

1 INCH-POUND

MIL-D-24151A(SH)

10 May 1990

SUPERSEDING

MIL-D-24151(SHIPS)

15 November 1965

(See 6.7)

MILITARY SPECIFICATION

DOORS, ROLLING, CURTAIN, AND THEIR
OPERATING EQUIPMENT

This specification is approved for use by 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 roller curtain doors and their operating equipment used for a wide variety of applications on Naval ships. Within this specification, the word "door" is frequently substituted for "roller curtain door".

2. APPLICABLE DOCUMENTS

2.1 Government documents.

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

SPECIFICATIONS

FEDERAL

- L-P-387 - Plastic Sheet, Laminated, Thermosetting (For Designation Plates).
- FF-B-171 - Bearings, Ball, Annular (General Purpose).
- FF-B-187 - Bearing, Roller, Tapered.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 2040

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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FEDERAL (Continued)

- FF-B-195 - Bearing, Sleeve, (Bronze, Plain or Flanged).
- FF-S-85 - Screw, Cap, Slotted and Hexagon Head.
- FF-S-86 - Screws, Cap, Socket Head.
- FF-S-92 - Screw, Machine: Slotted, Cross-Recessed or Hexagon Head.
- FF-S-200 - Setscrews: Hexagon Socket and Spline Socket, Headless.
- FF-S-210 - Setscrews: Square Head (Inch) and Slotted Headless (Inch and Metric).
- OO-K-220 - Key, Machine.
- QQ-A-250 - Aluminum and Aluminum Alloy Plate and Sheet: General Specification for.
- QQ-A-307 - Aluminum Alloy Forgings.
- QQ-A-601 - Aluminum Alloy Sand Castings.
- TT-P-645 - Primer, Paint, Zinc Chromate, Alkyd Type.
- GGG-P-781 - Puller, Mechanical, Attachment, Mechanical, and Puller Set, Mechanical.
- PPP-F-320 - Fiberboard: Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes.

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- MIL-S-901 - Shock Tests, H.I. (High Impact), Shipboard Machinery, Equipment and Systems, Requirements for.
- MIL-S-1220 - Studs, Bolts, Hex Cap Screws, Socket Head Cap Screws and Nuts.
- MIL-C-2212 - Controllers, Electric Motor A.C. or D.C., and Associated Switching Devices.
- MIL-R-2765 - Rubber Sheet, Strip, Extruded, and Molded Shapes, Synthetic, Oil Resistant.
- MIL-M-3184 - Machinery: Deck and Vehicle Mounted with Associated Equipment and Provisioned (Repair Parts) Items; Packaging of.
- MIL-C-5541 - Chemical Conversion Coatings on Aluminum and Aluminum Alloys.
- MS15000 - Fittings, Lubrication-Hydraulic, Acceptable Tip Designs.
- MS15004 - Fittings, Lubrication (Hydraulic) Surface Check 1/4-28 Taper Threads, Nickel-Copper Alloy, Type IV.
- MS15005 - Fittings, Lubrication, Throat or Surface Check, 1/8 Pipe Threads, Nickel-Copper Alloy, Type V.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-E-15090 - Enamel, Equipment, Light-Gray (Formula No. 111).
- DOD-P-15328 - Primer (Wash), Pretreatment (Formula No. 117 for Metals). (Metric)
- MS15720 - Fittings, Lubrication (Hydraulic) Throat or Surface Check, 1/4-28 Taper Threads, Corrosion Resistant Steel, Type VII.
- MS15721 - Fittings-Lubrication (Hydraulic) Throat or Surface Check, 1/8 Pipe Threads, Corrosion Resistant Steel, Type VIII.

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- MIL-S-16216 - Steel Plate, Alloy, Structural, High Yield Strength (HY-80 and HY-100).
- MIL-B-16392 - Brakes, Magnet, Naval Shipboard.
- MIL-M-17060 - Motors, 60-Hertz, Alternating Current, Integral Horsepower, Shipboard Use.
- MIL-B-17380 - Bearing, Roller, Thrust.
- MIL-F-18240 - Fastener, Externally Threaded, 250°F Self-Locking Element for.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.
- MIL-S-22473 - Sealing, Locking and Retaining Compounds: (Single-Component).
- MIL-S-22698 - Steel Plate, Shapes and Bars, Weldable Ordinary Strength and higher Strength: Structural.
- MIL-P-23377 - Primer Coatings: Epoxy-Polyamide, Chemical and Solvent Resistant.
- MIL-S-24093 - Steel Forgings, Carbon and Alloy Heat Treated.
- MIL-P-24441 - Paint, Epoxy-Polyamide, General Specification for.
- MIL-C-24707 - Castings, Ferrous, General Specifications for.
- MIL-C-24707/1 - Castings, Ferrous, for Machinery and Structural Applications.
- MIL-N-25027 - Nut, Self-Locking, 250°F, 450°F, 800°F.
- MIL-B-81820 - Bearings, Plain, Self-Aligning, Self-Lubricating, Low Speed Oscillation, General Specification for.
- MIL-B-81934 - Bearings, Sleeve, Plain and Flanged, Self-Lubricating, General Specification for.

