

INCH-POUND

MIL-DTL-16377H(SH)

2 August 1996

SUPERSEDING

MIL-F-16377G(SH)

5 June 1981

(See 6.13)

## DETAIL SPECIFICATION

### FIXTURES, LIGHTING; AND ASSOCIATED PARTS; SHIPBOARD USE, GENERAL SPECIFICATION FOR

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 fluorescent and incandescent lighting fixtures (lights) and associated parts, used for detail and general illumination on Naval ships and boats.

1.2 Classification. Lighting fixtures are of the following types and classes, as specified (see 6.2):

- Type I - Fluorescent.
- Type II - Incandescent.
- Class 1 - Detail illumination.
- Class 2 - General illumination.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, SEA 03R42, Naval Sea Systems Command, 2531 Jefferson Davis Hwy, Arlington, VA 22242-5160 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 6210

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## 2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 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 solicitation (see 6.2).

## SPECIFICATIONS

## FEDERAL

- J-C-580 - Cord, Flexible, and Wire, Fixture, (Electrical, 0- to 600-Volt Service).
- W-F-406 - Fittings for Cable, Power, Electrical and Conduit, Metal, Flexible.
- W-S-755 - Starter, Fluorescent Lamp.

## DEPARTMENT OF DEFENSE

- MIL-M-14 - Molding Compounds, Thermosetting.
- MIL-V-173 - Varnish, Moisture- and Fungus-Resistant (For the Treatment of Communications, Electronic, and Associated Equipment).
- MIL-S-901 - Shock Tests, H.I. (High-Impact); Shipboard Machinery, Equipment and systems, Requirements for.
- MIL-C-915 - Cable and Cord, Electrical, for Shipboard Use, General Specification for.
- MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
- MIL-B-5423 - Boots, Dust and Water Seal (for Toggle and Push-button Switches, Circuit Breakers, and Rotary- Actuated Parts), General Specification for.
- MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
- MIL-P-15024/5 - Plates, Identification.
- MIL-S-19622 - Stuffing Tubes, Nylon; and Packing Assemblies; General Specification for.
- MIL-P-24191 - Plastic Sheet, Cast, Acrylic, Shipboard Application (Illumination and Signal Lighting).
- MIL-C-24643 - Cables and Cords, Electric, Low Smoke, for Shipboard Use, General Specification for.

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## DEPARTMENT OF DEFENSE (Continued)

- MIL-C-24643/26 - Cable, Electrical, 600 Volts, Types LSDPS, LSFPS, LSTPS and LS7PS.
- MIL-I-24768 - Insulation, Plastics, Laminated, Thermosetting; General Specification for.
- MIL-I-24768/1 - Insulation, Plastic, Laminated, Thermosetting, Glass-Cloth, Melamine-Resin (GME).
- MIL-T-55164 - Terminal Boards, Molded, Barrier Screw and Stud Types, and Associated Accessories, General Specification for.

(See Supplement 1 for list of associated specifications.)

## STANDARDS

## FEDERAL

- FED-STD-H28 - Screw-Thread Standards for Federal Services.
- FED-STD-595 - Colors Used in Government Procurement.

## DEPARTMENT OF DEFENSE

- MIL-STD-108 - Definitions of and Basic Requirements for Enclosures for Electric and Electronic Equipment.
- MIL-STD-167-1 - Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited).
- MIL-STD-202 - Test Methods for Electronic and Electrical Component Parts.
- MIL-STD-454 - Standard General Requirements for Electronic Equipment.
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.
- MIL-STD-740 - Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment.
- MIL-STD-2175 - Castings, Classification and Inspection of.
- MS16569 - Switch, Toggle, Double Pole, Single Throw (For Use in Lighting Fixtures).
- MS16656 - Switch, Toggle, Single Pole, Single Throw.

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

**2.3 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 NATIONAL STANDARDS INSTITUTE (ANSI)

- B46.1 - Surface Texture (Surface Roughness, Waviness and Lay).  
(DoD adopted)
- Y14.36 - Surface Texture Symbols. (DoD adopted)

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(Application for copies should be addressed to the American National Standards Institute, Inc., 11 West 42nd Street, 13th Floor, New York, NY 10036.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- A 342 - Standard Test Methods for Permeability of Feebly Magnetic Materials.
- D 635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Self-Supporting Plastics in a Horizontal Position. (DoD adopted)
- D 2843 - Standard Test Method for Density of Smoke from the Burning or Decomposition of Plastics. (DoD adopted)
- D 4802 - Standard Specification for Poly (Methyl Methacrylate) Acrylic Plastic Sheet.

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

AMERICAN WELDING SOCIETY (AWS)

WHB - Welding Handbook.

(Application for copies should be addressed to the American Welding Society, Inc., 550 N.W. LeJeune Road, P.O. Box 351040, Miami, FL 33135.)

ILLUMINATION ENGINEERING SOCIETY OF NORTH AMERICA (IES)

General Guide to Photometry.

(Application for copies should be addressed to the Illumination Engineering Society of North America, 345 East 47th Street, New York, NY 10017.)

UNDERWRITERS' LABORATORIES (UL)

- UL-486 - UL Standard for Safety Wire Connectors and Soldering Lugs for Use with Copper Conductors.
- UL-496 - UL Standard for Safety Edison-Base Lampholders. (DoD adopted)
- UL-542 - UL Standard for Safety Lampholders, Starters, and Starter Holders for Fluorescent Lamps. (DoD adopted)

(Application for copies should be addressed to the Underwriters' Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.)

2.4 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for specification sheets), 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 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheet. In the event of any conflict between the requirements of this specification and the specification sheet, the latter shall govern.

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

3.3 Drawings acceptance. A prerequisite to submission of the first article for inspection shall be evidence satisfactory to the contracting activity that the Naval Sea Systems Command (NAVSEA) (see 6.6) has reviewed and accepted the manufacturing drawings for the fixture, light, or part to be furnished under this specification (see appendix A).

3.4 Materials.

3.4.1 General requirements. The materials used in the construction of the fixtures or parts shall be as specified herein and of a type, class, form, and grade which is readily available from normal sources of supply without the necessity for additional treatment or processing other than that which is normal to, or readily supplied by, the industry. The contractor shall ascertain compliance of all materials with the minimum requirements and suitability of each material for its specific use and for the service intended. Material requirements fall into three general categories as specified hereinafter.

3.4.1.1 Specific materials. Where a specific material and material specification is specified herein or in the specification sheet, the material used shall conform to that specification. Materials purchased in accordance with manufacturer's specification or specifications other than those indicated are acceptable only if materials and quality assurance procedures do, in fact, conform to the minimum requirements of the referenced specification.

3.4.1.2 Substitute materials. The contractor may substitute material of equivalent grade in lieu of the specified materials, provided that all other requirements of the individual specification are fulfilled (see 6.11).

3.4.1.3 Material not specified. Where a specific material is not specified or NAVSEA acceptance is not required, the contractor may select any material that will satisfactorily perform the intended function in the fixture, light, or part and will otherwise comply with specification requirements.

3.4.1.4 Recycled, recovered, or environmentally preferable materials. Recycled, recovered, or environmentally preferable materials should be used to the maximum extent possible provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.4.2 Prohibited materials. Flammable or explosive material, material which can produce toxic or suffocating fumes, or material which can produce a smoke density rating above 50 (see table I) when burned shall not be used unless specifically approved (see 6.11). Prohibited materials (toxic, flammable, fragile, radioactive, magnesium, and mercury, carcinogens, and asbestos), when allowed for the specific use shall conform to the requirement of MIL-E-917, except as specified hereinafter.

3.4.2.1 Flammable plastic materials. As a guide, plastic materials, when not specified herein or in the applicable specification sheet, shall be selected as specified in table I.

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TABLE I. Flammability characteristics of plastics.

Characteristic	Specimen (Inches)	Applicable test method	Limit
Flammability rate	5L. X 1/2W. X 1/4T	ASTM D 635	1.35 max. inches per minute
Smoke density rating	1L. X 1W X 1/4T	ASTM D 2843	0 to 50

3.4.3 Fungus-inert materials. Fungus-inert materials shall be in accordance with requirement 4 of MIL-STD-454.

3.4.4 Arc-resistant materials. Arc-resistant materials shall be in accordance with requirement 26 of MIL-STD-454.

3.4.5 Metals. Metals shall be selected or processed and applied in a manner that provides corrosion-resistance. Metals that are not inherently corrosion-resistant (see 3.4.5.2) shall be processed (treated, plated, or painted) to provide corrosion-resistance.

3.4.5.1 Selection of metals in direct contact. In order to minimize corrosion attack due to electrolytic action between dissimilar metals in contact with each other, metal-to-metal contacts shall be limited to those metals which, when coupled, are in accordance with MIL-E-917.

3.4.5.2 Corrosion-resistant metals. The following commonly used metals when properly applied are considered to be inherently corrosion-resistant without further processing:

- (a) Brass.
- (b) Bronze.
- (c) Copper.
- (d) Copper-nickel alloy.
- (e) Copper-beryllium alloy.
- (f) Copper-nickel-zinc alloy.
- (g) Nickel-copper alloy.
- (h) Nickel-copper-silicon alloy.
- (i) Nickel-copper-aluminum alloy.
- (j) Austenitic steels, AISI types 202, 302, 303, 304, 304L, 309, 310, 316, 316L, 321, 324A, and 347.

3.4.5.3 Aluminum. Aluminum alloy shall be used insofar as practicable. Aluminum alloys, except castings, shall conform to ASTM standards. Aluminum alloy casting shall be manufacturer's choice except sand castings and permanent mold castings shall conform to class 2B of MIL-STD-2175. Grade shall be manufacturer's choice.

3.4.5.4 Nonferrous material. Nonferrous materials, except aluminum, shall conform to commercial standards.

3.4.6 Plastics. Plastic materials shall conform to the requirements of MIL-E-917, 3.4.2.1, and as specified hereinafter.

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3.4.6.1 Uniformity. Plastic materials shall be free of defects such as blemishes, embedded particles, bubbles, scratches, and striations.

3.4.6.2 Mechanical parts. Whenever plastic materials are contemplated for mechanical applications as replacements or substitutes for metal parts, they shall meet the flammability characteristics specified in 3.4.2.1.

3.4.6.3 Thermoplastic materials. Plastics which melt or soften under test conditions imposed by the applicable specification sheet shall not be used.

3.4.6.4 Electrical insulating parts. Plastics used for electrical insulating parts shall be of the type specified hereinafter.

3.4.6.4.1 Plastics, laminated. Laminated plastic material shall be a glass cloth bonded with melamine resin, in accordance with MIL-I-24768 and MIL-I-24768/1. No other laminated plastic material shall be used for electrical insulation. All cut surfaces of laminated plastic shall be given two coats of varnish in accordance with MIL-V-173 to prevent absorption of moisture.

3.4.6.4.2 Thermosetting, molded. Thermosetting, molded insulated parts shall conform to type MAI-60 or type MMI-30 of MIL-M-14.

3.4.7 Springs. Material for springs, retaining clips, and retaining rings shall be as specified in the applicable specification sheets. Design of springs shall be in accordance with requirement 41 of MIL-STD-454.

3.4.8 Magnetic permeability. The magnetic permeability of all surfaces of completed fixtures shall be 2.0 or less after fabrication when tested as specified in 4.8.18. Unless otherwise specified (see 3.1 and 6.2), the magnetic permeability requirements shall not apply to shock mounts and fastening devices such as rivets and screws.

### 3.5 Parts and features - mechanical.

3.5.1 Hardware. Unless otherwise specified on the applicable specification sheet, hardware (bolts, nuts, screws, washers, and miscellaneous hardware) shall be of a good commercial grade material compatible with that of the basic fixture. Steel (corrosion-resisting steel excepted) hardware shall be zinc plated.

3.5.2 Dimensions and tolerances. Dimensions shall be as shown on the applicable specification sheet. Unless otherwise specified in the applicable specification sheet, the following tolerance shall apply:

- (a) Fractional dimensions - plus or minus 1/64 inch.
- (b) Decimal dimensions - plus or minus 0.005 inch.
- (c) Angular dimensions - plus or minus 0 degree 15 minutes.

Unless otherwise specified in the applicable specification sheet, a tolerance of plus or minus 1/32 inch is acceptable on fractional dimensions that are controlled by welding, brazing, and shockmounts. This wider tolerance shall not interfere with the interchangeability of assemblies or parts.



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**3.5.3 Assembly fabrication.** Assembled fixtures shall have no loose parts, subassemblies, baffles, and so forth, that will rattle or detract from their quiet operation during vibration tests, or from transmitted vibration under operating conditions of the ship. Auxiliary dampening materials shall not be used for cushioning parts, wiring, and so forth to achieve acceptable quiet operation. Rivets, pads, brackets, assemblies, and subassemblies shall be securely attached to prevent rotation, rattling, turning, or bending. No loosening of these items shall be evident at the conclusion of the shock and vibration tests specified in 4.8.7 and 4.8.8.

**3.5.4 Drilling, countersinking, and tapping.** Drilling, countersinking, and tapping shall be done before plating or finish is applied. Tapped holes that are used for normal replacement of parts (windows, cover plates, and so forth) shall be countersunk.

**3.5.5 Sharp edges.** Sharp edges and corners that are accessible shall be given a slight radius.

**3.5.6 Castings and molded parts.** Castings shall be free from cold shuts, blow holes, or any imperfections that may affect strength. Surfaces of castings shall have burrs and fins removed. Flash shall be removed from molded parts.

**3.5.7 Surface textures.** Surface textures specified on the applicable specification sheet shall be in accordance with ANSI B46.1. Surface texture symbols shall be in accordance with ANSI Y14.36.

**3.5.8 Threaded parts and devices.**

**3.5.8.1 Threads.** Threads for threaded fastening devices shall be in accordance with FED-STD-H28. The threads shall be right hand, coarse-thread series, unified thread form, class 2A or 2B or American National thread form, class 2. Other thread series and classes, such as fine thread, may be used where it is necessary to ensure functional operation of the equipment. Threads shall be checked during production run with "GO" and "NO-GO" gauges to ensure conformance to FED-STD-H28.

**3.5.8.2 Engagement of threaded parts.** Threaded parts shall engage by at least four full threads in soft metals like aluminum and aluminum alloys. A minimum of three full threads shall be used in harder materials such as brass or steel. When a screw mates with a plastic part, a threaded metal insert shall be molded therein (pressed-in inserts are not acceptable), except as specified in 3.5.8.4.

**3.5.8.3 Thread cutting screws.** Thread cutting screws (sheet metal screws and self-tapping screws that remove material while cutting the thread) shall not be used. Thread forming screws (self-tapping screws that compress the parent material around the engagement hole while forming the thread) are acceptable.

**3.5.8.4 Threads in plastics.** Threads shall not be employed in plastic parts without the use of threaded metallic inserts, except in instances where the use of the inserts would adversely affect the electrical or mechanical characteristics of the part. Inserts shall be secured by knurling or other method which will prevent their movement in the plastic material.



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**3.5.8.5 Threads in aluminum.** In general, threads in aluminum alloys shall not be used. Wherever practicable, through bolt holes shall be used. Inserts in aluminum shall be provided only where screws or bolts must be removed for routine maintenance of the equipment or where maximum stress in the screw or bolt is required for alignment of a vital part. Inserts in aluminum shall not be provided for securing identification or information plates, terminal boards, or other items that are removed only when equipment is modified. Inserts shall be of austenitic, corrosion-resistant steel.

**3.5.8.6 Anti-seizure coating.** Aluminum and steel fastening parts (screws, bolts, and so forth) in contact with threaded aluminum shall be coated with an anti-seize compound.

**3.5.8.7 Threads locking.** Unless otherwise specified herein, nuts, bolts, studs, and screws shall be secured by a locking device. Satisfactory locking devices are split ring type lockwashers, nut and lock nut, self-locking nuts, and castellated nuts with cotter pin or safety wiring. Internal tooth type lockwashers generally shall not be used. External tooth type lockwashers may be used where the weight of the part does not exceed 6 ounces per screw. Nuts or screws with captive lockwashers may be used provided they are replaceable with common type screws and lockwashers. Ovalhead screws, when used with cup-type washers, and pan head screws on identification plates do not require locking devices. Thread forming screws do not require locking devices. When a bonding agent is used to permanently secure two or more threaded fastening devices, an over-sized thread may be used to provide a stronger bond. The over-sized threads shall be checked during the production run with "GO" and "NO-GO" gauges to ensure conformance to the original established dimensional limits.

**3.5.9 Seals and special screws.** Lead seals or special screws which require a special tool (see 3.10.1) for removal shall be used for explosionproof and combined explosionproof-watertight portable fixtures. Seals or special screws used require approval (see 6.11).

**3.5.10 Gaskets.** Unless otherwise specified in the applicable specification sheet, gaskets shall be as specified in 3.5.10.1 through 3.5.10.4.

**3.5.10.1 Window gaskets for type 1, class 2 fixtures and lights.** Window gaskets for type I, class 2 fixtures and lights shall be neoprene tubing (45-55 durometer hardness); 0.295 inch maximum and 0.245 inch minimum outside diameter (od); 0.062 inch inside diameter (id). No petroleum or silicon base lubricants shall be used when extruding gasket. Gaskets shall be securely cemented at the scarf joint and shall completely fill the groove without stretching or bunching. Gaskets shall be retained in their grooves without resorting to cement. Retainer may be continuous. (See 3.5.11.6 for gasket groove.)

**3.5.10.2 O-ring gaskets.** Unless otherwise specified in the applicable specification sheet, O-ring gaskets shall be commercial neoprene (65-75 durometer hardness). No petroleum or silicon base lubricants shall be used when molding gaskets. Sizes of O-ring gaskets for window assemblies shall be as shown on figures 1, 2, and 4.

**3.5.10.3 U-shaped gaskets.** U-shaped gaskets for PAR lamps, roundels, and lenses shall be commercial neoprene rubber (45-55 durometer hardness) of a continuous band and of circumference less than the diameter of the PAR lamp, roundel, or lens. No petroleum or silicon base lubricants shall be used when molding gaskets. The gaskets shall be so arranged that when stretched over the PAR lamp, roundel, or lens the material will form over the edge and the faces of the PAR lamp, roundel, or lens to form a U-shaped gasket.

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3.5.10.4 Gasket coating. O-rings and tubular gaskets shall be coated with a lubricant, Penetone Div. P/N "Lube #806", Amerace Corp., 74 Hudson Ave., Tenafly, NJ, or equivalent before final assembly in the fixtures.

3.5.11 Enclosures. Enclosures shall be as specified in 3.5.11.1 through 3.5.11.6, and as specified in the applicable specification sheet. There shall be no evidence of failure when fixtures and parts are tested as specified in 4.8.14 to determine effectiveness of the enclosures.

3.5.11.1 Enclosures, type I, class 1. Enclosures for type I, class 1 fixtures shall be as specified in the applicable specification sheet. Thickness of aluminum, where used, shall be not less than 0.090 inch, unless otherwise specified on the applicable specification sheet. Grade of materials where not specified shall be manufacturer's choice.

3.5.11.2 Enclosures, type I, class 2. Enclosures for type I, class 2 fixtures shall be as specified in the applicable sheet. The enclosures shall be made of aluminum. The enclosures may be fabricated. Aluminum or zinc die cast ends may be used in assembly with sheet aluminum mid-section. Die cast ends shall not be in direct contact with the shockmounts. Grade of aluminum used shall be manufacturer's choice. Unless otherwise specified in the applicable specification sheet, thickness of aluminum shall be not less than 0.090 inch. For personnel safety while cleaning or relamping fixture, a small compartment with removable cover shall be provided at each end within the enclosure for the purpose of containing the necessary parts and wiring connections. Areas in way of shockmount bolts shall be indented to receive gaskets and shockmounts as shown on figure 6. The enclosure shall be sufficiently rigid to ensure effective alignment and closure between enclosure and lens upon completion of shock tests conducted on assembled fixtures. Cable entrance hole shall be of a size and shape to suit the style of cable entrance fitting. Protective cover shall be provided as specified on figure 19.

3.5.11.3 Enclosures, type II, classes 1 and 2. Enclosures for type II, classes 1 and 2 fixtures and lights shall be as specified in the applicable specification sheet.

3.5.11.4 Parts. Enclosures shall incorporate all parts specified in the applicable specification sheet. Parts shall be firmly attached to the enclosure.

3.5.11.5 Drainage. When specified on the applicable specification sheet, enclosures shall provide for drainage of water vapor condensation through drain holes or other means located so as to provide for maximum drainage when fixtures and light are mounted in their normal operating position.

