screws or pins shall not be used in lieu of keys. Where pins are used for securing collars, or other parts, they shall be taper pins in reamed holes.

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3.2.7 Hot dip galvanizing in accordance with MIL-Z-17871 shall be used for fittings that will not require reworking for deformation due to heat of this galvanized process. For fittings such as curtain slats, frames, and so forth, that may be deformed during hot dip galvanizing process and would require reworking, one of following, or equal, self curing inorganic zinc coatings, as approved by the bureau or agency concerned shall be used:

- (a) Dimetcote No. 3.
- (b) Zinkote.
- (c) Rust-Ban 191.
- (d) Carbo-Zinc No. 11 (HFP).
- (e) Zincilate.

3.3 Design and calculations. -

3.3.1 The clearances between metal parts shall be designed to the minimum to reduce noise.

3.3.2 The design of all parts used in the construction of the doors shall be approved by the bureau or agency concerned.

3.3.3 All necessary calculations shall be made to determine that the curtains, pilasters, guides, wind-lock end buttons, and all other parts and connections, will sustain the design load specified in 3.5.1.1 without permanent set. These calculations shall be submitted to the bureau or agency concerned at the time drawings are submitted for approval.

3.3.4 All welding shall conform to MIL-STD-278.

3.4 General requirements. -

3.4.1 The curtain doors shall consist of steel curtains comprising horizontal metal slats secured together in such a manner that the curtain will roll on a drum, or tube, and the vertical edges of the curtain travel in guides attached to the ships structure and movable pilasters as required. Unless otherwise specified in the contract or order, the curtains and guides holding curtains in place shall have sufficient strength to withstand a 30 pound per square foot (p. s. f.) wind pressure without permanent set. The door shall exclude light, wind, rain, missile gases, and spray. The curtains shall be raised and lowered by means of an electric motor drive with auxiliary manual drive, or manual drive only, as specified in the contract or order. Electric motor drive shall be provided with means for automatically stopping the curtain in both the opened and closed position.

3.4.2 No part of the operating gear or curtain parts shall extend within the clear opening when the curtains are in the opened position. Cable guide arrangements or track arrangement shall be provided at the bottom which will permit easy and controlled movement of pilasters in a seaway. Twin locking bolts shall be provided at top and bottom of the pilasters and they shall be manually and simultaneously operated. A gasket shall be fitted on the lower edge of the curtain, and portable dogs provided at the deck to secure the lower edge to the deck and to tighten the slats to prevent water getting through. Dogs shall be stowed in a box in a convenient location.

3.4.3 The operating gear for raising and lowering the curtains shall be so designed that either manual or electric power operation can be selected without the curtain taking charge, even though the counter-balance springs are not in operation. The operating mechanism shall also be designed so that the curtains can be raised or lowered should the counterbalance spring be disconnected. The shifting from electric power to manual operation or vice versa shall in no way affect the adjustment or timing of the limit switches with relation to the curtain door movements, regardless of the open, closed or intermediate position of the curtain, at the time the shift in method of operation is made. Suitable means shall be provided in the electric power drive which will cause the motor to be deenergized to prevent damage to the curtain, curtain guides, or operating gear, should the curtain be jammed during the hoisting cycle. This protection should be arranged so that the curtain may be operated after the jam is cleared without it being necessary to reset or shift any of the mechanism.

3.4.3.1 The mechanical or manual operating gears shall be adjusted to permit the lower edges of the curtains to stop a sufficient distance above the deck such that when the lower edges are dogged down to the deck a tension shall be set up in the slats to prevent water from being blown through the joints of the slats.

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3.4.4 The power units shall be furnished complete with all mechanical accessories required herein and shall include suitable reversing motors, controllers, master and auxiliary switches, electric brakes, and so forth. The power units shall be of compact design and shall be located where practicable inside of the hangars and at either end of the curtain barrels as approved by the bureau or agency concerned.

3.4.4.1 The electrical power unit shall be suitable for the voltage and duty cycle specified in the contract or order. The capacity of the motor shall be sufficient to operate the curtains without exceeding 150 percent of its full load rating.

3.4.4.2 The motor power unit shall be capable of completely raising or lowering the rolling curtains at an average rate of not less than one-half foot of curtain per second, and shall perform such operations under a wind pressure of 30 p. s. f. with counterbalancing springs in commission or under equivalent test conditions. That is, with the curtain's apron loaded with a uniformly distributed load, equal to the product of the exposed-to-wind-pressure area in square feet, multiplied by 30 for pounds wind pressure, multiplied by a coefficient of friction to be established as provided for in 4.2.1. Under this test condition the curtain shall be raised a distance of 12 inches above the deck its bottom member has contact with.

