



**DEPARTMENT OF TRANSPORTATION  
FEDERAL AVIATION ADMINISTRATION**

**PURCHASE DESCRIPTION**

**FILTER, LIGHT TRANSMITTING,  
FOR APPROACH LIGHTING SYSTEMS**

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## 1. SCOPE AND STYLE

1.1 Scope. This specification sets forth the requirements for aviation red and aviation green light transmitting filters that are used in approach lighting systems.

1.2 Style. Filters shall be furnished in the following styles in accordance with the following designations:

Style A	Aviation red, Type I (a)
Style B	Aviation green, Type I (c).

## 2. APPLICABLE DOCUMENTS

2.1 FAA documents. The following FAA documents of the issue in effect on date of invitation for bids or screening information request form a part of this specification and are applicable except as modified herein.

### 2.1.1 FAA specifications.

FAA-E-982	PAR-56 Lampholder
FAA-E-2408	Lamps, PAR-56 Incandescent, Aviation Service

2.2 Military and federal publications. The following military and federal publications, of the issue specified in the invitation for bids or screening information request, form a part of this specification and are applicable as specified herein.

### 2.2.1 Military standards.

MIL-STD-810F	Environmental Test Methods and Engineering Guidelines
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### 2.2.2 Federal standards.

FED-STD-129m	Marking for Shipment and Storage
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2.3 Other standard documents. The following national standards of issue in effect on the date of the invitation for bids or screening information request, form a part of this specification and are applicable to the extent specified herein.

ANSI/ASQC Z1.4	Sampling Procedure for Inspection by Attributes
ANSI/ASQC -Q9001-2000	Quality Management Systems Requirements, DID-FAA- QA-003 (QSP). Assurance in Final Inspection and Test

ASTM D 3580	Standard Test Method of Vibration (Vertical Sinusoidal Motion) Test Products
ASTM D 3951	Standard Practice for Commercial Packaging
ASTM D 4169	Standard Practice for Performance Testing of Shipping Containers and Systems
ASTM D 5112	Standard Practice for Testing of Shipping Containers and Systems
SAE-AS25050	Colors, Aeronautical Lights and Lighting Equipment, General Requirements for.

Copies of this specification and other applicable FAA specifications may be obtained from the Contracting Officer in the office issuing the invitation-for-bids or screening information request. Requests should fully identify material desired, i.e., specification and amendment. Requests should cite the invitation for bids, screening information requests, the contract involved, or the use to be made of the requested material.

Information on obtaining copies of federal specifications and standards may be obtained from General Services Administration offices in Atlanta; Auburn, Wash.; Boston; Chicago; Denver; Fort Worth; Kansas City, Mo.; Los Angeles; New Orleans; New York; San Francisco; and Washington, D.C.

ASTM documents may be obtained from American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428, or from:

<http://www.astm.org/cgi-bin/SoftCart.exe/STORE/store.htm?E+mystore>

American National Standards Institute/American Society for Quality Control (ANSI/ASQC) documents may be obtained from ASQC, 611 East Wisconsin Avenue, Milwaukee, WI 53202.

Single copies of military specifications and standards may be obtained from Federal Aviation Administration, Washington, D.C. 20590 Attn: Contracting Officer. Requests should cite the invitation for bids, screening information request, or contract for which the material is needed. Mail requests, if found acceptable, will be forwarded to a military supply depot for filling; hence, ample time should be allowed.

Military specifications and standards and federal and GSA specifications and standards may be downloaded from the Internet by accessing <http://assist.daps.mil> and then selecting the option for ASSIST Quick Search.

American National Standards Institute (ANSI) documents can be obtained electronically from <http://webstore.ansi.org/ansidocstore/shopperlookup.asp>. Paper standards are available through Global Engineering Documents.

Society of Automotive Engineers (SAE) documents can be obtained from SAE, 400 Commonwealth Drive, Warrendale, PA, 15096-0001, Phone: (412) 776-4841 or from <http://www.sae.org/servlets/index>.

2.4 Precedence. In case of conflict between this specification and specifications and standards referenced in 2.1, 2.2, and 2.3, this specification shall have precedence.

### 3. REQUIREMENTS

3.1 General. The light transmitting filter specified herein shall be designed for outdoor operation. The filter shall be made of heat-resistant high impact glass. The filter is installed in front of, and become a part of the PAR-56 lampholder assembly containing a PAR-56 lamp. The lampholder assemblies are installed in the runway threshold and approach areas extending outward from the landing threshold in the direction of the approach to the runway.

3.2 Aviation colors. The filter chromaticity shall meet the requirements of SAE-AS25050 for aviation red, Type I (a) and aviation green, Type I (c).

