CIVIL ENGINEERING DIVISION

UNITED STATES COAST GUARD

WASHINGTON, D.C.

JULY 1995

SPECIFICATION G-ECV 409-A
(INCLUDING CHANGE-1)

14-INCH RANGE LANTERN

1.0 SCOPE OF WORK

1.1 Purpose. This procurement is for a directional range lantern for use as a marine aid to navigation signal. Lanterns shall be manufactured in accordance with the attached Technical Data Package. The lantern will be used on fixed structures.

1.2 Major Hardware Deliverables.

a. Range lantern; as described in this specification and in the attached Technical Data Package.
b. Installation kits; as described in Section 3.4.

1.3 Major Documentation Deliverables.

a. Technical manual; in accordance with Section 3.5.

The U. S. Coast Guard shall be authorized to reproduce the above documentation, for the sole use of the U. S. Government, without a fee or notification to the manufacturer.

1.4 Government Furnished Property (GFP).

a. Two (2) 12VDC, solid-state flasher, Type CG-181.
b. Two (2) 12VDC, six-place lampchanger, Type CG-6P.
c. Two (2) Wire, Lug & Wiring Kit, Type WK-681.
d. Two (2) CG-234 Photoresistor (daylight control), Type L.
e. Ten (10) 12VDC, 1.9 amp, CC-8 filament lamps, S-11 bulb.
f. Two (2) 120VAC, solid-state flasher, Type FLAC-300.
g. Two (2) 120VAC, four-place lampchanger, Type CG-4P.
h. Two (2) Photoresistor (daylight control), Type K.
i. Eight (8) 120VAC, 150 watt, tungsten-halogen lamps.

2.0 APPLICABLE DOCUMENTS.

2.1 Government Documents. The following documents of the issues specified form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document will be omitted from future references to the document in this statement of work.

2.1.1 U. S. Coast Guard Specifications.

a. G-SEC-487A 18 Apr 2000 — 12-volt DC Marine Signal Lamps.

2.1.2 Federal Standards.

a. FED-STD-101C 19 May 1998 — Test Procedures for Packaging Materials.

2.1.3 Military Standards.

a.	MIL-STD-129N 15 May 1997	Markings for Shipment and Storage
b.	MIL-STD-810F(1) 01 Jan 2000	Environmental Test Methods and Engineering Guidelines.

2.2 Drawings. The latest revisions of the following U. S. Coast Guard drawings form a part of this specification to the extent referenced herein. These drawings comprise the attached Technical Data Package (TDP). Reference to "the drawings" or "the TDP" shall be understood as referring to one or more or all of these drawings.

a.	ECV 165001	14" Range Lantern.
b.	ECV 165002	Drum Assembly for 14" Range Lantern.
c.	ECV 165003	Drum Weldment for 14" Range Lantern.
d.	ECV 165004	Base Assembly Weldment for 14" Range Lantern.
e.	ECV 165005	12VDC Installation Kit for 14" Range Lantern.
f.	ECV 165006	120VAC Installation Kit for 14" Range Lantern.

2.3 Other Publications. The following documents of the issues specified form a part of this specification to the extent referenced herein. Suffixes denoting the specific issue of each document will be omitted from future references to the document in this statement of work.

2.3.1 American Society for Quality Control (ASQC).

a.	ANSI/ASQC C1-1996	American National Standard; Specification of General Requirements for a Quality Program.

2.3.2 International Association of Lighthouse Authorities (IALA).

a.	IALA Report #72 Dec 1977	Recommendation for the Colors of Light Signals on Aids to Navigation.

2.3.3 American Society for Testing and Materials.

a.	ASTM D 3951 10 Nov 1998	Standard Practice for Commercial Packaging

2.3.4 AIM USA

a.	ANSI/AIM BC 1 16 Aug 1995	Uniform Symbology Specification Code 39

3.0 REQUIREMENTS

3.1 General. Each range lantern shall be delivered fully assembled so that after installing lamps, lampchanger, flasher, photoresistor, and wiring (using the appropriate installation kit), applying power results in a fully operational, focused range lantern. Restraints to protect the mirror are allowed in shipping, but they must be labeled and easily removed by hand.

