

UNITED STATES COAST GUARD
OCEAN ENGINEERING DIVISION
WASHINGTON, D.C.

SPECIFICATION FOR BUOY LANTERN
FOR MARITIME AIDS TO NAVIGATION
SPECIFICATION NO. 205F

CHANGE 1

Make the following changes to the specification:

1. In subparagraph 1.1 and in TABLE 1 of subparagraph 3.3, Type II and Type III lens colors are reversed. Modify the list of lantern types in each section to read:

Type I --- clear lens
Type II --- red lens
Type III --- green lens
Type IV --- yellow lens

2. In subparagraph 3.1.1, the reference to attachment 4 in the third sentence should've been a reference to attachment 2 instead. Change the end of the third sentence to read:

“... fitted with S-8 marine signal lamps (see attachment 2).”

3. Attachment 5 now becomes attachment 4. After making the second change shown above, the reference to attachment 5 in the first sentence of subparagraph 4.3.3.1 becomes a reference to attachment 4. Change the first sentence of 4.3.3.1 to read:

“... except that a focus fixture (see attachment 4) shall be placed in ...”

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July 2001

UNITED STATES COAST GUARD
OCEAN ENGINEERING DIVISION
WASHINGTON, D.C.

JULY 2000

SPECIFICATION G-SEC 205F

BUOY LANTERN FOR MARITIME
AIDS TO NAVIGATION

1. SCOPE. This specification describes the lantern used on buoys and fixed structures to provide a marine aid-to-navigation light signal.

1.1 Classification of Lanterns. The buoy lantern shall be one of the following types:

- Type I — clear lens
- Type II — green lens
- Type III — red lens
- Type IV — yellow lens

2. APPLICABLE DOCUMENTS.

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

2.2 Government Documents.

2.2.1 Specifications, Standards, and Handbooks. The following specifications, standards, and handbooks form a part of this specification to the extent specified herein. Unless otherwise specified, the issues are those listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, or the DOD Index of Specifications and Standards (DODISS), and supplements thereto, cited in the solicitation.

STANDARDS:	MIL-STD-202F 1 April 1980	Test Methods for Electronic and Electrical Component Parts
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Unless otherwise indicated, copies of these documents are available as stated in the solicitation/contract clauses stating availability of specifications and standards listed in the GSA Index of Federal Specifications, Standards and Commercial Item Descriptions, and the DOD Index of Specifications and Standards (DODISS).

2.3 Non-Government Documents and Publications. The following non-government documents form a part of this specification to the extent specified herein.

STANDARDS:	ASTM B117 10 April 1997	Operating Salt Spray (Fog) Apparatus, Standard Practice for
	ANSI / ASQC Z1.4 1 January 1993	Sampling Procedures & Tables for Inspection by Attributes

2.4 Order of Precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been made.

3. PERFORMANCE REQUIREMENTS.

3.1 Design. Buoy lanterns offered under this specification shall be designed to be compatible with the Coast Guard solid-state flasher (see attachment 1) and the Coast Guard six-place lampchanger (see attachment 2). The exact design is at the discretion of the manufacturer, subject to the requirements of this specification and the size limitations illustrated in attachment 3. The lantern shall be pre-focused and require only the addition of a flasher, lampchanger, lamps, photoresistor, wiring, and 12-volt DC power to be fully operational.

3.1.1 Lens. The lens shall be closed-top, circular in cross-section and shall be molded in one piece. The dimensions shall conform to those shown in attachment 3. The interior of the lens shall be large enough for the proper operation of a six-place lamp changer fitted with S-8 marine signal lamps (see attachment 4). The lens shall focus light emitted from a source located at the center of the lens into a horizontal plane. The central plane of the lens shall be marked by four sighting marks, such as circles, crosses, etc., spaced 90° apart. The sighting marks shall be placed in such a manner that the intersection of the two lines joining the centers of the opposing pairs of sighting marks shall accurately locate the focal point of the lens. The closed top of the lens shall be designed to prevent roosting by birds and shall contain a bird spike at least one inch in height.