3.4.5 The auxiliary manual operating mechanism for electrically operated curtains, shall be non-overhauling, and shall be capable of raising the curtain approximately 30 feet per minute (f. p. m.) when subjected to 30 p. s. f. wind load loss (no wind load and with counter-balancing springs in operation) when the pull on the hand chain is not more than 35 pounds and the speed of the hand chain not greater than 180 f. p. m. The manual operating mechanism shall also be designed so that the curtains can be raised or lowered should the counter-balancing springs be disconnected; in which case the pull on the hand chain shall not exceed 75 pounds with no wind load, or 125 pounds with the 30-pound wind load. An electric brake shall be provided to hold the curtain in event of power failure. Manual override of the brake shall be provided.

3.4.6 Manual operation for curtains without power drive shall be accomplished preferably by means of hand crank, shaft and gear transmission or hand with sprocket and gear train transmission. Manually operated curtains shall be equipped with helical torsion springs and spring tension devices as described hereinafter for power driven curtains. The hand-operating gear shall be capable of completely raising or lowering the rolling curtains, one man operating the hand chain. The pull on the hand chain shall not exceed 50 pounds with the springs engaged and no wind load, 75 pounds with springs engaged and 30 p. s. f. wind load or 125 pounds with springs disengaged and 30 p. s. f. wind load.

3.5 Detail requirements. -

3.5.1 Curtains. -

3.5.1.1 The curtains shall be built of interlocking slats fabricated from open hearth steel at least 0.049 inch thick. The slats shall be galvanized with a zinc coating heavy enough to add at least 1.25 ounces p. s. f. of flat metal. The curtains shall be fitted with end locks, wind locks and closure ribs as required to provide continuous seal in curtain guides, and shall have sufficient strength to withstand a 30 p. s. f. wind pressure in any position. In addition, the curtains shall be designed for a load of 250 p. s. f. of curtain area to a height of ten feet above the hangar deck and 30 p. s. f. above this height with a unit stress not to exceed 22,500 pounds per square inch (p. s. i.) the loading to be applied when the curtain is dogged down to the deck. They shall be placed either inside or outside of the enclosed space as required. The top of the curtain shall be secured to the spring barrels in a manner so as to be readily detachable. Curtains shall operate in guides as described in 3.13.4.

3.5.1.2 End locks of galvanized medium steel designed to prevent lateral movement of the slats shall be attached to the ends of the slats with 5/16 inch diameter galvanized rivets or two piece mechanical fasteners. Galvanized intermediate closure ribs shall be fitted as required.

3.5.1.3 Wind locks shall be galvanized steel castings conforming to the requirements for grade B of MIL-S-15083 fitted with manganese bronze solid end buttons. They shall be secured to the curtain slats with not less than five 5/16 inch diameter galvanized steel rivets through backing strips spot welded to the curtain slats. Additional end buttons shall be added to bottom 5 feet of curtains, the number to be the maximum coverage on the outside periphery of the roll permissible without interference when curtain is in the "up" position - approximately alternate slats.

3.5.1.4 A steel apron plate about 3/16 inch thick with steel stiffening angles riveted or welded to it, shall be bolted to the bottom curtain slat with round head steel bolts and locked hexagonal nuts. The apron

plate and stiffening angles shall, after being assembled with the holes punched in them, be galvanized. Bolted to the bottom of apron with galvanized countersunk head bolts and hexagonal nuts shall be a galvanized steel angle or other member to which rubber gaskets shall be secured. The bottom of the apron plate and the member for securing the rubber gaskets shall be shaped to the sheer or camber of the deck. A sheer or camber diagram or mold for laying out the camber or sheer shall be secured from the shipbuilder. Lubricated guide rollers at the ends of the apron shall be installed of manganese bronze as required. Renewable rubber gaskets of suitable size and shape shall be secured to the bottom member with brass machine screws in accordance with FF-S-92, and shall conform to the camber or sheer of the deck making a reasonably watertight contact with the deck. The operation of the gasket shall be such as to provide a time interval of light excluding between the beginning of the curtain rise and the gasket clearing the deck, during which the electric light cut-out switch shall operate.

3.5.2 Spring barrels and counterbalances. -

3.5.2.1 Barrels shall be wrought iron pipe or tubing galvanized. Pipe shall be of proper diameter for curtains to roll on with a minimum of resistance and shall be of a sufficient thickness to resist deformation. The deflection of the barrel shall not exceed 1/360 of its length, when fully loaded. The ends of the barrels shall be enclosed by cast steel plugs, journaled on steel shafting supported by brackets. The end plugs shall be machined to fit barrels. Journal shafts in the driving end of barrels and the spring tension shafts extending to the spring adjusting devices on brackets shall be of cold-rolled steel and of ample diameter. Ball bearings shall be in accordance with FF-B-171 for the load-carrying bearings of the spring barrel.