3.1.1 Design and Construction. Range lanterns offered for acceptance under this specification shall be fully compatible with the GFP (1.4), and shall conform in design, dimensions, tolerances, materials used, and treatments to those specified in the TDP. All screws shall have slotted heads.

3.1.1.1 Discrepancies in TDP. The contractor is required to notify the government of discrepancies, errors or other problems with the TDP, or with the ability of a range lantern manufactured in accordance with the TDP to meet the requirements of this specification.

3.1.2 Nameplate. An identification plate shall be manufactured and installed on the exterior of each range lantern in accordance with the drawings. The manufacturer's identification code, required for Drawing ECV 165001-24, shall be provided by the Contracting Officer upon award of a contract for range lanterns.

3.2 Modes of Operation. The range lantern shall be capable of the following modes of operation:

3.2.1 12-volt DC. In this mode, the range lantern is outfitted with a CG-6P lampchanger, a CG-181 flasher, a CG-234 Type L photoresistor and any of the 12-volt lamps described in specification G-SEC-487A.

3.2.2 120-volt AC. 120-volt lamps approved for use in the range lantern include 150 watt and 250 watt CC-8 tungsten-halogen lamps with DC bayonet mounts. Modes of operation with 120-volt lamps are:

3.2.2.1 120-volt AC - Fixed-On. In this mode the range lantern is outfitted with a CG-4P lampchanger and 120-volt lamps.

3.2.2.2 120-volt AC - Fixed-On with Daylight Control. In this mode the range lantern is outfitted with a CG-4P lampchanger, a Type K photoresistor (daylight control), and 120-volt lamps.

3.2.2.3 120-volt AC - Flashing. In this mode the range lantern is outfitted with a CG-4P lampchanger, a FLAC-300 flasher, a CG-234 Type L photoresistor, and 120-volt lamps.

3.3 Optical Performance. Range lanterns shall provide the following minimum average peak intensities (fixed on) and full width at half maximum (FWHM) beam width when outfitted with the lamps specified, and with a clear cover window in place:

Lamp	Initial Lumen Output (lm)	Peak Intensity (cd)	FWHM (degree)
12-volt DC			
1.9A CC-8	390	400,000	0.80
110W T-H	2700	1,300,000	1.00
120-volt AC			
150W CC-8	2800	750,000	1.40
250W CC-8	4850	750,000	2.00

3.3.1 Variance in Optical Performance. The peak intensity (fixed on) and FWHM for each range lantern offered for acceptance under this specification shall not vary by more than 15% from the average peak intensity and FWHM, for a given lamp.

3.3.2 Chromaticity. Projected light from range lanterns shall satisfy the following chromaticity requirements, in terms of the CIE 1931 Standard Colorimetric System (see IALA Report #72):

a. White projected light shall be within the region bounded by the following relations:

$y = 0.382$, x equal or greater than 0.440;
$y = 0.047 + 0.762x$, x less than 0.440;
$x = 0.285$;
$y = 0.150 + 0.640x$;
$y = 0.440$; and
$x = 0.500$.

b. Yellow projected light shall be within the region bounded by the following relations:

$y = x - 0.200$
$y = 0.951 - 0.930x$; and
$y = x - 0.120$.

c. Green projected light shall be within the region bounded by the following relations:

$y = 4.50 - 12.5x$;
$y = 1.54x$; and
$y = 0.390 - 0.171x$.

d. Red projected light shall be within the region bounded by the following relations:

$y = 0.980 - x$; and
$y = 0.335$.