3.5.11.6 Gasket groove. Gasket groove for watertight type I, class 2 fixtures and lights shall be as shown on figure 7.

3.5.12 Shock. Fixtures and parts, as specified in 3.5.12.1 through 3.5.12.3, shall withstand, without damage or loosening of parts, the shock test specified in 4.8.7.

3.5.12.1 Types I and II, class 1 fixtures. Unless otherwise specified in the applicable specification sheet, types I and II, class 1 fixtures shall withstand the high impact (H.I.) shock for grade B, type A equipment in accordance with MIL-S-901.

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**3.5.12.2 Types I and II, class 2 fixtures.** Unless otherwise specified in the applicable specification sheet, types I and II, class 2 fixtures shall withstand the high impact (H.I.) shock for grade A, type A equipment in accordance with MIL-S-901. Type I lamps shall show no permanent loss of illumination during shock test. Failure of the type II lamp filament does not constitute failure of the fixture tested.

**3.5.12.3 Parts.** When specified in the applicable specification sheet, parts shall withstand the shock test specified for the basic fixture in which they are used (see 3.5.12.1 and 3.5.12.2).

**3.5.13 Vibration.** When specified in the applicable specification sheet, fixtures and parts shall withstand, without damage or loosening of parts, the type I vibration test in accordance with MIL-STD-167-1 as specified in 4.8.8. Use of locking devices is satisfactory to prevent loosening of parts. Type I lamps shall show no permanent loss of illumination during the vibration test. Failure of type II lamp filament does not constitute failure of fixture tested.

**3.5.14 Noise.** When specified in the applicable specification sheet, fixtures, lights, or parts shall not exceed the sound pressure level of 28 decibels (dB) referenced to 0.0002 microbars or the sound pressure level specified in the applicable specification sheet for airborne noise only when tested as specified in 4.8.9.

**3.5.15 Salt spray.** When specified in the applicable specification sheet, fixtures and parts made of steel or aluminum for weather deck installation shall withstand the salt spray test specified in 4.8.10 without excessive corrosion. Excessive corrosion is defined as that which interferes with the electrical or mechanical performance or, in the case of plated metals, corrosion which has passed through the plating and attacked the base metal.

**3.5.16 Shockmounts.** Shockmounts shall be furnished as specified in the applicable specification sheet, except that thickness of material shall be manufacturer's choice if failure occurs under the shock and vibration tests.

**3.5.17 Ambient temperature.** The fixtures, lights, and parts shall operate in the temperature specified in the applicable specification sheet when tested as specified in 4.8.19.

### **3.6 Parts and features - electrical.**

**3.6.1 Safety.** Fixtures and parts shall be constructed in a way that will ensure safety to operating and maintenance personnel. When properly installed and the enclosure is grounded, there shall be no accessible way for operating personnel to receive an electric shock even though an internal fault may exist between two circuits, between any circuit and a structural member, or between any circuit and ground. The design shall hold to a practical minimum the possibility of maintenance personnel being exposed to electric shock while servicing, adjusting, or checking out the fixtures or parts.

**3.6.2 Lamps.** Unless otherwise specified (see 6.2), lamps for type II fixtures shall not be furnished. Lamps for type I fixtures shall be as specified in the applicable specification sheet and shall be furnished assembled in the fixture.

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**3.6.3 Lamplocks for type I fixtures.** Lamplocks for type I fixtures shall be as specified in the applicable specification sheet and shall be furnished assembled in the fixture. Lamplocks shall provide for maximum protection against lamp loosening or rotation under the shock and vibration tests.

**3.6.4 Lampholders.** Lampholders shall be in accordance with UL-496 (SUPP. SA), UL-542 (SUPP. SA), and as specified hereinafter. The type shall be as specified in the applicable specification sheet.

**3.6.4.1 Lampholder spacing for type I fixtures and lights.** Unless otherwise specified in the applicable specification sheet, spacing between faces of lampholder supports at the point of lampholder attachment for type I fixtures and lights shall be as shown on figure 21.

**3.6.4.2 Insulating spacer for type II fixtures and lights.** An insulating spacer shall be installed between the lampholder metal mounting base and the lampholder in the case where the lampholder is provided with screws or other devices for electrical connections that are exposed to the mounting base. Material shall be as specified in 3.4.6.4. Counterbored holes in the bottom of lampholders or insulated bases shall not be filled with sealing wax or with rosin after screws are in place.

**3.6.5 Starter sockets for type I fixtures and lights.** Starter sockets for type I fixtures and lights shall be in accordance with UL-542 (SUPP. SA). The type shall be as specified in the applicable specification sheet.

**3.6.6 Starters for type I fixtures and lights.** When specified in the applicable specification sheet, starters for type I fixtures and lights shall be as specified in table II. Unless otherwise specified (see 6.2), the type to be furnished shall be as specified in the applicable specification sheet and shall be furnished assembled in the fixture or light. The interior of starters shall be filled with wax in cases where used in fluorescent lights having explosionproof requirements. Starters shall be furnished with ceramic condenser to reduce starting electromagnetic noise and with a paper sleeve inside the starter can to reduce noise from vibration of interior parts against can.

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TABLE II. Starters.

Voltage	Description	Fluorescent lamp	
		6 - 8 watts	15 - 20 watts
Alternating current	Item name	Simple glow switch without lockout	Simple glow switch, without lockout
	Specification	Type III of W-S-755	Type III of W-S-755
	Commercial designation	FS-5	FS-2
	National stock number	6250-00-299-5962	6250-00-299-2884
Direct current	Item name	Thermal switch without lockout	Thermal switch without lockout
	Specification	Type IV of W-S-755	Type IV of W-S-755
	Commercial designation	AT-58	AT-2
	National stock number	6250-00-283-9904	6250-00-884-2103

3.6.7 Starter washers for type I fixtures and lights. Starter washers as specified on figure 5 shall be provided for type I, classes 1 and 2 fixtures and lights that are furnished with starters (see 3.6.6). The washer shall be slipped over contacts of the starter. The washer and starter shall then be inserted into the starter socket and rotated to lock in the normal manner to provide a snug, rattle-free fit.

3.6.8 Ballasts for type I fixtures and lights. Ballasts for type I fixtures and lights shall be as specified in the applicable specification sheet and hereinafter.

3.6.8.1 Mounting. Ballasts shall be mounted so that they will not become loose under the shock and vibration tests. Ballast mounting shall make good contact with the fixture housing so as to aid conduction of normal operating heat away from the ballast to reduce noise. Ballasts shall be secured only by bolts (machine screws) and shall be capable of ready removal for replacement.

3.6.9 Terminal board. Unless otherwise specified in the individual specification sheet, terminal boards shall be in accordance with MIL-T-55164. The type shall be as specified in the applicable specification sheet.

3.6.9.1 Mounting. Terminal boards for receiving ships cable shall be secured to a fixed portion of the enclosure, not to movable assemblies that may require flexing of the ship's wiring during normal operation, maintenance, or servicing. Terminal boards shall be mounted so that they will not be broken or stressed by distortion of the enclosure. Terminal boards shall be secured only by bolts (machine screws) and shall be capable of ready removal and replacement.

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3.6.10 Switches. When specified (see 6.2), switches shall be furnished as specified in the applicable specification sheet and as specified hereinafter.

3.6.10.1 Toggle switches. Double-pole, single-throw (DPST) switches shall conform to MS16569. Single-pole, single-throw (SPST) switches shall conform to MS16656.

3.6.10.2 Push-button switches. Push-button switches shall be as specified in the applicable specification sheet.

3.6.10.3 Boots. Rubber boots in accordance with MIL-B-5423 shall be used to achieve the degree of enclosure effectiveness specified in the applicable specification sheet. Unless otherwise specified in the applicable specification sheet, type and style of boot shall be manufacturer's choice.

3.6.11 Wiring. Necessary internal wiring shall be furnished and installed. Connections at screw terminals shall be made with pressure grip (solderless) connectors, in accordance with UL-486. Splice connections shall be kept to a minimum and shall be made with UL approved insulated connectors, either crimp or screw type. Wires parallel to lamps in type I fixtures shall be run in a conduit, or shall be confined between reflector and housing. There shall be no exposed uninsulated electrical terminal joints, junctions, wiring, wiring accessories, and so forth.

3.6.11.1 Hook-up wires. Wire shall be of stranded, soft annealed copper of suitable cross section to provide ample and safe current carrying capacity and mechanical strength.

3.6.11.2 Harnessing. Wiring shall be neatly formed into groups which shall be laced, tied, taped, or clamped in a manner that provides support and prevents chafing of the wire insulation due to vibration and shock.

3.6.11.3 Insulation protection. Where wires are run through holes in metal partitions these holes shall be furnished with grommets for the mechanical protection of insulation which otherwise could be subject to abrasion. Care shall be exercised in the running of wires to ensure that they are not carried over or bent around any sharp corner or edge.

3.6.12 Cable and cable entrances. Cable shall be as specified in the applicable specification sheet. Commercial type cables for types I and II, class 1 fixtures shall be in accordance with J-C-580 with conductor color coding as specified in table entitled "Color codes for cords with not over 3 conductors". Commercial type cables for types I and II, class 2 fixtures shall be in accordance with J-C-580 except that standard identification code for conductors shall be as shown in the table for armor braid angle of MIL-C-915. Cable length shall be measured from the cable entrance of fixture, light, or part to the end of the cable. A cable length tolerance of plus or minus 3 inches shall apply. The following stuffing tubes or box connectors shall be used as cable entrance:

- (a) Stuffing tubes, stuffing tube assemblies, and stuffing tube parts shall be in accordance with MIL-S-19622 unless otherwise specified in the applicable specification sheet. Holes for stuffing tubes shall be smooth and true without any distortion of the box. Packing assembly and packing nut in accordance with MIL-S-19622 shall be used when cable entrances are integral with the housing.



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- (b) Box connectors shall be type I in accordance with W-F-406. Grade and style shall be as specified in the applicable specification sheet. Box connectors shall not be used in watertight fixtures or parts.

**3.6.13 Ground potential and grounding.**

**3.6.13.1 Electrical circuits.** Fixtures and parts shall operate satisfactorily on an ungrounded ship's power system. The design shall be such that it does not impose a ground upon the electrical power system from which it is energized. Wiring shall be as specified in the applicable specification sheet and figures 22, 23, and 24.

**3.6.13.2 Exposed metal (or other conductive) parts.** Construction of fixtures and parts shall be such that all exposed parts of metal or other electrically conductive material are at ground (ship's hull) potential at all times. Exposed metal portions of electrical parts (switches, lampholders, and so forth) or other parts located near electrical circuits (including parts inside enclosures where access is required for operation or adjustment) shall be in intimate physical contact with the frame of the equipment or electrically connected to the frame if these parts could touch the electrical circuits as a result of deformation, wear, insulation failure, and so forth.

**3.6.13.3 Ground connection.** Fixtures provided with a grounding conductor (green or red) in the supply cable shall have the end of that conductor, terminating within the fixture, securely attached and electrically connected to the metallic or conducting structure most likely to contact the body. This shall be accomplished in such a manner that all exposed metallic or conducting parts shall make adequate electrical contact with the grounding conductor when tested as specified in 4.8.11.

**3.6.13.4 Continuity of grounding.** Fixtures and parts provided with shockmounts shall be not greater than 0.10 ohm impedance between protruding tip of shockmount and any remote internal metallic structure of housing assembly when tested as specified in 4.8.12. Shockmounts shall not be painted.

**3.6.13.5 Portable fixtures.** The leakage current of the portable fixtures shall be not greater than 5 milliamperes. Leakage current is defined as the peak value of current flowing through the connection when any line of the power source is connected to the frame of the fixture for test purposes with fixture operating. Leakage current shall be measured as specified in 4.8.13.

**3.6.14 Electromagnetic interference (emission and susceptibility) (type I only).** When specified (see 6.2 and 6.10), electro-magnetic interference requirements for type I fixtures shall conform to the requirements of this specification when tested as specified in 4.8.16.

**3.6.15 Dielectric withstanding voltage.** There shall be no evidence of breakdown, arcing, corona (audible or visible), or punctured insulation when the interior of the fixture or part is subjected to the test specified in 4.8.2.

**3.6.16 Insulating resistance.** The insulation resistance between all current-carrying and noncurrent-carrying parts of fixtures or parts shall be not less than 1 megohm when tested as specified in 4.8.3.



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**3.7 Light output and associated hardware.**

**3.7.1 Candlepower distribution for fixtures.** Candlepower distribution curves shall be symmetrical to and shall be within plus or minus 10 percent of the curves shown in the applicable specification sheet. Tests shall be conducted as specified in 4.8.6.

**3.7.2 Footcandle distribution for fixtures.** Footcandle distribution curves shall be symmetrical to and shall be not less than 90 percent of the curves as shown in the applicable specification sheet. Tests shall be conducted as specified in 4.8.6.

**3.7.3 Color (chromaticity) and luminous transmittance for parts.** The chromaticity in CIE coordinates and luminous transmittance for parts such as windows, globes, roundels, lenses, filters, and others shall be as specified in the applicable specification sheet and as specified hereinafter. Color and luminous transmittance of plasticware parts shall be in accordance with MIL-P-24191. Color and luminous transmittance requirements shall be met prior to application of any diffusing process. If stippling is used for diffusing, the stippled surface shall be ground down and polished to a smooth surface or a test specimen shall be molded to a smooth surface of a nominal thickness as shown in the specification sheet for the part to be tested.

**3.7.3.1 Red transparent.** Red transparent color shall fall within the area bounded by the spectrum locus and  $y = 0.335$ ,  $X = 0.985 - y$  as shown on figure 8. Red glassware shall have a light transmission value that essentially follows the curves shown on figure 9 when specimens are tested as specified in 4.8.6.

**3.7.3.2 Yellow transparent.** Yellow transparent color shall fall within the areas bounded by the spectrum locus and

$$\begin{array}{ll} y = 0.382 & x = 0.454 + 0.240y \\ y = 0.790 - 0.667x & x = 0.698 - 0.333y \end{array}$$

as shown on figure 8. Luminous transmittance, using CIE illuminant A, shall be not less than 50 percent when specimens are tested as specified in 4.8.6.

**3.7.3.3 Green transparent.** Green transparent color shall fall within the area bounded by the spectrum locus and

$$\begin{array}{ll} y = 0.390 - 0.171x & x = 0.360 - 0.080y \\ & x = 0.650y - 0.030 \end{array}$$

as shown on figure 8. Luminous transmittance, using CIE illuminant A, shall be not less than 20 percent when specimens are tested as specified in 4.8.6.

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**3.7.3.4 Blue transparent.** Blue transparent color shall fall within the area bounded by the spectrum locus and

$$\begin{aligned} y &= 0.230 & x &= 0.133 + 0.600y \\ & & x &= 0.400 - y \end{aligned}$$

as shown on figure 8. Luminous transmittance, using CIE illuminant A, shall be not less than 2 percent when specimens are tested as specified in 4.8.6.

**3.7.3.5 White translucent.** White translucent, when tested as specified in 4.8.6, shall have luminous transmittance as specified on the applicable specification sheet. Transmitted light shall be distributed uniformly through the plastic.

**3.7.3.6 Red translucent.** Red translucent color shall fall within the area bounded by the spectrum locus and  $y = 0.335$ ,  $x = 0.085 - y$ , as shown on figure 8. Red material shall have a light transmission value that essentially follows the curve shown on figure 9 when tested as specified in 4.8.6.

**3.7.3.7 Clear (colorless) transparent.** The light transmitted by clear transparent ware shall not be noticeably different in chromaticity from that of the illuminant. Luminous transmittance shall be not less than the value specified in the applicable specification sheet. Clear transparent ware shall transmit all light between wave length 420 nanometers (nm) (violet) and 680 nm (red). Selective absorption at any wave length shall not exceed 5 percent of the entire energy at that wave length of the light source. Total absorption shall not exceed 18 percent.

**3.7.4 Windows and window assemblies for type I fixtures and lights.** Windows and window assemblies shall be as specified in the applicable specification sheet and hereinafter. Finish shall be as specified in 3.8.4.1. Annealing shall be as specified in 3.8.5.3. Typical styles of window assemblies are shown on figure 10.

**3.7.4.1 Material for windows.** Material for windows shall be cast, or ASTM D 4802 melt process category M-1, acrylic plastic sheet in accordance with MIL-P-24191 of a type and grade as specified in the applicable specification sheet. The requirements of MIL-P-24191 shall apply to the flat material prior to forming or fabrication. Windows after forming or fabrication shall be as specified in the applicable specification sheet. Injection molded, or extruded material is not permitted for parts that are formed to a specific shape. Flat windows may be made from extruded sheet.

**3.7.4.1.1 Optical uniformity.** The plastic windows shall have the best optical uniformity. Windows shall be free from defects such as imbedded particles, bubbles, scratches, blemishes, and striation, such as will seriously affect the optical properties.

**3.7.4.1.2 Corners.** In the process of fabrication of windows, the three-sided corners shall not be reduced in excess of 30 percent of the nominal window thickness specified in the applicable specification sheet. This wider tolerance shall be limited to an area bounded by the hypotenuse of three right-angled triangles, 3/4 by 3/4 inch, placed so that their vertex is at the point of the outside surface of the corner.

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3.7.4.2 Louver assembly. The louver assembly shall be as specified in the applicable specification sheet and hereinafter. Finish shall be as specified in 3.8.4.2.

3.7.4.2.1 Material. Material for louver assemblies shall be aluminum. Mounting hardware and grounding straps are excluded.

3.7.4.2.2 Attachment to window. The louver assembly shall be attached to the window as specified on figure 4 for attaching louvers to watertight plastic windows.

3.7.4.2.3 Louver grounding. The louver assembly shall be grounded to the fixture housing through the mounting screws. Louver grounding shall be continuous from one mounting screw to the other.

3.7.4.3 Window securing screw assemblies. Windows shall be provided with window securing screw assemblies as specified on figures 1, 2, and 3. The type and number to be provided shall be as specified in the applicable specification sheet. When window assemblies are purchased separately for replacement parts, the following procedures shall be followed (this does not apply to windows shown in MIL-F-16377/18, MIL-F-16377/65, and MIL-F-16377/66):

- (a) The center securing screw assembly(ies) (all except those at the two extreme ends) shall be snugly fitted with a flat washer, a lockwasher, and a nut as shown on figures 1 and 2. (Note: This arrangement allows the windows to be used with the previous design of non-watertight fixtures.)
- (b) A type VI label shall be provided with each window assembly as specified in 3.9.1.8.6.

3.7.4.4 Notches. When dimples or pins, as specified on figure 6, are used to retain window gasket in its groove, notches to clear these dimples or pins shall be filed on the sides of the window as shown in the applicable specification sheet and figure 27. Notches are not required when a continuous gasket retainer is used. Notches are required on windows when they are furnished separately from the lighting fixtures as replacement parts.

3.7.5 Lenses, globes, roundels, and windows for type II fixtures. Plastic lenses and windows shall be as specified in the applicable specification sheet. Glass lenses, globes, roundels, and windows, referred hereinafter as glassware, shall be as specified in the applicable specification sheet and hereinafter.

3.7.5.1 Optical uniformity. Glassware shall be free from defects that will prevent conformance with the light output requirements specified in the applicable specification sheet. Finished glassware shall be free from air bubbles, striae, wrinkles, mold marks, chipped edges, or any other blemishes which may affect the optical qualities.

3.7.5.2 Material. Glassware shall be made of high-impact, heat resistant glass of a type that will withstand all requirements specified in the applicable specification sheet. The glass shall be of such composition and quality as to withstand exposure to atmospheric sea conditions particularly that of salt water, high humidity, and bright sunlight without etching, discoloration, or any change in the light transmittance. Flashed glass shall not be used.

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3.7.5.3 Edges. The edges of all glassware shall be ground or molded to a true surface.

3.7.5.4 Colored glassware. Colored glassware shall be colored material throughout the entire thickness of the portions designed for light transmission.

3.7.5.5 Painted glassware. Those portions of the glassware designated by the applicable specification sheet to be painted shall be uniformly coated with an inorganic baking enamel. The color shall be as specified in the applicable specification sheet. The glassware shall be baked at such a temperature and period of time as to ensure adhesion of the enamel to the glass. There shall be no evidence of loosening or softening or other dissolution of the enamel when glassware is tested as specified in 4.8.17.2.

3.7.5.6 Mechanical shock. Glassware shall be resistant to one impact of a free falling 3-pound polished steel ball striking the glassware as specified in 4.8.17.3.

3.7.5.7 Thermal shock. Glassware shall withstand the stresses produced when tested as specified in 4.8.17.4 without visible or structural damage.

3.7.5.8 External hydrostatic pressure. Glassware shall withstand the stresses produced when tested as specified in 4.8.17.5 without visible or structural damage.