STANDARDS

FEDERAL

- FED-STD-828 - Screw-Thread Standards for Federal Services.

MILITARY

- MIL-STD-167-1 - Mechanical Vibration of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-278 - Welding and Casting Standard.
- MIL-STD-721 - Definitions of Terms for Reliability Maintainability.
- MIL-STD-781 - Reliability Testing for Engineering Development, Qualification and Production.
- MIL-STD-882 - System Safety Program Requirements.
- MIL-STD-1472 - Human Engineering Design Criteria for Military Systems, Equipment and Facilities.
- DDP-STD-2138 - Metal Sprayed Coating Systems for Corrosion Protection Aboard Naval Ships. (Metric)

HANDBOOKS

MILITARY

- MIL-HDBK-236 - Index to Standards for Palletizing, Truck Loading, Railroad Loading and Container Loading, of Hazardous Materials.

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MIL-HDBK-253 - Guidance for the Design and Test of Systems Protected Against the Effects of Electromagnetic Energy.

MIL-HBK-267 - Guide for Selection of Lubricants and Hydraulic Fluids for use in Shipboard Equipment.

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

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

AMERICAN SOCIETY FOR TESTING OF MATERIALS (ASTM)

E 119 - Standard Test Methods for Fire Tests of Building Construction and Materials. (DoD adopted)

F 1166 - Standard Practice for Human Engineering Design for Marine Systems, Equipment and Facilities.

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

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SP10 - Near-White Blast Cleaning. (DoD adopted)

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

(Non-Government standards and other publications are normally available from the organizations that prepare or 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 document and the references cited herein (except for related associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified (see 6.2), a sample shall be subjected to first article inspection (see 6.4) in accordance with 4.3.

3.2 General. The roller curtain door assembly shall consist of the doors, the door frame assembly, the drive system including the motors and controls and all other appurtenances required to meet service needs as specified herein (see 6.3). The door and door frame shall be adequate in strength and rigidity and be independent of the flexure of the enclosure where installed, so that door alignment sealing ability will be maintained at all times. The door shall be able to operate without any deformation or misalignment and be able to travel in its

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guides under ship motion conditions and temperature extremes as specified herein. Table I lists the specific applications of roller curtain doors and the appropriate requirements (see 6.2).

TABLE I. Requirements for roller curtain door applications.

Roller curtain door applications	Requirements
a. Helo Hangar Door (external only)	3.2, 3.3, 3.4.1 - 3.5.1 - 3.5.6, 3.6 - 4.6
b. External Door	3.2, 3.3, 3.4.1 - 3.4.7, 3.5.1 - 3.5.6, 3.6 - 3.8.3.1, 3.8.5 - 3.8.6, 4.6
c. Internal Door	3.2, 3.3.1 - 3.3.2, 3.3.3.1, 3.3.3.2, 3.4.1 - 3.4.7, 3.5.1 - 3.5.6, 3.6 - 3.8.3.1, 3.8.5 - 3.8.6, 4.6

3.3 Materials and processes.

3.3.1 Materials. The door shall be constructed of either steel or aluminum (see table II and 6.2) to meet the service conditions specified herein. Components that are stocked or supported by the National Stock System shall be used to the fullest extent possible. Special emphasis shall be placed on producing equipment which will have minimum weight and require a minimum of space in accordance with MIL-STD-1472. The material shall meet the fire resistance requirements specified (see 6.2).

TABLE II. Materials.

Component	Material	Specification
Slates, drums, guides, and frames	Steel plate HY-80, HY-100	MIL-S-16216
	Steel plate, carbon structural	MIL-S-22698
	Cast steel	MIL-C-24707, MIL-C-24707/1
	Forged steel	MIL-S-24093 Class H, type V
	Aluminum alloy plate and sheet	QQ-A-250
	Aluminum alloy castings	QQ-A-601
	Aluminum alloy forgings	QQ-A-367

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3.3.1.1 Mercury. Mercury in any form shall not be used in shipboard equipment, including materials and parts thereof. Mercury may be used in manufacturing and test processes for materials and parts provided it is used in such a way that the materials and parts themselves cannot be contaminated. No instruments containing mercury shall be used in the manufacture or testing of any equipment destined for installation on a nuclear powered ship (see 6.3).

3.3.1.2 Material defects. Materials shall be free from any defects that might affect the serviceability or appearance of the finished product.

