

MIL-L-24560(SH)
10 September 1979

MILITARY SPECIFICATION

LIGHTS AND GLASSWARE FOR NAVIGATION, SIGNAL, AND WARNING,
NAVAL 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 light assemblies and associated glassware used for navigation, signal, and warning purposes on Naval ships.

1.2 Classification. Light assemblies and glassware covered by this specification shall be of the following types and classes, as specified (see 6.1.1):

Light Assemblies

TYPE I - Splashproof
TYPE II - Submersible

Glassware

CLASS 1 - Fresnel type lens
CLASS 2 - Globe, roundel and lens
CLASS 3 - Fresnel globe

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

MILITARY

MIL-S-901 - Shock Tests, H.I. (High-Impact), Shipboard Machinery Equipment and Systems, Requirements for.
MIL-E-917 - Electric Power Equipment, Basic Requirements (Naval Shipboard Use).
MIL-C-6021 - Castings, Classification and Inspection of.
MIL-S-8660 - Silicone Compound.
MIL-I-17214 - Indicator Permeability, Low-Mu (Go-No-Go).
MIL-E-17555 - Electronic and Electrical Equipment, Accessories and Repair Parts; Packaging and Packing of.
MIL-T-22361 - Thread Compound, Antiseize, Zinc Dust-Petrolatum.

(See Supplement 1 for list of associated specification sheets.)

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 3112, Department of the Navy, Washington, DC 20362 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-L-24560 (SH)

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- 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-278 - Fabrication Welding and Inspection; and Casting Inspection and Repair for Machinery, Piping and Pressure Vessels in Ships of the United States Navy.
- MIL-STD-831 - Test Reports, Preparation of.

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

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

- AMERICAN NATIONAL STANDARD INSTITUTE, INC. (ANSI)
 - B46.1-1978 - Surface Texture.
 - Z138.2-1974 - Spectrophotometry and Description of color in CIE 1931 System, Practice for.

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

- ILLUMINATION ENGINEERING SOCIETY (IES)
 - General Guide to Photometry.

(Application for copies should be addressed to the Illumination Engineering Society, 345 East 47th Street, New York, N.Y., 10017.)

- UNDERWRITERS' LABORATORIES, INC. (UL)
 - UL-486 - Wire Connectors and Soldering Lugs for Use with Copper Conductors.

(Application for copies should be addressed to Underwriters' Laboratories, Inc., 1285 Walt Whitman Road, Melville, L.I. N.Y. 11746.)

- AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)
 - Aluminum Alloys

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

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

3. REQUIREMENTS

3.1 Specification sheets. The individual item requirements shall be as specified herein and in accordance with the applicable specification sheets. In the event of any conflict between requirements of this specification and the applicable specification sheet, the latter shall govern.

3.2 First article. When specified (see 6.1.1), the contractor shall furnish sample unit(s) for first article inspection and approval (see 4.4 and 6.2).

3.3 Parts and materials. Parts and materials shall be as specified herein and in the applicable specification sheets. Where a definite material is not specified, a material shall be used which will enable the light assembly or glassware to meet the requirements of this specification.

MIL-L-24560 (SH)

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

3.3.2 Metals. Metals shall be of the corrosion-resistant type as specified in the applicable specification sheet, or they shall be treated to resist corrosion as specified in MIL-E-917. Dissimilar metals in contact with each other shall be in accordance with MIL-E-917.

3.3.2.1 Aluminum. Unless otherwise specified (see 3.1), aluminum alloys, except castings, shall conform to ASTM standards. Aluminum alloy castings shall be manufacturer's choice except sand castings and permanent mold castings shall conform to Class 4 of MIL-C-6021; grade shall be manufacturer's choice.

3.3.3 Nonmagnetic materials. Unless otherwise specified (see 3.1), all parts shall be of a nonferrous material or a material generally considered nonmagnetic. The magnetic permeability shall be 2.0 or less after fabrication (see 4.7.1.9).

3.3.4 Nonmetallic materials. Nonmetallic materials shall be nonflammable, nontoxic and fungus-inert as specified in MIL-E-917.

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

3.3.6 Glassware. Glassware shall be high-impact, heat resistant with an extremely low-temperature coefficient of expansion. The glass shall be of such composition 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.

3.3.7 Commercial (hardware) parts. Where a definite material is not specified for utility hardware (items such as screws, bolts and nuts), commercial items may be used provided they meet the requirements specified herein (see 3.3.2, 3.3.3 and 3.3.4).

3.3.8 Calking compound. Calking compound shall be of a good commercial grade material compatible with the material of the basic light assembly. Compound consistency shall be such that the light assembly can be disassembled without requiring the use of special agents or tools.

3.3.9 Antiseize coating. Aluminum and CRES fastening parts such as screws and bolts in contact with threaded aluminum shall be coated with an antiseize compound in accordance with MIL-T-22361.

3.3.10 Gaskets. Unless otherwise specified (see 3.1), gaskets shall be commercial type neoprene 6-75 Durometer hardness.

3.3.11 Prohibited materials. The prohibited materials shall be those specified in MIL-E-917. Unless otherwise specified (see 3.1), asbestos shall not be used.

3.4 Design and construction.

3.4.1 Light assemblies. Light assemblies shall be of the design, construction and physical dimensions specified (see 3.1). Unless otherwise specified (see 6.1.1), lamps shall not be furnished.