3.3 Functional requirements. The filter shall be mounted in front of a 500 Watt, PAR-56 lamp conforming to FAA-E-2408 installed in a PAR-56 lampholder conforming to FAA-E-982. The filters shall function in their lampholders in continuous or intermittent outdoor service under the environmental conditions specified herein.

3.4 Equipment to be furnished under this specification. The filters furnished shall meet all requirements of this specification, in the quantities and color specified in the contract schedule. A filter shall be either aviation red, or aviation green, nondiffusing filter of Type I color and Grade A as described in SAE-AS25050 Table III Transmission and Brightness Limits. A filter shall be identified with the month and year manufactured, ordering designations, and manufacturer's identification. Each filter furnished under this specification on a given contract shall be identical to all other filters furnished under the contract. Every filter shall be tested for a minimum of 2 hours.

#### 3.5 Design and construction

3.5.1 General. Filters shall be free from defects that will prevent meeting photometric, strength, thermal shock, and other physical requirements. Open blisters or imbedded blisters, which may be opened with a pencil point, are not acceptable. Filters shall be entirely free from wrinkles and mold marks.

#### 3.5.2 Bubbles.

3.5.2.1 Bubble obstruction. The distribution of bubbles shall be reasonably uniform throughout the filter. The percentage of filter surface obstructed by bubbles (B) shall be not greater than one. This percentage (B) shall be determined by multiplying 100 times the sum of the squares of the projected effective diameters ( $\Sigma d^2$ ) of the bubbles divided by the square of the projected effective diameter ( $D^2$ ) of the filter.

3.5.2.1.1 Noncircular bubble. The effective diameter of a noncircular bubble is one half the sum of the largest and smallest dimensions of the bubble.

3.5.2.1.2 Total number of bubbles. The total number of bubbles shall be not more than the number shown in Table 1.

TABLE 1. Bubbles

Effective Diameter of Bubbles in Inches	Number of Bubbles per Effective Square Inch of Projected Area Filter
0.050-0.060	3
0.040-0.050	4
0.030-0.030	6
0.020-0.030	11
0.015-0.020	24
0.010-0.015	44
0.005-0.010	100

3.5.2.2 Large bubbles. When bubbles larger than 0.050 inches effective diameter are grouped, nonoverlapping circular or square areas of one square inch of projected area may be drawn about the projected pattern in such a way that no unit of area has more than three bubbles. No more than five bubbles greater than 0.050 inches effective diameter shall be allowed within any 1 square inch of projected area of the filter surface.

3.5.3 Colored filters. All colored filters shall be aviation colored (3.2) material throughout the entire thickness of the portions designed for light transmission. Surface color will not be accepted.

3.5.4 Exposure. Filters shall be capable of withstanding exposure to atmospheric conditions of high humidity and bright sunlight for a period of at least 10 years without showing surface roughening or undergoing an appreciable (large enough to be recognized and measured) change in color or optical properties as specified in 3.6, 3.7, and subparagraphs.

3.5.5 Heat resistance. The heat-resistant, high impact filters shall withstand continuous operation in front of a 500 Watt lamp mounted in the PAR-56 lampholder (4.5.11).

3.6 Environmental requirements. The filters, mounted in a FAA PAR-56 lampholder conforming to Specification FAA-E-982, shall be designed for outdoor installation and continuous or intermittent operation in driving rain, sleet, and snow and under the following environmental conditions.

3.6.1 Temperature. The filter shall function and survive any temperature between -67° F (-55° C) and 158° F (70° C) (4.5.4).

3.6.2 Humidity. The filter shall function and survive up to 100 percent humidity from sea level to 10,000 feet (3048 m) above sea level over the temperature range specified in 3.6.1 (4.5.5).

3.6.3 Salt fog. The filter shall function and survive exposure to an atmosphere containing salt laden moisture (4.5.6).

3.6.4 Rain. The filter shall function and survive exposure to wind-blown rain (4.5.7).

3.6.5 Sand and dust. The filter shall function and survive exposure to wind blown sand and dust particles as may be encountered in arid regions (4.5.8).

3.6.6 Thermal shock. The filter shall function and survive exposure to a sudden application of cold water. (4.5.9).

3.6.7 Icing/freezing rain. The filter shall function and survive with one half inch (1/2")(12.7 mm) of glaze ice on the filter. With these icing conditions, the filter shall operate without defect (4.5.3).

3.6.8 Solar radiation (sunshine). The filter shall function and survive exposure to sunshine with ambient temperature as stated in 3.6.1 (4.5.10).