3.3.1.3 Preferred material reference. Where materials of identical or equal quality can be identified by more than one specification or standard, the drawings shall reference only one such specification or standard. In selecting the specification or standard to be referenced for material not specified, the following is the order of preference:

- (a) Industry and technical society specification or standard.
- (b) Federal specification.
- (c) Military specification.
- (d) Manufacturer's specification or standard.

3.3.1.4 Material substitutions. Where materials other than as covered by 3.3.1 are to be used, the drawings shall show the complete chemical and physical properties of the material.

3.3.2 Fabrication, welding, and inspection. Fabrication, welding, and inspection shall be in accordance with MIL-STD-278, Class M. Construction shall incorporate bolted interfaces to assure access for maintenance. There shall not be any pockets where water can collect.

3.3.3 Corrosion control.

3.3.3.1 Metal spray coatings. Steel doors for external applications shall be coated with aluminum or zinc spray for corrosion control as specified in DOD-STD-2138.

3.3.3.2 Painting. If component specifications do not specify painting, then painting shall be as follows:

- (a) Ferrous or steel surfaces shall be coated with one pretreatment coating in accordance with DOD-P-15328, one coat of primer TT-P-645 and two finish coats of light grey enamel in accordance with MIL-E-15090.
- (b) Aluminum surfaces shall be coated with a chromate chemical conversion coating in accordance with MIL-C-5541 followed by one coat of primer in accordance with MIL-P-23377 applied at 1.0 mil. Within 16 to 24 hours, a top coat of epoxy polyimide in accordance with MIL-P-24441 shall be applied at 3.0 mils. Total thickness shall be from 3 to 4.5 mils.
- (c) Touch-up of damaged paint shall be in accordance with 3.3.3.2(a) or 3.3.3.2(b) as appropriate.
- (d) Bearing and machined surfaces, or interior "oil wetted" surfaces shall not be painted.

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- (e) Surfaces to be painted shall be completely free of rust, mill scale, dirt, oil, grease, moisture, deteriorated paint, and other surface contaminants. Coating shall have surfaces prepared to "near-white" metal in accordance with SSPC-SP10.
- (f) Corrosion resistant materials shall not be painted for the purpose of preservation.
- (g) When painting in the area of switches, safety devices, labels, and warning or operating plates, they shall be protected from paint and overspray.

3.4 Performance.

3.4.1 Door operation. Door operation shall be accomplished in one of two ways as specified (see 6.2):

- (a) Electrically operated with a manual back-up capability.
- (b) Manually operated only.

3.4.1.1 Rate of operation. In the electric mode, the doors shall be capable of opening or closing at a minimum rate of 20 feet per minute, and in the manual mode, they shall be capable of opening or closing within 5 minutes under the most adverse conditions specified herein. In the manual mode, the force on the hand crank shall not exceed 35 pounds.

3.4.2 Environment. The equipment shall operate at designed operating levels without deterioration due to the following environmental factors: All equipment shall be so designed unless specified (see 6.2).

3.4.2.1 Ship motion. Equipment shall operate in accordance with the requirements herein under ship motion conditions during a maximum roll of 45 degrees and a maximum pitch of 10 degrees, each applied separately. The door shall also operate with the ship permanently listed at 15 degrees.

3.4.2.2 External door. If specified that the roller curtain door be designed for external application (see 6.2), then it shall operate in normal and back-up operation under a 0.25-inch thick layer of ice on the door and its operating surface. In the closed and dogged position, the door shall withstand a wind load of 40 pounds per square foot (lbs/ft²) over its entire surface without damage. The door shall operate satisfactorily in any ambient air temperature between minus 20 degrees and 120 degrees Fahrenheit (°F) without any adjustment. (See 4.5.4.2 for cold weather test.)

3.4.2.3 Stress limitations. Under normal equipment operating conditions, calculated combined stresses, acting both individually and concurrently, for machine and structural components shall not exceed 35 percent of the yield point of the material in any part. Allowable stress at the maximum level of operation or when the door is dogged and exposed to maximum load, should be not greater than .75 of the door material elastic limit (see 6.3).

3.4.2.4 Fire resistance. When specified (see 6.2), the door shall be fire resistant to the extent that it shall withstand a standard fire test of Nonbearing Walls and Partitions for 1/2 hour in accordance with ASTM E 119 (see 6.3).

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3.4.2.5 Shock. When specified (see 6.2), the doors shall meet Grade A shock requirements in accordance with MIL-S-901. Doors intended for helicopter hangar application shall meet Grade A shock requirements in accordance with MIL-S-901 (see 4.5.5).