3.1.2 Lens Hinge. Provision shall be made for attaching the lens to the lantern base by a hinge. The hinge components may be integral with the lens and lantern-base castings or may be separate parts fastened to the lens and lantern base. The hinge shall incorporate a stop to permit the lens to be swung open through at least 90 degrees. The stop shall limit the travel of the lens such that the lens cannot swing into contact with the lantern base or swing into contact with the horizontal plane defined by the bottom of the lantern base. Design of the hinge shall be such that the lens may be swung open without contacting any of the S-8 lamps in a properly installed six-place lampchanger. The strength of the hinge shall be such that no breakage or permanent deformation of any part of the lantern shall occur when the opened lens is allowed to fall against the stop. The hinge pin shall be removable and shall be secured with a vibration-proof fastener.

3.1.3 Lens Fasteners. Provision shall be made for holding the lens in the closed position by at least three equally spaced fasteners. Design of the fasteners shall be at the discretion of the manufacturer, subject to the following restrictions. The fasteners shall be captive to either the lantern base or lens. The fasteners shall provide sufficient closing force to provide a spray tight seal between the lens and lantern base. The fasteners shall not permit relaxation of closing force or accidental release when subjected to the environmental conditions of 3.5. The fasteners shall be capable of being opened and closed by hand, by a number 2 slot-head screwdriver, or by both.

3.1.4 Mounting Bracket. The lantern shall include a bracket that supports a solid-state flasher and six-place lampchanger, and the hardware required to secure the bracket to the lantern base. The bracket shall be fabricated such that the filament of a 12-volt marine signal lamp in the operating position of a six-place lampchanger shall be placed automatically in the focal point of the lens without any further adjustments. Use of shims to position the operating lamp at the focus of the lens is not permitted. The bracket shall have a tangential slot in both ends to permit easy removal, even with a flasher and lampchanger mounted in place. The bracket shall be attached to the lantern base with two 10-32 filister-head or pan-head stainless steel screws with slotted heads.

3.1.5 Lantern Base. The lantern base shall incorporate bosses and screw inserts to permit rigid attachment of the mounting bracket. Orientation of the bracket shall be parallel to the axis of the hinge pin. The base shall contain two $\frac{3}{4}$ inch NPT threaded holes, as illustrated in attachment 3. One hole shall be plugged with a suitably lubricated, threaded plastic pipe plug, with a square external boss. The other hole shall be provided with a stuffing tube/packing gland assembly sized for 0.605 inch O.D. rubber-covered cable. If the holes are arranged vertically, the upper one shall contain the pipe plug and the lower one shall contain the stuffing tube. On the side of the lantern base opposite the required cable entrances, there shall be either a third $\frac{3}{4}$ inch NPT threaded hole with a suitably lubricated threaded plastic pipe plug installed or a flat surface or a boss sized for tapping a $\frac{3}{4}$ inch NPT threaded hole. The base shall be designed so that it can be mounted to a planar supporting structure by three $\frac{1}{2}$ inch diameter bolts spaced 120 degrees apart on a $7\frac{7}{8}$ inch diameter bolt circle. Bolt holes shall be $\frac{5}{8}$ inch diameter and may be elongated to form closed tangential slots. Design of the base shall be such that the material in the vicinity of the bolt holes is the only area of contact with the supporting structure. These contact areas shall define a plane parallel to the focal plane of the lens when the lens is fastened in the closed position. The vertical thickness of material surrounding the bolt holes shall be between $\frac{1}{2}$ and 1 inch. Design of the mounting bolt portion of the base shall be conservative from a strength standpoint. Strength shall be as high as practicable, consistent with good molding practice. All other parts of the base shall be elevated no less than $\frac{1}{16}$ inch from the supporting structure, to permit air circulation under the lantern. There shall be three or four $\frac{1}{16} \pm \frac{1}{64}$ inch diameter drain holes positioned as illustrated in attachment 3.

