INCH-POUND

MIL-L-29575(AS)
31 May 1989

MILITARY SPECIFICATION

LIGHT, WAVE-OFF, FLASHING, CAPACITANCE-DISCHARGE

This specification is approved for use within the Naval Air 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 a type of capacitance-discharge flashing light used for wave-off systems for shore based airfields.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications, standards and handbooks form a part of the 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 supplements thereto, cited in the solicitation.

SPECIFICATIONS

FEDERAL

PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-636	Box, Shipping, Fiberboard
QQ-P-416	Plating, Cadmium (Electrodeposited)
ZZ-R-765	Rubber, Silicone

MILITARY

MIL-P-116	Preservation, Methods of
DOD-D-1000	Drawings, Engineering and Associated Lists

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Systems Engineering and Standardization Department (Code 53), Naval Air Engineering Center, Lakehurst, NJ 08733-5100, 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

SPECIFICATIONS (continued)

MILITARY (continued)

MIL-C-7989	Covers, Light Transmitting, for Aeronautical Lights
MIL-C-8514	Coating Compound, Metal Pretreatment, Resin Acid
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys
DOD-P-15328	Primer (Wash) Pretreatment (Formula No. 117 for Metals)
MIL-C-22750	Coating, Epoxy Polyamide
MIL-P-23377	Primer Coating, Epoxy Polyamide, Chemical and Solvent Resistant
MIL-C-25050	Colors, Aeronautical Lights and Lighting Equipment, General Requirements for

STANDARDS

FEDERAL

FED-STD-595	Colors

MILITARY

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U. S. Military Property
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-276	Impregnation of Porous, Nonferrous Metal Castings
MIL-STD-810	Environmental Test Methods
MIL-STD-889	Dissimilar Metals
MIL-STD-970	Specifications and Standards, Order of Precedence for the Selection of
MS17814	Frangible Coupling

(Unless otherwise indicated, copies of federal and military specifications, standards and handbooks are available from the Naval Publications and Forms Center (Attn: NPODS), 5801 Tabor Avenue, Philadelphia, PA 19120-5099.)

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings and publications form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

FEDERAL AVIATION ADMINISTRATION

SPECIFICATIONS

FAA-E-1100	Photometric Test Procedures for Condenser Discharge Lights

ADVISORY CIRCULAR

AC 150/5345-7	Specification for L-824 Underground Electrical Cable for Airport Lighting Circuits

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

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

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM B633-78	Zinc on Iron and Steel, Electrodeposited Coatings of

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

NATIONAL ELECTRICAL MANUFACTURERS ASSOCIATION (NEMA)

NEMA 250-1979	Enclosures for Electrical Equipment

(Application for copies should be addressed to the National Electrical Manufacturers Association, 2101 L Street NW, Washington, DC 20036.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. Specifications and standards for necessary commodities and services not specified herein shall be selected in accordance with MIL-STD-970.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection and testing (see 4.4 and 6.3).

3.2 Materials. All materials used in fabrication of the capacitance-discharge wave-off lights shall be suitable for the intended purpose and adequately protected against corrosion. The components shall have adequate capacity and shall not be operated in excess of the component manufacturer's recommended rating. Any plastic components exposed to sunlight shall be made of infrared and ultraviolet stabilized material. All components and materials used in the optical assembly unit shall be ozone resistant (see 4.6.1).

3.2.1 Fungus-proof materials. Materials that are nutrients for fungi shall not be used where it is practical to avoid them. Where used and not hermetically sealed, they shall be treated with a fungicidal agent acceptable to the procuring activity. However, if they will be used in a hermetically sealed enclosure, fungicidal treatment will not be necessary.

3.2.2 Recycled and reclaimed materials. The use of recycled and reclaimed materials suitable for the purpose and adequately protected against corrosion will be permitted.

3.2.3 Metals. Metals shall withstand the mechanical stress involved and shall be inherently corrosion resistant or adequately protected as specified herein, after fabrication, to prevent corrosion or oxidation under the service conditions. The use of dissimilar metals in contact with one another shall be avoided where practicable. However, if their use cannot be avoided, they shall be in accordance with MIL-STD-889.

3.2.4 Aluminum. Aluminum castings, if used, shall be impregnated in accordance with MIL-STD-276.

3.2.5 Protective coatings. Protective coatings used for prevention of corrosion shall be as follows:

a. Plating. All iron and steel parts, excluding stainless steel, shall be zinc or cadmium-plated in accordance with ASTM B633 or QQ-P-416.

3.2.6 Glass. Glass used as an optical or structural part shall meet all requirements of this specification, which includes the requirement of MIL-G-7989 for Class B glass. Class C glass may be used, if required, for impact strength. The glass shall be tempered to withstand thermal shock. Glass parts shall be supported in such a way that they will not be damaged by vibration, shock or deflection of any part.

3.2.7 Silicone rubber. Gaskets used at separable joints for cushioning and sealing shall be capable of sustained operation at ambient temperatures from -55°C to +55°C. The rubber shall meet the requirements of ZZ-R-765, Class IIB. Low compression set material shall be used. If used in the optical assembly unit, the gaskets shall be ozone resistant.