3.4.2.6 Vibration. The equipment shall meet the requirements as specified in MIL-STD-167-1.

3.4.2.7 Humidity. The equipment shall sustain operation in an atmosphere of relative humidity 90 percent at 90°F.

3.4.2.8 Operational lighting levels. The system shall be designed to be safely maintained and operated under all possible operational lighting levels (for example, darken ship) in accordance with MIL-STD-1472. The operational lighting levels shall be clearly specified.

3.4.2.9 Solvents and lubricants. All system components shall withstand continued contact with the solvents and lubricants specified by MIL-HDBK-267.

3.4.2.10 Electro-magnetic vulnerability. All components shall operate in accordance with requirements of MIL-HDBK-236 and MIL-HDBK-253.

3.4.2.11 Firefighting materials. All components and lubricants shall withstand continued contact with all firefighting materials (for example, seawater, AFFF).

3.4.2.12 Abrasives. The system shall be designed to be subjected to all possible abrasives (for example, sand blast grit, non-skid) and remain operational. Where the threat of contamination exists, provisions shall be made for flushing all rotating and pivoting points.

3.4.2.13 Paint. All system components (except safety devices) shall withstand indiscriminate spraying of navy grade primers and paints and remain fully operational.

3.4.2.14 Weather proofing. All components permanently or temporarily exposed to the weather shall withstand continuous exposure without deterioration through out the life cycle.

3.5 Design and construction.

3.5.1 Curtains. The curtains shall be built of interlocking steel or aluminum, horizontal slats secured together in such a manner that the curtain will roll on a drum or tube. Spool pieces shall be provided at the ends of the curtain drum to preserve the vertical alignment of the door while in operation. The bracket carrying the curtain drum shall be bolted on the end columns of the door frame to allow accurate alignment of curtain drum after installation. The width of the slats shall be sufficiently narrow in relation to the circumference of the drum to allow the slats to be rolled up without excessive rattling. At each end the curtain shall be fitted with roller guides, wind locks, and end locks with bearing pads as required, to guide the curtain into the vertical guides of the door frame and to provide continuous seal under all operating conditions.

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3.5.2 Dogging mechanism. The doors shall have provisions to be dogged to the deck. The dogs shall be permanently attached to the bottom slat to eliminate the dogs being misplaced or lost. The dogs shall be of the wedge type only and shall be operable from both inside and outside the enclosure. Means shall be provided for the dogs to take up the slack as they get worn with use. The operating gears shall be adjustable to permit the lower edges of the curtain to stop a sufficient distance above the deck, such that when the lower edges are dogged, a tension will be set up in the slats to make the door more rigid and prevent water from being blown through. The number and spacing of dogs for the curtain door shall be adequate to meet the design requirements specified herein. The dogging mechanism shall be designed and constructed so that it will not be released by vibration. The dogs shall be located so as to prevent injury to operating personnel and shall cause no obstruction of the passage opening when the door is opened.

3.5.3 Sealing requirements. The door shall be fitted with seals all around its periphery to exclude the ingress of water and fuel. In the fully closed and locked position, the door shall be weathertight to the extent specified in 4.5.3. Provisions shall be made to interface the deck configuration with the sealing arrangement so that the sealing remains effective over the width of the door. The seal material shall provide a minimum service life of 3 years in a marine environment. Seals shall be mechanically fastened and be easily replaced when required. Where it is not possible to mechanically fasten the seals, the contractor may propose an alternate method to attach the seals that will be within the capability of the ships personnel to remove and replace at sea.

3.5.4 Light tight requirements. When specified (see 6.2), the door shall provide an effective light trap and prevent interior illumination (white, red or blue) which would violate light security from escaping outside the enclosure. Lighting shall be controlled by door switches should the door be opened during a darken ship condition. Switches shall be supplied by the manufacture of the door.

3.5.5 Door drive system.

3.5.5.1 Drive shaft system. Door drive shall be accomplished through the output shaft of a self-braking worm or other suitable gear. This shall prevent the door from taking charge and falling shut due to its own weight, when the door motor is de-energized or the force on the hand crank is removed. The operating gear for raising and lowering the curtains shall be such that either manual or electric power operation can be selected without the curtain taking charge and regardless of the open, closed or intermediate position of the curtain when the shift is made. A safety device shall be provided to prevent the free-fall of the door in case of any supporting component failure. The safety device may be in the form of a mechanical safety stop or a redundant support. For doors that are electrically operated, a mechanical interlock shall be provided to prevent accidental operation of the door with the locks or dogs engaged. A torque control device shall be provided on the door drive-train to prevent over torque if a door is jammed or locked.