3.1.6 Weight. The weight of the lantern shall not exceed 8 pounds.

3.2 Workmanship. All components of the lantern shall be free of cracks, burrs, sharp cutting edges, and other defects and blemishes affecting their life, appearance and serviceability. Castings shall be uniform in composition and free of blowholes, cracks, shrinks and other discontinuities prior to anodizing, annealing, sealing and/or other treatments.

3.2.1 Materials. All materials shall be selected and treated, as necessary, to withstand the rigors of service in the marine environment, as described in section 3.5, below.

3.2.2 Finish. External components shall have a smooth finish, and shall be uniform in color and appearance. All external metallic pieces, except marine grade stainless steel,

shall be painted. Paints shall be selected to withstand the rigors of the marine environment for a minimum of ten years.

3.3 Optical Performance. The ratio of the horizontal candlepower of the projected beam of the lantern to the horizontal candlepower of the bare lamp, known as the lens-to-lamp candlepower ratio, shall be used as a measure of the optical performance and light transmission of the lens. For this specification, the test lamp shall be a 12-volt, 0.77 ampere, S-8 bulb, marine signal lamp, with a C-8 filament that is 7.0 millimeters in height, operated at 12 volts DC. The lens shall be of such uniformity that the candlepower value, in any direction in the focal plane, shall not vary more than 15 percent about the mean, with the exception that the candlepower in the immediate vicinity of molding seams shall not be less than 60 percent of the mean over an angle of not more than 2 degrees. The average lens-to-lamp candlepower ratio, taken through 360 degrees in azimuth in the focal plane of the lantern shall not be less than shown in Table 1.

TABLE 1

<u>Lantern Type</u>	<u>Ratio</u>
Type I — clear	14.0
Type II — green	4.0
Type III — red	4.0
Type IV — yellow	8.0

3.3.1 Vertical Divergence. The vertical beam profile shall be such that the angle between the 50 percent intensity points above and below the horizontal is not less than 4 degrees. The peak intensity of the beam shall be within 0.55 degrees of the horizontal plane.

3.3.2 Chromaticity. The following requirements shall apply to the light transmitted by the lens, regardless of direction, including through its closed top. The x and y are the tristimulus color coordinates, based on the 1931 CIE chromaticity diagram.

- a. Type I lanterns shall have “x” and “y” chromaticity coordinates within the region bounded by these equations:

$$\begin{array}{lll} x = 0.500 & x = 0.285 & y = 0.382 \\ y = 0.440 & y = 0.150 + 0.640x & y = 0.047 + 0.762x \end{array}$$

- b. Type II lanterns shall have “x” and “y” chromaticity coordinates within the following region:

$$\begin{array}{l} 0.300 \leq y \leq 0.335 \\ x \geq 0.980 - y \end{array}$$

- c. Type III lanterns shall have “x” and “y” chromaticity coordinates within the following region:

$$\begin{array}{l} 0.195 \leq x \leq 0.215 \\ 0.480 \leq y \leq 0.500 \end{array}$$

- d. Type IV lanterns shall have “x” and “y” chromaticity coordinates within the following region:

$$0.435 \leq y \leq 0.415, \text{ and} \\ x = -1.075y + 1.023$$

3.4 Nameplate. A nameplate shall be permanently displayed on the lantern base. The nameplate may be a part securely attached to the base or consist of the required information molded or stamped into the base. The minimum information on the nameplate shall be the manufacturer's code and production lot identifier.

The manufacturer's code will be supplied by the Specification Preparing Activity. The production lot identifier shall be the date of the last delivery for a given delivery order, for example: SEPT 96. This information shall be legible for the life of the lantern.