3.4.1.1 Dimensional tolerances. Unless otherwise specified (see 3.1), the following tolerances shall apply to dimensions specified in the individual specification sheets:

- (a) Fractional dimensions - $\pm 1/64$ inch
- (b) Decimal dimensions - ± 0.005 inch
- (c) Angular dimensions - $\pm 1/2$ degree

Unless otherwise specified (see 3.1), a tolerance of plus or minus 1/32 inch is acceptable on fractional dimensions that are controlled by welding or brazing. The width tolerance shall not interfere with the interchangeability of assemblies or parts.

MIL-L-24560 (SH)

3.4.1.2 Enclosures. Light assemblies shall be type I, splashproof or type II, submersible as specified (see 1.2 and 3.1).

3.4.1.3 Drilling, countersinking, and tapping. Drilling, countersinking, and tapping shall be done before plating or finish is applied. All holes shall have burrs removed.

3.4.1.4 Sharp edges. Sharp edges and corners shall be given a slight radius.

3.4.1.5 Finishes. Surface finishes shall be in accordance with ANSI B46.1-1962. Score marks on side walls of all light assemblies in the way of nylon stuffing tubes shall not exceed 125 microinches.

3.4.1.6 Threaded parts and fastening devices. Screw threads; threads in copper, aluminum and plastic; and fastening of parts shall be in accordance with MIL-E-917 and as specified (see 3.1).

3.4.1.7 Wiring. Where required (see 3.1), internal wiring shall be furnished and installed. Connections at screw terminals shall be made with pressure grip (solderless) connectors in accordance with Publication UL-486. Splice connections shall be kept to a minimum and shall be made with UL approved insulated connectors, either crimp or screw type. There shall be no exposed uninsulated electrical terminal joints, junctions, wiring, or wiring accessories.

3.4.1.8 Castings and molded parts. Castings shall be free of cold shuts, blow holes, or any imperfections that may affect the strength or performance. Flash shall be removed from molded parts.

3.4.1.9 Stress relief.

3.4.1.9.1 Metals. Metals used in fabrication and assemblies which are susceptible to stress shall be stress relieved to prevent deterioration or failure.

3.4.1.9.2 Plastics. Measures shall be taken in molding or processing plastics to insure that stress buildup does not occur or is treated to relieve these stresses when required to prevent deterioration of the part or assembly.

3.4.1.10 Welding. Welding and allied processes used in fabrication shall be in accordance with MIL-STD-278 except welder qualification is not required.

3.4.1.11 Painting. Unless otherwise specified (see 3.1) painting, where required, shall be in accordance with MIL-E-917.

3.4.1.12 Gaskets. Rubber gaskets shall be securely cemented at the scarf joint and shall completely fill the groove without stretching or bunching. The gasket shall be retained in its groove without the use of cement.

3.4.1.13 Lubrication. "O" ring and tubular gaskets shall be coated with a compound in accordance with MIL-S-8660 before final assembly in the light assembly.

3.4.2 Glassware. Glassware shall consist of lenses, globes and roundels of the classes specified (see 1.2). The design, construction and physical dimensions shall be as specified (see 3.1) and hereinafter.

3.4.2.1 Coloring. Colored glassware shall be of uniform coloring throughout the entire thickness of the portions designed for light transmittance.

3.4.2.2 Thickness tolerances. Glassware shall be of uniform thickness throughout. Where thickness tolerances are not specified (see 3.1), a variation of 12 percent above or below the nominal dimensions will be permitted, except that these tolerances shall in no case exceed 1/16 inch.

3.4.2.3 Edges. Edges of all glassware shall be ground or molded to a true surface.

3.4.2.4 Fresnel type lens. The fresnel type lens of class 1 and 3 glassware shall have a central bull's eye with the required number of zones above and below the central zone to meet the performance requirements specified herein. Actual design as to the surface curvature, spacing of the zones, width of the zones and so forth shall be at the option of the manufacturer.

MIL-L-24560(SH)

3.5 Performance characteristics.

3.5.1 Light assemblies.

3.5.1.1 Operation. Light assemblies, when operated as specified in 4.7.1.1, shall perform their specified function.

3.5.1.2 Degree of enclosure. Type I and type II light assemblies shall conform to the splashproof and submersible (1600 foot) requirements, respectively, of MIL-STD-108 (see 4.7.1.2). Following the enclosure test, the assemblies shall satisfactorily pass the dielectric withstanding voltage and insulation resistance tests (see 4.7.1.6 and 4.7.1.7).

3.5.1.3 Shock. Light assemblies shall conform to the Class I or Class II (see 3.1), Grade A shock requirements of MIL-S-901 (see 4.7.1.3). Following the shock test, the light assemblies shall satisfactorily pass the dielectric withstanding voltage test (see 4.7.1.6). Lamp failure shall not be considered as an assembly failure.

3.5.1.4 Vibration. Light assemblies shall conform to the Type I vibration requirement of MIL-STD-167-1 and shall exhibit no signs of damage or loosening of parts during and after the vibration test (see 4.7.1.4). Following the vibration test, the light assemblies shall satisfactorily pass the dielectric withstanding voltage test (if applicable) (see 4.7.1.6).

3.5.1.5 Salt spray. There shall be no signs of excessive corrosion when the light assemblies are subjected to the salt spray test (see 4.7.1.5). Excessive corrosion is defined as that which interferes with electrical or mechanical performance, or in the case of plated metals corrosion which has passed through the plating and attacked the base metal. Where corrosion resistance treatments are used, it will be permissible to have limited superficial corrosion such as would result from scratches.