3.7.5.9 Breakage pattern. Breakage pattern shall be characterized by complete fracture of the glassware into small rectangular pieces predominantly not exceeding 2-1/2 by 5/8-inches when tested as specified in 4.8.17.6.

3.7.6 Reflectors. Reflectors shall be as specified in the applicable specification sheet, or of the size and shape necessary to produce the distribution curve required (see 3.7.1 and 3.7.2). Reflectors shall be made of aluminum sheet (manufacturer's choice) not less than 0.019 inch thick. Reflectors shall be reinforced to prevent noise when a fixture is tested as specified in 4.8.9. Clearance of holes of a size to accept the socket wrench for 1/4-20 hexagon nut shall be cut in the reflector where necessary to facilitate replacement of shockmounts in type I, class 2 fixtures. The holes shall align with shockmount hexagon nuts when the reflector is assembled in the enclosure. For finish of reflectors, see 3.8.3. Material for specular reflectors shall be aluminum pre-finished lighting sheet having a specular reflectance factor of not less than 80 percent. Plastic coating for specular reflecting surface is not acceptable.

3.7.7 Filters. Colored filters shall be as specified in the applicable specification sheet and hereinafter.

3.7.7.1 Red filter tubes for type I, class 2 fixtures. When specified (see 6.2), or when required by the applicable specification sheet, red filter tubes for insertion over type I lamps for use in red illumination shall be furnished installed in the fixtures. The procedures specified hereinafter shall apply when red filter tubes are installed in the type I standard fixtures. No symbol numbers or national stock numbers will be assigned for these fixtures.

3.7.7.1.1 "(R)" shall be placed next to the symbol number specified in the applicable specification sheet to signify an all red fixture; that is, red filter tubes have been installed on all lamps.

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3.7.7.1.2 "(R&W)" shall be placed next to the symbol number specified in the applicable specification sheet to signify a combination red and white fixture; that is, a red filter tube has been installed on one lamp of a two-lamp fixture or on the center lamp of a three-lamp fixture.

3.7.7.1.3 "(2R&W)" shall be placed next to the symbol number specified in the applicable specification sheet to signify a combination red and white fixture; that is, red filter tubes have been installed on the two outer lamps of a three-lamp fixture.

3.7.7.1.4 Installation of red filter tubes in directional fixtures shall be as specified in the applicable specification sheet. "(R&W)" shall be placed next to the symbol number specified in the applicable specification sheet to signify combination red and white fixture.

3.7.7.2 Blue filter tubes for type I fixtures. Identical requirements specified in 3.7.7.1 apply except blue "(B)" is substituted for red "(R)".

### 3.8 Processes.

3.8.1 Treatment and processing of metals for corrosion-resistance. The treatment and processing of metals for corrosion-resistance shall be in accordance with MIL-E-917.

3.8.2 Painting. Painting of metals to obtain corrosion-resistance shall be in accordance with MIL-E-917.

3.8.3 Finishing for fixtures and parts. When the salt spray test is specified in the applicable specification sheet, the procedures of 3.8.1 and 3.8.2 for finishing fixtures and parts for corrosion-resistance shall be strictly followed. When the salt spray test is not specified in the applicable specification sheet, the procedures for finishing fixtures specified hereinafter shall apply.

3.8.3.1 Cleaning. Cleaning shall be in accordance with the best commercial practice.

3.8.3.2 Surface preparation. The surface of metal parts shall be prepared for painting in accordance with the best commercial practice. This operation may be combined with the cleaning specified in 3.8.3.1.

3.8.3.3 Finish. Final finish shall be baking enamel of a good commercial grade. Color shall be as specified in 3.8.3.4 through 3.8.3.6.

3.8.3.4 Types I and II, class 1 fixtures. Unless otherwise specified in the applicable specification sheet, the color of the final finish applied to all exterior surfaces of types I and II, class 1 fixtures shall be a light gray in accordance with color number 16492 of FED-STD-595; the color of the final finish applied to all reflecting interior surfaces shall be white in accordance with color number 17875 of FED-STD-595, having a reflectance factor of not less than 80 percent. Specular reflectors shall not be painted (see 3.7.6).

3.8.3.5 Types I and II, class 2 fixtures. Unless otherwise specified in the applicable specification sheet, external and reflecting surfaces of types I and II, class 2 fixtures shall be white in accordance with color number 17875 of FED-STD-595, having a reflectance factor of not less than 80 percent. Specular reflectors shall not be painted (see 3.7.6).

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3.8.3.6 Parts. Unless otherwise specified in the applicable specification sheet, parts shall be painted a light gray in accordance with color number 16492 of FED-STD-595.

3.8.4 Finishing for windows and window assemblies for type I fixtures. Finishing for windows and window assemblies for type I fixtures shall be as specified in the applicable specification sheet and hereinafter.

3.8.4.1 Windows. Surfaces of areas specified in the applicable specification sheet to be finished shall be finished with air dry acrylic lacquer as follows:

- (a) White finish: Highly diffusing white. Luminous transmittance of the finished surface shall be  $60 \pm 10$  percent.
- (b) Black finish: Flat black. Surfaces shall be completely covered so that no pinholes or other blemishes exist.
- (c) Frosted finish: Clear frosted. Luminous transmittance of the finished surface shall be  $65 \pm 10$  percent.

3.8.4.2 Louver assemblies. After surface preparation (see 3.8.3.2), the final finish for louver assemblies shall be baking enamel of a good commercial grade. The color shall be as follows:

- (a) White louvers: White in accordance with color number 17875 of FED-STD-595, having a reflectance factor of not less than 80 percent.
- (b) Black louvers: Dull camera black.

3.8.4.3 Antistatic coating. Antistatic coating shall be applied to all unfinished surfaces of the window assemblies.

### 3.8.5 Stress relief.

3.8.5.1 Stress-corrosion cracking of metals. Stress-corrosion cracking characteristics are of primary concern in material selection for marine service. High residual stresses in tension in certain materials can cause stress-corrosion cracking when it is exposed to corrosive environment. Stress-corrosion cracking occurs under tensile stresses which are induced into metal parts that are formed by bending or drawing or that are fabricated by welding or torch welding. All susceptible metal parts under tensile stress shall be stress relieved to prevent deterioration or failure. Method of stress relieving shall be manufacturer's choice as required by the technical data furnished by the supplier of the raw material.

3.8.5.2 Plastics. Measures shall be taken in molding or processing plastics to ensure that stress build-up does not occur or is satisfactorily treated to relieve these stresses to prevent deterioration or failure of a part or assembly. The stress-relieving process shall be as required by the technical data furnished by the manufacturer of the raw material.

3.8.5.3 Plastic windows for type I fixtures. Plastic windows for type I fixtures that are formed to a specified shape from sheet shall be annealed to relieve internal stresses after fabrication and finishing operations have been completed. After annealing, there shall be very little or no evidence of stress when window assemblies are tested as specified in 4.8.5. Very



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little stress is defined as that which does not interfere with the optical uniformity of the window, or, in the case of window failure, stress which does not cause window cracking under the shock and vibration tests. Method of annealing shall be the manufacturer's choice as prescribed by the technical data furnished by the manufacturer of the raw material.

3.8.6 Welding. Welding and allied processes used in fabrication of fixtures and parts shall be in accordance with the best commercial practice. The American Welding Society Handbook (WHB) shall be used as a guide.

3.9 Designation and marking. Labels, identification, information and warning plates, instruction sheets, tags, and markings for fixtures and parts shall be as specified in the applicable specification sheet and hereinafter. Labels and identification plates are not required with plastic fixtures or parts where the specified information is molded in place.

3.9.1 Labels. Labels shall be furnished as specified hereinafter. Where advantageous, labels may be combined.

3.9.1.1 Material. The labels shall be of a grade of paper, fabric, or plastic, flatback, coated on one side with pressure-sensitive adhesive. The texture of material shall permit flexibility and shall have a finish capable of withstanding normal usage of handling and installation.

3.9.1.2 Adhesive. The adhesive shall be a pressure-sensitive, permanent type. It shall be water-insoluble, homogeneous, and shall be coated in a smooth layer on one side of the label. The adhesive shall require no solvent, heat, or other preparation prior to application. Adhesive shall adhere to metal or plastic.

3.9.1.2.1 Adhesion. The label shall adhere to the clean, dry surfaces to which applied under normal pressure without curling, breaking, or lifting.

3.9.1.3 Color. Unless otherwise specified herein, the color of the labels shall be white or yellow.

3.9.1.4 Thickness. Thickness of material prior to coating with adhesive shall be sufficient to give structural body for printing and handling.

3.9.1.5 Size. The size of labels shall accommodate the desired information.

3.9.1.6 Writing quality. Labels shall be suitable for printing or writing on with ink.

3.9.1.7 Marking. Marking, in general, shall be with black waterproof ink. Other colors of ink may be used when contrast is desired. Nonwaterproof ink may be used, provided it is followed by the application of a transparent waterproof coating. Height of characters shall be approximately as shown on figure 11 for type I labels and not less than 1/16 inch for types II, III, IV, and VI labels.

3.9.1.8 Application and classification. Unless otherwise specified in the applicable specification sheet, labels shall be applied as specified hereinafter. Labels shall be of the types specified hereinafter, as specified in the applicable specification sheet.



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**3.9.1.8.1 Type I labels.** Type I label shall be for equipment identification and shall be as shown on figure 11. Unless otherwise specified in the applicable specification sheet, two type I labels shall be applied to each fixture; one located on the outside back surface and the other located on an inner nonreflecting surface.

**3.9.1.8.2 Type II labels.** Type II labels for use with type I fixtures that are provided with three (or more) conductor cables for either single white or red or combination white and red illumination shall be as shown on figure 12. Type II labels shall be applied on the outside surface adjacent to the cable entrance of each flush mounted fixture.

**3.9.1.8.3 Type III labels.** Type III labels shall be used to indicate internal wiring of fixtures and shall be as shown on figure 13, unless otherwise specified in the applicable specification sheet. Type III labels shall be applied as specified in the applicable specification sheet.

**3.9.1.8.4 Type IV labels.** Type IV labels shall be used for supplying information pertinent to the fixtures or parts and shall be as shown on figure 14. The information to be imprinted thereon and the application to fixtures or parts shall be as specified in the applicable specification sheet.

**3.9.1.8.5 Type V labels.** Type V labels shall be as shown on figure 15 and shall be used for warning information. The warning information and the application to fixtures or parts shall be as specified in the applicable specification sheet.

**3.9.1.8.6 Type VI labels.** Type VI labels shall be as shown on figure 16. Unless otherwise specified in the applicable specification sheet, one type VI label shall be applied on the outside of each window assembly that is furnished as a replacement part for type I fixtures. The adhesive for these labels shall be of a pressure-sensitive type that will allow the label to be easily removed (this does not apply to windows shown in MIL-F-16377/18, MIL-F-16377/65 or MIL-F-16377/66).

**3.9.2 Identification and information plates.** When specified in the applicable specification sheet, identification and information plates shall be furnished in accordance with MIL-P-15024 and MIL-P-15024/5. Identification plates for use on fixtures that will be exposed to the weather shall be type A, B, C, D, or I, made from nickel-copper alloy, brass, or type H made from anodized aluminum. Type E and G plates shall be used only for wiring diagrams and other plates that are housed within the equipment enclosure. Plastic type B plates shall have black inner (or record) laminations and gray cover laminations.

**3.9.3 Identification plate (explosionproof).** An identification plate in accordance with MIL-P-15024 and MIL-P-15024/5, bearing the following legend, in upper case letters, shall be provided for fixtures and lights having explosionproof or combined explosionproof-watertight enclosures:

"FOR USE IN THE FOLLOWING EXPLOSIVE  
ATMOSPHERES: GASOLINE, PETROLEUM,  
NAPHTHA, ALCOHOL, ACETONE, LACQUER  
SOLVENT VAPORS, AND NATURAL GAS."

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The identification plate shall be securely attached to the outside of the fixture where it can best be seen. Where space permits, this legend may be combined with the aforementioned identification and information plate (see 3.9.2).

**3.9.4 Instruction sheets or tags.** When specified in the applicable specification sheet, instruction sheets or tags providing pertinent design and installation information shall be furnished with the fixtures or parts.

**3.10 Interchangeability and standardization.**

**3.10.1 Interchangeability.** Each repair part shall be equal to the original and suitable for replacement without special tools, (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 Defense Contract Management Area Operations (DCMAO)), and without the removal of rivets or pins dependent on a force fit. Mechanical and electrical interchangeability shall exist between like assemblies, subassemblies units, and replaceable parts, regardless of the manufacturer or contractor. Interchangeability does not mean identity, but requires that a substitution of such like assemblies, subassemblies, units, and replaceable parts be easily effected without physical or electrical modifications to any parts of the lights or assemblies, including globes, lenses, roundels, lamps, lampholders, wiring, and mounting and without resorting to selection.

**3.10.2 Standardization.**

**3.10.2.1** Standardization of units, assemblies, subassemblies, and parts shall be accomplished to as great an extent as practicable to simplify supply parts and replacement problems. Electrical and mechanical interchangeability of units, assemblies, subassemblies, and parts shall conform in detail to the various individual specification sheets.

**3.10.2.2 Equipment standardization.** Progressive standardization of complete equipments is required, at least to the extent that similar articles of different manufacture are electrically and mechanically interchangeable. In order to accomplish maximum practicable standardization, individual specifications will include requirements as to mounting dimensions, limiting overall dimensions, and electrical characteristics of individual items of equipment. Mounting dimensions shall be as specified in the applicable specification sheet and figures 25, 26, and 28.

**3.10.2.3 Standard stock parts.** Standard stock parts and hardware shall be used to as great an extent as practicable. For the purpose of this specification, standard stock is defined as material listed in the Federal Supply Catalog and includes such items as globes, lenses, roundels, lamps, lampholders, cable, cord, wire, bolts, screws, nuts, and washers.

**3.10.2.4 Proprietary parts.** Where Navy standard stock parts are not suited for the purpose intended, parts and materials shall be used which are standard, easily obtainable, and produced by reliable manufacturers, as far as possible within the limits of this specification. In order to facilitate the acquisition of replacement parts, the design shall not be based upon the use of parts of special manufacture where (suitable) units of standard manufacture are available. Similarly, the design shall not be based on the use of parts produced by only one manufacturer when an equivalent design available from several sources of manufacture might be employed.

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**3.11 High-temperature fluorescent lighting fixtures.** When specified (see 6.2), the procedures specified hereinafter shall apply when high-temperature fluorescent lighting fixtures are required.

**3.11.1 Symbol numbers.** A "HT" shall be placed next to the symbol number specified in the applicable specification sheets to indicate a high temperature modification of the standard lighting fixture (Example: Symbol Number 77.4HT).

**3.11.2 Component substitution.** Standard components specified in the applicable specification sheets shall be substituted with corresponding high-temperature components listed in table III. Other features, except National Stock Numbers, shall remain as specified in the applicable specification sheets.

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TABLE III. Component substitution for high-temperature fluorescent lighting fixtures.

Component	Fluorescent lighting fixtures using the 6 or 8 watt fluorescent lamps		Fluorescent lighting fixtures using the 15 or 20 watt fluorescent lamps	
	Use	In lieu of	Use	In lieu of
Lampholders	UL-542, (SUPP. SA. FIG. SA2.1 150°C (302°F))	UL-542, (SUPP. SA. FIG. SA2.1 105°C (221°F))	UL-542, (SUPP. SA. FIG. SA2.2 150°C (302°F))	UL-542, (SUPP. SA. FIG. SA2.2 105°C (221°F))
Starter sockets	UL-542, (SUPP. SA. FIG. SA2.4 150°C (302°F))	UL-542, (SUPP. SA. FIG. SA2.4 105°C (221°F))	UL-542, (SUPP. SA. FIG. SA2.4 150°C (302°F))	UL-542, (SUPP. SA. FIG. SA2.4 105°C (221°F))
Ballasts	M16377/45-002 of MIL-F-16377/45	M16377/45-001 of MIL-F-16377/45	M16377/72-002 of MIL-F-16377/72	M16377/72-001 of MIL-F-16377/72
Internal wiring	Wire with silicone impregnated fiber-glass insulation (SF-2, 150°C wire)	Wire with thermoplastic insulation	Wire with silicone impregnated fiber-glass insulation (SF-2, 150°C wire)	Wire with thermoplastic insulation
Wire connectors	Connectors with polyvinylidene fluoride (PVDF)	Connectors with nylon insulation	Connectors with polyvinylidene fluoride (PVDF)	Connectors with nylon insulation
Supply cable	Type DPS-3 or TPS-3 of MIL-C-24643 and MIL-C-24643/26	Two or three conductor thermoplastic insulated cable	Type DPS-3 or TPS-3 of MIL-C-24643/26	Two or three conductor thermoplastic insulated cable
Cable entrances	Aluminum washers and cap. Dimensions shall be as specified by applicable specification sheets of MIL-S-19622	Nylon washers and cap as specified by applicable specification sheets of MIL-S-19622	Aluminum washers and cap. Dimensions shall be as specified by applicable specification sheets of MIL-S-19622	Nylon washers and cap as specified by applicable specification sheets of MIL-S-19622

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**3.12 400-Hertz (Hz) fluorescent lighting fixtures.** When specified (see 6.2), the procedures specified hereinafter shall apply when 400-Hz in lieu of 60-Hz fluorescent lighting fixtures are required.

**3.12.1 Symbol numbers.** A "-400 Hz" for standard fixtures or a "HT-400 Hz" for high-temperature fixtures shall be placed next to the symbol numbers specified in the applicable specification sheet to indicate a 400-Hz modification of the standard 60-Hz lighting fixtures. (Example: Symbol Number 77.4-400 Hz for standard fixtures or 77.4 HT-400 Hz for high-temperature fixtures.)

**3.12.2 Component substitution.** The 60-Hz ballasts specified in the applicable specification sheets shall be substituted with corresponding 400-Hz ballasts in accordance with MIL-F-16377/72 and MIL-F-16377/45. Other component substitution for high-temperature fixtures shall be as listed in table III.

**3.13 Workmanship.** The fixtures, lights, and parts shall be manufactured and finished in a thoroughly workmanlike manner. Particular attention shall be paid to neatness and thoroughness of soldering, wiring, marking of parts and assemblies, plating, painting, machine screw assemblage, welding, and freedom of parts from burrs and sharp edges.

#### 4. VERIFICATION

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

- (a) First article inspection (see 4.3).
- (b) Conformance inspection (see 4.4).

**4.2 Inspection conditions.** Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.8 and the applicable specification sheets.

**4.3 First article inspection.** First article inspection shall consist of the examination of 4.5 and the tests of 4.8 and as specified in the applicable specification sheet.

**4.3.1 Government inspection.** When the contract specifies the first article inspection to be performed by the Government, the contractor shall provide the first article sample and a set of prints of the manufacturing drawings to the laboratory specified (see 6.2 and 6.5) for the performance of the first article inspection.

**4.3.2 Contractor inspection.** When the contract specifies the first article inspection be performed by the contractor, the inspection shall be performed by the contractor and it will be witnessed and the test results verified by the Government inspector.

**4.3.3 Order of tests.** The order of tests may be at the option of the contractor except that for watertight and submersible enclosures, the following tests shall be performed in the order specified:

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- (a) Effectiveness of enclosure.
- (b) Dielectric withstanding voltage.
- (c) Insulation resistance.
- (d) Shock.
- (e) Vibration.
- (f) Noise (when applicable).
- (g) Dielectric withstanding voltage.
- (h) Insulation resistance.
- (i) Effectiveness of enclosure.

For enclosures other than watertight and submersible, the tests shall be in the same order, except that the effectiveness of enclosure, dielectric withstanding voltage, and insulation resistance test are not required prior to shock and vibration.

**4.3.4 Inspection of parts.** When shock, vibration, and effectiveness of enclosure tests are specified in the applicable specification sheet for parts (window assemblies and glassware) that are an integral part of a fixture or light and are furnished as replacement parts, these parts shall be installed in a fixture or light, furnished by the Government, for the performance of these tests.

**4.3.5 Combination of tests.** Where advantageous, the contractor may combine tests in cases where the basic body of the fixture or light to be tested is the same for different styles of the fixture or light. For example, in the case where a red globe is substituted for a diffusing globe to obtain red illumination in the incandescent fixtures or a clear white shielded window is substituted for a diffusing one in the fluorescent fixtures.

**4.4 Conformance inspection.** Conformance inspection shall consist of the following:

- (a) Comparison inspection of 4.4.1.
- (b) Inspection of product for delivery of 4.4.2.

**4.4.1 Comparison inspection.** One sample from the first production run on each fixture, light, or part shall be subjected to the same inspection specified in the applicable specification sheet for first article inspection when specified (see 6.9). Procedures for first article inspection specified in 4.3 shall also apply for comparison inspection.