3.3 Design. Normally, six (6) of these lights are installed to form a wave-off lighting system. Each light shall consist of an optical assembly unit, a power converter unit, and the interconnecting cable between these assemblies (see 4.6.1). The light shall be capable of operating with up to 150 feet of cable between the optical assembly unit and the power converter unit. The light shall be designed to operate satisfactorily under all weather conditions. The weight and size shall be held to the minimum consistent with the necessary strength and rigidity. The exact shape and design are optional provided all requirements specified herein are met. The electrical requirements are as follows:

3.3.1 Input voltage. The photometric intensity and flash rate requirements shall be met at an input voltage of 480 volts alternating current ±10 percent, 60 Hertz ±2 percent frequency, single phase (see 4.6.2.1), except if a lower input voltage is specified (see 6.2). The source of electrical power may be from the lighting vault or an alternate source, but all lights in a system shall be energized simultaneously from the same source.

3.3.1.1 Variation of input voltage. The light shall continue to operate for input voltage variations of ±20 percent without damage to components. Photometric intensity may not comply with the requirements of 3.7.1.1. Specified performance shall be obtained within two seconds after return to rated voltage (see 4.6.2.2).

3.3.2 Power. The average power required for each light during operations shall not exceed 600 watts. The volt-amperes shall not exceed 1200 VA (see 4.6.2.3).

3.3.3 Operation and intensity control. The lights shall operate upon application of power at one of two intensities as selected by a manual switch or automatic control such as a photoelectric cell or electrical timer controlled relay. If a change in intensity setting occurs during an operating cycle, the initial intensity shall be maintained to the end of the cycle (see 4.6.2.4).

3.3.4 Operation cycles. The operation cycle for these lights may be varied from 5 to 60 seconds. The lights shall provide the required performance for three consecutive 60 second cycles and repeat continuously after a 30 second cooling period following each set of three 60 second cycles (see 4.6.2.5).

3.3.5 Dielectric protection. The lights shall be capable of withstanding the application of 5000 volts potential for a period up to 10 milliseconds between the equipment enclosure (electrical ground) (see 3.3.7) and any power or control cable without damage to components (see 4.6.2.6). Lightning arrestors shall be installed at the terminal connections for the power cables and the intensity control cables, but shall be disconnected for the dielectric protection test.

3.3.6 Circuits protection. The solid state or electronic circuits shall be designed such that failure of one or more lights shall not damage or affect operation of other lights (see 4.6.2.7).

3.3.7 Grounding. Both the optical assembly unit and the power converter unit shall be provided with an external connection or device for connecting the unit to the installed ground (see 4.6.1).

3.3.8 Electromagnetic interference. The system shall be designed to be capable of operating in proximity to other electronic equipment without causing electromagnetic interference to other electronic equipment in the vicinity. The lights shall not be sensitive to EMI on the input cables or to radiated noise from nearby equipment.

3.4 Construction. The light shall be so constructed that no parts will work loose in service. It shall be built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation and service (see 4.6.1).

3.5 Hardware. Standard military hardware shall be designed into the assemblies to the maximum extent possible, except that assembly hardware, including screws, nuts, bolts, washers and latches, shall be 18-8 stainless steel (see 4.6.1).

3.6 Maintainability. All components shall be designed for ease of maintenance. If required, means shall be provided for refocusing the optical assembly unit after certain maintenance procedures. Adjustments and repairs shall be such that maintenance personnel can easily make them using tools which are normally available commercially (see 4.6.1).

3.6.1 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The drawing number requirements of DOD-D-1000 shall govern changes in the manufacturer's part numbers.

3.7 Performance characteristics. The performance requirements of the lights shall be as follows:

3.7.1 Photometric requirements.

3.7.1.1 Effective intensity (white). The emitted light in the peak of the beam of the optical assembly unit shall have a peak effective intensity of white light (color filter removed) for the high intensity setting not less than 800,000 candelas nor more than 1,600,000 candelas, and not less than 80,000 candelas nor more than 160,000 candelas for the low intensity setting (see 4.6.3.1).

3.7.1.2 Effective intensity (red). With the color filter installed, the peak effective intensity of red light in the peak of the beam for the high intensity shall be not less than 50,000 candelas (see 4.6.3.2).

3.7.1.3 Beam distribution. The width of the beam at 50 percent of the minimum required peak effective intensity at the peak of the beam shall be not less than 10 degrees horizontally and 8 degrees vertically. The shape of the beam may be approximately rectangular, elliptical, or circular, but the isocandela curve shall enclose the 10 degree by 8 degree rectangle, except the corners may be rounded on a 2 degree radius (see 4.6.3.3).

3.7.1.4 Beam axis location. The beam axis shall not be more than 1.5 degrees from the mechanical axis of the optical assembly or of the aiming alignment (see 4.6.3.4).

3.7.2 Color of emitted light. The color of the emitted light with the filter installed shall be aviation red or comparable to that with a Wratten 29 filter. With the filter removed, the preferred color of emitted light is aviation white but xenon white is acceptable. The aviation red and aviation white colors shall be in accordance with MIL-C-25050 except the 3 coordinate for aviation red shall be $3 \leq 0.0230$ instead of $3 \leq 0.002$ (see 4.6.4).