3.5.1.6 Dielectric withstanding voltage. There shall be no evidence of breakdown, arcing, corona, (audible or visible) or punctured insulation when the light assemblies are subjected to the test specified in 4.7.1.6.

3.5.1.7 Insulation resistance (Wired assemblies). The insulation resistance between all current carrying parts and non-current carrying parts of the wired light assemblies (see 3.1) shall be not less than 100 mehoohms when tested in accordance with 4.7.1.7.

3.5.1.8 Hydrostatic pressure (type II). Type II light assemblies shall withstand the stresses produced when subjected to the hydrostatic pressure specified (see 3.1) without visible or structural damage or evidence of leakage of water into the enclosure (see 4.7.1.8).

3.5.2 Glassware.

3.5.2.1 Light output. Unless otherwise specified (see 3.1) the light output shall be as specified in 3.5.2.1.1 through 3.5.2.1.3 (see 4.7.2.1).

3.5.2.1.1 Class 1 - Fresnel type lens. Class 1 glassware shall have a minimum luminous intensity of 94 candelas for clear (colorless), and 12 candelas for red, green and yellow from 5 degrees above to 5 degrees below the horizontal axis of the central zone of the bull's eye. At least 60 percent of the required minimum intensity shall be present from 7.5 degrees above to 7.5 degrees below the horizontal axis (see 4.7.2.1(a)).

3.5.2.1.2 Class 2 - Globe, roundel and lens. Class 2 glassware shall have a minimum luminous transmittance of 17.5 percent for red, 40 percent for yellow, 20 percent for green, 2 percent for blue and 95 percent for clear (colorless) when specimens are tested using CIE illuminant A (see 4.7.2.1(b)).

3.5.2.1.3 Class 3 - Fresnel globe. Class 3 glassware shall have a minimum luminous intensity of 94 candelas for clear (colorless), 12 candelas for red, green and yellow and 4.5 candelas for blue from 5 degrees above to 5 degrees below the horizontal axis of the central zone of the bull's eye. At least 60 percent of the required minimum intensity shall be present from 7.5 degrees above to 7.5 degrees below the horizontal axis (see 4.7.2.1(c)).

3.5.2.2 Color (chromaticity). Unless otherwise specified (see 3.1), the chromaticity in CIE coordinates of the class 1, 2, and 3 glassware shall be as specified in 3.5.2.2.1 through 3.5.2.2.5, when installed in the appropriate light fixture (see 4.7.2.2).

MIL-L-24560(SH)

3.5.2.2.1 Red transparent. Red transparent color shall fall within the areas bounded by the spectrum locus and the following coordinates (see figure 1):

X	0.680	0.660	0.735	0.721
Y	0.320	0.320	0.265	0.259

3.5.2.2.2 Yellow transparent. Yellow transparent color shall fall within the areas bounded by the spectrum locus and the following coordinates (see figure 1):

X	0.612	0.618	0.575	0.575
Y	0.382	0.382	0.425	0.406

3.5.2.2.3 Green transparent. Green transparent color shall fall within the areas bounded by the spectrum locus and the following coordinates (see figure 1):

X	0.028	0.009	0.300	0.203
Y	0.385	0.723	0.511	0.356

3.5.2.2.4 Blue transparent. Blue transparent color shall fall within the areas bounded by the spectrum locus and the following coordinates (see figure 1):

X	0.148	0.232	0.060	0.170
Y	0.025	0.167	0.230	0.230

3.5.2.2.5 Clear (colorless) transparent. Clear transparent color shall fall within the areas bounded by the spectrum locus and the following coordinates (see figure 1):

X	0.525	0.525	0.452	0.310	0.310	0.443
Y	0.382	0.440	0.440	0.348	0.283	0.382

3.5.2.3 Painted glassware. Those portions of the glassware designated to be painted shall be uniformly coated with a baking enamel as specified (see 3.1). The glassware shall be baked at such a temperature and for such a period of time as to insure adhesion of the enamel to the glass. There shall be no evidence of loosening, softening or dissolution of the enamel when glassware is tested as specified in 4.7.2.3.

3.5.2.4 Mechanical shock. When specified (see 3.1), glassware shall not break, crack or chip when subjected to one impact of a free falling 3-pound polished steel ball as specified in 4.7.2.4.

3.5.2.5 Thermal shock. When specified (see 3.1), glassware shall withstand the stresses produced when tested as specified in 4.7.2.5 without visible or structural damage.

3.5.2.6 Hydrostatic pressure (class 3). Class 3 glassware shall withstand the stresses produced when tested as specified in 4.7.2.6 without visible or structural damage.

3.5.2.7 Breakage pattern. The 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 (see 4.7.2.7).

3.5.3 Marking. The marking format, information, and location shall be as specified (see 3.1).

3.5.4 Workmanship. The light assemblies and glassware, shall be manufactured and finished in a thoroughly workmanlike manner. Light assembly joined parts shall fit as tightly as expected with good manufacturing practices and workmanship and shall be free of damage or displaced parts, burrs and other defects which will affect the life, serviceability or appearance. Finished glassware shall be of uniform quality as to color and clarity and shall be free from dead zones, strae, air bubbles, wrinkles, mold marks, chipped edges, cracks or other blemishes which will affect the life, serviceability or appearance.