3.5.2.2 The counterbalance of each curtain shall consist of oil-tempered helical steel springs, designed with a factor of safety of 4. The springs shall be of ample strength to counterbalance the weight of the curtain at any point of its travel and shall be capable of being adjusted to counterbalance 125 percent of the normal load. They shall be mounted upon cast steel heads attached to barrel and securely anchored to the tension shaft and completely enclosed within the barrel.

3.5.2.3 The arrangement shall be such as to accommodate suitable provision (at the end of and on the outside of the barrels) for adjusting the tension of the springs without having to release them and raise or lower the curtains to secure adjustment. Tension shall be adjusted with a self-locking worm and gear wheel arrangement to be operated by a portable crank or with an adjustable steel locking wheel actuated by rods and secured with a locking pin. Adjustment secured through releasing the curtain and altering the relative position of the springs will not be acceptable.

3.5.2.4 Springs shall be thoroughly cleaned and lubricated just before enclosing in the barrel.

3.5.2.5 End plugs shall be galvanized and sealed into pipe barrels with white lead. All other exterior parts except shafting, if made of steel, shall be galvanized. Pressure lubricating nipples shall be provided as found necessary. Plugs shall be bushed with bronze bushings. Machine screws securing plugs shall be of steel, cadmium plated.

3.5.2.6 Supporting brackets may be steel castings, forgings or weldments adequately stiffened and with suitable bolting flanges and rim for the attachment of the hood. Brackets shall be formed to make curtain enclosure in conjunction with the hood. Brackets shall be galvanized. The throat of the brackets shall be arranged with curtain guides and stops, and suitable steel bearing hubs shall be provided. The center hub on the operating bracket shall be fitted with a ball bearing in accordance with FF-B-171, mounted in a self-aligning sleeve. Pressure lubrication shall be provided for conveniently lubricating bearings. The bracket supporting the fixed end shall be the same as the operating brackets, except for the bearings.

3.5.3 Hood. - Each rolled curtain and spring barrel shall be housed in a galvanized sheet steel portable hood of not less than 0.03125 inch thickness. The hood shall be made in easily removable sections, circular shaped with no flat sections or obstructions on which rats can build nests, and formed to follow closely and to fit the contour of the curtain when it is rolled up on the barrel. The hood shall be secured to the supporting brackets. Intermediate supports shall be provided as found necessary and shall be attached to and shall support the hood sections. At the operating bracket the hood shall extend completely over the main driving gear and pinion and completely house them from exposure. The hoods shall be of a shape that will prevent the collection of moisture and provide drainage from all parts, both inside and outside. Stiffening at the bottom edge of hood shall be provided and shall be arranged for fastening to the brackets and for securing the ends of hood supports. Hood shall be stiffened elsewhere as required by galvanized angles or solid half rounds. All parts shall be galvanized, including bolts and nuts not made of composition.

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3.5.4 Foundations. - Suitable structural foundations shall be provided for the support of the motors, magnetic brakes, gear boxes, and so forth.

3.5.5 Reduction and driving gears, shafting and bearings. -

3.5.5.1 Reduction gearing shall operate in an oil bath, and all gear teeth shall have smooth-finish, machine-cut teeth. Pins shall not be used in lieu of keys for securing gears, pinions, sprockets and so forth. All keys shall be fitted and of forged steel. Flexible couplings shall be of the metallic type.

3.5.5.2 Gear box. - An oiltight gear box of suitable design built of wrought iron with portable cover and oilproof gasket, stuffing box or oil seals as approved by the bureau or agency concerned and composition drain plug and bleeder pipe, visible oil gauge, and so forth, shall enclose the spur gearing and worm gearing, specified in 3.5.5.1, in an oil bath.

3.5.5.3 Bearings of ample capacity shall be provided to take up the axial thrust of the worm, which will be mounted in the gear box for manual operation. Bearings and their mountings shall be lubricated.

3.5.5.4 Driving gears on the operating bracket shall be steel castings with machine-cut teeth with ample width of faces, and diametral pitch, and shall be provided with suitable fitted keys and keyways for mounting on shafts. Unless otherwise specified herein, all shafting shall be cold-rolled polished steel. Bearings shall be used as required and they shall be easily accessible for maintenance.

3.5.5.5 Bearings shall be in accordance with FF-B-171, and wherever necessary fitted with pressure grease fittings.

3.5.5.6 All other parts shall be made of steel castings conforming to the requirements for grade B of MIL-S-15083 or other material approved by the bureau or agency concerned.