**4.4.2 Inspection of product for delivery.** Inspection of product for delivery shall consist of the following:

- (a) Examination of 4.5.
- (b) Conformance tests of 4.6.
- (c) Examination for preparation of delivery of 4.7.

**4.4.2.1 Sampling plan for inspection of product for delivery.** Sampling plan for inspection of product for delivery shall be as specified in 4.4.2.1.1 through 4.4.2.1.3.

**4.4.2.1.1 Lot.** For the purpose of sampling, a lot shall be the identical number of items on the contract or order.

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**4.4.2.1.2 Sampling for examination.** As a minimum, the contractor shall randomly select a sample quantity of fixtures from each lot in accordance with table IV and examine them as specified in 4.5. Detection of any nonconforming characteristic in any sample shall result in the rejection of the entire lot. The contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with the sampling plan contained herein.

**TABLE IV. Sampling for examination and conformance tests.**

Lot size	Sample size
2 to 50	5
51 to 90	7
91 to 150	11
151 to 280	13
281 to 500	16
501 to 1,200	19
1,201 to 3,200	23
3,201 to 10,000	29
10,001 to 35,000	35
35,001 and over	40

**4.4.2.1.3 Sampling for conformance tests.** As a minimum, the contractor shall randomly select a sample quantity of fixtures from each lot in accordance with table IV and examine them as specified in 4.6. Detection of any nonconforming characteristic in any sample shall result in the rejection of the entire lot. The contractor has the option of screening 100 percent of the lot for the defective characteristic(s) or providing a new lot which shall be inspected in accordance with the sampling plan contained herein.

**4.5 Examination.** Fixtures, lights, or parts shall be examined as specified in 4.5.1 and 4.5.2.

**4.5.1 Visual examination.** Fixtures, lights, or parts shall be examined for the defects listed in table V, as applicable.



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TABLE V. Visual defects.

Examine	Defect
Finish	Finish not as specified: blistered, peeled, chipped, or area of no film. Color not as specified.
Materials	Materials not as specified.
Construction and workmanship, general (applicable to all parts and assemblies)	Part missing, fractured, split, punctured, dented, deteriorated. Not in proper alignment. Sharp burr or edge, sliver or splinter.
Welding and brazing (where applicable)	Missing, incomplete, burn holes, cracked, fractured, or otherwise not fused, slag inclusion, slight undercut, not smooth and uniform, scale or flux deposits not removed.
Soldering (when applicable)	Missing, not adherent or incomplete. Not clean (flux or flux residue not removed); not smooth (surface not finished neatly), or pinholes in solder.
Bolts, nuts, screws, studs, pads, rivets, and other types of fasteners	Missing, broken, stripped, fractured, loose, bent, not peened or insufficiently peened.
Electrical assembly	Connections at screw terminals and splice connection not as specified. Wiring not properly joined, loose at terminal, or not enclosed in specified conduit where required. Adequate slack not provided for wiring to relieve strain or excessive insulation stripped from wiring.
Gaskets (where applicable)	Not coated where required, missing, not as specified.
Marking for Identification	Missing, incomplete, not legible.
Instruction manual, tag, or sheet (where applicable)	Missing, incomplete, not legible.

**4.5.2 Examination for weight and dimensions.** Fixtures, lights, or parts shall be examined to determine compliance with weight and dimensional requirements. Weights or dimensions not within specified tolerances shall be classified a defect.

**4.6 Conformance tests.** Fixtures, lights, or parts shall be subjected to the tests specified in 4.6.1 through 4.6.3.

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**4.6.1 Complete fixtures or lights.** Sample fixtures or lights shall be subjected to the operation, the dielectric withstanding voltage, and the insulation resistance tests of 4.8.1, 4.8.2, and 4.8.3.

**4.6.2 Plastic windows for type I fixtures and lights.** Sample plastic windows for type I fixtures and lights shall be subjected to the optical uniformity and stress relief tests of 4.8.4 and 4.8.5. These tests shall be performed when the windows are furnished as an integral part of a fixture or light or as a repair part.

**4.6.3 Lenses, globes, and roundels for type II fixtures and lights.** Lenses, globes, and roundels for type II fixtures and lights shall be subjected to the optical uniformity test of 4.8.4. This test shall be performed when the lenses, globes, and roundels are furnished as an integral part of a fixture or light or as repair parts.

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

**4.8 Test procedures.**

**4.8.1 Operation.** The fixtures, lights, and parts shall be electrically and mechanically operated to determine conformance to the requirements of this specification.

**4.8.2 Dielectric withstanding voltage.** Fixtures, lights, or parts shall be subjected for 1 minute to a dielectric test voltage, the effective potential of which is twice rated voltage plus 1,000 volts, applied between points of polarity and also between live parts and ground. The frequency of the test voltage shall be 60 Hz, root mean square, alternating current, and shall approximate a true sine wave. (A test potential of twice rated voltage plus 500 volts may be used for fixtures or lights rated 28 volts or less.)

**4.8.3 Insulation resistance.** After the dielectric withstanding voltage test (see 4.8.2), insulation resistance of the sample fixtures, lights, or parts shall be measured between all current carrying parts and noncurrent carrying parts with a megohmmeter at a voltage not less than 500 volts direct current, at normal room temperature. This test is not required for unwired fixtures wherein plastic parts approved by NAVSEA are certified by the manufacturer as meeting the requirements of 3.6.16.

**4.8.4 Optical uniformity test for windows, lenses, globes, and roundels.** Windows, lenses, globes, and roundels furnished either as a part of a fixture or light or as replacement parts shall be examined to ascertain that the product is of uniform quality as to color, clarity, and freedom from dead zones or streaks. Unless otherwise specified (see 6.2), the source of light shall be a standard 100-watt, 120-volt, tungsten filament lamp operating at approximately normal rated voltage. This test may be combined with the operation test of 4.8.1 where the source of light shall be that of the fixture or light.

**4.8.5 Stress relief test for plastic window for type I fixtures and lights.** The windows shall be placed between a pair of polarizing lenses and a light source to determine conformance to 3.8.5.3.

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**4.8.6 Light output.** Test procedure for measuring light output shall conform to the appropriate Illuminating Engineering Society (IES) guides for photometric and colorimetric testing and the applicable specification sheet.

**4.8.6.1 Candlepower distribution.** When specified in the applicable specification sheet, a candlepower distribution curve shall be obtained from the sample fixture or light. Before any measurements are taken, the fixture or light shall be operated until the light output has reached a stable condition.

**4.8.6.2 Footcandle distribution.** When specified in the applicable specification sheet, a footcandle curve shall be obtained from the sample fixture or light. Before any measurements are taken, the fixture or light shall be operated until the light output has reached a stable condition.

**4.8.6.3 Color and luminous transmittance.** When specified in the applicable specification sheet, the color and luminous transmittance of windows, globes, roundels, lenses, and filters shall be checked to determine conformance to 3.7.3.

**4.8.7 Shock test.** The sample fixture, light, or part shall be subjected to the type A, H.I. shock test in accordance with MIL-S-901 for grade A or B (see 3.5.12), class I for fixtures and lights without shockmounts or class II for fixtures and lights with shockmounts, light weight equipment. Fixtures or lights shall be energized during this test. The first article inspection shall include photographs of the test set-up and any failed element.

**4.8.7.1 Mounting.** Mounting of fixtures, lights, and parts on the shock machine shall simulate normal shipboard installation. Mounting dimensions and hardware shall be as specified in the applicable specification sheet. Fixtures, lights, and parts shall be securely mounted on the shock machine in accordance with the standard methods shown on figure 17.

**4.8.8 Vibration test.** The sample fixture, light, or part shall be subjected to a vibration test conforming to type I vibration of MIL-STD-167-1 (see 3.5.13). Mounting for fixtures and lights shall simulate shipboard installation. Fixtures or lights shall be energized during this test. The first article inspection shall include the vibration test results and photographs as outlined in MIL-STD-167-1.

**4.8.9 Noise test.** When required (see 3.5.14), after the vibration and shock tests are conducted, the sample fixture, light, or part shall be submitted to an airborne noise test as follows: Using a sound level meter (Gen Rad Inc., type 1551-C sound level meter, or equal) determine the ambient noise level 12 inches from the fixture, light, or part under test. The maximum acceptable ambient noise level is 40 dB. With the fixture, light, or part energized, determine the maximum combined (ambient plus test piece) noise level at a distance of 12 inches from the test piece in all directions. The combined noise shall fall within the shaded area of figure 20. The fixture, light, or part shall be mounted as in actual service during this test. MIL-STD-740 may be used as a guide. Calibration testing and recording of results shall be in accordance with MIL-STD-740.

**4.8.10 Salt spray test.** The sample fixture, light, or part shall be subjected to a salt spray test in accordance with method 101 of MIL-STD-202, test condition A (see 3.5.15). The salt solution concentration shall be 20 percent.

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**4.8.11 Grounding circuit.** The grounding circuit of the fixture, light, or part shall be tested by placing a current of not greater than 5 nor less than 4 amperes through the grounding circuit for a period of not less than 1 minute. This shall be done with the fixture, light, or part insulated from the ground conductor. The ground conductor of a 2-foot cable shall be connected to one end of the circuit, and the exposed metal portion of the fixture, light, or part shall be connected by means of a test clip to the other end of the circuit. This circuit shall be placed in series with an ammeter and some means of limiting the current to the specified value. The potential drop through the ground connection when carrying between 4 and 5 amperes shall be measured by means of a voltmeter having a full scale deflection of not more than 3 volts connected between a metal portion of the fixture, light, or part in electrical contact with the grounding circuit and the ground conductor of the cable. This potential shall be not greater than 0.25 volt, and no arcing or burning in the grounding circuit shall be evident. The resistance of the grounding circuit shall be measured with a milliohmmeter and the resistance of the circuit shall be not greater than 0.1 ohm.

**4.8.12 Continuity of grounding.** The resistance shall be measured with a milliohmmeter between protruding tip of shockmount and any remote internal metallic structure of the housing assembly of the fixture, light, or part.

**4.8.13 Leakage current (portable fixtures only).** Leakage current test shall be conducted with the fixture, light, or part operating at approximately the normal operating temperature. The metal portion of the fixture, light, or part shall be ungrounded. Prior to the leakage current test, the resistance from the grounding conductor of the extension cable to the exposed metal portion of the light shall be measured and found to be less than 0.1 ohm. For measurement of leakage current, all connections shall be made at the end of a 2-foot long cable. An adapter may be used to facilitate making connections to the power source and meter. To operate the fixture, light, or part, the power source shall be connected to the proper conductors of the cable; however, the grounding conductor shall be left unconnected except as required for this test. For leakage current measurements, each line shall be connected successively to the grounding contact of the cable and the current flowing in the connecting wire measured.

**4.8.14 Enclosure effectiveness.** Effectiveness of the enclosures of the sample fixture, light, or part shall be determined as specified hereinafter (see 3.5.11).

**4.8.14.1 Totally enclosed.** No special tests are required. It shall be ascertained by examination that the enclosure effectively performs its function and that the openings are not larger than those permitted by MIL-STD-108.

**4.8.14.2 Dripproof.** Dripproof enclosures shall be tested in accordance with MIL-STD-108. The fixture, light, or part shall be mounted in normal position when tested. There shall be no leakage except as permitted by MIL-STD-108.

**4.8.14.3 Splashproof.** Splashproof enclosures shall be tested in accordance with MIL-STD-108. The fixture, light, or part shall be mounted in normal position when tested. There shall be no entry of water into the enclosure when the fixture, light, or part is subjected to a stream of water as specified in MIL-STD-108.

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4.8.14.4 Watertight and submersible. Upon completion of the tests specified in 4.8.7 and 4.8.8, watertight and submersible enclosures shall be tested in accordance with MIL-STD-108. Before conducting this test, joints that have gaskets or sealing compound, or that have been painted, and which are subjected to being opened and closed shall be opened and closed three times (this includes doors and covers but does not include indicator and observation windows). There shall be no leakage of water into the enclosure after it has been subjected to the test conditions of MIL-STD-108.

4.8.14.5 Explosionproof. Explosionproof enclosures shall be tested as specified in 4.8.15.

4.8.14.6 Combined explosionproof-watertight. Combined explosion-proof-watertight enclosures shall be tested as specified in 4.8.14.4 and 4.8.15.

4.8.15 Explosionproof tests. After all tests have been conducted, sample fixtures and lights having explosionproof or combined explosionproof-watertight enclosures shall be forwarded to the Department of Labor, Mine Safety and Health Administration (MSHA), Approval and Certification Center, P.O. Box 201B, Industrial Park Rd., Triadelphia, WV, 26059, for explosionproof tests. A copy of the applicable master drawing shall accompany the fixture or light.

4.8.15.1 Test procedures. Test procedures shall be as follows:

- (a) The fixture or light shall be drilled and tapped to permit making pipe and valve connections for circulation of vapors through it, and for inserting a spark plug and pressure indicator. Electrical connections for operating the fixture or light in some of the tests shall also be made where necessary. If the fixture or light is required to be watertight, the explosionproof tests shall be conducted with the watertight gaskets in place.
- (b) When the fixture or light is ready for testing, measured amounts of highly volatile petroleum ether, or suitable equivalent, shall be evaporated on a hot plate. After circulating the vapor through the enclosure and test chamber long enough to ensure a uniform mixture, the valve shall be closed to isolate the interior from the surrounding atmosphere. Then the mixture in the enclosure shall be ignited by means of the spark plug. The percentage of petroleum ether in the atmosphere shall be varied throughout the explosive range by using different amounts of petroleum ether. The discharge of flame from any point in the enclosure, even though no ignition of the surrounding atmosphere takes place, shall be recorded as a failure of the fixture or light. Twenty such tests shall be conducted and shall be sufficient to prove the safety of the fixture or light unless some weakness such as deformation of the enclosure develops that in the judgment of the testing personnel needs further investigation. Deformation of flat surfaces shall be checked by means of a straight edge.

4.8.15.2 Rejection. Any of the following shall be cause for rejection of the fixture or light.

- (a) Discharge of flame from any joint or opening.
- (b) Ignition of surrounding explosive mixtures.

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- (c) Development of dangerous after-burning (that is, the burning, immediately after an internal explosion, of a gaseous mixture that was not in the enclosure at the time of the explosion but was drawn in as the result of the cooling of the products of the original explosion).
- (d) Rupture or permanent distortion of the fixture or light.

**4.8.16 Electromagnetic interference (type I only).** Type I fixtures, lights, or parts shall be subjected to an electromagnetic interference test in accordance with MIL-STD-462.

**4.8.17 Tests for glassware.** Tests for glassware shall be conducted as specified hereinafter.

**4.8.17.1 Color determination test.** One sample of each colored glassware shall be broken to determine conformance to 3.7.5.4.

**4.8.17.2 Paint removal test.** Sample glassware shall be submerged in any commercially available paint and varnish remover for a period of not less than 3 minutes to determine conformance to 3.7.5.5.

**4.8.17.3 Mechanical shock test.** Sample glassware shall rest with its flat surface on a soft 2-foot by 2-foot by 2-inch thick wood plank as shown on figure 18. A 3-pound polished steel ball shall be allowed to fall free and strike the glassware on the center of the outside surface. Striking force shall be as specified in the applicable specification sheet (see 3.7.5.6).

**4.8.17.4 Thermal shock test.** Sample glassware shall be uniformly heated to a temperature of  $100 \pm 2$  degrees Celsius ( $^{\circ}\text{C}$ ) for 1 hour. The samples shall then be immediately immersed completely in water at a temperature of 0 to  $10^{\circ}\text{C}$ . At least ten consecutive cycles shall be performed on each sample (see 3.7.5.7).

**4.8.17.5 External hydrostatic pressure test.** Sample glassware shall be installed on lights for which they are designed and shall then be submerged in water in a pressure tank. An external hydrostatic pressure as specified in the applicable specification sheet shall be applied for a period of 1 hour (see 3.7.5.8).

**4.8.17.6 Breakage pattern test.** Sample glassware shall rest with its flat surface on a soft 2-foot by 2-foot by 2-inch thick wood plank as shown on figure 18. A steel ball shall be allowed to fall free and strike the glassware on the center of the outside surface with a force great enough to break the glassware (see 3.7.5.9).

**4.8.18 Magnetic permeability.** The magnetic permeability of the material shall be determined in accordance with ASTM A 342 (see 3.4.8).

**4.8.19 Ambient temperature.** The lights shall be operated for 100 hours at the ambient temperature and voltage specified in the applicable specification sheet (see 3.5.17). The light shall be fully assembled (with all gaskets, if applicable, in place).



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## 5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of materiel is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

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

6.1 Intended use.

6.1.1 Class 1 fixtures and lights are intended for use in detail lighting on board ship. Examples of such applications among others are mirror and berth illumination, desk lighting, gaugeboard, and spot illumination.

6.1.2 Class 2 fixtures and lights are intended for use in general illumination on board ship. Fixtures and lights for general white illumination are also used for red or blue illumination by the use of proper filters inserted either in the lighting fixtures or over the fluorescent lamps.

6.1.3 Overhead standard mounted fixtures and lights are intended to be mounted on the overhead by standard shockmounts.

6.1.4 Overhead flush mounted fixtures and lights are intended to be flush mounted in areas where sheathing is employed in the overhead.

6.1.5 Explosionproof fixtures and lights are intended for use in areas where explosive atmospheres exist. Examples of such applications, are gasoline, jet fuel, paint, and ammunition storage areas.

6.2 Acquisition requirements. Acquisition documents must specify the following:

- (a) Title, number, and date of this specification.
- (b) Type, class, and symbol required (including title, number, and date of the applicable specification sheet) (see 1.2).
- (c) Issue of DoDISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.2.1 and 2.3).
- (d) If first article inspection is required (see 3.2).
- (e) Whether one hundred percent nonmagnetic material is required (see 3.4.8).
- (f) If lamps are required for incandescent fixtures (see 3.6.2).
- (g) Type of starter required if other than specified on the applicable specification sheet (see 3.6.6).

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- (h) Whether switches are required (see 3.6.10).
- (i) If electromagnetic interference requirements are required (see 3.6.14).
- (j) Whether red filter tubes for fluorescent lamps are required (see 3.7.7.1).
- (k) If high temperature fluorescent lighting fixtures are required (see 3.11).
- (l) If 400-Hz standard or 400-Hz high-temperature fluorescent lighting fixtures are required (see 3.12).
- (m) Type of inspection required and designation of laboratory (see 4.3.1).
- (n) If the source of light shall be standard (see 4.8.4).
- (o) Packaging requirements (see 5.1).

**6.3 Provisioning.** Provisioning Technical Documentation (PTD), spare parts, and repair parts should be furnished as specified in the contract.

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

**6.4 First article inspection.** Invitations for bids should provide that the Government reserves the right to waive the requirements for first article inspection to those bidders offering a product which has previously passed first article inspection. Bidders offering such products, who wish to rely on such test results, must furnish such evidence with the bid.

6.4.1 The contractor, prior to award of a contract or order, may perform the first article inspection at a Government laboratory (see 6.5) at his own expense and risk. This action, however, neither constitutes an obligation by the Government to purchase nor authorizes the expenditure of Government funds.

6.4.2 Contractors and manufacturers should contact NAVSEA before conducting tests to discuss technical details of testing.

6.4.3 Unless otherwise directed by NAVSEA, substitution of comparison inspection in lieu of first article inspection is acceptable and desirable for those companies offering products which have been previously acquired or tested by the Government.

**6.5 Government inspection.** Unless otherwise directed by NAVSEA, Government inspection should be performed at the Portsmouth Naval Shipyard, Equipment Testing Laboratory, Portsmouth, NH 03801.

**6.6 NAVSEA.** The word "NAVSEA" as used herein refers to the Naval Sea Systems Command, Electrical Equipment Division, Department of the Navy, Arlington, VA 22242-5160.

**6.7 Symbol number.** Symbol number is a standard equipment designation. Symbol numbers are listed in MIL-HDBK-290.

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6.8 Approval of the first article inspection report. Unless otherwise directed by NAVSEA the Purchasing Contracting Officer (Naval Shipyards, Private Shipyards/Supervisor of Shipbuilding Conversion and Repair, and Defense Supply Agencies) will, by written notice to the contractor, waive, approve, conditionally approve, or disapprove the first article inspection report. When it is deemed necessary, the Purchasing Contracting Officer will forward the first article inspection report to NAVSEA for resolution on acceptance or nonacceptance of marginal or nonconforming supplies.

6.9 Comparison inspection. Comparison inspection is not mandatory but it is highly desired to assure that production runs conform to the test results of the first article inspection. Comparison inspection should be mandatory for these companies manufacturing the fixtures, lights, or parts under this specification for the first time.