4. QUALITY ASSURANCE PROVISIONS

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

MIL-L-24560 (SH)

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

- (a) First article inspection (see 4.4).
- (b) Quality Conformance Inspection (see 4.5).

4.3 Inspection conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with the test conditions specified in the "GENERAL REQUIREMENTS" of MIL-STD-202.

4.4 First article inspection. First article inspection shall be performed by the contractor, after award of contract and prior to production, at a location acceptable to the Government. First article inspection shall be performed on sample units which have been produced with equipment and procedures normally used in production. First article approval is valid only on the contract under which it is granted, unless extended by the Government to other contracts.

4.4.1 Government inspection. When the contract specifies the first article inspection is to be performed by the Government, the contractor shall submit the first article sample and a set of prints of the manufacturing drawings to the laboratory specified (see 6.1.1 and 6.5) for the performance of the first article inspection.

4.4.2 Contractor inspection. When the first article inspection is to be performed by the contractor, the inspection shall be witnessed and the test results shall be verified (see 4.4.3.1(d)) by the Government inspector.

4.4.3 First article inspection report. For each acquisition, the contractor (or the Government laboratory, (see 4.4.1)) shall submit to the contracting activity for approval a complete first article inspection report (see 6.1.2). Unless otherwise specified, one copy of the report shall also be forwarded to the following activities (see 6.1.1):

- (a) NAVSEA (see 6.3)
- (b) Cognizant Defense Contract Administration Service
- (c) Navy Ships Parts Control Center, Mechanicsburg, Pennsylvania 17055

4.4.3.1 Report content. The first article inspection report to be prepared by the testing laboratory shall be bound into an 8-1/2 by 11-inch binder and shall contain the following information. (MIL-STD-831 may be used as a guideline in preparing this report.)

- (a) Front matter. The front matter of the inspection report shall include a title page and a table of contents. The title page shall include the complete identification of the light assembly or glassware, contractor's name, test report number and date. The table of contents shall list each major section or subsection of the report and each of the individual first article inspection tests.
- (b) Summary. The summary shall give a brief resume of the inspection test results and shall contain a statement certifying that the light assembly or glassware does or does not meet the applicable specification requirements. In addition, the resume shall contain a statement certifying that the inspections were conducted on the same light assembly or glassware in accordance with the test procedures specified in this specification. The resume shall contain a list of all points where the light assembly or glassware does not meet the specification requirements if failures occur. Any unusual items, adjustments or failures encountered during the various tests shall also be described. The content of the summary shall be certified by the signatures of the test engineer and contractor's official representative.
- (c) Equipment and inspection facilities. The test report shall include a list of all equipment and inspection facilities used during the inspection tests. This list shall include the model numbers and manufacture of all equipment and test instruments used and calibration data.
- (d) Test data. The test data shall be presented in the general manner specified herein; however, no special format or approval of the proposed format is required. Each test shall be prefaced by the name of the test and the applicable specification paragraph which requires the test. Each final test result shall be listed adjacent to the specification requirement for that test. At the end of each test result, space

MIL-L-24560(SH)

shall be provided for the Government inspector's signature verifying that the inspector witnessed the test. Government Inspector's signature is not required for tests performed at a Government's laboratory.

4.4.4 Combination of tests. Where advantageous, the contractor may combine tests in cases where the basic body of the light assembly to be tested is the same for different symbol numbered assemblies. For example, the symbol number changes when a red globe is substituted for a clear globe in the same basic light fixture.

4.4.5 Replacement glassware. When glassware is being furnished only as replacement parts, the Government will furnish the applicable light assemblies where required to complete the necessary first article tests.

4.4.6 Sampling size. One light assembly or one glassware furnished as a replacement part shall be subjected to first article inspection.

4.4.7 Inspection routine. When specified (see 3.1), the sample light assemblies and glassware shall be subjected to the inspections shown in table I, in the order shown.

TABLE I. First article inspection.

Inspection	Requirement paragraph	Test method paragraph
<u>Light Assemblies</u>		
Examination of product	3.1, 3.4.1, 3.5.3, 3.5.4	4.5.1.2
Magnetic permeability	3.3.2	4.7.1.9
Operation	3.5.1.1	4.7.1.1
Dielectric withstanding voltage ^{1/}	3.5.1.6	4.7.1.6
Insulation resistance ^{1/}	3.5.1.7	4.7.1.7
Vibration	3.5.1.4	4.7.1.4
Dielectric withstanding voltage ^{1/}	3.5.1.6	4.7.1.6
Shock	3.5.1.3	4.7.1.3
Dielectric withstanding voltage ^{1/}	3.5.1.6	4.7.1.6
Salt spray	3.5.1.5	4.7.1.5
Degree of enclosure	3.5.1.2	4.7.1.2
Hydrostatic pressure (type II)	3.5.1.8	4.7.1.8
Dielectric withstanding voltage ^{1/}	3.5.1.6	4.7.1.6
Insulation resistance ^{1/}	3.5.1.7	4.7.1.7
<u>Glassware</u>		
Examination of product	3.1, 3.4.2, 3.5.3, 3.5.4	4.5.1.2
Light output	3.5.2.1	4.7.2.1
Color (chromaticity)	3.5.2.2	4.7.2.2
Mechanical shock	3.5.2.4	4.7.2.4
Thermal shock	3.5.2.5	4.7.2.5
Paint removal	3.5.2.3	4.7.2.3
Hydrostatic pressure (class 3)	3.5.2.6	4.7.2.6
Breakage pattern	3.5.2.7	4.7.2.7
Color determination	3.4.2.1	4.7.2.8

^{1/} If applicable (see 3.1).