3.6 Chain drive. - Drive chains shall be steel roller chain, cadmium plated and of a design with pockets to retain lubricant. Chains shall be prelubricated by the manufacturer, at the time of assembly, with a special long-lasting lubricant. A drip pan shall be provided under the chain and sprockets. The chains and sprockets shall be guarded by suitable wire mesh enclosures which shall be easily removable for inspection and maintenance of drives. Such guards shall be at locations where considered necessary by the bureau or agency concerned.

3.7 Manual hand operating mechanism. -

3.7.1 Manual operation of the power-operated curtains shall be provided in accordance with 3.4.5 and unless otherwise directed by the bureau or agency concerned, the operation shall be by means of an endless galvanized hand chain engaging a cast steel chain-pocketed wheel (with chain guard) on the transmission shaft. The chain shall extend within 30 inches of and be operated from the deck with which the bottom of the curtain contacts. When not in use, the hand chain shall be secured in such a way as to prevent unnecessary noise. Securing means shall permit ready release of the chain for use.

3.7.2 Hand chains for operating trolleys, power and manually operated curtains. - All hand chains shall be made of steel, electrically or forge-welded on the sides of the links and shall have smooth finish. Links shall be of uniform size and shape, free from laminations and scale, and shall properly fit the pockets of the chain wheel. Chain shall be galvanized, free from any tendency to snarl.

3.8 Rustproofing. - All parts of structure of curtains, barrels, hoods, brackets, pilasters, mullions, swinging panels, and so forth, subject to rust, shall be galvanized. The galvanizing shall be done, when possible, after assembly. Bolts, nuts, screws, washers, and other like items, shall be galvanized, or cadmium plated, when of corrodible composition.

3.9 Bolts, nuts and machine screws. -

3.9.1 Bolts shall not be used for permanent connections where rivets, or two piece mechanical fasteners, can be used. Two or more body-bound, that is, fitted bolts shall be used to align mechanical and structural parts where they are assembled to form a unit. Stud bolts with composition nuts and locknuts shall be used where through bolts are unsuitable. Unless approved by the bureau or agency concerned, cap screws and tap bolts shall not be used. Bolts shall be of medium steel galvanized or cadmium plated and

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shall have a clearance in bolt hole not to exceed 1/32 inch. Machine screws shall be of naval brass throughout. All bolts and nuts shall be secured by lock or joint nuts.

3.10 Motor gear reducers. - Unless approved by the bureau or agency concerned, chain reduction transmission shall not be used between motor and curtain in lieu of shaft and reduction gear drive.

3.11 Electrical equipment. -

3.11.1 Motors. - Rolling curtain doors shall be provided with suitable reversing motors in accordance with the following:

	<u>A.C.</u>	<u>D.C.</u>
Specification	MIL-M-17060	MIL-M-17413
Service	A	A
Voltage	440	230
Ambient temperature	50°C.	50°C.
Duty	Intermittent 15 minutes	Intermittent 15 minutes
Horsepower	As required	As required
Speed	Varying-reversing	Varying-reversing
Type	Squirrel-cage induction	Compound
Bearings	Ball	Ball
Insulation	Class B	Class B
Enclosure	Watertight	Watertight

3.11.2 Controllers. - Controllers shall be in accordance with the following:

	<u>A.C.</u>	<u>D.C.</u>
Specification	MIL-C-2212	MIL-C-2174
Operation	Magnetic	Magnetic
Voltage	440, 3 phase	230
Type	Across-the-line	Reduced-voltage
Performance	Automatic	Automatic
Protection	Undervoltage	Undervoltage
Function	Motor starting and reversing	Motor starting and reversing
Enclosure	Dripproof	Dripproof
Master Switches:		
Location	Remote	Remote
Type	Pushbutton and limit	Pushbutton and limit

3.11.3 Electric brakes. - Electric brakes shall be in accordance with MIL-B-16392 and the following:

	<u>A.C.</u>	<u>D.C.</u>
Voltage	440	230
Enclosure	Dripproof	Dripproof

3.11.4 Master control stations. - The master control stations shall be of an approved (see 3.11.6) momentary contact pushbutton type of dripproof construction and shall be clearly designated "Open", "Close", and "Stop". Control stations may be located inside or outside the hangar and at either or both ends of curtains.

3.11.5 Auxiliary switches. - The limit switches and interlock switches shall be of approved types (see 3.11.6) and shall be of dripproof construction.

3.11.6 Closures. - The closures of the electrical equipment for installation in locations subject to explosive mixtures shall be explosionproof in accordance with the requirements of either the Bureau of Mines or the Underwriters Laboratories Incorporated, as selected by the bureau or agency concerned.

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3.11.7 Operation. -

3.11.7.1 The auxiliary limit switches shall be actuated by suitable mechanical means attached to the curtain structure and shall deenergize the motor controller circuit and simultaneously deenergize and set the electric motor brake. These auxiliary limit switches shall be so located as to insure complete opening and closing of the roller curtain. By depressing the "Stop" button of the master control stations while the curtain is being raised or lowered, the motor control circuit shall be deenergized and simultaneously the electric brake shall be deenergized and set and the curtain shall then be operable either up or down.