3.5.5.2 Speed gear reducer. The gearing shall be totally enclosed in an oil tight case and shall be lubricated by oil bath. The housing shall permit the ready examination, removal and replacement of gear elements. Gaskets shall be in

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accordance with MIL-R-2765. Oil fill, drain and vent fittings shall be provided. A dipstick which indicates oil level shall be provided. The dipstick shall be marked to indicate the "full" and the "add oil" levels. Seals shall be provided to prevent leakage of oil where shafts penetrate the gear housing. The reducer shall be oil-tight for non-operating inclinations up to 45 degrees roll. The reducer lubrication shall be unimpaired while operating with inclination angles up to 30 degrees from the vertical in roll or 10 degrees in pitch or both. Lubricating oil shall be in accordance with MIL-HDBK-267. The service factor shall be 1.5 times calculated worst load condition.

3.5.5.3 Electric motor. For electrically operated doors, the electric motor shall be in accordance with MIL-M-17060 and the following requirements:

- (a) Voltage: 440 volts alternating current (Vac) (± 20 percent)
- (b) Phase: 3
- (c) Frequency: 60 hertz (Hz)
- (d) Enclosure: Class 1, group D
- (e) Bearing type: Ball
- (f) Insulation: Class B
- (g) Design: C
- (h) Service: A
- (i) Intermittent duty

Overload protection shall be provided for the motor during both starting and running conditions. Resetting shall be accomplished by a button external to the motor enclosure and situated on the door control panel. Operating elements shall be mounted on a common bedplate to the maximum extent possible and shall be arranged in the most compact manner consistent with maintenance requirements. The bedplate shall be rigid enough to maintain alignment of equipment mounted thereon, without aid from the foundation which shall be provided by the installing activity.

3.5.5.4 Motor controls. Motor controllers, other switching devices and control circuits shall be 115 volts, 60 Hz, single phase in accordance with MIL-C-2212. Momentary lever type controls suitable for bulkhead mounting shall be provided for the motor. One set shall be located inside the enclosure and the other outside. Both shall be positioned to allow the operator full view of the door. The levers shall be spring loaded for automatic return to the "Off" position when released. On de-energizing of the door motor, the door travel shall stop immediately. This shall be achieved through a solid state electronic brake unit or through a fail-safe electric brake in accordance with MIL-B-16392. Travel limit switches shall be provided at the ends of the door travel to stop the door when the fully open or fully closed positions are reached. Continuous actuation of the pushbuttons shall be required until the "DOWN STOP" or "UP STOP" limit switch is activated. Limit type switches shall be provided to prevent operation until the door is undogged. The limit switches shall each incorporate spare contacts for functions other than controlling motor power.

3.5.5.5 Manual curtain operation. Manual operation of the curtain door shall be accomplished by means of a hand crank assembly accessible for operation at the deck level. The hand crank assembly shall drive the speed gear reducer through a torsion drive rod. The hand crank assembly shall include a mechanical

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stop arrangement positioned so as to define the upper and lower limits of curtain travel. Means shall be provided to secure the hand crank in all positions to prevent curtain movement or slippage under all ship motion and environmental conditions as specified herein.

3.5.5.6 Fail-safe operations. The door shall be designed for "fail-safe" operation. This is defined as the ability to maintain the safety of the equipment and personnel at all times. Failure of the power source or manual or power-operated drive mechanism shall not result in damage to equipment or jeopardize the safety of personnel or result in uncontrolled movement of the equipment. In event of power failure, the door shall be immobilized. Fail-safe shall not be applied to static components or to structural members or other static parts or mechanisms. Fail-safe operations design shall be based on a safety study in accordance with 3.6.4.

3.5.5.7 Lubrication. Lubrication fittings in accordance with MS15000 and MS15004, MS15005, MS15720 or MS15721 shall be provided for bearing elements not equipped with special lubrication means. Fittings shall be accessible for the use of a hand lubrication gun and shall utilize the same type and grade of lubricant. The lubricant shall be in accordance with MIL-HDBK-267. Where practicable, points requiring lubrication may be permanently lubricated for the life of the equipment. The motor operator unit shall maintain satisfactory lubrication with no loss of lubricant under the pitch, roll, and list conditions as specified in 3.4.2. Operating parts for the door system shall be easily accessible. No special technical skills or tools shall be required to perform routine maintenance.

3.5.6 Other parts and components.

3.5.6.1 Keys, keyways. Where used, straight cut keyways shall be closed end to prevent loss of keys. Keys and keyways shall be in accordance with OO-K-220.

3.5.6.2 Bearings. Bearings capable of meeting the physical, functional, environmental, and service life requirements of the application shall be in accordance with MIL-B-81820 for spherical bearings and MIL-B-81934 for journal bearings. Where these types of bearings do not meet design requirements, then bearings conforming to one or more of the following specifications shall be used: FF-B-171, FF-B-187, FF-B-195, and MIL-B-17380. Rolling element bearings shall be selected to result in an L-10 life of not less than 10,000 hours. Bearings shall be replaceable utilizing one of the tools contained in a Naval shipboard set of tools specified in GGG-P-781. Where special tools are required, they shall be provided. Special tools are defined as those tools not listed in the Federal Supply Catalog.