3.3.3 Transmittance Ratio. Colored cover windows/lenses shall have minimum transmittances, in terms of a clear cover window/ lens, of:

Lamp Type	Yellow	Red	Green
a. 12-volt DC			
tungsten-filament	0.43	0.18	0.23
tungsten-halogen	0.43	0.15	0.24
b. 120-volt AC	0.50	0.19	0.25

3.4 Installation Kits. The following installation kits shall be supplied with each range lantern:

a. 12-volt Installation Kit. This installation kit, labeled "12 VOLT RANGE LANTERN," shall be provided as specified in the drawings.

b. 120-volt Installation Kit. This installation kit, labeled "120 VOLT RANGE LANTERN," shall be provided as specified in the drawings.

3.5 Technical Manual. One technical manual shall be provided with each range lantern. The manual shall include instructions for installation, maintenance, repair, and cleaning of the range lantern, and any necessary safety instructions. Each component of the range lantern shall be identified. Drawings, photographs and illustrations shall be used where appropriate to facilitate understanding of the instructions. The instructions for repair or replacement of components shall be described so a high school graduate can perform these tasks.

4.0 QUALITY ASSURANCE PROVISIONS

4.1 Quality System. The contractor's quality assurance program shall meet the minimum requirements of ANSI/ASQC C-1.

4.2 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, a prescribed calibration interval, the source of calibration, and a monitoring system. The calibration documentation and monitoring system shall be available for review by U. S. Coast Guard inspectors upon demand.

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

a. First article test (Section 4.4.2); and
b. Production inspection (Section 4.4.3).

4.4 Inspection.

4.4.1 Responsibility.

4.4.1.1 First Article Test Responsibility. The U. S. Coast Guard will be responsible for the performance of the first article tests listed in Section 4.4.2. These tests will be performed on each of three prototype range lanterns, unless otherwise stated in this specification. Each of the three range lanterns shall conform to the acceptance/rejection criteria for the visual (4.4.2.1.1), environmental (4.4.2.2.3), optical (4.4.2.3.3), hardware interchangeability (4.4.2.4.1), and rough handling (4.4.2.5.1) tests. The following items shall be submitted for first article tests:

Three (3) range lanterns with clear cover windows and installation kits

4.4.1.2 Production Inspection Responsibility. The contractor shall be responsible for production inspection. Production inspections may be witnessed by the Contracting Officer's Technical Representative. The Contracting Officer shall be notified of inspections at least 15 days before they are scheduled. Except as noted in the contract or purchase order, the contractor may select the facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Contracting Officer. The U. S. Coast Guard reserves the right to perform any of the inspections set forth in this specification to ensure deliverables conform to the prescribed requirements.

4.4.2 First Article.

4.4.2.1 Visual Inspection. Each range lantern will be visually examined and operated at standard ambient conditions, as described in 5.1 of MIL-STD-810, to ensure compliance with the following requirements:

a. General (Section 3.1);
b. Modes of Operation (Section 3.2); and
c. Installation Kits (Section 3.4).

4.4.2.1.1 Acceptance/Rejection Criteria. Failure of any range lantern to comply with all aspects of Sections 3.1, 3.2 and 3.4 shall constitute a failure, and shall be cause to reject the first article units.

4.4.2.2 Environmental Tests.

4.4.2.2.1 Salt Fog Test. One range lantern, outfitted for the 12-volt DC mode of operation (3.2.1), less lamps, will be subjected to the salt fog test of MIL-STD-810; method 509.3, using a 5 percent salt solution. The lantern will be subjected to two cycles of 24 hours of salt fog exposure followed by 24 hours of drying, at a constant temperature of +95 degrees F. Following the test, the lantern will be inspected for corrosion, lamped and powered. Evidence of corrosion or failure of the lamp to light shall constitute failure. The lantern will be cleaned of salt residue following this test.

4.4.2.2.2 Rain Test. One range lantern, outfitted for the 12-volt DC mode of operation (3.2.1), including lamps, will be subjected to the rain test of MIL-STD-810; method 506.3, procedure III. All drain holes and openings will be plugged for this test. Immediately after the rain test the lantern will be powered. The lamp shall light or the lantern fails. At the conclusion of the test, the lantern will be opened and inspected for evidence of leakage.