3.11.7.2 The auxiliary interlock switches shall prevent the motor control circuit from being energized unless the pilasters are locked in proper position to brace or guide the roller curtain. The switches shall be actuated by locking bolts or other approved mechanical means attached to the movable structures and, if possible, shall be located on the ship's overhead structure.

3.11.7.3 Provision shall be made to facilitate shunting out the auxiliary interlock switches when the roller curtain is required to be closed quickly in the emergency of fire. This device shall consist of an approved momentary contact type push button with an approved enclosure (see 3.11.6) having a locked cover with a glass plate with suitable means of breaking the glass plate. The enclosure shall be so designed as to prevent opening of the cover or operation of the switch unless the cover is unlocked or the glass broken. A suitable warning plate shall be attached to or directly above or below the switch and be legibly marked in red "USE ONLY TO CLOSE CURTAIN IN CASE OF FIRE." The switch box shall be painted with a suitable red enamel.

3.12 Movable pilasters with portable guides attached. -

3.12.1 Movable pilasters, as required (see 3.4.1) shall be supplied. They shall be built up of structural channels, "I" or "H" beams of medium steel, in accordance with MIL-S-20166 and medium steel plate conforming to MIL-S-16113. Ample strength and rigidity shall be provided and the deflections under full load shall not exceed 1/360 of their length. Calculations shall be based on a tensile stress not to exceed 16,000 p.s.i. The bottom seven feet of pilasters shall be portable to facilitate removal of damaged slats.

3.12.2 The pilasters shall be suspended from special overhead roller-bearing carriages mounted on and geared to suitable overhead trolley eye beam tracks. This arrangement shall provide means by which the pilasters can be positively controlled and easily transported by manual operation (without hand assistance or guiding of their bottom ends), to one side of and clear of the hangar opening, where they can be stowed and locked top and bottom. The roller carriage shall be self-aligning and shall be bolted to the top of the pilasters. The rollers shall be widely spaced (not less than 18-inch centers) in order to provide stability for the pilasters while they are in motion. They shall be motivated at a speed of not less than 20 f.p.m. with a starting pull not exceeding 35 pounds and a normal operating effort of not more than 12 pounds on the hand chain at a rate of 180 f.p.m. of hand chain.

3.12.3 Locomotion of the trolley carriage shall be controlled by a 5/8-inch galvanized hand chain which shall be of sufficient length to reach within 4 feet of the hangar deck. The hand chain shall operate an iron sprocket which shall be provided with a guard. The sprocket shall drive the carriage through spur or worm gearing by means of a rack and pinion or by means of a sprocket and roller chain arranged as a rack. The roller chain, if used, shall be not less than 1 inch pitch and of standard construction. If a worm drive is used, the worm gear shall have a hardness of not less than 350 Brinell and shall have a generous helix angle. The worm wheel shall be in accordance with the chemical composition in table I. Means shall be provided for automatically and positively preventing motion of the trolleys along the track when the ship rolls or pitches.

Table I—Chemical composition.

Copper	Tin	Phosphorus	Nickel	Lead, Zinc and other impurities
Percent	Percent	Percent	Percent (max.)	Percent (max.)
88.00-90.00	10.00-12.00	0.10-0.30	0.05	0.50

3.12.4 The lower end of the pilaster shall be provided with cable guide or roller track arrangement as approved by the bureau or agency concerned. The cable guide shall be built of galvanized pipe with heavy bronze guides at pipe ends. Through this cable guide there shall work a pliable plow steel galvanized wire rope with hemp center. The guide cable shall be of suitable size and dead-ended to a galvanized structural support at one side of the curtain. At the other side similarly in the clear there shall be a structural support through which the guide rope's threaded socket bolt is rove in a manner approved by the bureau or agency concerned, so that a small threaded bronze or corrosion-resistant steel handwheel can operate to take up the slack.

3.12.5 The installation of guide roller track arrangement in lieu of cable guides may be used where it meets the approval of the bureau or agency concerned. It may be used only where a flush deck is not required, or where there is no objection to the installation of ramps and where camber and sheer do not interfere. The track shall consist of two structural members attached to the hangar deck in such a manner as to care for any camber or sheer. Guide brackets attached to the bottom of the pilaster shall be equipped with one pair of horizontal rollers and two pair of smaller vertical rollers, spaced not less than 12 inches and 20 inches, respectively. Rollers shall work within the track and shall be manganese bronze fitted with self-lubricating bushings. Steel roller support castings shall be detachable. Portable or stationary steel ramps shall be furnished if required. The entire arrangement shall guide the bottom of the pilasters throughout their travel without manual assistance.