3.7.3 Flash requirements.

3.7.3.1 Flash rate. The flash rate shall be 90 $\pm$ 5 flashes per minute (see 4.6.5.1).

3.7.3.2 Flash duration. The duration of the flash shall be not longer than 50 milliseconds (see 4.6.5.2). The flash duration is the time interval between the one-third (1/3) peak intensity points.

3.7.3.3 Delay to initial flash. The maximum time between switching on the system and the initial flash shall not exceed 0.75 seconds (see 4.6.5.3).

3.7.3.4 Synchronization of flash. All light units in a system shall flash simultaneously (see 4.6.5.4).

3.7.4 Lamp life. The average lamp life for high intensity operation shall be not less than 500 hours of continuous flashing at 90 flashes per minute. After 500 hours of operation, the peak effective intensity shall be not less than 70 percent of the intensity after one hour of operation, nor shall misfires (skipped flashes) exceed one percent averaged over the test, nor shall there be any occurrences of two consecutive skipped flashes (see 4.6.6).

3.8 Safety (interlocks). The power converter unit shall be provided with an interlock switch so that opening the enclosure shall (1) disconnect input power and (2) discharge all DC voltages over 150 volts to 50 volts or less within 30 seconds. This discharge shall occur even if components which normally draw current from the high voltage circuit are removed. In addition, the circuit shall provide bleeder resistors to discharge the flash capacitors (if used) to 50 volts or less within 5 minutes if the interlock should fail. Means shall be provided to defeat the interlock with the enclosure open for maintenance purposes. If an interlock is not provided on the optical assembly unit, a label shall be attached warning not to open the unit until input power has been disconnected (see 4.6.7).

3.9 Environmental requirements. The lights shall be capable of operating at the performance requirements (see 3.7) when subjected to the following environmental conditions:

3.9.1 Temperature range. All temperatures from +55°C to -55°C.

3.9.1.1 High temperature. +55°C (see 4.6.8.1).

3.9.1.2 Low temperature. -55°C (see 4.6.8.2).

3.9.2 Altitude. Barometric pressures for altitude range from sea level to 10,000 feet (see 4.6.8.3).

3.9.3 Humidity. Relative humidity up to 100 percent including conditions where condensation takes place in the form of water or frost (see 4.6.8.4).

3.9.4 Salt fog. Exposure to salt-laden atmosphere (see 4.6.8.5).

3.9.5 Sand and dust. Exposure to windblown sand and dust particles (see 4.6.8.6).

3.9.6 Rain. Exposure to windblown rain (see 4.6.8.7).

3.9.7 Thermal shock. Sudden application of cold water to external surfaces (see 4.6.8.8).

3.9.8 Wind. Exposures to wind velocities up to 130 knots (see 4.6.8.9).

3.10 Details of units and parts. (See 4.6.1.)

3.10.1 Optical assembly unit. The optical assembly unit shall consist of the housing, parts and circuits which generate the emitted light as follows:

a. Flashtube. The flashtube shall be a gaseous-discharge type suitable to provide the photometric characteristics requirements (see 3.7.1). The flashtube may be a separate part or sealed in a reflector as a lamp. Replacement of the flashtube shall not require focusing.

b. Reflector. The reflector may be a separate part or part of a sealed reflector lamp. If not hermetically sealed, the reflector shall be of corrosion-resistant material or treated, such as anodized aluminum, to prevent corrosion of the reflecting surface.

c. Filter. The red filter, if used, together with the flashtube specified by the manufacturer, shall emit aviation red light in accordance with MIL-C-25050 modified (see 3.7.2). The filter, if not protected from the weather, shall withstand thermal shock (see 4.6.8.9).

d. Housing. The housing for the optical assembly unit shall be weathertight and provide adequate strength to support the components for the vibrations, jars, and wind, jet or prop blasts up to 130 knots. Corrosion-resistant metal or metal treated to prevent corrosion is preferred for the housing, except for the light transmitting window. If other materials are used, they shall resist the effects of infrared and ultraviolet radiation and shall not be affected by fuel or salt spray.

the same conditions and submitted for tests at substantially

essentially

e. Terminals. A terminal strip shall be provided for the interconnecting cable.

f. Mounting. The assembly unit shall provide for mounting on one or more frangible couplings and shall be stable after tightening. The frangible coupling shall be an MS17814 type, unless the manufacturer requires another type to meet wind loading requirements of 3.9.9.

g. Aiming. The optical assembly unit shall provide for horizontal and vertical aiming of the light fixture. Horizontal alignment of the mechanical axis of the beam shall have a range of not less than 15 degrees toward or away from parallel to the runway centerline. The vertical aiming shall provide for the mechanical axis to have a range from horizontal to 10 degrees above horizontal. An indicator for the vertical aiming shall be provided with increments of one degree or less and shall have a tolerance not to exceed ±2.0 degrees from the beam axis. After tightening, the aiming shall be maintained within 0.25 degree. The assembly shall provide surfaces or other devices for correct horizontal and vertical aiming as described in the instruction manual (see 4.6.9).

h. Mounting of flashtube. The socket or mounting method of the flashtube shall be such that the flashtube may be replaced without refocusing the light.

i. Cooling. If required, a self-contained, internally powered fan is permitted.