4.4.8 Failures. One or more failures shall be cause for refusal to grant first article approval.

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspection of product for delivery shall consist of the examination and tests specified in 4.5.1.2 and 4.5.1.3.

4.5.1.1 Inspection lot. An inspection lot shall consist of all light assemblies or glassware of the same part number, produced upder essentially the same conditions, and offered for inspection at one time.

4.5.1.2 Examination. Light assemblies and glassware shall be examined to determine conformance with Table II.

MIL-STD-24560 (SH)

TABLE II. Examination.

Examine	Defect
VISUAL	
<u>Light Assemblies</u>	
Finish	Finish not as specified; blisters, peeled, chipped, or area of no film. Color not as specified.
Materials	Materials not as specified.
Construction and Workmanship	Part missing; fractures, 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 of 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 (where applicable)	Connections at screw terminals not as specified. Wiring not properly joined, loose at terminals.
Gaskets (where applicable)	Not coated where required; missing; not as specified.
Marking for identification	Missing; incomplete, not legible.
<u>Glassware</u>	
Construction and Workmanship (may be combined with operation test specified in 4.7.1.1)	Color not as specified; dead zones, striae, air bubbles, wrinkles, mold marks, chipped edges, cracks or other blemishes. Paint not as specified. Bull's eye design for Classes 1 and 3 not as specified. Refractive index not specified.
Marking for identification	Missing; incomplete, not legible.
<u>WEIGHT AND DIMENSIONS (ALL)</u>	
Weight	Weight not as specified.
Dimensions	Dimensions not within specified tolerances.

4.5.1.2.1 Sampling plan for examination. Samples shall be selected at random from each lot in accordance with MIL-STD-105 at inspection level I for the examination specified in 4.5.1.2. The AQL shall be 2.5 percent defective. Samples containing one or more defects shall not be offered for delivery, and if the number of nonconforming items exceeds the acceptance number for that sample, the lot represented by the samples shall not be offered for delivery.

4.5.1.2.2 Rejected lots. If an inspection lot is rejected, the contractor may rework or to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be inspected using tightened inspection. Such lots shall be kept separate from new lots, and shall be clearly identified as reinspected lots.

4.5.1.3 Quality conformance inspection. Quality conformance inspections shall be as specified in Table III.

MIL-L-24560(SH)

TABLE III. Quality conformance inspection.

Inspection	Requirement paragraph	Test method paragraph
<u>Light Assemblies</u>		
Examination of product	3.1, 3.4.1, 3.5.3, 3.5.4	4.5.1.2
Operation	3.5.1.1	4.7.1.1
Hydrostatic pressure (Type II only)	3.5.1.8	4.7.1.8
Dielectric withstanding voltage ^{1/}	3.5.1.6	4.7.1.6
Insulation resistance (wired assemblies only) ^{1/}	3.5.1.7	4.7.1.7
<u>Glassware</u>		
Examination of product	3.1, 3.4.2, 3.5.3, 3.5.4	4.5.1.2
Light output	3.5.2.1	4.7.2.1
Color (chromaticity)	3.5.2.2	4.7.2.2
Hydrostatic pressure (Class 3 only)	3.5.2.6	4.7.2.6

^{1/} If applicable.

4.5.1.3.1 Sampling plan for quality conformance tests. Samples shall be selected at random from each lot in accordance with MIL-STD-105 at inspection level B-2 for the tests specified in table III, except that 100 percent of type II light assemblies shall be subjected to the hydrostatic pressure test. If any sample fails to conform to these tests, the sample and the lot represented thereby shall not be offered for delivery.

4.5.1.3.2 Rejected lots. If an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units, and resubmit for reinspection. Resubmitted lots shall be kept separate from new lots, and shall be clearly identified as reinspected lots.

4.5.1.3.3 Quality conformance inspection report. A quality conformance inspection report shall be furnished in accordance with the data ordering document specified (see 6.1.2).

4.6 Inspection of preparation for delivery. Sample packages and packs and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of Section 5 and the document(s) specified therein.

4.7 Methods of inspection.

4.7.1 Light assemblies. The following tests for complete light assemblies shall be performed.

4.7.1.1 Operation. The light assembly, with specified lamp installed (see 3.1), shall light and remain steady when power is applied. Application of power shall be similar to that normally supplied the light assembly when installed onboard a ship (see 3.5.1.1).

4.7.1.2 Degree of enclosure. Splashproof and submersible assemblies shall be subjected to the water repellent and submergence tests, respectively, in accordance with MIL-STD-108 (see 3.5.1.2). Before conducting this test, all joints that have gaskets, or sealing compound or that have been painted, and which are subject to being opened, shall be opened and closed three times. Following this test the light assembly shall be subjected to the dielectric withstanding voltage test of 4.7.1.6 and insulation resistance test of 4.7.1.7 if applicable.

4.7.1.3 Shock test. The light assembly shall be subjected to the Type A, class I, or II, as applicable, grade A shock test for lightweight equipment in accordance with MIL-S-901 (see 3.5.1.3). Mounting of the light assembly on the shock machine shall simulate normal shipboard installation (see 3.1). Light assembly shall be energized during this test. The first article inspection report shall include photographs of the test set-up and any failed element. Following this test, the light assemblies shall be subjected to the dielectric withstanding voltage test of 4.7.1.6 (if applicable).