3.12.6 Twin locking bolts shall be provided at top and bottom of pilasters to lock them in the required position to brace the curtain and in the stowed position. They shall be not less than 1-3/16 inches in diameter and shall be made of cold-rolled steel, finished smooth and galvanized. They shall engage into cold-rolled steel galvanized sockets which shall be provided for installation in the deck and overhead to receive the bolts in both positions of pilasters, namely, stowed and securing curtain. The operation of the top and bottom locking bolts shall be controlled by small handwheels of bronze, or corrosion-resisting steel, condition A in accordance with QQ-S-763, located on the pilasters about 3 feet, 9 inches above deck. These handwheels shall operate multiple-threaded screws. By revolving the handwheels, the bolts shall move quickly and simultaneously into or out of their respective sockets. The locking bolts shall actuate the electric interlock in the electric motor drive circuit.

3.12.7 Smooth-finished renewable hardwood strips of ample size black or yellow locust, straight-grained shagbark or pignut hickory with a specific gravity of not less than 0.65 (based on oven-dry weight and volume) or teak shall be bolted to the face of the pilasters in order to provide a smooth working surface for the curtains to slide against and to deaden the sound. Rubbing strips shall be painted on faying surfaces with lead paint and on the exposed surfaces with at least two coats of spar varnish.

3.12.8 Electric interlock switches shall be provided as described in 3.11.7.2.

3.13 Manually operated curtains. -

3.13.1 Manually operated curtains shall be in accordance with the applicable requirements specified herein for power operated curtains.

3.13.2 Curtains shall be operated by suitable hand cranks or hand chain wheels located at either or both ends of the curtain and from the inside or outside of the hangar space. The hand crank type operating gear shall consist of forged galvanized rotating handled cranks which will operate cut steel mitre gears fully enclosed in a steel gear box with vertical transmission shafts and cut steel worm actuating a worm wheel attached to the barrel shaft. The worm and worm wheel shall be self-locking. Easily lubricated ball bearings shall be provided at both ends of the worm. Shaft bearings throughout shall be self-lubricated. Bearings worm, wormwheel and mitre gears shall be fully enclosed in a 1/8 inch galvanized steel box arranged for easy removal of parts within. Hand chain type operating gear shall conform to the requirements of MIL-H-904.

3.13.3 Where curtains are operated from both ends the gearing shall be synchronized by mitre gearing and idler shaft arrangement with the idler shaft parallel to the barrel and meshing with the end mitre gears on the vertical shafts extended. Supporting end brackets shall be galvanized steel castings arranged to receive gear boxes and shaped to suit hood and curtain guides.

3.13.4 Chain drive. - Shaft drive is considered preferable to chain drive method for connecting the gear reduction unit to the curtain drum. However, when approved by the bureau or agency concerned chain and sprockets may be used. Operation shall be by means of a galvanized endless type A, class 1, long link

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sprocket-wheel chain in accordance with MIL-H-904, engaging a galvanized cast steel or composition pocketed chain sheave (with malleable iron chain guard) actuating a pinion and spur gear train. Gearing shall be galvanized steel castings, or of composition with cut teeth.

3.13.5 Gear train shall be fully enclosed. Enclosure shall be arranged for lubrication and removal of parts within. Barrel shall be fitted with spring tension adjustment device. All bearings shall be self-lubricating if possible, otherwise pressure lubricated.

3.14 Government furnished material. - When the ship is built in a Government shipyard, the following will be furnished by the Government:

- (a) Foundations, only for assemblies furnished by the supplier, including holding-down bolts for securing assemblies to ships structure.
- (b) Electric wiring complete up to and between the electrical units furnished by the supplier.
- (c) Conduit tubes, terminal boxes, and so forth.
- (d) Necessary oil, greases, and lubricating materials to be used at or after time of erection.
- (e) All curtain equipment to be erected on ships structure by the building yard.

3.15 Onboard repair parts and special tools. -

3.15.1 Mechanical. - Mechanical onboard repair parts for each vessel shall include four right-hand and four left-hand combination stops and wind locks equipped with rollers complete, also 10 right and 10 left of each of the other types of end locks or light stops for not less than every two curtains installed. A total of eight spare slats shall be supplied, the length of each spare slat being long enough for the widest curtain. Double the required number of rivets for attaching the spare stop and wind locks, end locks, and light stops shall be furnished. A set of special riveting blocks to be used as a base for riveting end locks to curtain slats, together with a countersinking tool for countersinking the slat end lock holes shall be furnished.

3.15.2 Electrical. - Electrical onboard repair parts shall be furnished as required by the applicable specifications referenced herein.