6.10 Electromagnetic interference. Fluorescent lighting fixtures (type I) manufactured in accordance with this specification meet the radiated electromagnetic interference requirements of MIL-STD-461 for electrical equipment without solid state when tested in accordance with MIL-STD-462. When more stringent requirements are required, these requirements should be as specified in the contract or order and the fixtures modified and tested accordingly. Suggested modification methods may be obtained from NAVSEA.

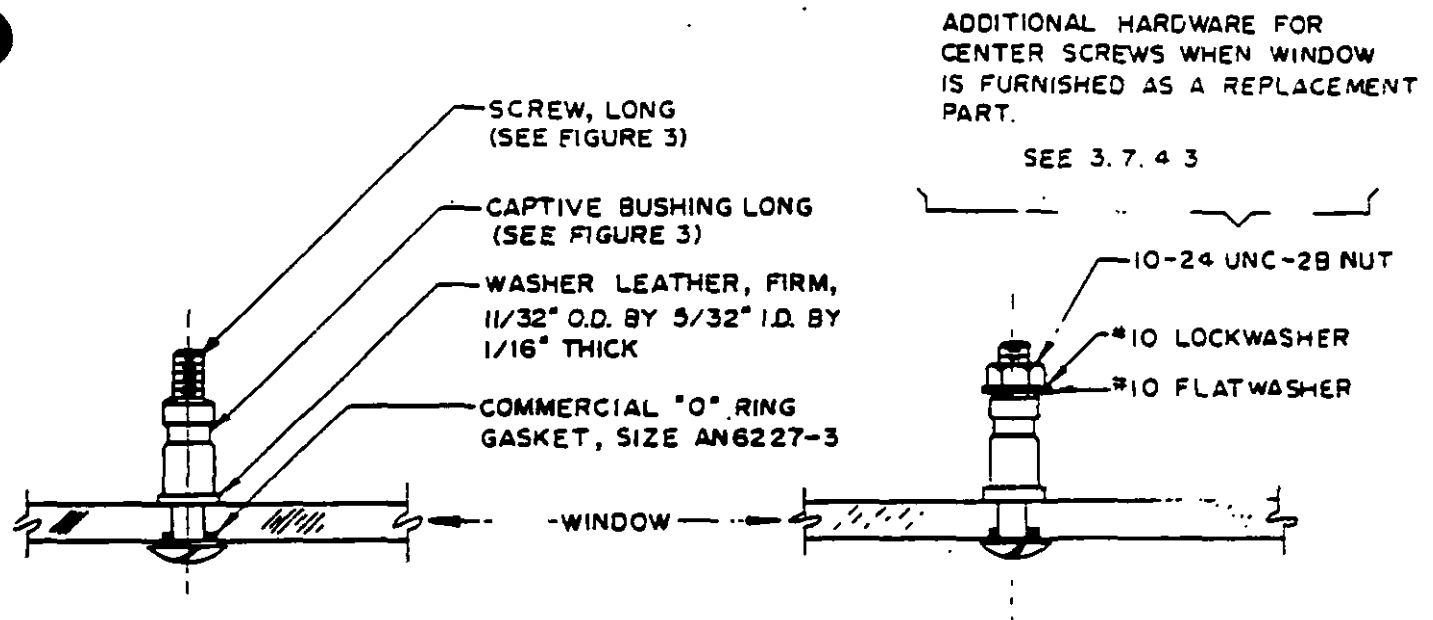
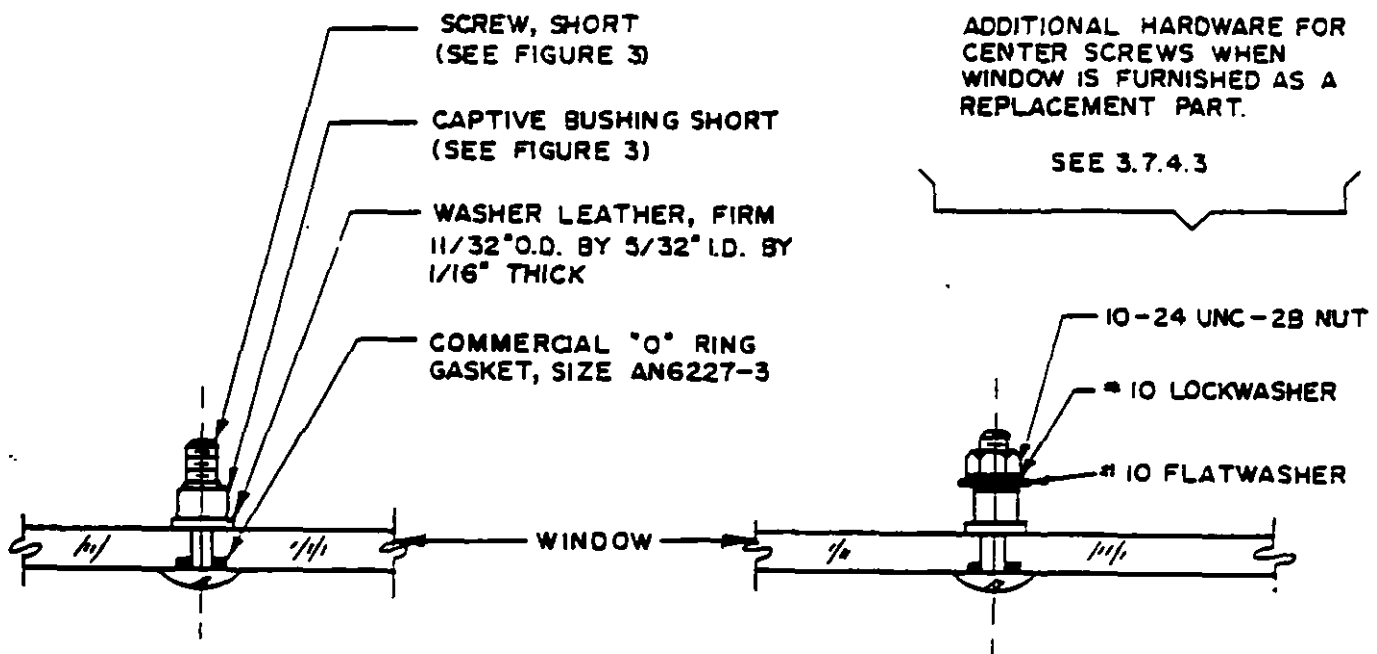
6.11 NAVSEA approval and direction. Unless otherwise specified, deviations from specified materials, procedures, and requirements and selection of specific alternative materials and procedures require NAVSEA approval or direction. Requests should include supporting documentation.

6.12 Subject term (key word) listing.

Explosionproof  
Flammability  
Fluorescent  
Illumination  
Incandescent

6.13 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 6210-N661-01)

FIGURE 1. Securing screw assembly (long) for watertight window assemblies.FIGURE 2. Securing screw assembly (short) for watertight window assemblies.

## MIL-DTL-16377H(SH)

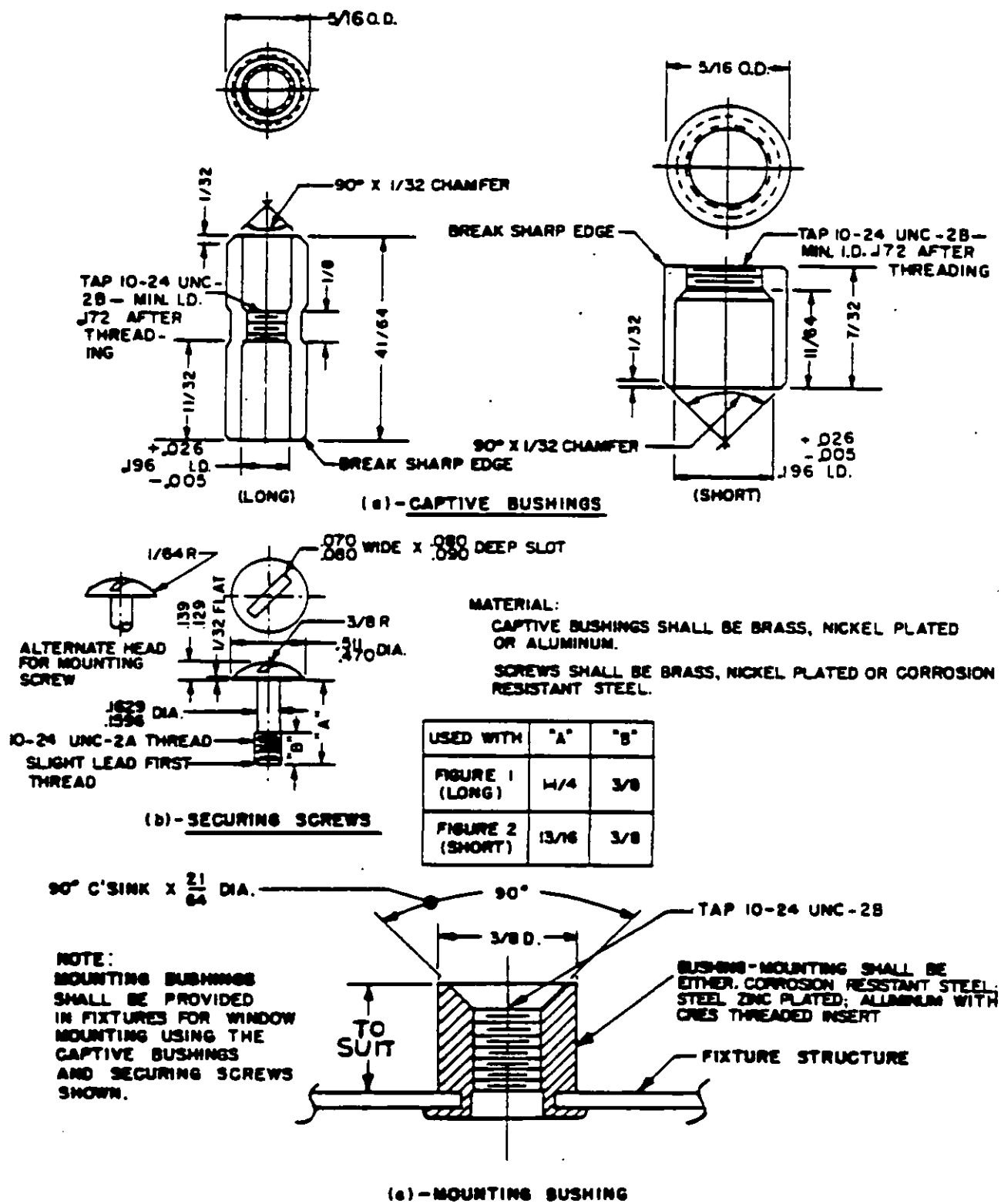


FIGURE 3. Captive bushings, securing screws and mounting bushings.

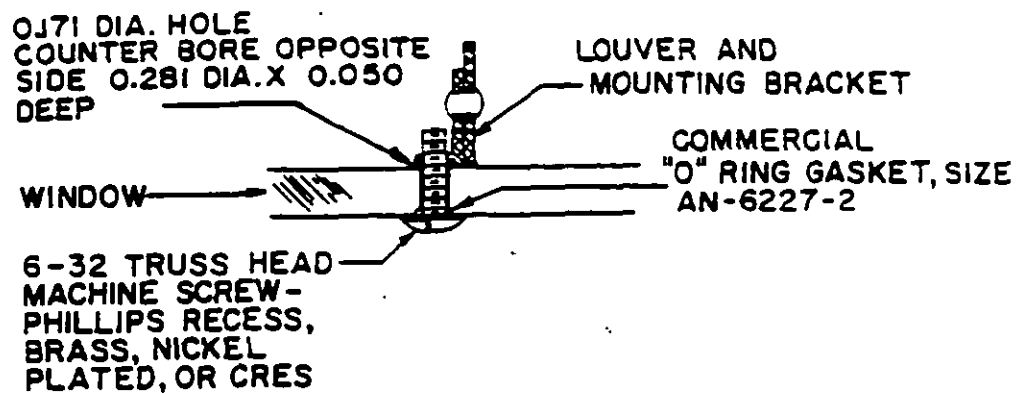


FIGURE 4. Louver attachment for watertight window assemblies.

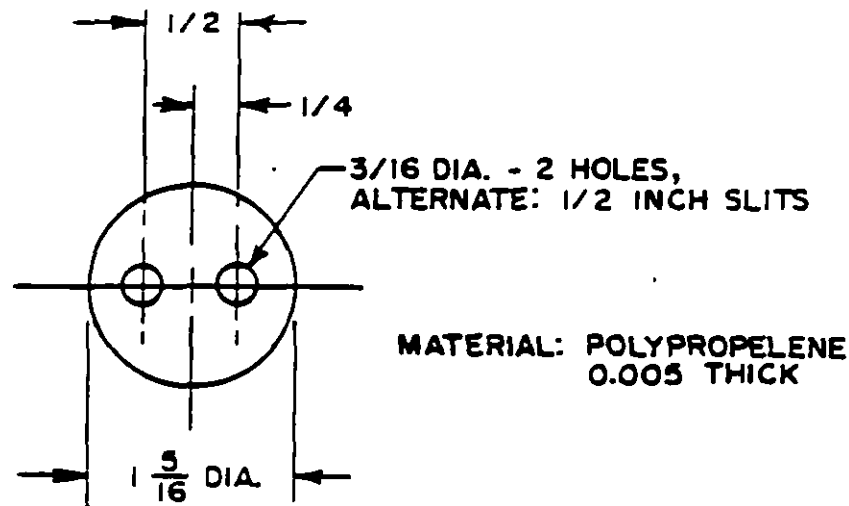


FIGURE 5. Starter washer.



MIL-DTL-16377H(SH)

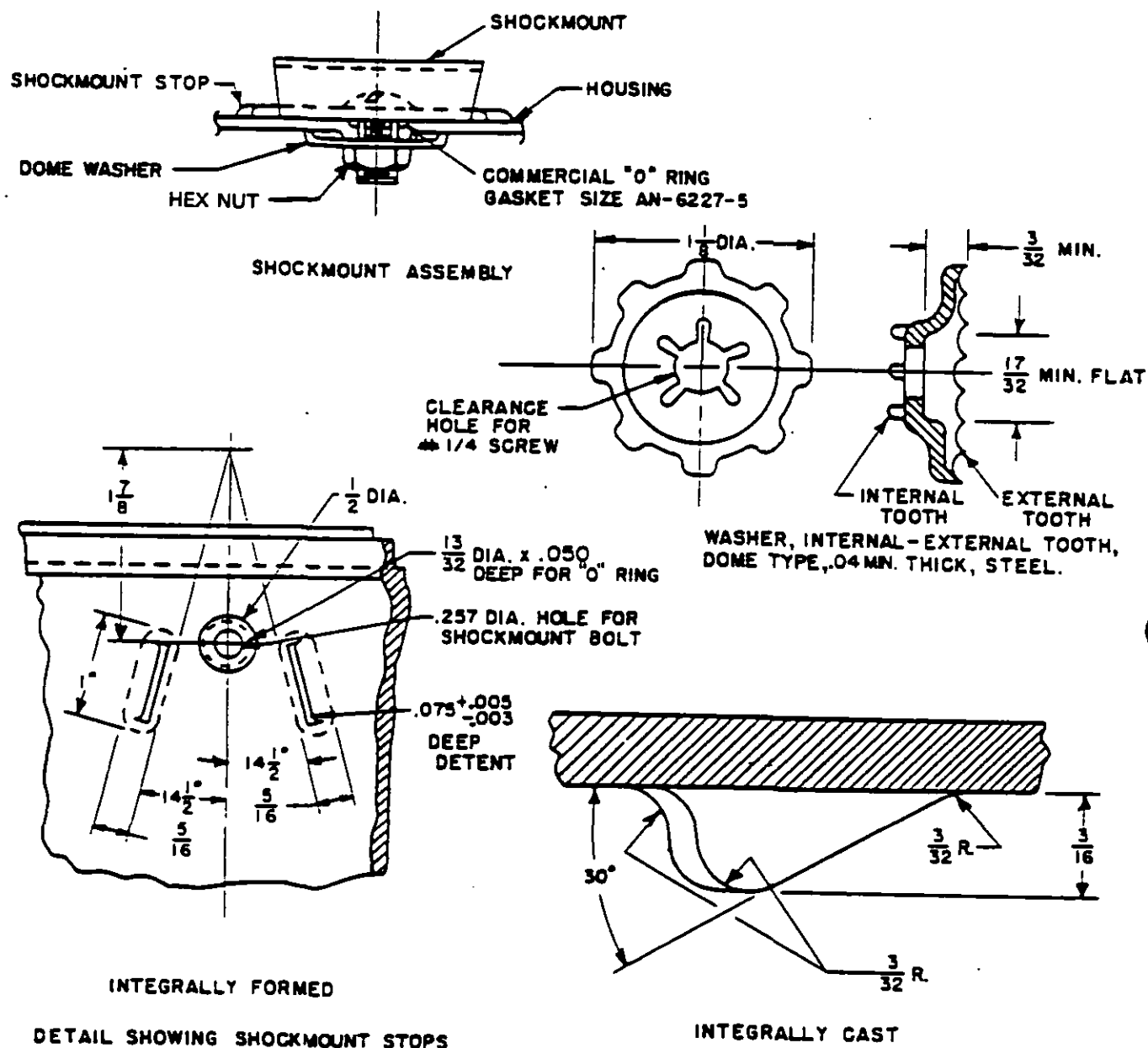
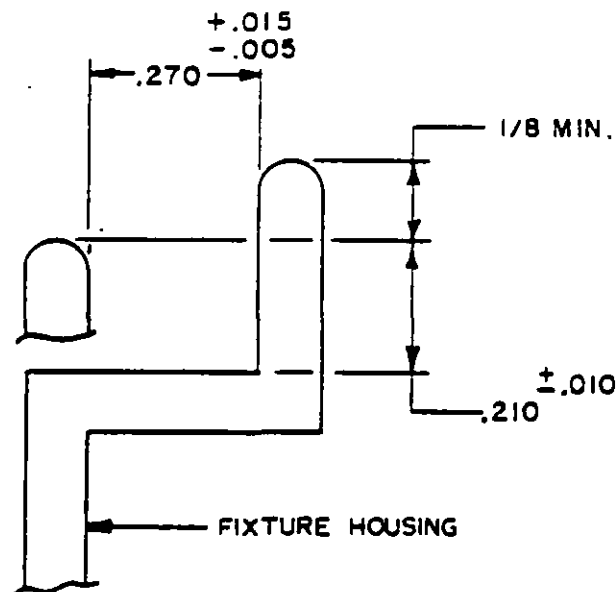
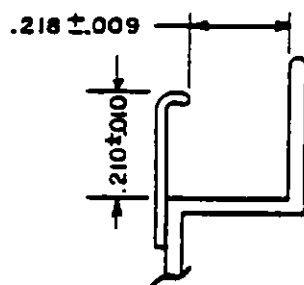


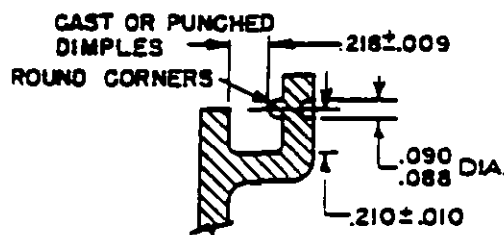
FIGURE 6. Shockmount installation for type I, class 2 fixture.