4.7.1.4 Vibration test. The light assembly shall be subjected to the Type I vibration test in accordance with MIL-STD-167-1 (see 3.5.1.4). Mounting for the light assembly shall simulate shipboard installation (see 3.1). The light assembly shall be energized during this test. The first article inspection report shall include copies of the vibration test

MIL-L-24560(SH)

reports and photographs as outlined in MIL-STD-167-1. Following this test, the light assembly shall be subjected to the dielectric withstanding voltage test of 4.7.1.6 (if applicable).

4.7.1.5 Salt spray test. The light assembly shall be subjected to a salt spray test in accordance with method 101 of MIL-STD-202, test condition A (see 3.5.1.5).

4.7.1.6 Dielectric withstanding voltage. The light assembly shall be subjected for 1 minute to a dielectric withstanding voltage test, the effective potential of which is twice rated voltage (see 3.1), 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 Hertz, root mean square alternating current, and shall approximate a true sine wave. The light assembly shall be examined for evidence of breakdown, arcing, corona (audible or visible) or punctured insulation (see 3.5.1.6).

4.7.1.7 Insulation resistance test. Insulation resistance test shall be conducted between all current carrying parts and non-current carrying parts with a megohmmeter at a voltage not less than 500 volts d.c. (see 3.5.1.7). This test is not required for unwired light assemblies wherein plastic parts are certified (see 6.1.2) by the manufacturer as meeting the requirements specified (see 3.1).

4.7.1.8 Hydrostatic pressure test (type II). Type II assemblies shall be submerged in water in a pressure tank. External hydrostatic pressures as specified in the applicable specification sheet shall be applied for the durations specified. Following the test, the assembly shall be examined for conformance to the requirements of 3.5.1.8.

4.7.1.9 Magnetic permeability. The relative permeability when checked with a low-mu indicator conforming to MIL-I-17214 shall not exceed the permeability level specified in 3.3.3.

4.7.2 Glassware. The following tests for glassware shall be performed.

4.7.2.1 Light output. The light output shall be measured in accordance with the appropriate guides for photometric and colorimetric testings as specified in the Illumination Engineering Society (IES) General Guide to Photometry (see 3.5.2.1). Before any measurements are taken, the light assemblies shall be operated until the light has reached a stable temperature condition. Unless otherwise specified (see 3.1), the following applicable lamp, located at the focus of the system shall be used.

- (a) Class 1 - Fresnel type lens. A standard 50-watt rough service tungsten filament lamp.
- (b) Class 2 - Globe, roundel and lens. Light source shall be CIE illuminant A.
- (c) Class 3 - Fresnel globe. An industry no. 50/50T12 (Primary Filament) lamp.

4.7.2.2 Color (chromaticity). The chromaticity of the glassware shall be determined by colorimetric testing as described in the Standard Methods of Measuring and Specifying Color, ANSI Z138-2 - 1974 (see 3.5.2.2).

4.7.2.3 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 with 3.5.2.3.

4.7.2.4 Mechanical shock test. Sample glassware shall be placed with the flat surface on a soft 2-foot by 2-foot by 2-inch thick wood plank as shown on figure 2. A 3-pound polished steel ball shall be allowed to fall free from a height of 2 feet and strike the glassware on the center of the outside surface (see 3.5.2.4).

4.7.2.5 Thermal shock test. Sample glassware shall be uniformly heated to a temperature of 110°Celsius (C) \pm 2°C and then immersed in cold water 1.7°C \pm 2.8°C (35°F \pm 5°F) for not less than 2 minutes. At least ten consecutive cycles shall be performed on each sample (see 3.5.2.5). Following the test, painted glassware shall be examined for conformance to the requirements of 3.5.2.3.

4.7.2.6 Hydrostatic pressure test. Class 3 glassware shall be installed on a type II light assembly and subjected to the test of 4.7.1.8 (see 3.5.2.6).

4.7.2.7 Breakage pattern test. Sample glassware shall be placed with the flat surface on a soft 2-foot by 2-foot by 2-inch thick wood plank as shown on figure 2. 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 3.5.2.7).

MIL-L-24560(SH)

4.7.2.8 Color determination test. A small number of pieces of broken glassware (see 4.7.2.7) shall be visually examined to determine conformance with 3.4.2.1.

5. PACKAGING

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

5.1 Preservation-packaging, packing and marking. Light assemblies and associated parts shall be preserved-packaged level A or C, packed level A, B or C as specified (see 6.1.1) and marked in accordance with MIL-E-17555.

5.2 Cushioning, filler, dunnage, and wrapping materials.

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

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

"CAUTION

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

5.2.3 Cushioning, filler, dunnage, and wrapping materials selected, whenever available, shall exhibit improved performance for resistance to fire.

6. NOTES

6.1 Ordering data.

6.1.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Title, number, and date of the applicable specification sheet (see 3.1).
- (c) That prior to submission of the sample for first article inspection, the Government inspector shall verify that the sample was manufactured with production tools and processes (see 3.2).
- (d) Type of light assembly or class of glassware when ordered as replacement parts (see 1.2).
- (e) Whether lamp is to be furnished with light assembly (see 3.4.1).
- (f) Whether first article inspection is required prior to beginning production (see 3.2).
- (g) Laboratory, when the first article inspection is to be performed by the Government (see 4.4.1 and 6.5).
- (h) Inspection report distribution if other than that specified (see 4.4.3).
- (i) Levels of preservation-packaging and packing required (see 5.1).