3.15.3 Special tools. - All special tools, wrenches, and other like items, that may be required for proper service and maintenance of equipment shall be furnished by the supplier. Special tools are defined as those tools not listed in the Federal Supply Catalog. (Copies of this catalog may be consulted in the office of the Government inspector.)

3.15.4 Marking. - Each tool and wrench shall be indelibly marked for the service for which it is intended, and each repair part shall have a noncorrosive and nonefacing label securely attached.

3.16 The supplier shall clean and paint all faying surfaces where necessary with red lead prior to assembly. Insulate such surfaces as may require it. Provide necessary and proper gaskets to secure tightness. Paint, grease or tape all finished parts and shafting to protect same prior to erection in ship.

3.17 Operating directions and lubricating chart. -

3.17.1 Complete directions for operation of curtains, pilasters, and so forth, shall be etched on brass plates and mounted on the ships structure as directed by the bureau or agency concerned.

3.17.2 A complete legible lubricating chart showing and locating all parts requiring periodic lubrication, setting forth the approximate position of internal parts, and the kind of lubricant to be used, shall be mounted in a frame under glass and attached to the ships structure as directed by the bureau or agency concerned.

3.18 Drawings. - Drawings shall be classes B and D in accordance with MIL-D-963. In addition to the requirements of MIL-D-963, drawings shall be as specified in 3.18.1, 3.18.2 and 3.18.3. Drawings shall be submitted for approval in accordance with MIL-D-963 and as specified in the contract or order.

3.18.1 Arrangement drawings. - Arrangement drawings shall include the following:

- (a) The arrangement of the roller curtain doors in plan view, section and elevation.
- (b) Clear openings, widths of doors, location of pilasters in service and stowed positions, line of overhead trolley track, cable guides, and location of operating motors.

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- (c) All welding as to type, size, spacing, and so forth, using welding symbols in accordance with MIL-STD-278.
- (d) Diameter, number of threads, coarse or fine, and fit of all bolts and machine screws.
- (e) Calculations for pilasters (see 3.12.1).
- (f) Average speed of trolley under ordinary working conditions (see 3.12.2).

3.18.2 Detail drawings. - After the arrangement drawings have been approved, complete detail working drawings shall be developed and submitted for approval. Detail drawings shall include the following:

- (a) Applicable Military specifications.
- (b) Where the applicable specification permits a range of values, or where other than material in accordance with the military specifications is proposed, the chemical analysis and physical properties of the materials, including hardness and heat treatment shall be shown.
- (c) The comparable Military specification which can be used for replacement of material not furnished in accordance with the Military specifications.
- (d) Complete bills of material.
- (e) Unit weights.
- (f) Total weight.

3.18.3 Copies of all final drawings shall be furnished to the Bureau of Ships and the agency concerned, for record purposes, as follows:

- (a) One set of Vandyke process negatives.
- (b) Blueprints as specified in the contract or order.

3.19 Manuals. - Manuals shall be type I in accordance with MIL-M-15071.

3.20 Workmanship. - The material and workmanship shall be of the best grade throughout.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. - Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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.

4.2 Quality conformance inspection. - Rolling curtain doors shall be inspected as specified in 4.2.1 and 4.2.2.

4.2.1 In order to establish an applicable coefficient of friction to be used as a basis for the test load-equivalent for the fully lowered curtain under a 30 p. s. f. wind pressure, which it is impracticable to simulate, and to demonstrate the adequacy of the strength of the windlock end buttons and their parts, connections and riveting, also to establish the fact that the windlock end button guides will not permanently distort, the test in 4.2.1.1 shall be conducted.

4.2.1.1 The test shall be conducted with the guides and test section of curtain horizontal. Guide's shall be attached to supports (provided by the supplier) by the holding bolts which connect them to the ships structure. A section of the curtain consisting of four windlock end buttons shall be riveted to two slats with intermediate slats equal to the greatest number similarly proposed in the curtain. To these shall be added one-half the number of slats on both sides of these end buttons which are located between the adjacent end buttons of the section of curtain being duplicated. The resulting test section shall represent the maximum number of slats in the curtain which are supported by two pairs of end buttons. Means shall be provided for holding the slats in alignment in order that the slats may be loaded with sand bags or other approved means to simulate the wind pressure. The sand bags plus the weight of curtain section and alignment structure, and so forth, shall equal the 30 p. s. f. wind pressure. The loaded section shall be motivated in the guides by an arrangement for pulling it at the specified speed, which shall simulate the barrel pull. The pull shall be measured and a coefficient of friction established based on the square foot area which can be applied to the area of the entire curtain. Based on this data the supplier shall furnish computations showing that motors, curtains, barrels, and so forth, meet the requirements specified herein.

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4.2.2 Shipboard inspection. - Rolling curtain doors shall be examined and tested as specified in 4.2.3 and 4.2.4.

