

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

APRIL 18, 2000

**SPECIFICATION G-SEC 487A**

12-VOLT DC MARINE SIGNAL LAMPS

1. SCOPE. This specification describes 12 volt DC (VDC) lamps of various current/wattage ratings and constructions to be used in standard U. S. Coast Guard marine signal lanterns installed on buoys and fixed structures.

1.1. Classification of Lamps.

Type I: C-8 Filament

Class 1:	Class 2:
Tungsten Filament	Tungsten-Halogen
0.25 A	35W
0.55 A	50W
0.77 A	75W
1.15 A	100W
2.03 A	110W
3.05 A	

Type II: CC-8 Filament

Class 1:	Class 2:
Tungsten Filament	Tungsten-Halogen
1.0 A	NA
1.9 A	
3.0 A	

2. APPLICABLE DOCUMENTS. None.

3. PERFORMANCE REQUIREMENTS.

3.1. Mechanical. Lamps offered under this specification shall meet the requirements for dimensions, material, and configuration described in this specification and as illustrated in the attached drawings. Lamps shall meet the performance requirements of Sections 3.2 and 3.3 and shall operate as specified under the environmental conditions listed in Section 3.4.

3.1.1. Dimensions. The dimensions and tolerances of the lamps; including base, bulb, filament, filament axis, filament support orientation, and light center length (LCL), shall be in accordance with Table 1 of this specification and the attached drawings.

3.1.2. Bulb. Lamp bulbs shall be clear glass or quartz. Bulb sizes are specified for the various lamps in Table 1 of this specification. There shall be no markings on the lamp bulb.

3.1.3. Base. The lamps shall have a single contact candelabra base with a prefocus collar. The dimensions, tolerances, material, and orientation of the base and prefocus collar shall comply with the attached drawings.

3.1.4. Alignment. The filament axis is defined as a straight line centered in the filament coil and running the entire length of the filament. The prefocus collar axis is defined as a straight line originating in the geometric center of the collar and extending perpendicular to the plane of the collar. The prefocus collar and filament axes shall coincide, within  $\pm 0.4\text{mm}$ , along the entire filament length. This requirement is met if every part of the filament is within a cylinder of radius  $0.4\text{mm}$  plus  $\frac{1}{2}$  the allowable width of the filament, which is centered on the prefocus collar axis.

**Table 1A**

Lamp Type	Tungsten Filament (reference drawings SK1401-A, 121059)								
Filament Type	C-8						CC-8		
Rating (amps)	0.25	0.55	0.77	1.15	2.03	3.05	1.0	1.9	3.0
Filament Height (mm)	6.0	5.5	7.0	7.0	8.0	9.3	2.0	4.0	5.5
Filament Width (mm)	0.15	0.20	0.30	0.40	0.60	0.80	1.15	1.5	1.9
Luminous Flux (lm)	30	70	120	180	380	600	145	390	600
Bulb Type	S-8					S-11			
LCL (mm)	28.58								
Rated Life (Hrs)	500						1000		

**Table 1B**

Lamp Type	Tungsten Halogen (reference drawings 121114)				
Filament Type	C-8				
Rating (watts)	35	50	75	100	110
Filament Height (mm)	3.0	3.6	4.0	4.0	5.65
Filament Width (mm)	1.3	1.5	1.5	1.5	1.62
Luminous Flux (lm)	630	975	1575	2400	2700
Bulb Type	T-3.5				
LCL (mm)	28.58				
Rated Life (Hrs)	2000			600	

Tolerances: Rating  $\pm 7\%$ ;  
 Filament Height  $\pm 20\%$ ;  
 Filament Width  $\pm 25\%$ ;  
 Luminous Flux  $-15\%$  (no upper limit);  
 LCL  $\pm 0.41\text{mm}$ .

3.1.5. Marking. The rated current/wattage and voltage, and the manufacturer's name or trademark shall be marked on the top (bulb) side of the prefocus collar of each lamp, or on the upper section of the lamp base (between the bulb and the prefocus collar).

3.1.6. Shadowing. The filament support for lamps with S-8 or S-11 bulbs (see sketch SK 1401A, attachment (1)) shall spiral about the filament as illustrated in drawing G-ECV 121059, attachment (2). Filament supports for lamps in T-3.5 bulbs may be vertically oriented as illustrated in drawing G-ECV 121114, attachment (3), with a thickness less than 14% of the filament width and with a filament surface to support separation of at least 1.8 mm.

3.2. Electrical. All lamps described in this specification shall have a rated operating voltage of 12 VDC. Lamps shall be capable of being operated in base down ( $\pm 15^\circ$ ) and horizontal ( $\pm 15^\circ$ ) orientations, with no reduction in the required performance or service life.