3.10.2 Power converter unit. The power converter unit shall consist of an enclosure and components and circuits which provide the energy and triggering signal for the optical assembly unit as follows:

a. Capacitors. The capacitors providing energy to the flashtube shall be of a type and rating suitable for the purpose and shall have a life expectancy of 50,000,000 flashes. The capacitors shall be connected to provide both the high and low intensities. Means shall be provided internally to change the peak effective intensity of white light for the low intensity setting from 80,000 candelas to either 160,000 or 40,000 candelas.

b. Circuits. The circuits for triggering and supplying power to the flashtube shall consist of a combination of solid-state or electronic devices and individual components. The life expectancy of these devices and components shall be not less than 50,000,000 flashes.

c. Enclosure. The housing for the power converter unit shall conform to NEMA 250, Type 4X. Access to the circuits shall be provided preferably through a hinged, gasketed access door. External controls, if used, shall be provided with waterproof seals.

s conducted. Any leakage as indicated by bubbles between the base test

d. Terminals. A terminal strip shall be provided for the input power, control and for interconnecting cables.

e. Mounting. The power converter unit shall provide for mounting on three (3) frangible couplings, on a bolt circle diameter of 8 inches, that shall be stable after tightening. The cables shall enter the unit through the frangible couplings or separate conduits.

3.10.3 Cables. The cables, although not supplied by the manufacturer, shall be as follows:

a. Power cables. The power cables shall be two single-conductor, #6 AWG, 5000 volt minimum.

b. Control cables. A maximum of two (2) conductors, #14 AWG or larger, shall interconnect all power converters in parallel and connect to a photoelectric control relay or intensity control switch. No additional interconnecting control conductors shall be required.

c. Connecting cables. The interconnecting cables shall connect the power converter unit to the junction box, if used, and the junction box to the optical assembly unit. The number and size of conductors shall be determined by the manufacturer.

3.10.4 Instruction manual. One or more instruction manuals shall be provided (see 6.2). These manuals shall include the following:

a. Safety precautions used in maintenance of the equipment.

b. Physical and electrical characteristics.

c. Theory of circuits and system operation.

d. Operating instructions.

e. Complete schematics and interconnecting wiring diagrams.

f. Parts list with field replaceable components identified with the designations used on the schematic or wiring diagrams. Complete information for each field replaceable part shall be given to permit ordering for replacement.

g. Installation instructions for a standard six light system.

h. Recommended preventative maintenance.

i. Troubleshooting procedures, including instructions for replacing field replaceable parts and assemblies.

3.11 Dimensions. The dimensions of the units of the light shall be as follows:

3.11.1 Optical assembly unit. Maximum envelope dimensions: height (not including pipe nipple or frangible coupling) 22 inches; width 20.5 inches; depth (with the axis of the beam horizontal) 12 inches (see 4.6.10).

3.11.2 Power converter unit. Maximum envelope dimensions: height 23 inches; width 23 inches; depth 14 inches (see 4.6.10).

3.12 Weight. The weight of the light unit shall not exceed 40 pounds for the optical assembly unit, or 125 pounds for the power converter unit (see 4.6.11).

3.13 Finish and color.

3.13.1 Aluminum housings. The exterior finish of aluminum housings shall consist of an anodic coating conforming to MIL-A-8625, Type I, followed by an epoxy polyamide primer coating conforming to MIL-P-23377 and a topcoat of polyamide epoxy conforming to MIL-C-22750, gloss international orange, color no. 12197 of FED-STD-595.

3.13.2 Corrosion-resisting steel (CRES) housings. The exterior finish of CRES housings shall consist of a wash primer conforming to MIL-C-8514 or DOD-P-15328, followed by an epoxy polyamide primer coating conforming to MIL-P-23377 and a topcoat of polyamide epoxy conforming to MIL-C-22750, gloss international orange, color no. 12197 of FED-STD-595.

3.14 Identification and part number marking. Identification data shall be permanently affixed to each equipment unit (optical assembly and power converter unit) and shall contain at least the name of the light, the name of the unit, the part or assembly number, and the name of the manufacturer in accordance with MIL-STD-130. Manufacturers' serial numbers are not required. The parts of the circuits shall be marked with the designations used on the circuit diagrams in accordance with MIL-STD-129 (see 4.6.1 and 6.2).

3.15 Workmanship.

3.15.1 General. The light, including all parts and accessories, shall be constructed and finished in high quality workmanlike manner. Particular attention shall be given to neatness and thoroughness of soldering, wiring, marking of parts and assemblies, welding and brazing, painting, riveting, machine screw assemblies and freedom of parts from burrs and sharp edges (see 4.6.1).

3.15.2 Screw assemblies. Assembly screws shall be tight. The word "tight" means that the screw or bolt cannot be appreciably tightened further without damage or injury to the screw, bolt or threads.

3.15.3 Finish. Painted surfaces shall be free from runs, blotches and scratches.

3.15.4 Cleaning. The light units shall be thoroughly cleaned of loose, spattered or excess solder, metal chips, and other foreign material after final assembly. Burrs and sharp edges, as well as resin flash, shall be removed.