3.5.6.3 Bolting. Screw threads, except as noted below shall be unified 2A/2B fit in accordance with FED-STD-H28. Nuts shall be of the plastic insert, self-locking type. The use of sintered metal fasteners is prohibited.

3.5.6.4 Fasteners. Cap screws, machine screws, setscrews, bolts, and nuts shall comply with FF-S-85, FF-S-86, FF-S-92, FF-S-200 or FF-S-210, and MIL-S-1222.

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3.5.6.5 Fastener practice. For a threaded fastener, not less than one thread but no more than four threads shall protrude beyond the crown of the nut. With plastic insert self-locking nuts, the end of the thread runout shall be at least one thread above the top of the plastic insert. Washers shall not be used under the nut for the sole purpose of lessening thread protrusion.

3.5.6.6 Studs. Class 3 fit, as specified by FED-STD-H28, shall be used for the setting end of studs and the studs shall be secured with thread locking compound, in accordance with MIL-S-22473, grade CV (blue) or equivalent to commercially available Loctite 242 (BLUE).

3.5.6.7 Stud engagement. Thread engagement for the setting end of a stud shall be such that the shear load strength of the engaged threads is more than the tensile load strength of the stud. For materials having similar mechanical properties, the full thread engagement of studs shall not be less than 1 major diameter (ID). For materials having dissimilar mechanical properties, the minimum engagement of stud setting threads shall be computed in accordance with FED-STD-H28, part I, appendix 5, using the maximum tensile strength of the stud material and minimum specified tensile strength of the body material, plus one thread; but in no instance less than the root diameter.

3.5.6.8 Bottom tapping. Bottom tapping is permissible only where metal thickness is insufficient for ID full thread engagement plus thread run-out and beveled end. Bottom-tapped holes shall have full threads for the entire depth.

3.5.6.9 Thread locking features. To prevent loosening due to shock or vibration, self-locking nuts in accordance with MIL-N-25027 shall be used. Bolts shall have self-locking elements as specified in MIL-F-18240, except for use with self-locking nuts. Where a thread-sealing or thread-locking compound is used, the material and its application shall comply with MIL-S-22473 and the threads shall be unified 3A/3B fit in accordance with FED-STD-H28. Fasteners, with the exception of the lower door dogging bolts, shall be locked.

3.6 Reliability and maintainability.

3.6.1 General definitions. Reliability and maintainability terms are defined according to MIL-STD-721.

3.6.2 Definition of failure. A system failure is defined as any event which necessitates corrective maintenance, including failures as specified in MIL-STD-781. Chargeable failures include any major or minor failures attributable to the internal operation of the system and system components. Failures due to external sources or operator error do not constitute chargeable failures, but are to be evaluated as part of the safety program plan referred to in 3.6.4.

3.6.3 Reliability requirements. The door assembly including operating mechanism shall have a Mean Time Between Failure (MTBF) of 2400 hours with 6 hours Mean Time To Repair (MTTR) (see 6.3).

3.6.4 Safety. Safety features shall be incorporated into the door configuration to prevent damage to equipment and to insure optimal personnel protection (see 6.3).

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3.6.5 Maintainability requirements. The contractor shall identify replacement components and the time needed to replace them (see 6.3). The maximum target replacement time is 6 hours while the target time to diagnose problems is 15 minutes.

3.7 Human engineering. Human engineering design criteria, principles and practices as specified in ASTM F 1166 shall be followed. Particular attention shall be directed to ease of opening and closing the door, the dogging operation and access for maintenance, lubrication, and part replacement.

3.7.1 Warning/caution/instruction plates. Warning, caution, and instruction plates shall be installed wherever necessary to minimize the possibility of injury to personnel or damage to equipment due to:

- (a) Faulty operation resulting from lack of posted instructions.
- (b) Inadequate maintenance resulting from lack of posted instructions.
- (c) Lack of special safety precautions.

Warning, caution and safety plates shall be fabricated from anodized-hydrated aluminum and comply with MIL-P-15024 plate type H. These plates shall have a red inscription on black background, visible in both low level red and white illumination. A 1/4-inch wide, red and black diagonally striped margin shall be provided around the border of the plate. Operating instructions shall be fabricated using plastic sheeting as specified in L-P-387, 0.06 inch thick with matte finish. Lettering shall be black. Size shall be 8 by 10-1/2 inches, 8 by 5-1/4 inches, or 16 by 10-1/2 inches as practicable for the proper display of the material. Plates shall be mounted in a conspicuous place on or near the control point.