3.2.1. Power rating. When operated at  $12.00 \pm 0.01$  VDC, the tolerance for lamp current/wattage tolerance shall be  $\pm 7\%$  of rated current/wattage.

3.2.2. Luminous flux. All lamps shall meet the requirements for total luminous flux, outlined in Table 1 of this specification, when operated at  $12.00 \pm 0.01$  VDC.

3.3. Service Life.

3.3.1. Fixed-on lamp life. The average lamp life for all fixed-on burning lamps shall meet or exceed the rated lamp life values in Table 1, disregarding the initial burn-in.

3.3.2. Flashed lamp life. Lamps operating in a flashed mode shall meet or exceed a lamp life calculated by:

$$\frac{\text{Rated Lamp Life}}{\text{Duty Cycle}} \times 0.80, \quad \text{Equation 1.}$$

disregarding the initial burn-in. The duty cycle is the contact closure time (power applied) during a flash characteristic period, divided by the total length of the period. The flash characteristic period is the total time for a flashing rhythm to repeat.

3.3.3. Lumen maintenance. The luminous flux of all lamps shall exceed 88% of the initial total luminous flux after lamps have operated an equivalent of 58% of rated lamp life.

3.4. Environment. Each lamp, when properly installed in standard U. S. Coast Guard marine signal lanterns, shall meet or exceed all the requirements of this document under the environmental conditions outlined below.

3.4.1. Extreme temperature: Exposure to temperatures from  $-30$  to  $+65$  degrees C.

3.4.2. Humidity: Exposure to relative humidity from 0 to 100%.

3.4.3. Salt air: Continuous exposure to salt air.

3.4.4. Shock and vibration: Continuous exposure to the shock and vibration experienced in transportation on vehicles (including cars, trucks, boats and ships) and in service on marine aids-to-navigation, including on buoys and wooden, single-pile structures. Exposure to the shock caused by operation of a spring-loaded CG-6P lampchanger.

#### 4. VERIFICATION.

4.1. Conformance inspection. Conformance inspection shall consist of the examinations of 4.2 and the tests and inspections in 4.4 through 4.6.1. Unless otherwise specified, power provided to the lamps during these tests and inspections shall be  $12.00 \pm 0.05$  VDC.

4.2. Examination. Lamps shall be visually examined and dimensionally inspected to verify conformance to the requirements specified in 3.1.1 through 3.1.6.

4.3. Methods of inspection. The tests and inspections outlined in 4.4 through 4.5.3 correlate to the requirements of 3.2 through 3.3.3, above. The test outlined in 4.6.1 correlates to the requirement of 3.4.1.

4.4. Performance testing. All lamps that undergo testing shall be conditioned by undergoing a five-hour burn-in period, at a voltage of  $12.00 \pm 0.05$  VDC. After cooling for  $5 \pm 1$  minute, each lamp shall be mechanically rotated in a standard U. S. Coast Guard CG-6P lampchanger for ten complete revolutions, rewinding the CG-6P after each revolution, to verify that the filament does not break or separate from the filament support.

4.4.1. Power rating. The power consumption of the lamps shall be measured and recorded while the lamps are operated at  $12.00 \pm 0.01$  VDC, and with lamps burning in both base-down ( $\pm 15^\circ$ ) and horizontal ( $\pm 15^\circ$ ) orientations.

4.4.2 Luminous flux. The total luminous flux of the lamps shall be measured and recorded while the lamps are operated at  $12.00 \pm 0.01$  VDC, and with the lamps burning in both base-down ( $\pm 15^\circ$ ) and horizontal ( $\pm 15^\circ$ ) orientations.

#### 4.5. Service life testing.

4.5.1. Fixed-on lamp life. Lamps shall be burned, fixed-on, in both base-down ( $\pm 15^\circ$ ) and horizontal ( $\pm 15^\circ$ ) orientations, at  $12.00 \pm 0.05$  VDC until filament failure. The total lamp life, in hours, shall be recorded.

4.5.2 Flashed lamp life. Lamps shall be burned, with a 1 second contact closure and a duty cycle of 50% (Isophase 2 seconds), in both base-down ( $\pm 15^\circ$ ) and horizontal ( $\pm 15^\circ$ ) orientations, at  $12.00 \pm 0.05$  VDC until filament failure. The total lamp life, in hours, shall be calculated and recorded.

4.5.3. Lumen maintenance. The luminous output of all lamps that survive to 58% of rated service life during the fixed-on and flashed lamp life tests shall be measured.

4.6. Environmental testing. For the test described in 4.6.1, lamps shall be operated base down, at an input voltage of  $12.00 \pm 0.01$  VDC.