4. QUALITY ASSURANCE PROVISIONS

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

4.1.1 Responsibility for compliance. All items must meet all requirements of Sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in this specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.1.2 Test equipment and inspection facilities. The manufacturer shall assure that test and inspection facilities of sufficient accuracy, quality and quantity are established and maintained to permit performance of required inspections.

4.2 Classification of inspections. 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.

4.3.1 Conditions. Unless otherwise specified herein, all inspections shall be performed in accordance with test conditions specified in the "General Requirements" of MIL-STD-202.

4.4 First article inspection. First article inspection shall be performed at a laboratory acceptable to the Government (see 6.4) on a sample unit produced with equipment and procedures normally used in production.

4.4.1 Inspection routine. The sample unit shall be subjected to the first article inspection specified in Table I in the order shown.

4.4.2 Failures. Any failure shall be cause for rejection of the sample unit until the failure has been corrected. After correction of the failure, all inspection procedures shall be repeated, except those exempted in writing by the responsible Government representative.

TABLE I. First article inspection routine. 1/

Inspection	Requirement paragraph	Method paragraph 2/
Group I		
Visual and mechanical inspection	3.3.6, 3.3.7, 3.4, 3.5, 3.6, 3.8, 3.10.1, 3.10.2, 3.10.3, 3.10.4, 3.11, 3.12, 3.13, 3.14 and 3.15	4.6.1, 4.6.9, 4.6.10, and 4.6.11
Group II		
Input voltage and power	3.3.1, 3.3.1.1 and 3.3.2	4.6.2.1, 4.6.2.2 and 4.6.2.3
Controls and cycling	3.3.3 and 3.3.4	4.6.2.4 and 4.6.2.5
Temperature exposure	3.9.1.1 and 3.9.1.2	4.6.8.1 and 4.6.8.2
Altitude test	3.9.2	4.6.8.3
Atmosphere exposure	3.9.3, 3.9.4, 3.9.5, 3.9.6 and 3.9.7	4.6.8.4, 4.6.8.5, 4.6.8.5, 4.6.8.7 and 4.6.8.9
Group III		
Wind	3.9.8	4.6.8.10
Effective intensity	3.7.1.1, 3.7.1.2, and 3.7.1.3	4.6.3.1, 4.6.3.2 and 4.6.3.3
Color of emitted light	3.7.2	4.6.4
Flash requirements	3.7.3.1, 3.7.3.2, 3.7.3.3 and 3.7.3.4	4.6.5.1, 4.6.5.2, 4.6.5.3 and 4.6.5.4
Group IV		
Dielectric protection	3.3.5	4.6.2.6
Circuits protection	3.3.6	4.6.2.7
Group V		
Lamp life	3.7.4	4.6.6

1/ The first article sample is one complete light with red filter.
2/ A failure during any test procedure is justification for rejection and requires corrective action.

4.4.3 Production for delivery. After the first article inspection has been completed and approved by the procuring activity, production may occur for delivery. For additional procurement, exemption from first article inspection may be requested by providing a certificate of compliance to the procuring activity, or at their request, a complete report on the first article inspection, and certification by the manufacturer that the company still has the capabilities and facilities necessary to produce the lights.

4.5 Quality conformance inspection.

4.5.1 Inspection of product for delivery. Inspections of product for delivery shall consist of Group A and B inspections of Table II.

TABLE II. Quality conformance inspection.

Inspection	Requirement paragraph	Test paragraph
Group A		
Dimensions	3.11	4.6.10
Weight	3.12	4.6.11
Visual	3.8, 3.10.1, 3.10.2, 3.10.3, 3.13, 3.14 and 3.15	4.6.1
Input voltage	3.3.1	4.6.2.1 and 4.6.2.2
Power	3.3.2	4.6.2.3
Intensity steps	3.3.3	4.6.2.4
Cycle operation	3.3.4	4.6.2.5
Peak effective intensity (white)	3.7.1.1	4.6.3.1
Group B		
Beam distribution	3.7.1.3	4.6.3.3
Beam axis location	3.7.1.4	4.6.3.4
Flash rate	3.7.3.1	4.6.5.1

4.5.1.1 Inspection lot. An inspection lot shall consist of light units manufactured under essentially the same conditions and submitted for inspection at substantially the same time.

4.5.1.2 Sampling plan. Each light unit supplied under this specification shall be subjected to the Group A inspection. One light unit shall be selected at random from each lot of 100 units or fraction thereof produced in a lot and subjected to the Group B inspection. For procurement orders subsequent to the order requiring first article testing, one light unit selected at random from the lot may be required to be subjected to any inspection listed in Table I, as specified in 6.2.

4.5.2 Noncompliance. If a light unit fails to pass Group A or B, or any inspection specified in 6.2, the manufacturer shall notify the procuring activity of such failure, and take corrective action on the materials or processes, or both, as warranted, and on all units of product which can be

corrected and which were manufactured with essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of the product shall be discontinued until corrective action, acceptable to the procuring activity, has been taken. After the corrective action has been taken, Group B or any inspection specified in 6.2 shall be repeated on additional sample units (all tests and examinations or the test which the original sample failed, at the option of the procuring activity). Groups A and B inspections may be reinstituted; however, final acceptance and shipment shall be withheld until the Group B or any inspection specified in 6.2 has shown that the corrective action was successful. In the event of failure after reinspection, information concerning the failure shall be furnished to the procuring activity.