### 3.7 Filter design and construction.

3.7.1 General. Filters shall be free from defects that will prevent meeting photometric, strength, thermal shock, or other physical requirements. Open blisters or imbedded blisters, which may be opened with a pencil point, are not acceptable. Filters shall be free from wrinkles and mold marks. The filters shall be suitable for use on PAR-56 lampholders conforming to FAA-E-982 and operated with a 500 Watt PAR-56 lamp at ambient temperatures from -67° F (-55° C) to 158° F (70° C). The filters shall conform to the dimensions specified in Figure 1.

3.7.2 Selection of materials. Materials and equipment components shall be as specified herein. Parts or materials not specifically designated shall be suitable for the intended purpose and shall be in accordance with industrial standards and practices.

3.8 Marking. Each filter shall be marked (molded) at the edge (rear) with the Manufacture's name, part number, and date made (see Figure 1). The marking shall remain permanent, clear, durable and legible for the life of the filter.

### 3.9 Workmanship.

3.9.1 Cleaning. Prior to packaging, each filter shall be thoroughly cleaned.



3.10 Packaging, packing, and marking. The filters shall be packaged, packed, and marked in accordance with Section 5.

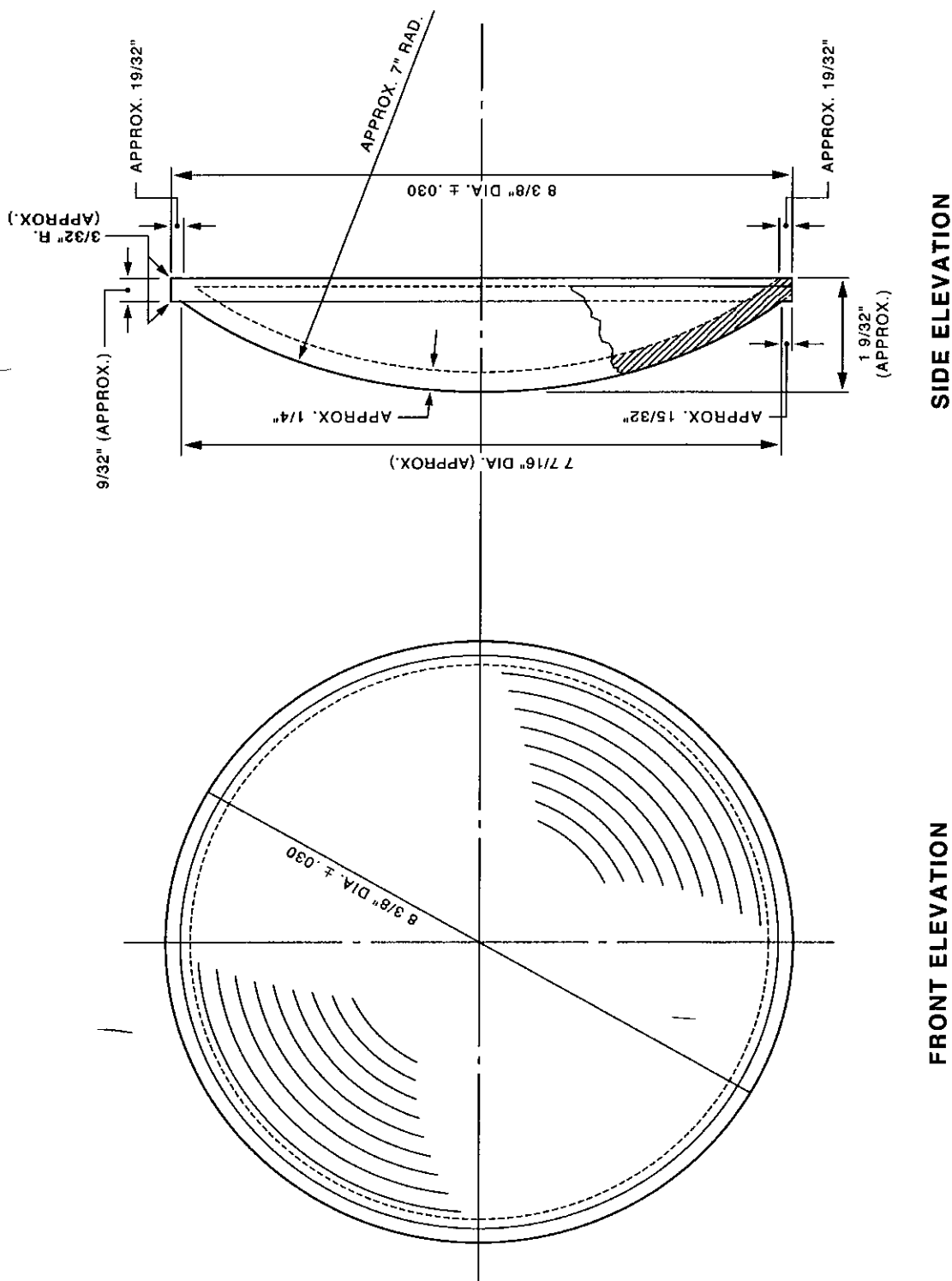


FIGURE 1. Filter

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 General. The contractor shall provide and maintain a quality control program that fulfills the requirements of American National Standards ANSI/ASQC-Q9001-2000. The contractor shall prepare and submit a Quality System Plan (QSP) in accordance with ANSI/ASQC Q9001-2000, Quality Management Systems Requirements, DID-FAA-QA-003 (QSP). International Standards Organization (ISO) certification is not required. Unless otherwise stated in this specification or in the contract, all tests and inspections to determine compliance with the requirements shall be made by the contractor and shall be subject to Government inspection. The term "government inspection" as used in this specification, means that an FAA representative will witness the contractor's testing and inspection, and will carry out such visual and other inspection as deemed necessary to assure compliance with contract requirements. The government reserves the right to waive government inspection at the contractor's plant. When Government inspection is waived, the contractor shall furnish to the Contracting officer (CO) two copies of test data, certified by an independent testing agency, describing the results obtained during the inspection and tests required by the contract and specifications. The test data must demonstrate that the equipment meets contract requirements, and shall include the statement: "This certifies that this unit fully meets all technical requirements of the contract." The statement shall be dated and signed by a responsible official of the contractor or the testing agency. Shipment shall be made only after the contractor receives written government approval of the certified test data. Inspecting and testing shall be conducted by the contractor using test procedures prepared in accordance with ANSI/ASQC-Q9001-2000 and approved by the Government. The contractor shall prepare the test procedures. The Government will require 45 calendar days after receipt of the test procedures for approval.