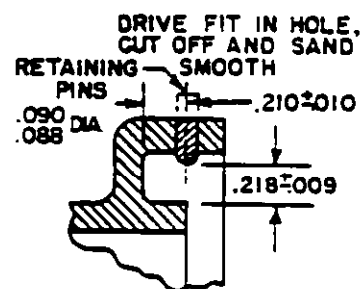
DIMENSIONS FOR GASKET GROOVE



(A) CONTINUOUS RETAINER



(B) DIMPLES



(C) PINS

## NOTES:

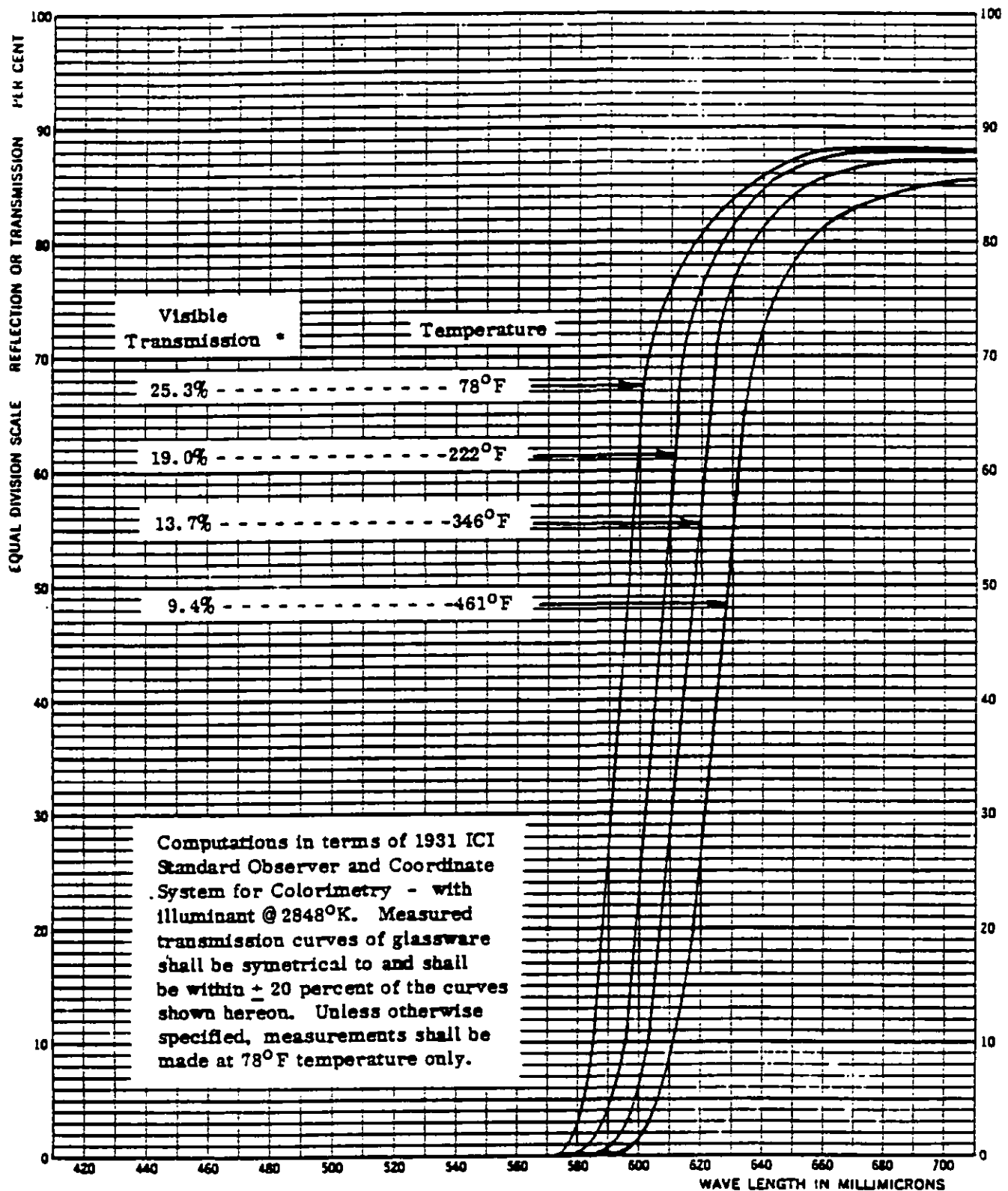
1. CONTINUOUS GASKET RETAINER SHALL SPAN AT LEAST THE LENGTH SHOWN ON APPLICABLE SPECIFICATION SHEET BY THE TWO (2) EXTREME NOTCHES ON EACH SIDE OF THE WINDOW ASSEMBLIES.
2. LOCATION OF GASKET RETAINING DIMPLES OR PINS ON FIXTURE HOUSINGS SHALL CORRESPOND TO THE LOCATION OF THE NOTCHES SHOWN ON APPLICABLE SPECIFICATION SHEET FOR THE WINDOW ASSEMBLIES.

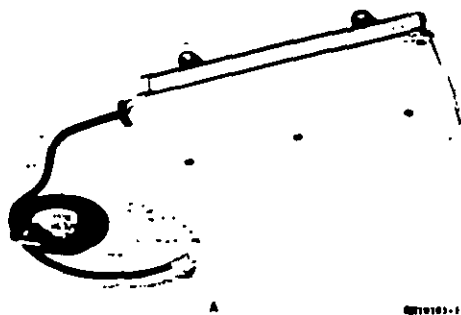
## METHODS OF RETAINING "O" RING GASKET

FIGURE 7. Dimensions for gasket groove and methods for retaining O-ring gasket for type 1, class 2 fixtures.



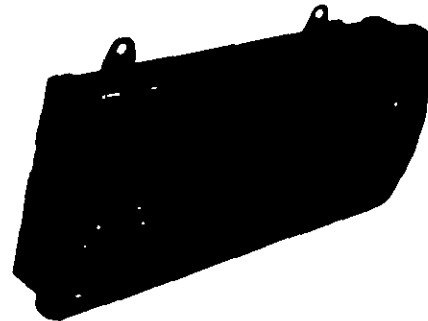
MIL-DTL-16377H(SH)

FIGURE 9. Light transmission curves of red glassware.



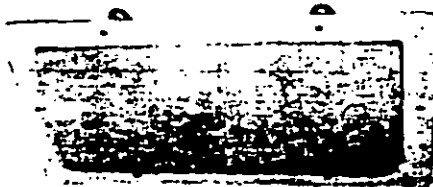
A

MIL1637-1A



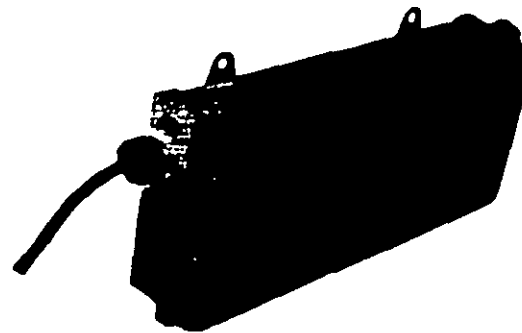
C

MIL1637-4A



B

MIL1637-2A



D

MIL1637-5A

- A - Standard mounting - white diffusing window assembly.
- B - Flush mounting - white diffusing window assembly.
- C - Standard mounting - clear and white prismatic.
- D - Standard mounting - clear and white prismatic directional.

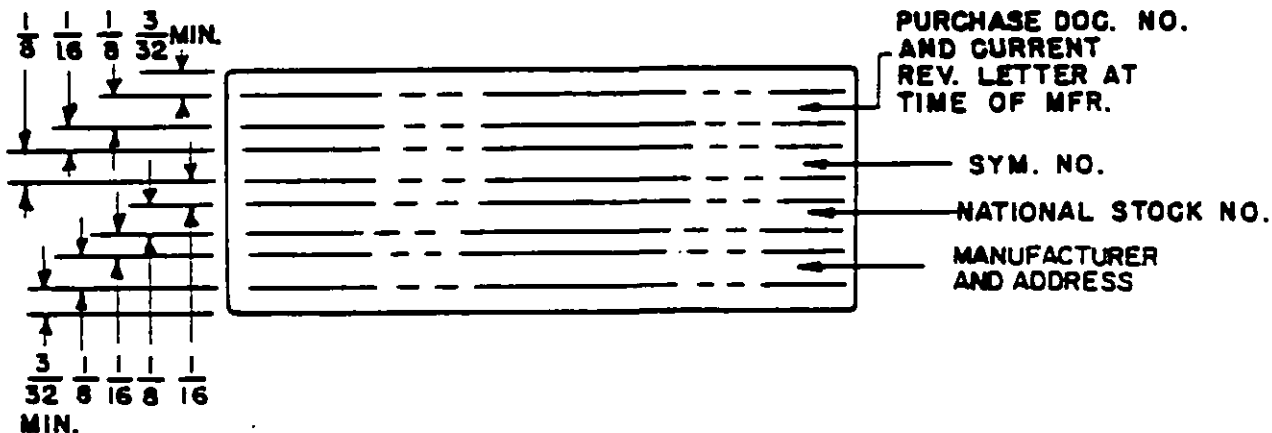
**NOTE:**

1. Clear white shielded windows are also available with flush mounting fixture, style "B".
2. Details for different styles and sizes are shown on MIL-F-16377/5 to MIL-F-16377/12, MIL-F-16377/14, MIL-F-16377/65 and MIL-F-16377/66.

**FIGURE 10. Typical styles of fluorescent lighting fixtures for general overhead lighting.**

MIL - F - 16377/21 A
SYM. NO. 90.2
NSN 6210-00-548-0081
JOHN DOE CO. TROY N. Y.

### EXAMPLE FOR EQUIPMENT IDENTIFICATION

FIGURE 11. Type I labels.

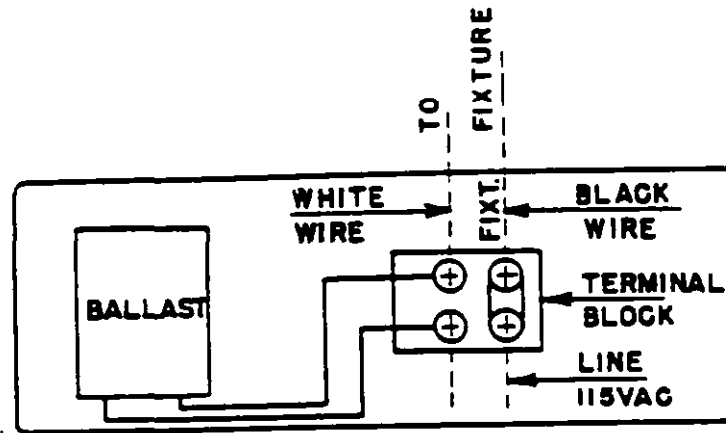
FOR SINGLE WHITE OR RED CIRCUIT: CONNECT WHITE LEAD TO WHITE LINE TERMINAL. CONNECT RED AND BLACK LEADS TO OTHER LINE TERMINAL.

FOR COMBINATION RED AND WHITE CIRCUITS: CONNECT WHITE LEAD TO WHITE LINE TERMINAL. CONNECT BLACK LEAD TO BLACK LINE TERMINAL. CONNECT RED LEAD TO RED LINE TERMINAL.

FIGURE 12. Type II labels.



MIL-DTL-16377H(SH)



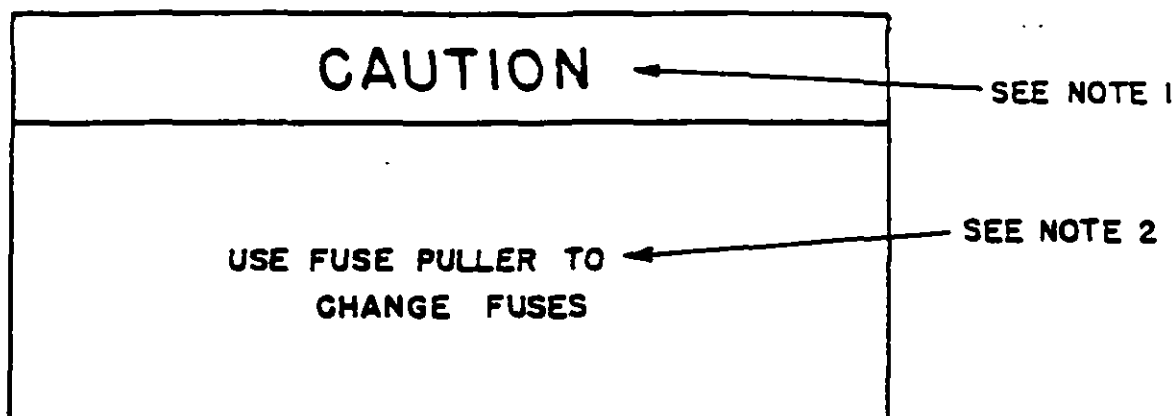
TYPICAL WIRING DIAGRAM LABEL

FIGURE 13. Type III labels.

INSTALL THE FOLLOWING LAMP ONLY  
NSN6240-00-246-3054

TYPICAL INFORMATION LABEL

FIGURE 14. Type IV labels.

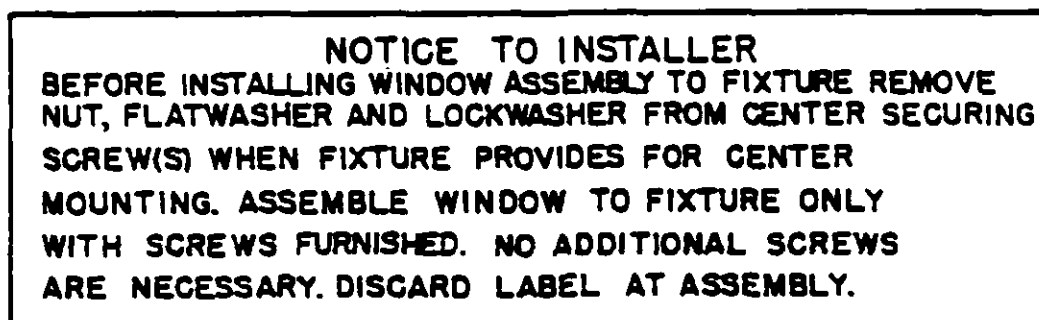


**NOTES:**

1. YELLOW WORDING ON BLACK.
2. BLACK WORDING ON YELLOW.
3. MINIMUM HEIGHT OF LETTERS SHALL BE 3/32 INCH.

**TYPICAL WARNING LABEL**

FIGURE 15. Type V labels.



**TYPICAL INFORMATION LABEL FOR WINDOWS THAT ARE  
FURNISHED AS REPAIR PARTS.**

FIGURE 16. Type VI label.

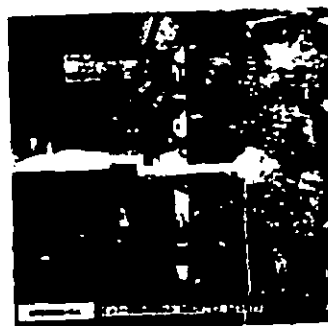
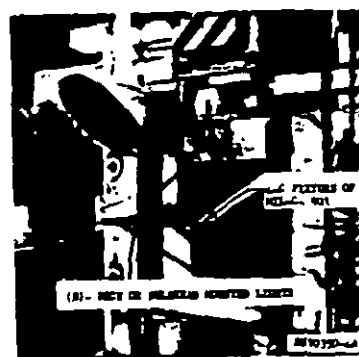
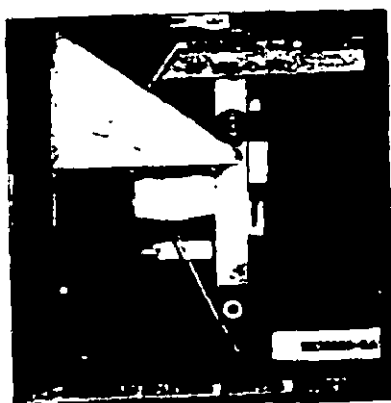
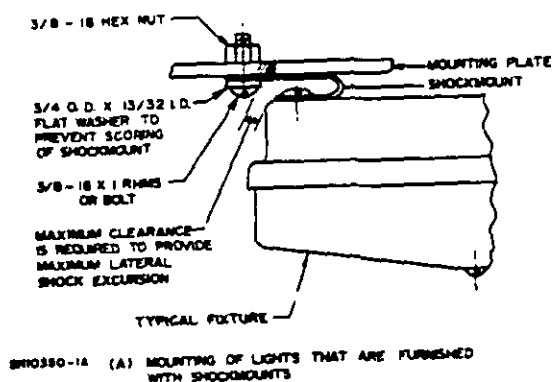


FIGURE 17. Standard methods of mounting lights for shock tests.

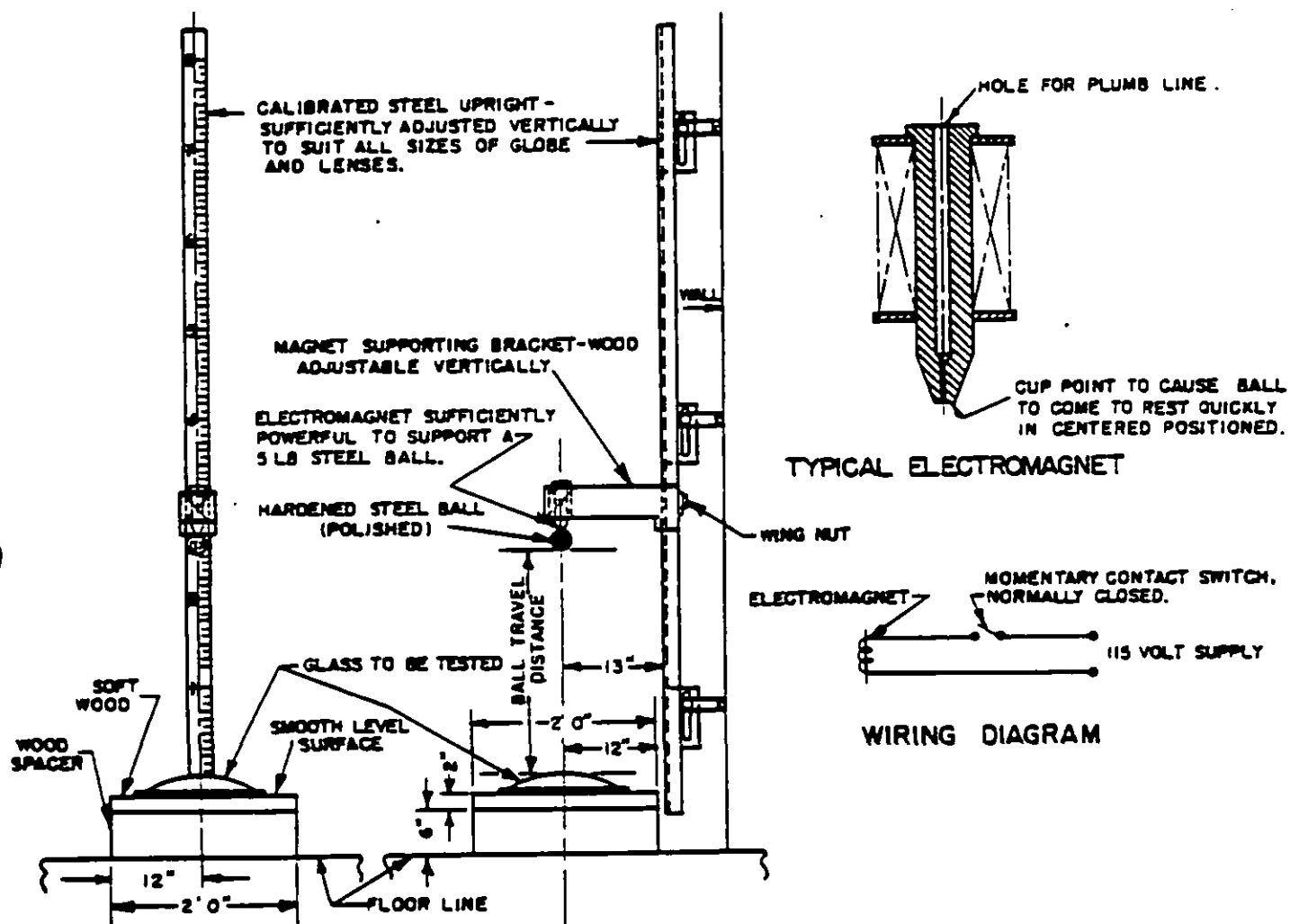
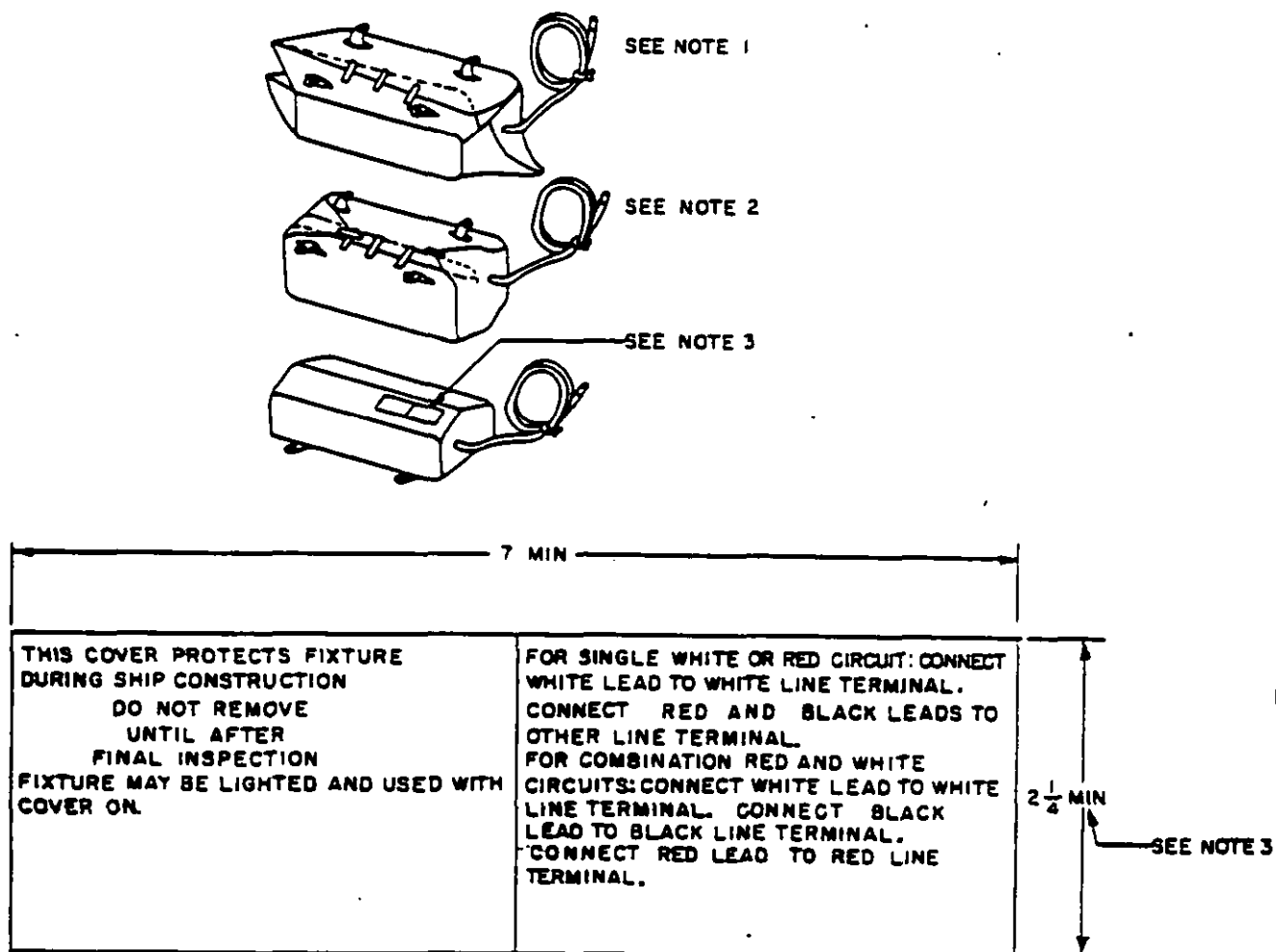