4.5.3 Inspection of packaging. Except when industrial packaging is specified, the sampling and inspection of the preservation and interior package marking shall be in accordance with Groups A and B quality conformance inspection requirements of MIL-P-116. The sampling and inspection of the packing and marking for shipment and storage shall be in accordance with the quality assurance provisions of the applicable container specification shown in Section 5 and the marking requirements of MIL-STD-129. The inspection of industrial packaging shall be as specified in the contract (see 6.2).

4.6 Methods of inspection. The methods of inspection of the lights to assure compliance with first article and quality conformance requirements of Sections 3 and 5 are as follows:

4.6.1 Examination of product. The sample lights shall be visually inspected to determine compliance with the requirements herein with respect to materials (3.2), design (3.3), circuits protection (3.3.6), grounding terminal (3.3.7), construction (3.4), hardware (3.5), maintainability (3.6), parts (3.10), color and finish (3.13), identification and marking (3.14) and workmanship (3.15).

4.6.2 Operation. The light shall be completely assembled and operated. It shall be inspected to determine proper operation as follows:

4.6.2.1 Rated input voltage. The light shall function as specified for input voltages when varied between 432 and 528 volts, 60 Hertz, or ±10 percent of other specified input voltage.

4.6.2.2 Input voltage variations. The light shall continue to flash at the required flash rate when the input voltage is varied between 384 and 576 volts, 60 Hertz, or ±20 percent of other specified input voltage. Recovery time after voltage surges cease shall conform to 3.3.1.1.

4.6.2.3 Power demand. For rated input voltage and frequency, the input power and volt-amperes shall be measured for conformance to 3.3.2.

4.6.2.4 Operation and intensity control. The light shall be activated by applying power. The light shall continue to operate for as long as power is applied. By operating a photoelectric control relay or switch in the intensity setting circuit prior to application of power, the flash intensity shall change to the high or low intensity (see 3.3.3).

4.6.2.5 Operation cycling. With the light set for high-intensity and the power applied for approximately 60 seconds, the light shall be immediately reactivated after the previous cycle is completed, and shall operate for three consecutive cycles without failure or indication of damage.

4.6.2.6 Dielectric protection test. With the light in the operating status, but not energized and with the lightning protectors disconnected and the housing of both the optical assembly unit and power converter unit grounded, a 5000 volt potential of 10 milliseconds duration shall be applied repeatedly for 5 times at one second intervals between equipment ground and the conductor of each of the power and control cables. The light shall not fail nor shall there be indication of component damage.

4.6.2.7 Circuit fault protection. Simulated faults in various lights shall be installed and the system energized to determine if the other lights are protected. When operational components replace the simulated faults, the system shall be operational.

4.6.3 Photometric inspection methods. The methods of inspection of the photometric requirements shall be as follows:

4.6.3.1 Effective intensity (white light). With the red filter removed, photometric measurements of the intensity-time characteristics shall be conducted using a procedure similar to that in FAA-E-1100. The effective intensity shall be calculated in accordance with the following equation:

$$I_e = \frac{\int_{t_1}^{t_2} I \, dt}{0.2 + (t_2 - t_1)}$$

where

Ie (candela) is the effective intensity,
I (candela) is the instantaneous intensity, and
t_1, t_2 (second) are the time limits of integration.

The effective intensity is calculated to determine compliance with 3.7.1.1 Measurements shall be made for both high and low intensity settings.

4.6.3.2 Effective intensity (red light). Determine the luminous transmittance of the red filter in combination with the unfiltered light source used in 4.6.3.1. Multiply the unfiltered light output (effective intensity) by the luminous transmittance to determine compliance with 3.7.1.2.

4.6.3.3 Beamspread. With the red filter removed, photometric measurements at 50 percent of the minimum required peak effective intensity of the white light, 4.6.3.1, shall be obtained to determine that the beam distribution is in compliance with 3.7.1.3.

4.6.3.4 Beam axis. Measure the angle between the center of the peak intensity of white light for high intensity setting and the optical axis of the optical assembly as determined by the aiming procedure to determine compliance with 3.7.1.4.

4.6.4 Color of light. The light shall be operated at the high intensity setting with and without the red filters installed, to determine that the color of the emitted light is in compliance with 3.7.2.

4.6.5 Flash requirements.

4.6.5.1 Rate of flashing. The flash rate for both high and low intensity settings shall be determined for compliance with 3.7.3.1.

4.6.5.2 Duration of the flash. Using oscilloscope photographs of the discharge pulse shape or other approved method, the duration of the flash shall be measured to determine compliance with 3.7.3.2.

4.6.5.3 Delay to initial flash. With the light operating at high intensity setting, measure the time elapsed between the application of power and the occurrence of the initial flash for five operating cycles to determine compliance with 3.7.3.3.

4.6.5.4 Flash synchronization. With all wave-off lights connected to flash as a system, initiate 10 operating cycles, 5 on high intensity and 5 on low intensity and by visual observation, determine compliance with 3.7.3.4.