3.7.2 Label plates. Assemblies, sub-assemblies and replaceable components such as switches shall have a label plate to identify it by functional name and assigned number. Label plates shall comply with MIL-P-15024 and shall be the most economical permitted provided they are suitable for their environment.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an

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acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

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

- (a) First article inspection (see 4.3).
- (b) Quality conformance inspection (see 4.6).

4.3 First article inspection. First article inspection shall be conducted on the first application of the door by the agency concerned (see 6.3). Inspection shall consist of the general examination specified in 4.4 and first unit tests specified in 4.5.

4.4 General examination.

4.4.1 Visual and dimensional. Each door shall be subjected to a thorough visual and dimensional examination to ascertain that the material, workmanship and construction are in conformance with the requirements of this specification.

4.4.2 Parts and components. Examination shall be conducted to determine that all parts and components conform to the specification; the size, type and rating are shown on the certified drawings; and that they are oriented and mounted as illustrated on the drawings. This shall include but not be limited to the following items: motor, speed reducer, brake, shafts, bearings, dogging mechanisms, hand crank mechanism, controls, solenoids, switches, door frame, guides, rollers and seals.

4.4.3 Completed equipment. Examination of the completed equipment shall be conducted to determine the following:

- (a) Parts and assemblies are readily accessible for maintenance and repair in place; equipment that may need to be replaced during the life of the system shall lend itself to convenient and easy replacement.
- (b) Fasteners are securely fastened and lockwired where required.
- (c) Identification and instruction plates are furnished and attached as required.
- (d) Potentially hazardous equipment and machinery is adequately grounded or insulated.

4.5 First unit tests. Ship operating conditions shall be simulated during which the representative door shall be subjected to first article testing in accordance with 4.5.1 through 4.5.5. Throughout the test and for purpose of simulation, the door and door frame assemblies shall be considered to be installed athwartships. During the test, the door shall operate smoothly without binding or interference of any sort.

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4.5.1 Endurance test.

- (a) The electrically operated door shall be continuously operated for 1000 cycles, installed in its own frame and using its own power source. During the test the door shall be operated for a period of 8 hours each day with an interval of 5 seconds between each open and close cycle. For at least 10 percent of the total test cycles, the door shall be inclined at 30 degrees from the vertical, measured on an axis running along the length of the door. The test shall be repeated if a component malfunction or breakdown, which causes the door to be inoperable, cannot be corrected or repaired within 2 hours of shut down, or if the same fault occurs twice during the test, irrespective of the time taken to rectify it.
- (b) The manually operated door shall be subjected to the same test as in (a) above, except that the door shall be continuously operated for only 4 hours.

4.5.2 Roll and pitch test. The door and door frame assembly shall be demonstrated to be normally operable in a simulated 45 degree roll condition with a period of 10 seconds. The door shall also be shown to be normally operable in a 10 degree pitch condition. Roll and pitch need not occur simultaneously. This door shall also operate with the ship permanently listed at 15 degrees.

4.5.3 Sealing tightness. This test shall be accomplished both prior to and following completion of the endurance test. Adequate sealing of the doors shall be demonstrated by a water hose test. The hose nozzle shall be within 10 feet of the door under test and the stream shall be directed against all portions of the door in a manner most likely to cause leaks. The nozzle diameter shall not be less than 1/2 inch and the pressure at the nozzle shall be not less than 50 pounds per square inch (lb/in²). All door boundaries shall be sprayed by a copious amount of water. The door tightness shall be considered adequate if there is no free flow of water from one side of the door to the other.

4.5.4 External doors. Doors which are designed for external applications to be installed on the main deck and above shall be subjected to the tests specified in 4.5.4.1 and 4.5.4.2.

4.5.4.1 Wind pressure test. This test shall be accomplished by laying the door flat on the floor with its operating mechanism fully connected and its surface loaded uniformly with ballast weight distributed so as to simulate a wind pressure of 40 lbs/ft². The door shall then be cycled 10 times without defects or failure in order to establish conformance with the requirement specified in 3.4.2.3.

4.5.4.2 Cold weather and icing test. The following test shall be accomplished at an ambient temperature of not greater than minus 20°F. Icing shall be achieved by spraying the door with water in freezing conditions so that ice at least 1/4 inch thick may form on at least 75 percent of the door's surface. The door shall operate satisfactorily without failure of defects for at least ten cycles.

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4.5.5 Shock testing. When specified (see 6.2), the door shall be subjected to and shall meet Grade A shock requirements in accordance with MIL-S-901 when in the closed and dogged position. Doors intended for helicopter hangar application shall meet Grade A shock requirements in accordance with MIL-S-901 when in the closed and dogged position.

4.6 Quality conformance inspection. Each door and drive system shall be examined and tested as specified in 4.4 and 4.6 respectively.