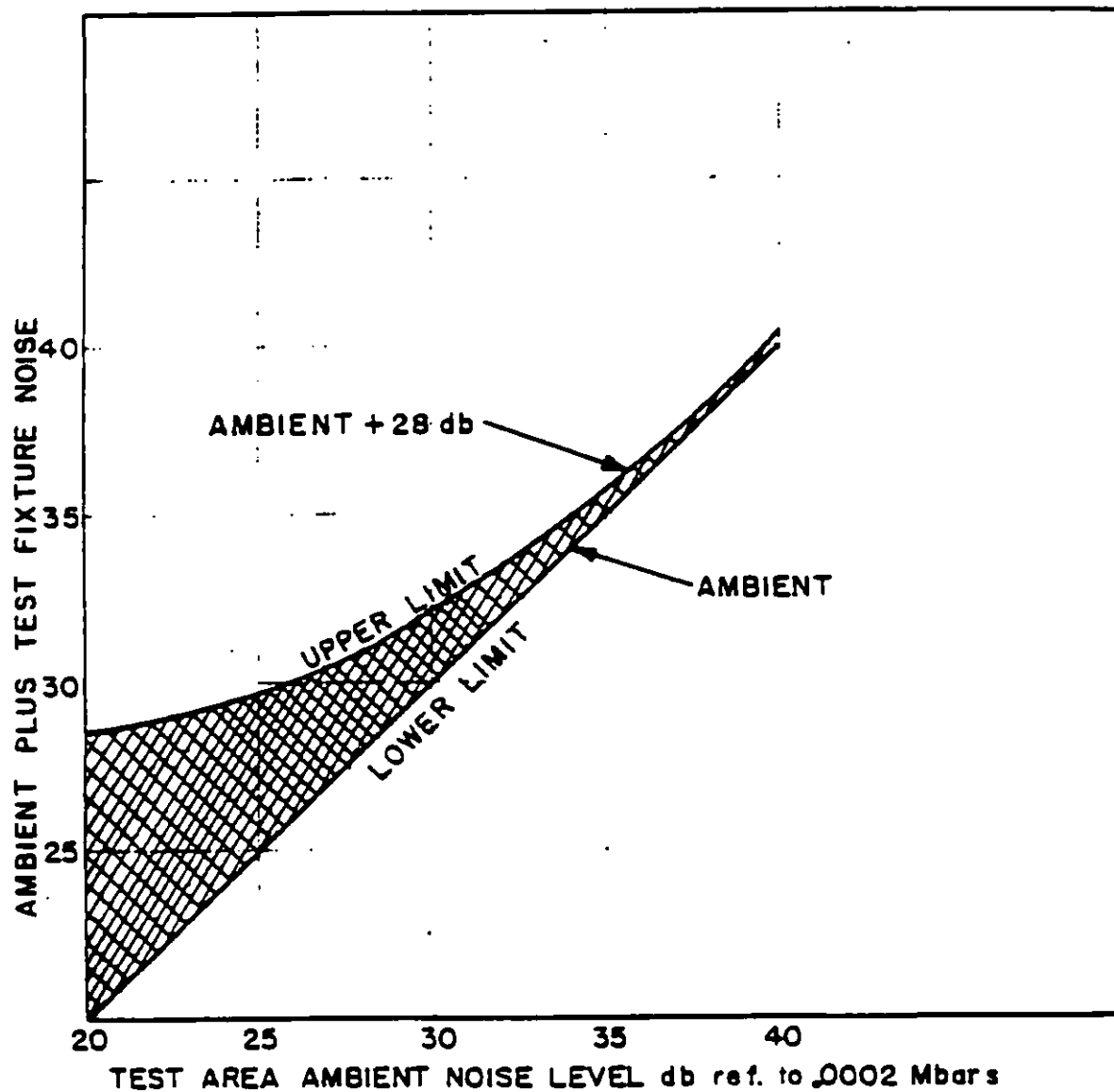
FIGURE 18. Typical ball impact equipment for shock test of glassware.

**NOTES:**

1. Insert fixture in cover. Secure with adhesive tape or weld.
2. Fold ends over top of fixture and secure with adhesive take or weld.
3. The legend shown on the above diagram shall be stamped on the lower edge of the closed side of the cover. Size and style of type used shall produce a legible copy when applied to the cover. Legend shall fill the space indicated by the minimum dimensions shown on the diagram.

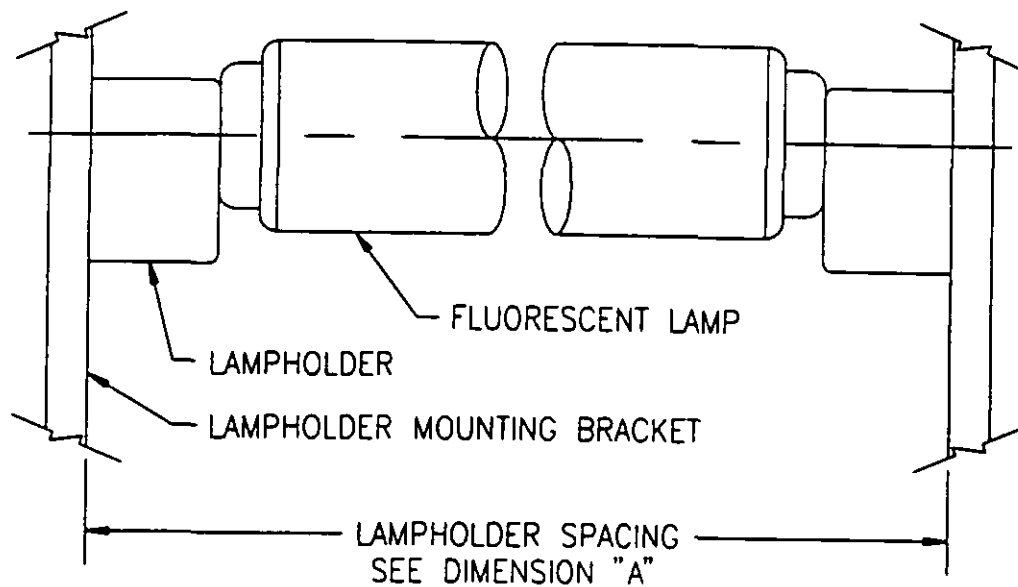
**FIGURE 19. Method of installing cover on type I, class 2 fixtures and lights with standard mounting.**

MIL-DTL-16377H(SH)

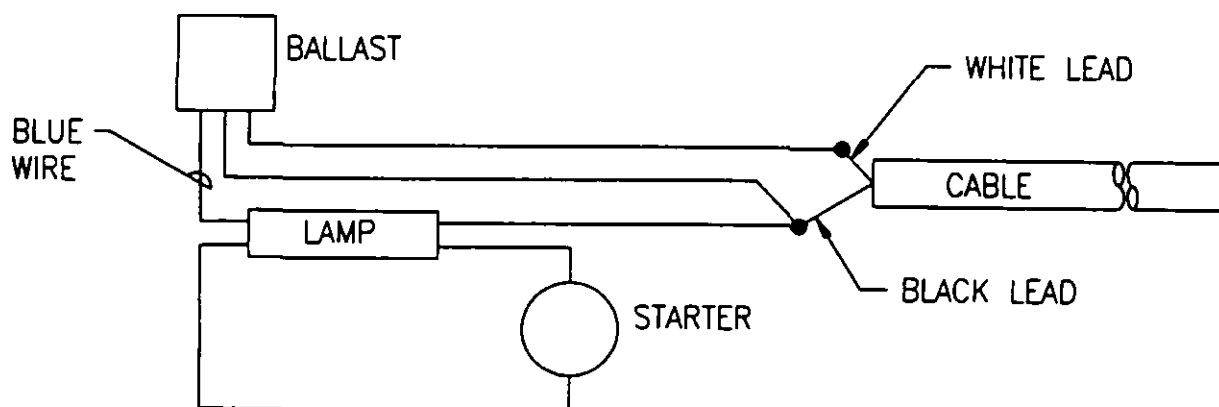
FIGURE 20. Airborne noise acceptable levels.



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LAMP (WATTS)	DIMENSION "A" (INCHES) $\pm .015$ "
6	9.360
8	12.360
15	18.150
20	24.150

FIGURE 21. Lampholder spacing.FIGURE 22. Wiring diagram to operate one fluorescent lamp.

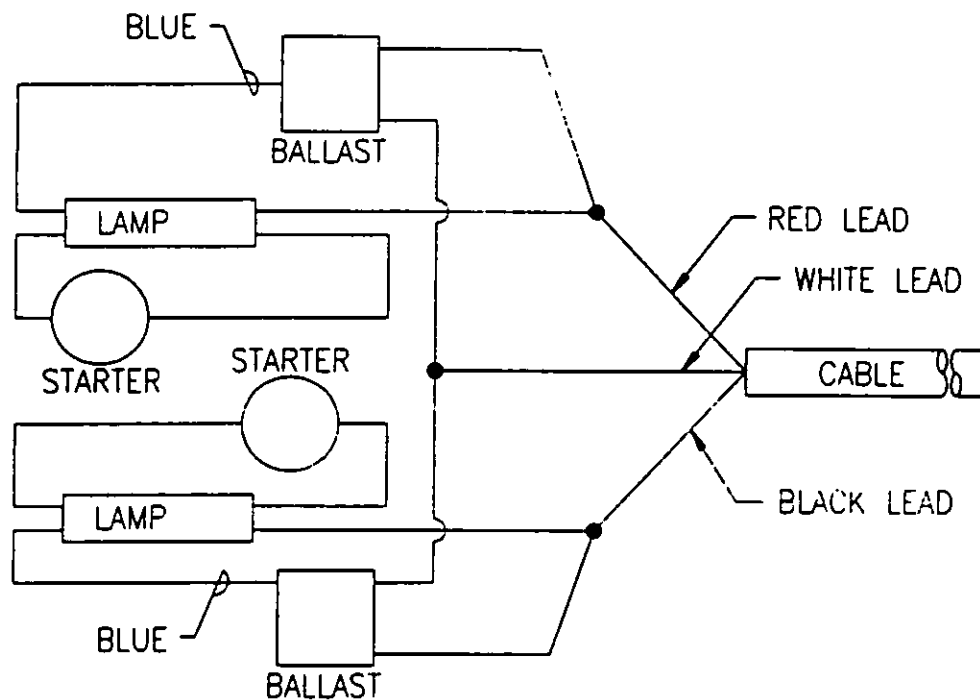


FIGURE 23. Wiring diagram to operate two fluorescent lamps.

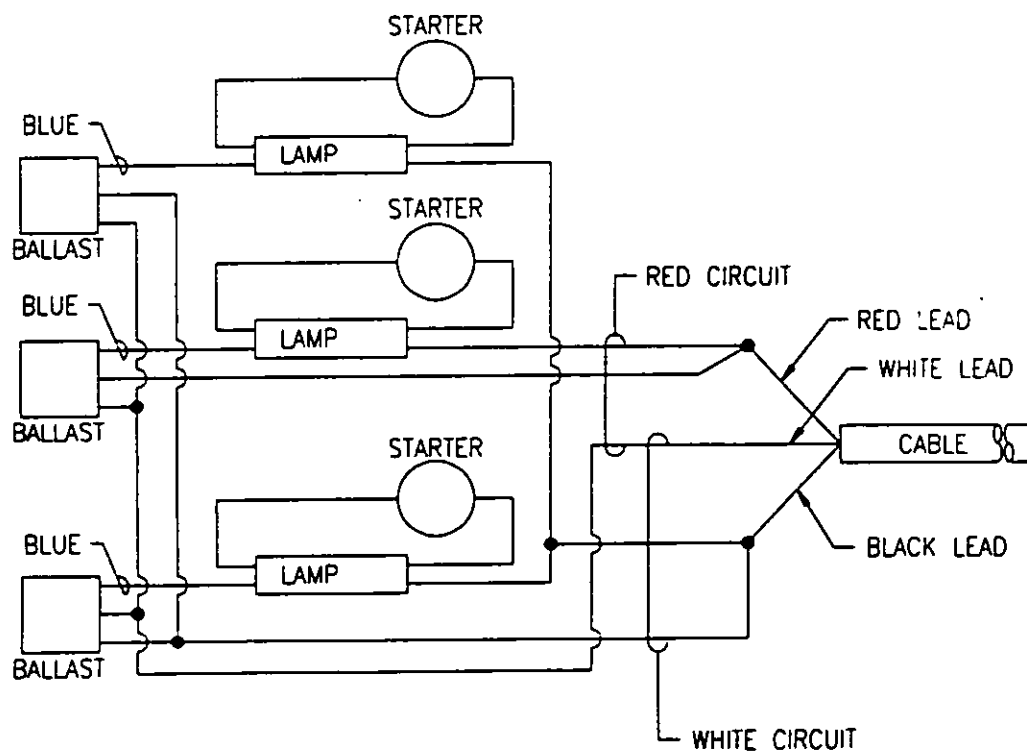
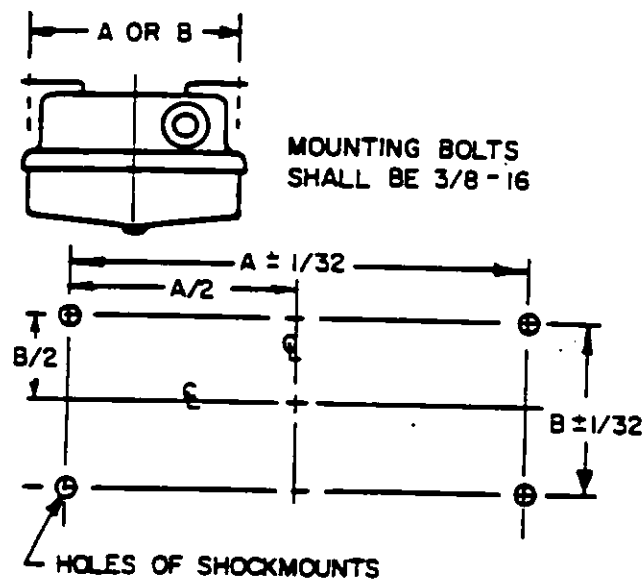


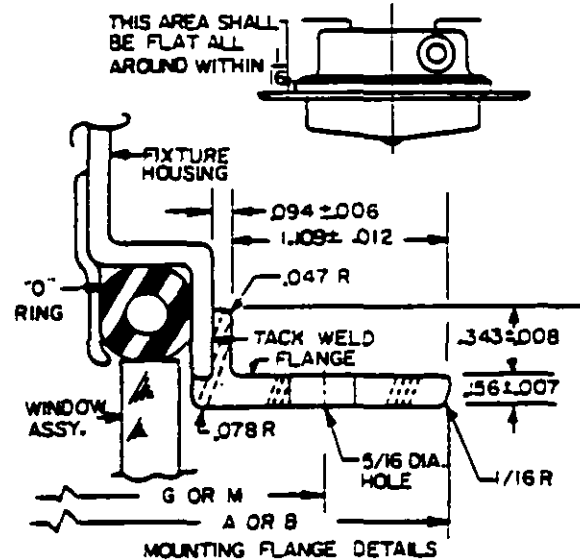
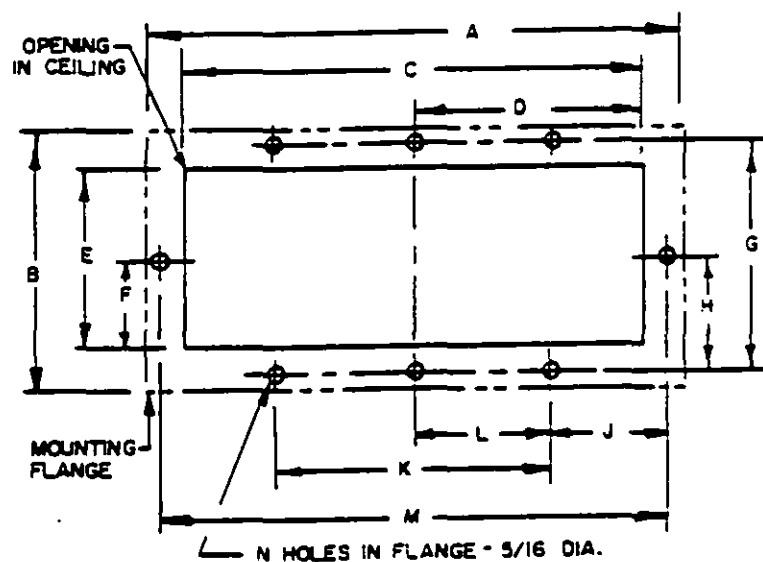
FIGURE 24. Wiring diagram to operate three fluorescent lamps.

## MIL-DTL-16377H(SH)



SPECIFICATION SHEET	SYMBOL NUMBER	A	B
MIL-F-16377/5	338.1, 339.1	13 7/8	4 3/4
MIL-F-16377/6	149.4	9 1/4	7 1/4
MIL-F-16377/7	70.3, 336	9 1/4	4 3/4
MIL-F-16377/8	331.1, 347.2	19 7/8	4 3/4
MIL-F-16377/9	73.3, 346.2	9 1/4	7 1/4
MIL-F-16377/10	145.4	19 7/8	7 1/4
MIL-F-16377/11	77.4, 344.2	19 7/8	7 1/4
MIL-F-16377/12	333.1, 341.1, 342.2	19 7/8	9 1/4
MIL-F-16377/14	80.1, 79.1	9 1/4	4 3/4
MIL-F-16377/65	81, 345.2	13 7/8	7 1/4
MIL-F-16377/66	82, 343.1	13 7/8	9 1/4

FIGURE 25. Mounting dimensions for standard mounting of fluorescent fixtures.