6.1.2 Data requirements. When this specification is used in a contract which invokes the provision of the "Requirements for Data" of the Defense Acquisition Regulation (DAR), the data identified below, which are required to be developed by the contractor, as specified on an approved Data Item Description (DD Form 1664), and which are required to be delivered to the Government, should be selected and specified on the approved Contract Data Requirement List (DD Form 1423) and incorporated in the contract. When the provisions of the "Requirements for Data" of the DAR are not invoked in a contract, the data required to be developed by the contractor and required to be delivered to the Government should be selected from the list below and specified in the contract.

<u>Paragraph</u>	<u>Data requirements</u>	<u>Applicable DID</u>
4.4.3	First article inspection report	UDI-T-23473
4.5.1.3.3	Quality conformance inspection report	UDI-T-23473
4.7.1.7	Certification	UDI-T-23741

MIL-L-24560(SH)

(Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.)

6.1.2.1 The data requirements of 6.1.2 and any task in section 3, 4, or 5 of the specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.2 First article. When a first article is required, it shall be tested and approved under the appropriate provisions of paragraph 7-104.55 of the Defense Acquisition Regulations. The first article should be a preproduction sample. The first article should consist of one unit. The contracting officer should include specific instructions in all acquisition instruments, regarding arrangements of examinations, test and approval of the first article. Contractors should contact NAVSEA before conducting tests to discuss technical details of testing.

6.2.1 Extension of first article approval. Invitations for bids should provide that the Government reserves the right to waive the requirement for the samples for first article inspection, as to those bidders, offering a product which has been previously acquired or tested by the Government, and that bidders offering such products who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending acquisition.

6.2.2 First article testing prior to contract award. The contractor, prior to award of a contract, 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.

6.3 Approval of the first article inspection report. The Purchasing Contracting Officer (Naval Shipyards, Private Shipyards/Supervisor of Shipbuilding Conversion and Repair, Naval Sea Systems Command field activities and Defense Supply Agencies) shall, 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 shall forward the first article inspection report to NAVSEA for resolution on acceptance or non-acceptance of marginal or nonconforming supplies.

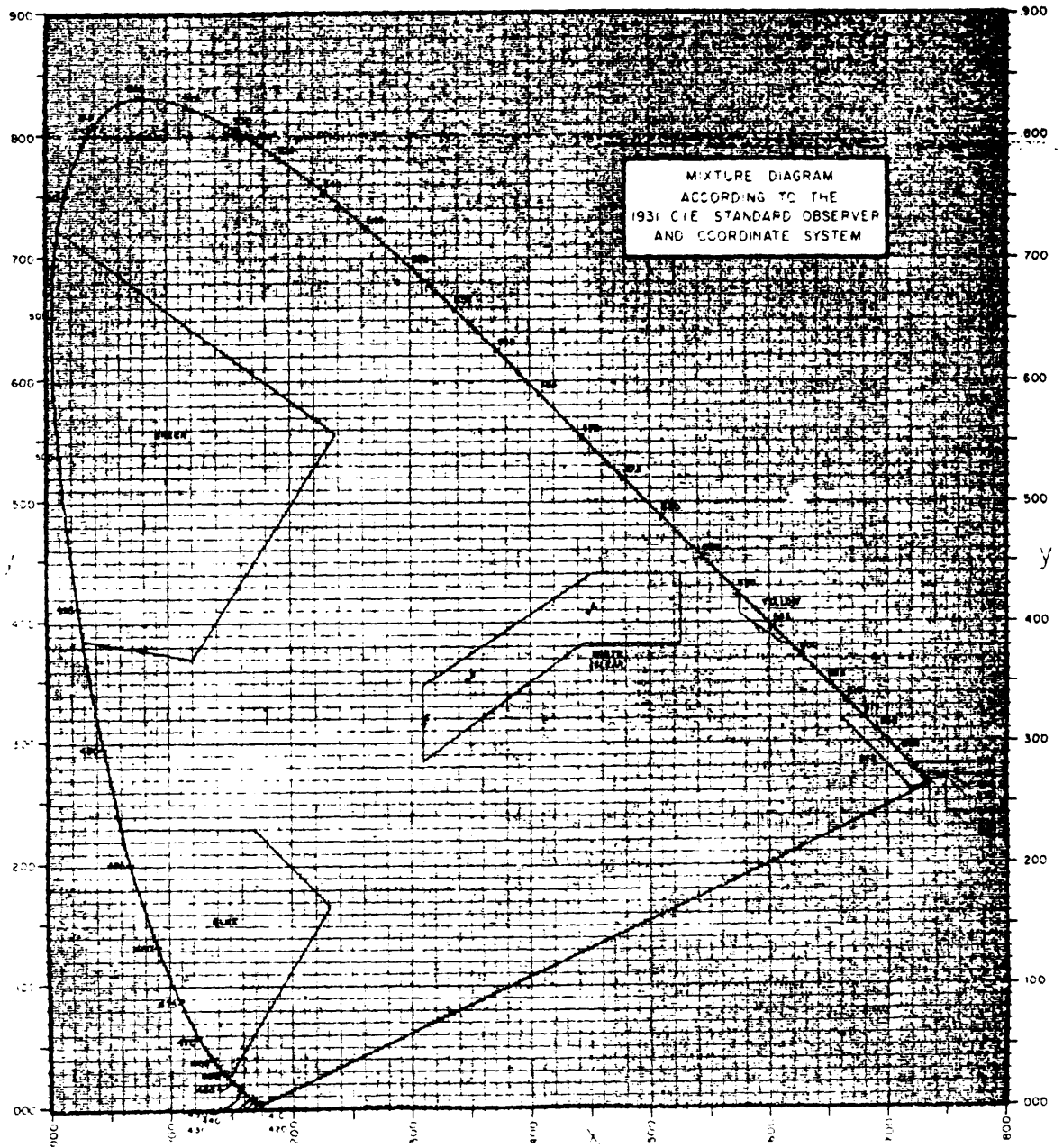
6.4 Symbol number. Symbol number is a standard equipment designation. Symbol numbers are listed in Publication NAVSHIPS 0960-000-4000.