4.6.6 Lamp life test. The sample light with the red filter removed shall have a new lamp installed and shall be operated at high intensity at 90 flashes per minute continuously or continuously in 8-hour periods for a minimum of 500 hours to determine compliance with 3.7.4. After the first hour of operation, the peak effective intensity of the emitted light in the peak of the beam (see 4.6.3.2) shall be measured, and after 500 hours operation, measure the peak effective intensity again to evaluate decrease of intensity. The number of skipped flashes and any occasions of two consecutive skipped flashes over the total test period shall be recorded.

4.6.7 Interlocks. The installation and functioning of the interlock for the power converter enclosure for disconnecting power and discharging capacitors, and the installation of interlocks or safety warning labels on the optical assembly unit shall be checked to determine compliance with 3.8.

4.6.8 Environmental inspection. (NOTE: The high temperature and low temperature exposure tests require performance evaluations of the effective intensity under certain conditions which are not practical for conventional photometric measurements. Effective intensity during these environmental inspections may be determined for the input voltage limits as relative light from the energy delivered to the flashtube by measuring the capacitor's voltage and using curves of capacitance and equivalent series resistance (ESR) versus temperature for the measured voltage on the capacitor. If a similar measurement of the capacitor's voltage for the effective intensity at the time the photometric intensity was measured by integrating the intensity-time response of the flash, an acceptable correlation of effective intensity under the environmental conditions can be obtained.)

4.6.8.1 High temperature exposure. The high temperature test of the sample light shall be conducted in accordance with MIL-STD-810, Method 501.2,

Procedure II, to determine compliance with 3.9.1.1. The light shall be subjected to a stable temperature of +55°C for a period of 4 hours after temperature stabilization. The light shall be operated at plus 10 percent and then minus 10 percent of the rated input voltage. The flash rate and effective intensity shall be checked at both conditions for compliance with 3.7.1.2 and 3.7.3.1. Any deterioration in materials or performance shall be cause for rejection.

4.6.8.2 Low temperature exposure. The low temperature test of the sample light shall be conducted in accordance with MIL-STD-810, Method 502.2, Procedure II, to determine compliance with 3.9.1.2. The light shall be exposed to -55°C or less for 24 hours. The equipment shall be operated at the beginning and end of the test. At the end of the test, with the input voltage at 432 volts or at the specified rated voltage minus 10 percent (see 6.2), the flash rate and effective intensity shall be checked for compliance with 3.7.1.2. Any deterioration in materials or failure to meet specified performance shall be cause for rejection.

4.6.8.3 Altitude test. The altitude test of the sample light shall be conducted in accordance with MIL-STD-810, Method 504.1, with the following modification to Table 504.1-II; omit steps 1a, 6, 8 and 11 and change temperature of step 16 to -55°C and step 10 to +55°C to determine compliance with 3.9.2.

4.6.8.4 Humidity exposure. The humidity test of the sample light shall be conducted in accordance with MIL-STD-810, Method 507.2, Procedure I, except a total of three cycles (72 hours) shall be required and the maximum temperature shall be +55°C to determine compliance with 3.9.3.

4.6.8.5 Salt fog exposure. The salt fog test of the sample light shall be conducted in accordance with MIL-STD-810, Method 509.2, Procedure I, for not less than 168 hours to determine compliance with 3.9.4. Salt buildup as a result of the test may be removed with tap water. Deterioration of any part preventing the light from meeting functional, service and maintenance requirements or surface degradation shall be cause for rejection.

4.6.8.6 Sand and dust exposure. The sand and dust tests of the sample light shall be conducted in accordance with MIL-STD-810, Method 510.2, Procedure I, except steps 2 and 3 shall be deleted, to determine compliance with 3.9.5. The light shall be rotated for two 120 degree increments and the air velocity shall be 2500 $\pm$ 500 feet per minute.

4.6.8.7 Rain exposure. The rain test of the sample light shall be conducted in accordance with MIL-STD-810, Method 506.2, Procedure I, to determine compliance with 3.9.6.

4.6.8.8 Thermal shock test. The sample light shall be subjected to the following thermal shock test to determine compliance with 3.9. With the light connected for operation and the optical assembly heated to a stabilized ambient temperature of +55°C and using chilled water at a temperature between 0°C and 5°C, sprinkle the light emitting window and any other exposed glass,

plastic or metal surfaces of the optical assembly with droplets between 0.5 and 4.5 millimeters in diameter while the light is operating. Any cracking of glass, plastic or metal shall be cause for rejection.

4.6.8.9 Wind test. Evidence shall be provided by either calculations and mechanically applied force or by wind testing. If wind tested, the sample optical assembly unit shall be mounted on a 2 inch section of electrical metallic tubing on an acceptable frangible coupling as for a service installation and shall be subjected to winds of 130 knots or more to determine compliance with 3.9. The winds shall be directed perpendicular to the face and rear of the optical assembly and to each side. For each of the four directions, the wind velocity shall be increased from 0 to 130 knots in 10 seconds or less, and maintained at 130 knots for not less than 10 seconds and repeated for a total of three cycles. Any mechanical failure or evidence of permanent distortion shall be cause for rejection.