4.6.1. Extreme temperature. Place lamps with a measured total luminous flux in a black box with an aperture of  $2.0 \pm 0.5$  mm. Place the black box in an environmental chamber with a window. The aperture should be level with and facing the window. Power leads should be wired to the lamp, but not energized. Apply power to the lamp. After the lamp has operated for  $15 \pm 1$  minutes, record current consumption and luminous output emitted from the aperture. The ammeter and photometer shall be outside of the chamber, under ambient room conditions. Disconnect power to the lamp and record the background illumination. (Note: background lighting should provide no more than 50% of the value recorded when the lamp is energized.) Disconnect power and lower the chamber temperature to  $-30 \pm 2$  degrees C. The chamber shall

be maintained at that temperature for a period of  $24 \pm 1$  hours. Apply power to the lamp. After the lamp has operated for  $15 \pm 1$  minutes, record current consumption and luminous output emitted from the aperture. Disconnect power to the lamp and record the background illumination. Raise the chamber temperature to  $+65 \pm 2$  degrees C over a period of  $8 \pm 1$  hours. Maintain that temperature for  $5 \pm 1$  hours. Apply power to the lamp. After the lamp has operated for  $15 \pm 1$  minutes, record current consumption and luminous output. Disconnect power to the lamp and record the background illumination. Subtract the background luminous intensity measurements from the measurement of luminous output emitted from the aperture when the lamps were energized. The ratios of the resultant luminous output at the extreme temperatures to the resultant luminous output at room temperature shall be multiplied by the previously measured total luminous flux to calculate the total luminous flux at the extreme temperatures.

5. PACKAGING. Packaging requirements are specified in the Contract.

# **SPECIFICATION G-ECV-487A**

## **12-VOLT DC MARINE SIGNAL LAMPS**

APRIL 18, 2000

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UNITED STATES COAST GUARD  
OCEAN ENGINEERING DIVISION  
WASHINGTON, DC

APRIL 2000

STATEMENT OF WORK  
FOR  
12-VOLT MARINE SIGNAL LAMPS



1. GENERAL.

1.1. Scope of work. The contractor shall provide all necessary management, supervisory, personnel, labor, materials and equipment required to manufacture 12-volt marine signal lamps in accordance with U.S. Coast Guard Ocean Engineering Specification G-SEC 487A, dated April 18, 2000, hereafter referred to as “the specification.”

1.2. Personnel. The contractor shall provide a project manager who shall be responsible for all work performed under this contract and shall be a single point of contact for the Contracting Officer and designated representatives of the Contracting Officer. The name of this person, and the name(s) of any alternate(s) who shall act for the contractor when the project manager is absent shall be stated in writing to the Contracting Officer within 15 working days after award of any contract. During any absence of the project manager, only one alternative shall serve as the Government contact point. The project manager, and any designated alternative(s) shall have full authority to act for the contractor on all contract matters relating to daily operation of this contract. The project manager and all designated alternatives shall be able to read, write, speak, and understand English fluently.

1.3. Quality control program. The contractor shall establish and maintain a written Quality Control Program that meets the minimum requirements of ANSI/ASQC C1-1996.

1.3.1. 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 the contract. The system shall include, 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 request.

1.3.2. Inspection system. The contractor shall maintain an inspection system to ensure that items offered to the U.S. Coast Guard for acceptance or approval conform to all contract requirements. The inspection system shall be documented and available for review by U.S. Coast Guard inspectors upon request. The inspections set forth in the contract shall become a part of the contractors overall inspection system or quality program. The absence of any inspection requirements in the contract 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. Sampling inspection, as part of manufacturing operations, is an acceptable process to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the U.S. Coast Guard to accept defective material.

2. DEFINITIONS.

2.1. Production lot. A production lot is defined as all lamps of a specific Type, Class and current/wattage rating, manufactured in one continuous production run, at one plant, from one batch of materials, and submitted for acceptance at one time.

2.2. Sample lot. A sample lot is defined as a set of lamps randomly drawn from a given production lot. Sample lot size shall be as specified in Table 1.

TABLE 1

<u>Production Lot Size</u>	<u>Sample Lot Size</u>	<u>Rejection Level 1</u> (# of failures)	<u>Rejection Level 2</u> (# of failures)
91 to 150	8	1 1	
151 to 280	13	1 2	
281 to 500	20	2 3	
501 to 1200	32	3 5	
1201 to 3200	50	5 7	
3201 to 10000	80	7 10	

3. GOVERNMENT FURNISHED PROPERTY. U.S. Coast Guard six-place lampchangers (CG-6P), normal and/or high-wattage, shall be provided to the contractor for use in required testing. The number of lampchangers and type(s) shall be as required.