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

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

Preparing activity:
Navy - SH
(Project 6220-N267)

MIL-L-24560 (SH)

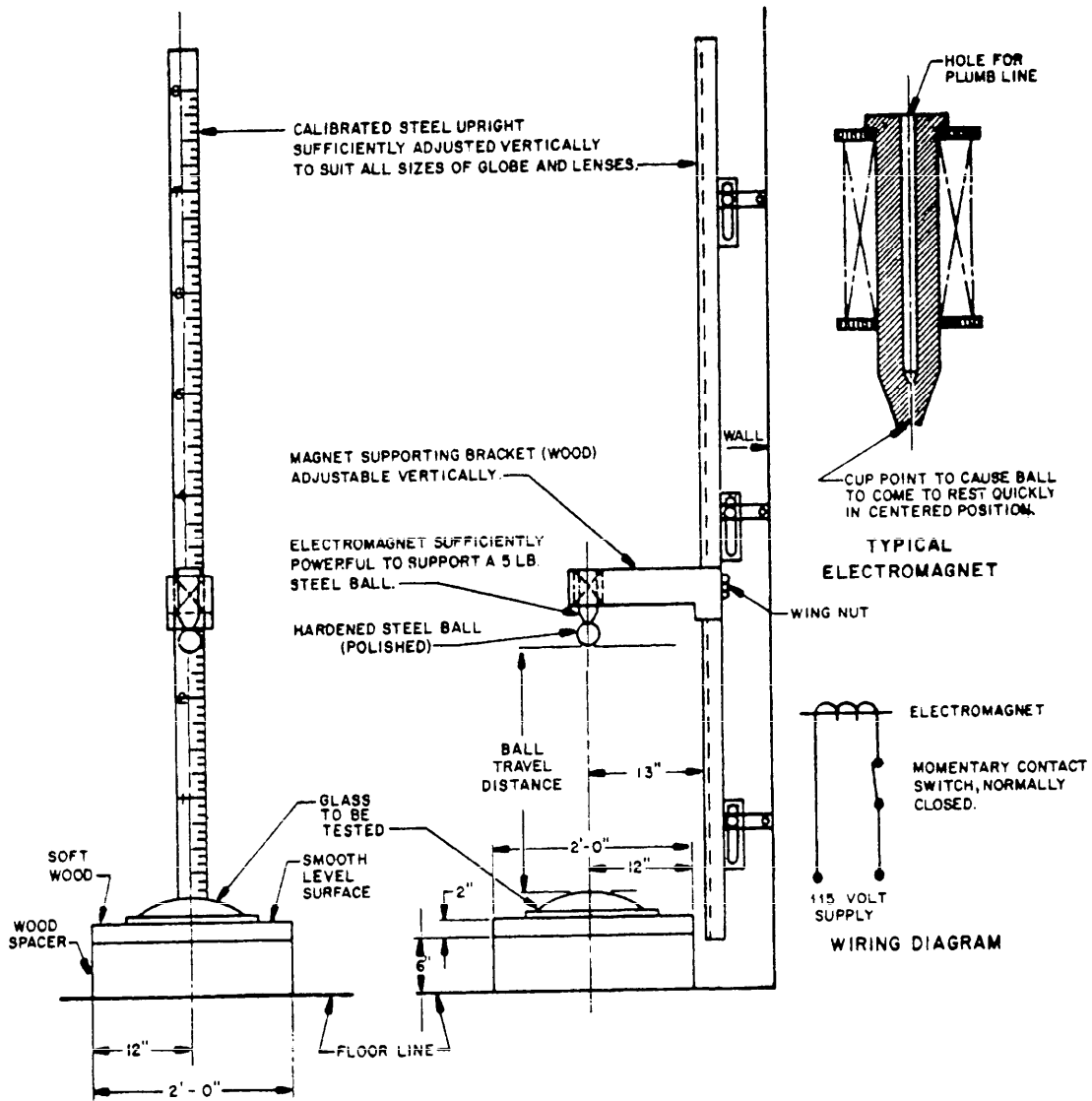


SH 11406

NOTE: Figure is for information only. Colors shall be as specified in 3.5.2.2.1 through 3.5.2.2.5.

FIGURE 1. Chromaticity diagram.

MIL-L-24560 (SH)



SH 11407

FIGURE 2. Typical ball impact equipment for shock and breakage pattern test of glassware.

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