3.5 Environmental Conditions. The lantern shall operate satisfactorily in the following environmental conditions:

3.5.1 Ambient Temperature. The lantern shall be capable of continuous reliable operation over the temperature range from -10°F to 140°F.

3.5.2 Humidity. Operation shall be possible at relative humidity ranging up to 95 percent for both continuous and intermittent periods, including conditions where condensation takes place in and on the lantern in the form of both water and frost.

3.5.3 Wind Speed. The lantern shall withstand, without damage, winds having relative velocity as great as 100 knots.

3.5.4 Icing. The lantern shall withstand an ice load of 4.5 pounds per square foot.

3.5.5 Salt Air and Seawater. Each lantern shall be constructed to operate under and withstand continuous exposure to salt air and intermittent exposure to seawater. The nameplate shall remain attached to the lantern and remain legible.

3.5.6 Shock and Vibration. Each lantern shall be constructed to operate under and withstand continuous exposure to the shock and vibration experienced on navigational buoys. Lanterns shall be capable of passing the shock and vibration tests specified in section 4.3.4.

4. INSPECTION AND ACCEPTANCE.

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

- a. Qualification: 4.3
- b. Production: 4.4

4.2 Responsibility.

4.2.1 Qualification Tests Responsibility. All qualification tests are the responsibility of the contractor and shall be conducted at a facility acceptable to the Government. A test plan shall be submitted to the Specification Preparing Activity not later than 40 days prior to the commencement of qualification testing. At a minimum this plan shall include:

- a. A chronological listing of the tests to be performed;
- b. Location of the test facility;
- c. A complete listing of all equipment to be used;
- d. Detailed test procedures for each test and with wiring diagrams of test setups and pass/fail criteria;
- e. All information necessary to fully describe the test;
- f. Test data sheets shall be provided with the test plan and shall be used to record observed performance data; and
- g. Examples of calculations needed to evaluate test data.

4.2.2 Report on Qualification Tests. A final report shall be submitted to the Specification Preparing Activity within ten days after completion of the qualification tests. The report shall include at a minimum:

- a. All test data sheets with recorded measurements and observations;
- b. All calculations and graphics used to evaluate the data; and
- c. A list of all failed tests.

4.2.3 Production Inspection Responsibility. The contractor shall conform to all requirements of the Federal Acquisition Regulations (FAR) Part 52.246—1, contractor Inspection Requirements, and Part 52.246—2 Inspection of Supplies, Fixed Price.

4.3 Qualification.

4.3.1 Qualification Tests. Upon notification to the Specification Preparing Activity of a desire to be placed on the Qualified Products List (QPL), the contractor shall provide to the Specification Preparing Activity a detailed test plan of the qualification testing. After approval of the qualification test plan by the Specification Preparing Activity the contractor shall notify the Specification Preparing Activity one week prior to the start of testing. The Government shall have the right to monitor any and all qualification tests. Tests 4.3.3 through 4.3.5.2, inclusive, shall be performed in the order listed.

4.3.2 Test Samples. Manufacturers desiring to qualify lanterns for the QPL shall submit sample lanterns of each of the four types. The number of lanterns of each type submitted shall be as follows:

Two (2) Type I

One (1) Type II

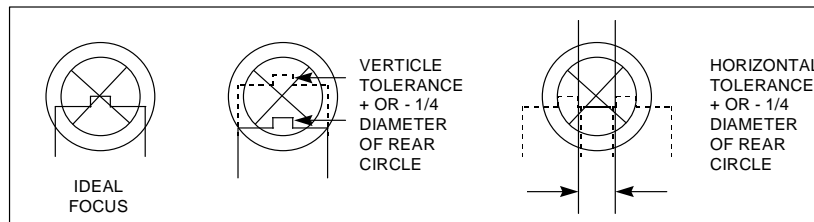
One (1) Type III

One (1) Type IV

Two (2) Type I lanterns shall both be subjected to all the tests of 4.3.3 through 4.3.4.6 inclusive. These two lanterns and one (1) each Type II, Type III, and Type IV lanterns shall then be subjected to the tests in 4.3.5.1 and 4.3.5.2.