4.6.9 Aiming inspection. The sample optical assembly unit shall be mounted as for service and subjected to the following adjustments to determine compliance with 3.10.1g. The aligning of the beam axis shall be rotated through the required horizontal and vertical angular ranges and determined that it can be clamped to maintain any desired alignment in these ranges. Following the manufacturer's instructions for aiming, determine that the beam may be aimed at any desired angle within the tolerances permitted. Ascertain that the vertical aiming indicator will align the axis of the beam within the indicated tolerance.

4.6.10 Dimensional measurements. The sample optical assembly unit and power converter unit shall be measured to determine compliance with 3.11.1 and 3.11.2.

4.6.11 Weighing. The sample optical assembly unit and the power converter unit shall be weighed to determine compliance with 3.12.

5. PACKAGING

5.1 Preservation and packaging. Preservation and packaging shall be Level A or C, as specified (see 6.2).

5.1.1 Level A. Each light shall be packaged one (1) each in accordance with MIL-P-116, Method III. The unit container shall conform to PPP-B-636, Class weather resistant.

5.1.2 Level C. Lights shall be packaged in a manner which affords adequate protection against deterioration and physical damage during shipment from supply source to the first receiving activity for immediate use. This level may conform to the supplier's commercial practice, provided the latter meets the requirements of this level (6.2).

5.2 Packing. Packing shall be Level A, B or C, as specified (see 6.2).

5.2.1 Level A. Lights packaged as specified in 5.1.1 shall be packed in cleated plywood containers conforming to PPP-B-601, overseas type. As far as practical, containers shall be uniform in shape and size and contain identical

quantities. Gross weight shall be limited to approximately 350 pounds. Container closure and strapping shall be in accordance with the appendix to PPP-B-601.

5.2.2 Level B. Level B shall be the same as Level A, except shipping containers shall conform to PPP-B-601, domestic type.

5.2.3 Level C. Lights packaged as specified in 5.1.2 shall be packed in a manner which affords adequate protection against damage during shipment from supply source to the first receiving activity for immediate use. This level shall conform to applicable carrier rules and regulations and may be the supplier's commercial practice, provided it meets the requirements of this level.

5.3 Marking. In addition to any special or other identification marking required by the contract (see 6.2), each unit, supplementary, intermediate and exterior container shall be marked in accordance with MIL-STD-129. The complete military or contractor's part number, as applicable, shall be marked on all unit, supplementary and intermediate packs in accordance with MIL-STD-129.

5.4 General.

5.4.1 Exterior containers. Exterior containers (see 5.2.1, 5.2.2 and 5.2.3) shall be of minimum tare and cube consistent with the protection required and shall contain equal quantities of identical stock numbered items to the greatest extent possible.

5.4.2 Packaging inspection. The inspection of those packaging requirements shall be in accordance with 4.5.3.

6. NOTES

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

6.1 Intended use. The wave-off lights covered by this specification are for use as emergency signals to inform a pilot that he must immediately execute a "go around" procedure to avoid a possible accident. A set of six (6) of these lights located along both sides of the runway near the touchdown area form a wave-off lighting system.

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.

b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).

c. The rated input voltage if other than 480 volts, 60 Hertz (see 3.3.1).

d. The length of the connecting cables for each light (see 3.10.3c).

e. The number of instruction manuals to be provided (see 3.10.4 and 6.3).

f. Any inspection from Table I not included in Table II which is required to assure quality conformance (see 4.5.1.2 and 4.5.2).

g. All or only certain inspection tests to be conducted on additional sample units after corrective action for non-compliance is completed (see 4.5.2).

h. Selection of applicable levels of preservation and packaging and of packing (see Section 5).

i. Industrial or commercial packaging requirements, if such packaging is permitted (see 5.1.2).

j. Special identification markings requirements (see 5.3).

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

Reference Paragraph	DID Number	DID Title	Suggested Tailoring
3.10.4	DI-TMSS-80527	Commercial off-the-shelf manuals	Use contractor format
	DI-TMSS-80528	Supplement for commercial off-the-shelf manuals	
4.4	UDI-T-21349	First article test reports	

The above DIDs were those cleared as of the date of this specification. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs ae cited on the DD Form 1423.

6.4 First article. When a first article inspection is required, the light should be an item produced of the materials, equipment and procedures intended to be used in production or a standard production item from the contractor's current inventory as specified in 4.4. The article should consist of one complete light. The contracting officer should include specific instructions in acquisition documents regarding arrangements for

required (see 3.4.1.1

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

6.5 Subject term (keyword) listing.

Light, wave-off
Light, flashing
Light, emergency

Preparing activity:
Navy - AS
(Project 6210-N647)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions — Reverse Side)

1. DOCUMENT NUMBER	2. DOCUMENT TITLE
MIL-L-29575(AS)	LIGHT, WAVE-OFF, FLASHING, CAPACITANCE-DISCHARGE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)*
	☐ VENDOR
	☐ USER
b. ADDRESS *(Street, City, State, ZIP Code)*	☐ MANUFACTURER
	☐ OTHER *(Specify)*: _____

5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* — Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* — Optional
c. MAILING ADDRESS *(Street, City, State, ZIP Code)* — Optional	8. DATE OF SUBMISSION *(YYMMDD)*

DD FORM 82 MAR 1426 PREVIOUS EDITION IS OBSOLETE.

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

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