4. CONTRACTOR FURNISHED ITEMS. The contractor shall provide all facilities, equipment and materials required for the performance of this contract.

5. SPECIFIC TASKS.

5.1. Production of 12-Volt Marine Signal Lamps. The contractor shall provide all services required for the manufacture of 12-volt marine signal lamps in accordance with the specification.

5.2. Inspections & Tests of 12-Volt Marine Signal Lamps. The contractor shall provide all services required to inspect and test 12-volt marine signal lamps offered for acceptance by the U.S. Coast Guard. Inspections and tests shall be made in accordance with the specification.

5.2.1. Visual Inspection. All lamps offered for acceptance by the U.S. Coast Guard shall be visual inspected by the contractor to insure that the lamp bulb is intact and is not marked or otherwise marred, and that the filament is intact and is not separated from the filament supports. Lamps that do not pass the visual inspection shall be discarded.

5.2.2. Sampling. A sample lot of each production lot of lamps offered for acceptance by the U.S. Coast Guard shall undergo the tests and inspections of 4.2, 4.4 through 4.5.1, and 4.5.3 of the specification. A sample lot of the first production lot offered to the U.S. Coast Guard for acceptance by a contractor shall undergo the tests and inspections of 4.2, 4.4 through 4.4.2, and 4.5.2 through 4.5.3 of the specification. A separate sample lot of the first production lot offered to the U.S. Coast Guard by a contractor shall undergo the tests and inspections of 4.2, 4.4 through 4.4.2, and 4.6.1 of the specification.

5.2.3. Sample Lot Failures. If failures occur during the tests and inspections required by 5.2.2, additional lamps shall be drawn from the production lot to maintain the size of the sample lot, following the procedure during which the lamp(s) failed. Any lamps added to the sample lot shall undergo conditioning and all the tests to which that sample lot was subjected. Any deficiencies of replacement lamps shall be added to the previous results for that test or inspection. Acceptance or rejection of the production lot shall be based on the final count of deficiencies for the tests and inspections, based on the rejection level criteria.

5.2.4. Rejection Level. Production lots shall be rejected when the number of failures meet or exceed the specified

rejection level for the test or inspection. Rejection levels are identified in Table 1. Table 2 provides the rejection levels for the tests and inspections described in the specification.

Table 2

<u>Test/Inspection Reference</u>	<u>Rejection Level</u>
4.2 (less requirement 3.1.6)	1
4.2 (requirement 3.1.6 only)	2
4.4	1
4.4.1	1
4.4.2	1
4.6.1	1

The acceptance/rejection criteria for lamp life and lumen maintenance testing are based on the cumulative lamp life for the sample lot. The ratios of the average lamp life for lamps in sample lots to the rated lamp life of the lamps are provided in Table 3.

Table 3

<u>Sample Lot Size</u>	<u>Ratio of Sample Lot Life to Rated Life</u>
8	0.80
13	0.84
20	0.88
32	0.90
50	0.92
80	0.95

For a production lot to be accepted the sample lot must meet the following conditions:

- a. The life of the sample lot meets or exceeds the applicable sample lot life for that sample size, from Table 3;
- b. Lamps maintain a minimum luminous flux of 88% of rated output after burning for 58% or rated lamp life; and
- c. No more than 15% of the lamps in the sample lot fail prior to completion of rated lamp life, as specified in Table 1 of the specification.

Failure of a lamp to maintain a minimum luminous flux of 88% or rated lumen output after burning for 58% of rated lamp life shall constitute a failure of the lamp to complete rated lamp life. Luminous flux shall be measured at a voltage of  $12.00 \pm 0.01$  VDC.

5.3. Contractor's records. The contractor shall maintain records of all inspections and tests conducted to fulfill the requirements of this work statement. The records shall include measured values and any and all plots and graphs required by the specification.

5.3.1. Test report. The contractor shall provide a test report in accordance Exhibit A, CDRL A001.

6. REFERENCES. The following specifications, standards and handbooks form a part of this work statement to the extent specified. Unless otherwise stated, the issues are those listed in the GSA Index of Federal Specifications, Standards or Commercial Item Descriptions, or the DOD Index of Specifications and Standards (DODISS). While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements of the documents cited in this work statement, whether or not they are listed herein.

6.1. Commercial Standards and Publications.

ANSI/ASQC C1      Specification of General Requirements for a Quality Program  
November 1985

Copies of ANSI/ASQC C1 are available from American National Standards Institute, 11 West 42<sup>nd</sup> Street, New York, New York 10036 (Tel: 212-642-4900).

6.2. Precedence. In the event of a conflict between this work statement and the references cited herein, the text of this work statement takes precedence. Nothing in this document supercedes applicable laws and regulations unless a specific exemption has been obtained.