4.2.3 Examination. - Each rolling curtain door shall be examined to determine the following:

- (a) That curtains, pilasters, and all parts function in accordance with requirements, and within the time limits, specified herein.
- (b) That satisfactory operation of curtain pilasters, and so forth, under all working conditions is obtained.
- (c) Suitability and satisfactoriness of hand operating gears as to speed and ease of operation.
- (d) That both hand and power motivation is satisfactory when curtains are operated with counterbalancing springs disengaged.

4.2.4 Tests. -

4.2.4.1 Motor-operated curtains. - Where more than one motor-operated curtain is installed on a vessel, a representative curtain with the greatest exposed area shall be tested as representative of the balance of the motor driven curtains. This curtain shall be tested with a test load the weight of which shall be the product of the clear opening height multiplied by the clear opening width in feet times the coefficient of friction (established in 4.2.1.1). This test load will include the weight of straps and will be secured uniformly along the lower edge of the curtain. Tests shall be conducted with pilasters in position and counterbalancing springs engaged. Curtain shall be operated a sufficient number of times and the following data in (a) taken:

(a) With test weights applied, raise curtain approximately the opening height. -

Volts to start.	Amperes to start.
Volts during run.	Amperes during run.
Time in seconds.	Average speed in feet per second.

- (b) Raise and lower the curtain the whole distance without weights.
- (c) In addition to the foregoing, similar data shall be taken as outlined in (a) and (b) inclusive, but with the counterbalancing springs disengaged.
- (d) Data similar to that required by (a) and (b) shall be taken when curtain is operated manually with emergency hand chains and the effort in pounds pull on the hand chains for hand operation shall be recorded.

4.2.4.1.1 The motor driven curtains other than the curtain covered by 4.2.4.1 shall be tested by power and hand drive to demonstrate their satisfactory operation in accordance with the requirements of this specification. The time to open and close the curtains and the effort in pounds pull on the hand chains for emergency hand operation shall be recorded.

4.2.4.2 Manually operated curtains. - Tests as follows shall be applicable to the manually-operated curtain having the largest exposed area:

- (a) With springs in commission, the time required to raise, also lower the curtains, and the average speed in feet per second.
- (b) Same as (a) with springs disengaged.
- (c) The pull in pounds shall be given for (a) and (b).
- (d) The actual distance that the bottom bar travels shall be given.

4.2.4.2.1 Manually operated curtains other than the ones specified in 4.2.4.2 shall be operated to demonstrate their satisfactory performance.

4.2.4.2.2 Tests of manually operated pilasters. - The pilasters located at the motor-operated curtain having the greatest exposed area shall be tested as follows:

- (a) Test to demonstrate average rate of travel of pilaster in f.p.m. under average working conditions.
- (b) The time it takes to unlock, transport, stow and lock pilasters in stowed positions.
- (c) Same as (b) except to unlock (in stowed positions), transport and lock in service positions.
- (d) The effort on pounds pull on the hand chains required to move (overcome inertia and motivate) pilasters.

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5. PREPARATION FOR DELIVERY

5.1 Domestic shipment and early equipment installation and for storage of onboard repair parts. -

5.1.1 Doors. -

5.1.1.1 Preservation and packaging. - Preservation and packaging which may be the supplier's commercial practice, shall be sufficient to afford adequate protection against corrosion, deterioration and physical damage during shipment from the supply source to the using activity and until early installation.

5.1.1.2 Packing. - Packing shall be accomplished in a manner which will insure acceptance by common carrier, at lowest rate, and will afford protection against physical or mechanical damage during direct shipment from the supply source to the using activity for early installation. The shipping containers or method of packing shall conform to the Uniform Freight Classification Ratings, Rules and Regulations or other carrier regulations as applicable to the mode of transportation and may conform to the supplier's commercial practice.

5.1.1.3 Marking. - Shipment marking information shall be provided on interior packages and exterior shipping containers in accordance with the contractor's commercial practice. The information shall include nomenclature, manufacturer's part number, contract or order number, contractor's name and destination.

5.1.2 Onboard repair parts and special tools. - Onboard repair parts and special tools listed in 3.15.1, 3.15.2 and 3.15.3 for onboard stowage and future use shall be packaged, packed and marked in accordance with 5.1.1.1, 5.1.1.2 and 5.1.1.3, and with the applicable specification.

6. NOTES

6.1 Ordering data. - Procurement documents should specify the title, number and date of this specification.

Preparing activity:
NAVY - SH
(Project 2040-N059Sh)

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

SPECIFICATION

ORGANIZATION (Of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

DIRECT GOVERNMENT CONTRACT

SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

YES

NO IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity)

DATE

FOLD

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BUREAU OF SHIPS
WASHINGTON, D. C. 20360**

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