4.4.2.2.3 Acceptance/Rejection Criteria. Range lanterns shall not show signs of leakage or accumulation of water after the salt fog and rain tests. Any noticible film, water droplets or accumulation of water inside the lantern is unacceptable and cause for rejection. Corrosion shall not degrade the performance or use of fasteners, mounting bolts, pipe plugs, nameplates or hinges. Corrosion which reduces the lamp circuit conductivity, degrades the lamp life or lumen emission, or degrades the performance of the lantern from that specified shall be cause to reject the first article units.

4.4.2.3 Optical Measurements. All three first article units will be subjected to the optical measurements outlined in 4.4.2.3.1 and 4.4.2.3.2, below. Optics will be carefully cleaned before the performance of these measurements. The range lanterns will be taken apart and reassembled in accordance with the manufacturer's instructions prior to these tests. The tests will be performed for both the 12-volt DC (3.2.1) and 120-volt AC - fixed on (3.2.2.1) modes of operation. For the 12-volt DC mode of operation the lantern will be fully lamped with 1.9A CC-8 lamps, and the input voltage will be set at 12.00 volts DC, as measured at the lampchanger terminals. For the 120-volt AC mode of operation the lantern will be fully lamped with 150 watt lamps, and the input voltage will be set at 120.0 volts DC, as measured at the lampchanger terminals.

4.4.2.3.1 Photometric Measurements. The range lanterns will be mounted on a goniometer table and the peak intensity point of the beam will be located. The table will be rotated about a vertical axis through the focal point of the lantern and normal to the optical axis of the lantern. The luminous intensity in the horizontal plane will be measured at intervals of 0.1 degrees (azimuth) for the beam. The vertical intensity profile will be measured by locating the peak horizontal intensity point and rotating the beacon in the vertical plane which is coincident with the optical axis of the emitted beam. Measurements will be taken at intervals of 0.1 degrees (elevation). The photometric measurements will be conducted for all the lamps in the lampchanger. The angular separation of the peak intensity point of subsequent beams from the initial beam shall be recorded. The measured intensity [I(meas)] will be corrected for variation in lumen output (LUMENS) and variation in filament length (L) as follows:

$$I(corr) = I(meas) \times \frac{L(meas) \times Lumens(ideal)}{L(ideal) \times Lumens(meas)}$$

4.4.2.3.2 Chromaticity and Transmittance Ratio. The peak intensity and chromaticity coordinates, in terms of the CIE 1931 standard colorimetric system (see IALA Report #72), for a range lantern outfitted with clear, yellow, green, and red cover windows, for both 12VDC 1.9A CC-8 and 120VAC 150 watt lamps, will be determined. The transmittance ratio of the yellow, green, and red cover windows, relative to the clear cover window, will be computed. (Note: This test is performed only if red, yellow or green lanterns are purchased).

4.4.2.3.3 Acceptance/Rejection Criteria. Failure of any range lantern to meet the requirements of Section 3.3 shall constitute a failure, and shall be cause for rejection of the first article units.

4.4.2.4 Hardware Interchangeability. The lampchanger mounts for two range lanterns picked at random will be exchanged, and the photometric testing (4.4.2.3.1) repeated. Next, the lampchanger mounting spacers will be exchanged and the photometric testing repeated. Finally, the mirror assemblies will be exchanged and the photometric testing repeated.

4.4.2.4.1 Acceptance/Rejection Criteria. Failure of any configuration of range lantern and components to comply with all the requirements of 3.3 and 3.3.1 shall constitute a failure, and shall be cause to reject the first article units.

4.4.2.5 Rough Handling Test. Using production packaging, the three first article units will be subjected to the following tests for Level B packing in accordance with FED-STD-101:

5005, 5007 (Procedures B and E only), 5008, 5012, 5016,
5017, 5018, 5019, 5020, and 5023.