4.3.3 Material and Dimension Test. Lanterns shall conform to all dimensions, tolerances, and materials listed in this specification, as outlined in paragraphs 3.1 through 3.2.2, inclusive, and 3.4, and accompanying drawings and documents.

4.3.3.1 Lens Quality Test. Each of the Type I lanterns shall be equipped as described in 4.3.5.1, except that a focus fixture (see attachment 5) shall be placed in the first position of the CG-6P lampchanger. The test shall consist of using the four sighting marks located at 90° intervals around the lens to ensure that the tip of the focus fixture is properly located at the focal point of the lens, as shown in this diagram:



4.3.3.2 Acceptance/Rejection Criteria. Failure of any one lantern to comply with the requirements of paragraphs 3.1 through 3.2.2, inclusive, and 3.4, and the dimensions and limitations listed in attachment 3 shall constitute failure of the qualification procedure and shall be reason not to qualify a manufacturer's product.

4.3.4 Environmental Tests. Two (2) Type I lanterns shall be subjected to the environmental tests of 4.3.4.1 through 4.3.4.6, inclusive.

4.3.4.1 Shock. Lanterns shall be rigidly mounted to a planar supporting structure by three ½ inch diameter bolts through the base mounting holes. A Coast Guard six-place lampchanger and solid-state flasher shall be mounted on the flasher/lampchanger support bar. The lens shall be fastened closed. Lanterns shall be subjected to the shock test of MIL-STD-202, Method 213, Test Condition I. Shock shall be applied on the following axes:

Axis I: Parallel to Hinge Pin

Axis II: Vertical Axis to Lantern

Axis III: Mutually Perpendicular to I and II

Shock tests shall be performed as soon as possible after removing the lanterns from a two-hour confinement in a chamber at -10°F.

4.3.4.2 Vibration. Lanterns shall be prepared and mounted as in 4.3.4.1. Lanterns shall be vibration tested in accordance with MIL-STD-202, Method 204, Test Condition D with amplitude reduced to 5G. The axes used for application of vibration shall be those listed in 4.3.4.1. This test shall be conducted as soon as possible after removing the lanterns from a two-hour confinement at -10°F. The test duration shall be reduced to three 20-minute cycles in each of the three axes.

4.3.4.3 Hinge Drop Test. The lanterns shall be mounted as in 4.3.4.1 on a vertical mounting plane with the hinge pin horizontal in such a manner that the lens will fall open against its stop when the lens fasteners are released. The test shall consist of allowing the lens to fall open from the closed position a total of ten (10) times. This test shall be conducted as soon as possible after removing the lanterns from a two-hour soak at -10°F.

4.3.4.4 Acceptance/Rejection Criteria. After the shock, vibration, and hinge drop test the lanterns shall show no evidence of structural fatigue or failure and no chemical or physical change in the materials used. This includes stress cracks, permanent deformation, corrosion, fastener failure or accidental release, loosening of screw inserts, or any other change that departs from the requirements of this specification. Identification of one such defect shall constitute failure of the qualification procedure and shall be reason not to qualify the product.

4.3.4.5 Spraytight Test. Lanterns shall be subject to a spraytight test in accordance with MIL-STD-202, Method 101. Drain holes shall be plugged for this test. The test duration shall be 48 hours.

4.3.4.6 Salt Spray (corrosion). Lanterns shall be mounted vertically and subjected to the salt spray test of ASTM B117.

4.3.4.7 Acceptance/Rejection Criteria. Lanterns shall show no sign of leakage or accumulation of water after the spraytight test. Corrosion shall not deteriorate the performance or the use of fasteners, pipe plugs, nameplate and hinges. Identification of one such defect shall constitute failure of the qualification procedures and shall be reason not to qualify the product.