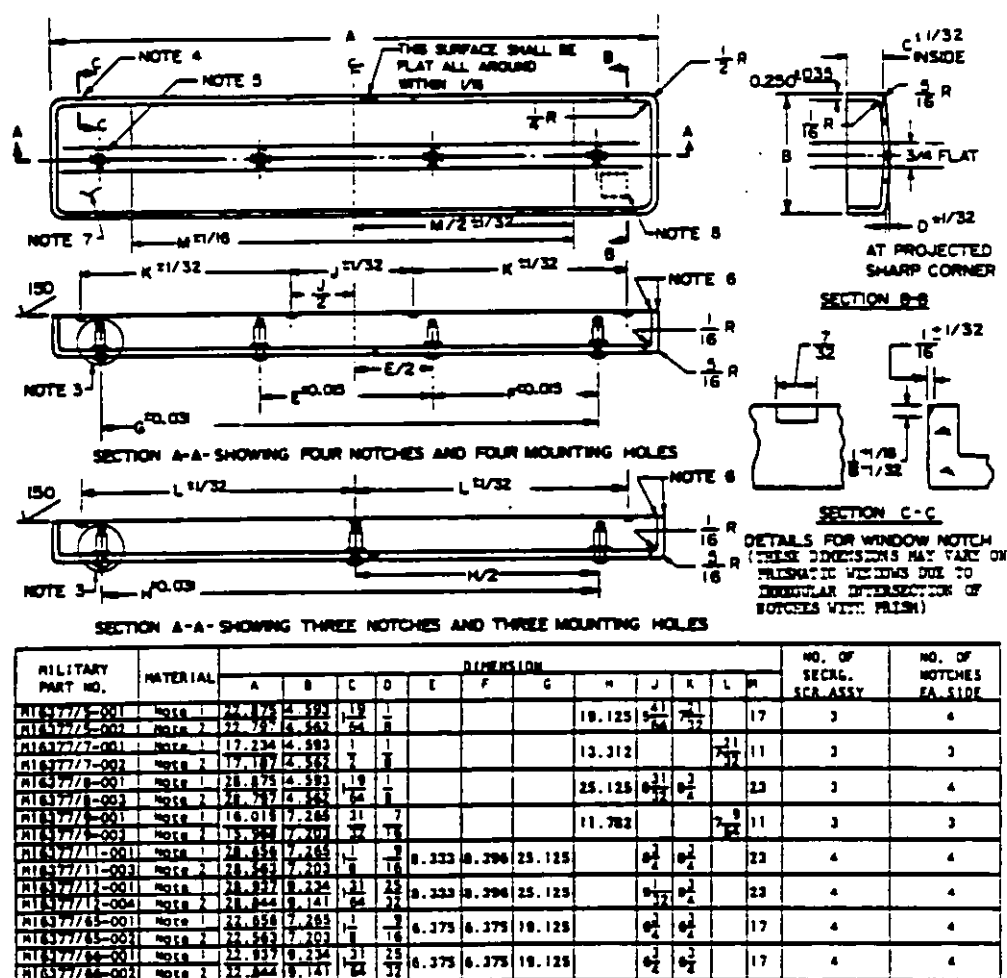


SPECIFICATION SHEET	SYMBOL NUMBER	A	B	C	D	E	F	G	H	J	K	L	M	N
MTL-F-16377/5	138.2 and 339.2	25 $\frac{5}{16}$	7 $\frac{1}{4}$	25 $\frac{5}{16}$	11 $\frac{23}{32}$	4 $\frac{1}{4}$	2 $\frac{5}{8}$	6	3	5 $\frac{7}{32}$	13 $\frac{7}{8}$	4 $\frac{15}{16}$	24 $\frac{1}{16}$	4
MTL-F-16377/6	148.8	18 $\frac{11}{16}$	9 $\frac{15}{16}$	16 $\frac{11}{16}$	8 $\frac{11}{32}$	7 $\frac{15}{16}$	3 $\frac{21}{32}$	4 $\frac{11}{16}$	4 $\frac{11}{32}$	4 $\frac{1}{32}$	9 $\frac{1}{4}$	1 $\frac{1}{8}$	17 $\frac{1}{16}$	6
MTL-F-16377/7	78.4 and 338.1	19 $\frac{23}{32}$	7 $\frac{1}{4}$	17 $\frac{23}{32}$	4 $\frac{51}{64}$	3 $\frac{1}{4}$	2 $\frac{3}{4}$	4	3	4 $\frac{15}{64}$	9 $\frac{1}{4}$	4 $\frac{5}{8}$	18 $\frac{21}{32}$	6
MTL-F-16377/8	331.2 and 347.3	31 $\frac{9}{16}$	7 $\frac{1}{4}$	25 $\frac{5}{16}$	14 $\frac{23}{32}$	3 $\frac{1}{4}$	2 $\frac{5}{8}$	6	3	5 $\frac{7}{32}$	19 $\frac{1}{2}$	9 $\frac{15}{16}$	38 $\frac{1}{16}$	4
MTL-F-16377/9	73.4 and 348.3	18 $\frac{11}{16}$	9 $\frac{15}{16}$	16 $\frac{11}{16}$	8 $\frac{11}{32}$	7 $\frac{15}{16}$	3 $\frac{21}{32}$	4 $\frac{11}{16}$	4 $\frac{11}{32}$	4 $\frac{1}{32}$	9 $\frac{1}{4}$	4 $\frac{5}{8}$	17 $\frac{1}{16}$	4
MTL-F-16377/10	148.8	31 $\frac{5}{16}$	9 $\frac{15}{16}$	25 $\frac{5}{16}$	14 $\frac{21}{32}$	7 $\frac{15}{16}$	3 $\frac{21}{32}$	4 $\frac{11}{16}$	4 $\frac{11}{32}$	5 $\frac{3}{32}$	19 $\frac{1}{2}$	9 $\frac{15}{16}$	28 $\frac{1}{16}$	9
MTL-F-16377/11	77.5 and 344.3	31 $\frac{5}{16}$	9 $\frac{15}{16}$	25 $\frac{5}{16}$	14 $\frac{21}{32}$	7 $\frac{15}{16}$	3 $\frac{21}{32}$	4 $\frac{11}{16}$	4 $\frac{11}{32}$	5 $\frac{3}{32}$	19 $\frac{1}{2}$	9 $\frac{15}{16}$	16 $\frac{1}{16}$	4
MTL-F-16377/12	38.2, 38.3 and 38.3	31 $\frac{5}{16}$	11 $\frac{7}{8}$	25 $\frac{5}{16}$	14 $\frac{13}{16}$	9 $\frac{7}{8}$	4 $\frac{15}{16}$	10 $\frac{3}{8}$	5 $\frac{3}{16}$	3 $\frac{1}{4}$	19 $\frac{1}{2}$	4 $\frac{15}{16}$	38 $\frac{2}{4}$	4
MTL-F-16377/14	90.2 and 79.2	17 $\frac{17}{64}$	5 $\frac{7}{32}$	16 $\frac{7}{8}$	8 $\frac{7}{16}$	3 $\frac{7}{16}$	1 $\frac{29}{64}$	3 $\frac{21}{32}$	1 $\frac{53}{64}$	—	9 $\frac{13}{16}$	1 $\frac{21}{32}$	—	4
MTL-F-16377/68	81.7 and 348.1	25 $\frac{5}{16}$	9 $\frac{15}{16}$	25 $\frac{5}{16}$	11 $\frac{21}{32}$	7 $\frac{15}{16}$	3 $\frac{21}{32}$	4 $\frac{11}{16}$	4 $\frac{11}{32}$	5 $\frac{3}{32}$	13 $\frac{7}{8}$	4 $\frac{15}{16}$	24 $\frac{1}{16}$	4
MTL-F-16377/66	92.1 and 343.2	25 $\frac{5}{16}$	11 $\frac{7}{8}$	25 $\frac{5}{16}$	11 $\frac{13}{16}$	9 $\frac{7}{8}$	4 $\frac{15}{16}$	10 $\frac{3}{8}$	5 $\frac{3}{16}$	3 $\frac{1}{4}$	13 $\frac{7}{8}$	4 $\frac{15}{16}$	24 $\frac{2}{4}$	4

N - represents the number of mounting holes in mounting flange.

FIGURE 26. Mounting dimensions for flush mounting of fluorescent fixtures.

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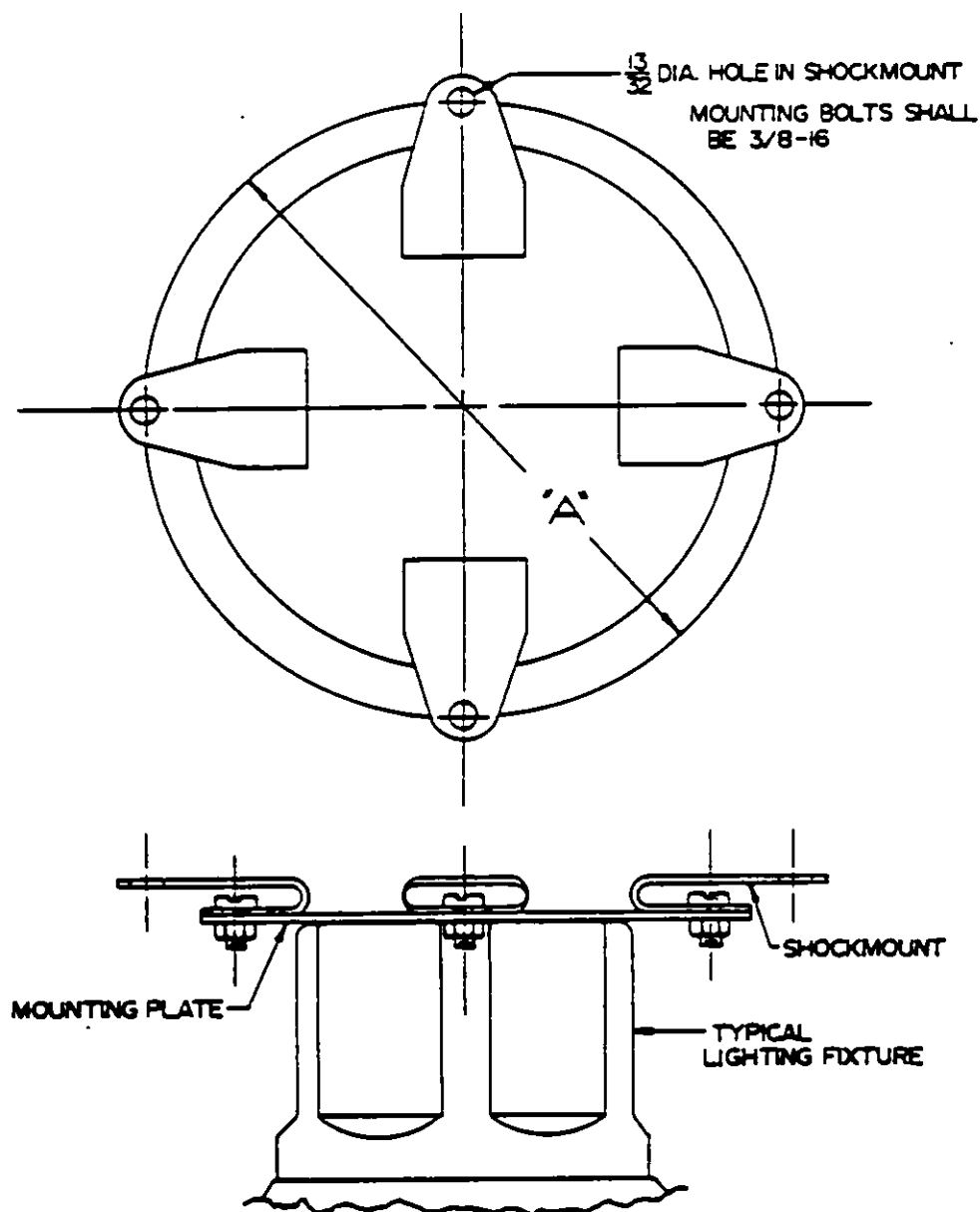


## NOTES:

- Material shall be 1/4 inch thick, white translucent acrylic plastic, type WTLS-4, Grade G of MIL-P-24191.
- Material shall be 1/4 inch thick, clear prismatic acrylic plastic, type CLEAR-2 of MIL-P-24191. The prisms shall be on the outside surface of the windows.
- Short window securing screw assemblies in the number indicated on the table shall be installed as specified in 3.7.4.3.
- When required, notches in the number indicated on the table shall be filed as shown as specified in 3.7.4.4.
- Drill 0.191 diameter hole and counterbore opposite side 0.323 diameter, 0.050 deep. Break sharp edges on the inside surface on all holes.
- Break sharp edges 1/64 of an inch around entire window.
- The inside surface of both ends (bottom, sides and end) of windows with clear prismatic material shall be finished white as specified in 3.8.4.1.
- When required, one type VI label shall be applied on the outside surface of the white translucent windows and on the inside surface of the clear and white prismatic windows as specified in 3.7.4.3.

FIGURE 27. Window assemblies.

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SPECIFICATION	SYMBOL	"A" DIA.
MIL-F-16377/20	64.1, 65	7-5/8
MIL-F-16377/21	89, 90.2	7-5/8
MIL-F-16377/22	94.1	7-5/8
MIL-F-16377/23	57, 57.1, 69, 69.1	7-5/8
MIL-F-16377/24	66.2	11-1/4
MIL-F-16377/25	48.2, 68.2	7-5/8
MIL-F-16377/26	112, 113	7-5/8
MIL-F-16377/64	67	7-5/8

FIGURE 28. Mounting dimensions for incandescent fixtures.

## APPENDIX A

## CERTIFICATION/DATA REPORT TECHNICAL CONTENT REQUIREMENTS

## 10. SCOPE

10.1 Scope. This appendix covers information that shall be included in the certification/data report when specified in the contract or order. This appendix is a mandatory part of the specification. The information contained herein is intended for compliance.

## 20. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

## 30 CERTIFICATION CONTENT

30.1 Certification of drawings acceptance. A prerequisite to submission of the first article for inspection shall be provision of satisfactory evidence to the contracting activity that the Naval Sea Systems Command (NAVSEA) (see 6.6) has reviewed and accepted the manufacturing drawings for the fixture, light, or part to be furnished under this specification. The contractor shall provide drawing acceptance procedures, drawings, and certification data sheets in accordance with the data ordering documents included in the contract or order, and as specified in 30.1.1 through 30.1.1.2.

30.1.1 Drawing acceptance procedures. Two sets of prints of the manufacturing drawings for the fixture, light, or part followed by two sets of prints of the certification data sheet shall be provided for review. Acceptance will be based upon the completeness of the drawing and other data submitted by the contractor conclusively providing proof of proper performance of the fixture, light, or part in accordance with this specification and the applicable specification sheet. Drawing acceptance shall be obtained in writing.

30.1.1.1 Submission of revised drawings. When a drawing is not accepted, submission of a revised drawing is required. In addition, NAVSEA may require other drawings and documents which may be required for reference.

30.1.1.2 Changes. The contractor shall make no changes in any accepted drawing. If changes are required, revised drawings shall be submitted as specified in 30.1.1.



## APPENDIX B

## 10. SCOPE

10.1 Scope. This appendix details the procedure for the extension of first article approval to other similar lighting fixtures covered by this specification. The approval extension is based upon the similarity of design, the type and class of lighting fixtures and tooling and fabrication methods and techniques used in the production of the fixtures. This appendix is not a mandatory part of the specification. The information contained herein is intended for guidance only.

## 20. APPLICABLE DOCUMENTS

This section is not applicable to this appendix.

## 30. FAMILY GROUPINGS

## 30.1 Group I - Fluorescent fixtures (type I, class 1).

## 30.1.1 Family coverage:

16377/2 - Water gauges (6 watt)  
 /3 - Water gauges (8 watt)  
 /4 - Secretary bureau (8 watt)  
 /15 - Desks (8 watt)  
 /16 - Desks (8 watt)  
 /17 - Berths (8 watt)  
 /18 - Mirrors (15 watt)  
 /19 - Radio operators desk (8 watt)  
 /49 - Extension (8 watt)  
 /58 - Mirrors (30 watt)  
 /59 - Step (8 watt)  
 /68 - Extension (4 watt)  
 /71 - Small boat mirrors (8 watt)

## 30.1.2 Approval extension:

Approval of	Extends approval to
16377/2	16377/3
/3	/2
/4	.....
/15	/4, 16, 19
/16	/4, 15, 19
/17	/4, 15, 16, 19
/18	/71

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/19	/4, 15, 16
/49	.....
/58	/71
/59	.....
/68	.....
/71	.....

### 30.2 Group II - Fluorescent (type I, class 2)

#### 30.2.1 Family coverage:

16377/5 - General lighting (15 watt)  
 /6 - General lighting Directional (16 watt)  
 /7 - General lighting (16 watt)  
 /8 - General lighting (17 watt)  
 /9 - General lighting (24 watt)  
 /10 - General lighting Directional (32 watt)  
 /11 - General lighting (34 watt)  
 /12 - Syms. 333.1, 333.2, 342.1, 342.2 (51 watt)  
 /12 - Syms. 341.1, 341.2 (51 watt)  
 /13 - General lighting (180 watt)  
 /14 - General lighting (8 watt)  
 /57 - General lighting (51, 68, & 102 watt)  
 /65 - General lighting (30 watt)  
 /66 - General lighting (45 watt)

30.2.2 Approval extensions - Optical uniformity and light output testing shall be required if lens material is different.

Approval of	Extends approval to
16377/5	.....
/6	16377/7, 14
/7	/6, 14
/8	/5
/9	/6, 7, 14
/10	/6, 7, 9, 14
/11	/5, 8, 65
/12 (333.1, 333.2, 342.2 & 342.3)	/5, 8, 11, 65, 66
/12 (341.1 & 341.2)	/5, 8, 11, 12, 65, 66
/13	.....
/14	.....

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/57 (51 watt)	*****	
/57 (68 watt)		/57 (51 watt)
/57 (102 watt)		/57 (51 & 68 watt)
/65		/5
/66		/5, 65

### 30.3 Group III - Incandescent (type II, class 1)

#### 30.3.1 Family coverage:

- 16377/1 - Motors and generators
- /28 - Ammunition hoist
- /29 - Boiler outer casing
- /31 - Spot illumination
- /32 - Water gauges
- /33 - Sightglasses
- /34 - Submarine gyrocompasses
- /35 - Small boats
- /37 - Minesweeper bunks
- /38 - Hull numerals
- /39 - Streamers
- /50 - Extension, small boats
- /51 - Extension, explosionproof & watertight (25 watt)
- /52 - Extension, explosionproof & watertight (100 watt)
- /53 - Handlantern
- /56 - Machine tool
- /63 - Portable floodlight

30.3.2 Approval extension - The incandescent detail lighting fixtures in this family are unique in design and each must be approved individually.

### 30.4 Group IV - Incandescent (type II, class 2)

#### 30.4.1 Family coverage:

- 16377/20 - General lighting (50 watt)
- /21 - General lighting (100 watt)
- /22 - General lighting (200 watt)
- /23 - General lighting (200 watt)
- /25 - General lighting (explosionproof)
- /26 - General lighting (110 watt)
- /27 - General lighting (50 watt)
- /30 - General lighting (psychiatric wards)
- /36 - General lighting (25 watt)
- /60 - Floodlight (150 watt)

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- /61 - Floodlight (300 watt)
- /62 - Floodlight (500 watt)
- /64 - General lighting (decorative)

30.4.2 Approval extension:

Approval of	Extends approval to
16377/20	16377/21, 22
/21	/20, 22
/22	/20, 21
/23	/20, 21, 22
/25	/26
/26	/25, 27
/27	.....
/30	.....
/36	.....
/60	.....
/61	/60
/62	.....
/64	/20, 21, 22, 25

30.5 Group V - Miscellaneous parts

30.5.1 Family coverage:

- 16377/40 - Lamp locks
- /41 - Shockmounts
- /42 - Filters
- /44 - Ballasts (20 watt)
- /45 - Ballasts (8 watt)
- /46 - Ballast box (8 watt)
- /47 - Ballast and starter box
- /48 - Filter assemblies
- /54 - Bracket
- /55 - Bracket assembly
- /67 - Window assemblies

30.5.2 Approval extension - The miscellaneous parts in this family are unique in design and must be approved individually.

## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

## INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the comment 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 this 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-DTL-16377H(SH)

2. DOCUMENT DATE (YYMMDD)

960802

## 3. DOCUMENT TITLE

FIXTURES, LIGHTING; AND ASSOCIATED PARTS; SHIPBOARD  
USE, GENERAL SPECIFICATION FOR

## 4. NATURE OF CHANGE (identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

## 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) DSN

(if applicable)

7. DATE SUBMITTED (YYMMDD)

## 8. PREPARING ACTIVITY

A. NAME Technical Point of Contact (TPOC)

MR. ALEXANDER VAUGHAN, NAVSEA 03E23

ADDRESS ALL CORRESPONDENCE AS FOLLOWS:

b. TELEPHONE (Include Area Code)

(1) Commercial:

DSN:

TPOC: 703-602-7440

8-332-7440

c. ADDRESS (Include Zip Code)

COMMANDER, NAVAL SEA SYSTEMS COMMAND

ATTN: SEA 03R42

2531 JEFFERSON DAVIS HIGHWAY

ARLINGTON, VA 22242-5160

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 DSN 289-2340