4.4.2.5.1 Acceptance/Rejection Criteria. Functional or physical damage to any lantern, and/or functional damage to the packaging, including structural damage which may result in damage to a lantern during subsequent shipping, handling or storage, shall be cause for rejection of the proposed production packaging.

4.4.3 Production Inspection. The Contractor shall maintain an inspection system to ensure each range lantern offered to the U.S. Coast Guard for acceptance conforms to the contract requirements. The inspection system shall be documented and available for review by the Contracting Officer's designated representative. All lanterns shall meet all requirements of Sections 3 and 5 of this specification. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility for ensuring that all deliverables submitted to the U. S. Coast Guard for acceptance comply with all requirements of the contract. Section 4.4.3.2 establishes the minimum requirements for production inspection.

4.4.3.1 Contractor's Records. The Contractor shall maintain records of all inspections and tests. The records shall indicate the nature and number of observations made, the number and type of deficiencies found, and the corrective action(s) taken.

4.4.3.2 Production Quality Assurance. The contractor shall conduct the following inspections (examinations and tests) of range lanterns offered to the U. S. Coast Guard:

4.4.3.2.1 Visual Inspection. Each range lantern (100%) will be visually examined and operated at standard ambient conditions, as defined in 5.1 of MIL-STD-810, to ensure compliance with the following requirements:

a. General (Section 3.1);
b. Modes of Operation (Section 3.2); and
c. Installation Kits (Section 3.4).

4.4.3.2.2 Acceptance/Rejection Criteria. Failure of any range lantern to comply with all aspects of Sections 3.1, 3.2 and 3.4 shall constitute a failure, and shall be reason to reject that individual lantern.

4.4.3.3 Certificate of Conformance for Colored Lenses. The contractor shall certify that all colored lenses, offered for acceptance by the U. S. Coast Guard, conform to the requirements of chromaticity (3.3.2) and transmissivity (3.3.3).

5.0 PREPARATION FOR DELIVERY.

5.1 Inspection and Acceptance. The contractor shall conform to all requirements of the Federal Acquisition Regulations (FAR), Part 52.246-02: Inspection of Supplies-Fixed Price, Part 52-246-15: Certificate of Conformance and Part 52-246-16: Responsibility for Supplies.

5.2 Preparation for Delivery.

a. Packaging. Preservation, packing, and packaging shall be in accordance with ASTM D 3951 Standard Practice for Commercial Packaging, and shall assure delivery at destination and to prevent deterioration of supplies and damages due to hazards of shipping, handling, and storage.

b. Marking. Containers shall be marked in accordance with MIL-STD-129; national stock number bar codes are required in accordance with ANSI/AIM BC 1. Precautions necessary for the full protection of the beacons shall be prominently displayed as specified in MIL-STD-129.

Marking shall include the following information:

1. National Stock Number
2. Item Name
3. Part Number
4. Serial Number
5. Contact number
6. Delivery Order Number
7. Condition Code
8. Quantity and Unit of Issue

5.3 Turn Key Lantern. Each range lantern shall be delivered fully assembled. Application of power after installation of lamps, lampchanger, flasher, photoresistor, and associated wiring shall result in a fully operational lantern. Restraints to protect lantern components are allowed in shipping. Restraints must be labeled and easy to remove by hand.

SPECIFICATION FOR 14-INCH RANGE LANTERN

SPECIFICATION NO. 409-A

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CONTRACT DATA REQUIREMENTS LIST

(1 Data Item)

COMMERCIAL OFF-THE-SHELF MANUALS

Attachment (1)

TECHNICAL DATA PACKAGE

FOR

14-INCH RANGE LANTERN

The attached Technical Data Package (TDP) is the property of The Carlisle & Finch Company, Cincinnati, Ohio. The U. S. Government has limited rights for use of the TDP for federal procurements. Use of the TDP for other than federal procurements by companies other than The Carlisle & Finch Company is forbidden.