4.3.5 Optical tests. Lanterns shall be subjected to the optical tests of 4.3.5.1 and 4.3.5.2. Lenses shall be cleaned carefully before performance of these tests.

4.3.5.1 Photometric Test. The optical performance and vertical divergence shall be tested as follows. The lamp described in 3.3 shall be used, and it shall be operated in a Coast Guard standard six-place lampchanger (CG-6P). The lampchanger shall be loaded with one lamp in the first position for these tests. The lantern shall be rotated about a vertical

axis through the lens' focal point, and the light intensity in the horizontal plane measured at intervals of one degree of azimuth. The average horizontal intensity shall be calculated. The ratio of this average horizontal intensity to the average horizontal intensity calculated for the bare lamp shall be computed. The lantern shall be rotated about a horizontal axis and the light intensity in the vertical plane shall be recorded as a function of angle of elevation. This vertical profile test shall be conducted twice for each lantern using perpendicular horizontal axes chosen such that the lamp filament support does not obscure the light in the direction of measurement.

4.3.5.2 Chromaticity and Transmittance Ratio. The spectral transmittance ratio as a function of wavelength of each lantern lens shall be measured with a spectroradiometer using a source of 2850 degrees K color temperature. Orientation shall be such that the lamp filament support does not obscure light in the direction of measurement. Chromaticity coordinates for Type I, II, III and IV lenses shall be computed. Transmittance ratios of Type II, III and IV lenses relative to Type I lenses shall be computed.

4.3.5.3 Acceptance/Rejection Criteria. Failure to meet any requirement of paragraphs 3.3, 3.3.1, and 3.3.2 in tests 4.3.5.1 and 4.3.5.2 shall constitute a failure of the qualification procedure and shall be reason not to qualify the product.

4.4 Production Inspections. Production inspection shall consist of the tests in paragraphs 4.3.3, 4.3.3.1, and 4.3.4.3. The inspections required in this paragraph are not intended to replace or substitute any controls, examinations, inspection, or tests normally employed by the contractor to assure the quality of this product. If this specification is used to buy only lenses, the manufacturer shall supply the bases and hardware necessary to perform the hinge drop test of 4.3.4.3.

4.4.1 Contractor's Calibration System. The contractor shall maintain a calibration and maintenance system to control the accuracy of measurement and test equipment used in the fulfillment of this specification. The system shall include, as a minimum, prescribed calibration intervals. Source of calibration and monitoring system to this requirement shall be readily available to the Coast Guard Inspector. Calibration shall be traceable to the National Institute of Standards and Technology.

4.4.2 Inspection Lot. A lot shall be all of the lanterns from an identifiable production period from one manufacturer and one plant and submitted for acceptance at one time.

4.4.3 Sample Size. The inspection sample size for tests 4.3.3 and 4.3.3.1 shall be in accordance with General Inspection Level I, Table I of ASQC Z1.4. Three lanterns from each production lot shall be subjected to test 4.3.4.3.

4.4.4 Acceptance/Rejection Criteria. An acceptable quality level 4.0 in Table I-A of ASQC Z1.4 shall apply for tests 4.3.3 and 4.3.3.1. Any damage to one or more of the three lanterns in test 4.3.4.3 is deemed a failure of the entire production lot.

4.4.5 Resubmitted Lots. If an inspection lot is rejected, the manufacturer may rework the lot or screen out defectives and resubmit it for inspection. Resubmitted lots shall be kept

separate from new lots. The sample size shall be determined by Inspection Level II, Table I and acceptable quality level 4.0 in Table I-A of ASQCC Z1.4 for tests 4.3.3, 4.3.3.1, and 4.3.4.3.

5. PREPARATION FOR DELIVERY.

5.1 Packaging. Packaging requirements are specified in Section D, Part I, Contract Schedule.

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