4.6.1 Operating test. The following tests shall be performed:

- (a) Opening and closing of the door in all operating modes (manual and power if applicable). The door shall be stopped and restarted at any point in its travel. Movements shall be smooth and free of binding or interference.
- (b) The average speed of the door shall be demonstrated to be within the specified time limits. The manual hand crank shall be easy to operate and be operable by one person.
- (c) Ease of dogging and undogging operations shall be demonstrated, and in the dogged position, no visible openings shall exist.
- (d) Satisfactory operation of all control and safety features shall be verified.

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

5. PACKAGING

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

5.1 Packaging requirements. The packaging (preservation, packing and marking) requirements shall be in accordance with MIL-M-3184 for the level (A, C or commercial) of preservation; level of packing (A, B, C, or commercial), marking including packaging acquisition options therein as specified (see 6.2). In addition, the following applies:

(a) Navy shipboard stowage fire-retardant requirements.

- (1) Treated lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping containers and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	- Type II - weather resistant.
	Category 1 - general use.
Level C	- Type I - non-weather resistant.
	Category 1 - general use.

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- (2) Fiberboard. When specified (see 6.2), fiberboard used in the construction of class-domestic, non-weather resistant fiberboard and cleated fiberboard boxes including interior packing forms shall meet the flamespread index and the specific optic density requirements of PPP-F-320 and amendment thereto.

6. NOTES

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

6.1 Intended use. These doors are intended for a variety of applications for use on Naval ships. Each application has its own unique set of requirements.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (c) First article (see 3.1).
- (d) Intended use (see 3.2 and 3.4.2.3).
- (e) Material of door (see 3.3.1).
- (f) Fire resistance requirements (see 3.3.1 and 3.4.2.4).
- (g) Primary mode of operation (electrical or manual) (see 3.4.1).
- (h) Environmental factors (see 3.4.2).
- (i) Shock requirements (see 3.4.2.5 and 4.5.5).
- (j) Light tight requirements (see 3.5.4).
- (k) Level of preservation and packing and packaging options (see 5.1).
- (l) Fire retardant packaging requirements (see 5.1(a) and (b)).

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

<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.2	DI-E-7031	Drawings, Engineering and Associated Lists	---
3.2	DI-E-20477	Card, Imaged Aperture/Tabulating	---
3.3.1.1	DI-MISC-80678	Certification Data/Report	---
3.4.2.4	DI-MISC-80296	Design Data and Calculation	---
3.4.2.4	DI-NDTI-80604	Test Report	---

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<u>Reference Paragraph</u>	<u>DID Number</u>	<u>DID Title</u>	<u>Suggested Tailoring</u>
3.6.3	DI-R-7079	Reliability Program Plan	---
3.6.3	DI-R-7080	Reliability Status Report	---
3.6.3	DI-R-7082	Reliability Productions Report	---
3.6.3	DI-R-7085	Failure Mode, Effects, and Criticality Analysis Report	---
3.6.4	DI-SAFT-80102	Safety Assessment Report	---
3.6.4	DI-SAFT-80103	System Safety Engineering Report	---
3.6.5	DI-R-7103	Maintainability Program Plan	---
3.6.5	DI-R-7104	Maintainability Status Report	---
3.6.5	DI-R-7110	Maintainability Design Criteria Plan	---
4.3	UDI-T-23790	Report. First Article Test	---

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

6.3.1 Technical manuals. The requirement for technical manuals should be considered when this specification is applied on a contract. If technical manuals are required, military specifications and standards which have been cleared and listed in DoD 5010.12-L (AMS DL) must be listed on a separate CDRL (DD Form 1423), included as an exhibit to the contract. The technical manuals must be acquired under separate contract line item in the contract.

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

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6.5 Subject term (key word) listing.

Dogs
External
Frame
Hangar
Internal

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. Marginal notations 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 2040-N183)

5. REASON FOR RECOMMENDATION**6. SUBMITTER**

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (include Zip Code)	d. TELEPHONE (include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

a. NAME Technical Point of Contact (TPOC): Mr. Rowe (NAUSSIS 0741)	b. TELEPHONE (include Area Code) (1) Commercial (2) AUTOVON	
PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS: c. ADDRESS (include Zip Code) Commander, Naval Sea Systems Command Department of the Navy (SEA 5572) Washington, DC 20362-5101	TPOC: (215) 897-7957 443-7957 IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

DD Form 1426 OCT 89

Previous editions are obsolete

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL**INSTRUCTIONS**

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

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

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER MIL-D-24151A(SH)	2. DOCUMENT DATE (YYMMDD)
3. DOCUMENT TITLE DOORS, ROLLING, CURTAIN, AND THEIR OPERATING EQUIPMENT		
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)		