4.2 Test and inspection of production models. The first 10 units of production are designated as production models, shall be subjected to the examinations specified in 4.4.1 and the tests specified in 4.5.1 through 4.5.11. The filters shall be mounted on PAR-56 lampholders containing PAR-56, 500 Watt, 20 A, quartz halogen lamps and shall be operated at 20 A during the tests specified in 4.5.1 through 4.5.11.

4.3 Test and inspection of production units. Testing of the production unit shall start after acceptance of the production models. All of the production units shall be examined as specified in 4.4.1. Ten out of each 120 production units shall be tested as described in 4.5.1, 4.5.2, 4.5.3, and 4.5.9. During acceptance inspection after production tests, if 10 percent of the pre-selected number of production units fail the inspection, as specified in 4.3.2, then all production units shall be tested. Any cracking, fading, or failure of the filters shall be cause for rejection.

4.3.1 Inspection data. The contractor shall prepare and submit a list of test procedures, acceptance inspections, and test data forms to the Contracting Officer for approval.

4.3.2 Acceptance inspection. Acceptance shall be made on a sampling basis in accordance with ANSI/ASQCZ1.4-1993, using Special Inspection Level S-3, AQL 4.0 and a single sampling plan for normal inspection as per Table II-A, page 11. All units of each lot will be visually inspected for damage and integrity of packaging. Inspection of the selected samples for acceptance will include: marking, packaging, concealed damage, physical dimensions, and specified cleanliness

of the filters. Any cracking, staining, fogging of the filters, illegible marking, poor packaging or packing, concealed damage when the external package has no visible damage, and specified packaging attributes shall be considered a defect and the unit will not be accepted.

#### 4.4 Examinations.

4.4.1 Examination of product. The filters shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, and marking. The filters shall be inspected using a template provided by the manufacturer to determine that dimensions meet those depicted in Figure 1.

4.4.2 Preparation for delivery. The preservation, packaging, packing, and marking shall be examined for conformance to Section 5.

4.5 Test methods. Testing of the system shall be performed as follows.

4.5.1 Visual examination. Each filter shall be inspected to ensure it is free of cracks, sharp edges, large chips, and blisters. Each filter shall meet the requirements in 3.1, 3.3, 3.5.1, and 3.8. Any cracking or fogging of the filters shall be cause for rejection.

4.5.2 Chromaticity and transmission tests. Chromaticity tests shall be conducted to demonstrate the ability of the filter to comply with chromaticity requirements (3.2). The filter shall be tested for meeting the chromaticity (3.2) and transmission (3.4) requirements of SAE-AS25050 for nondiffusing wares, Type I colors (aviation), Grade A, at the center of the main beam and the extremes of the horizontal and vertical beam distribution. Chromaticity outside of distribution boundaries may be verified visually.

4.5.3 Icing test. This test shall be performed on the filter. The icing test shall be conducted in accordance with Procedure I, Method 521.2 of MIL-STD-810F. The filter shall be placed in an environment of  $23^{\circ} \pm 2^{\circ} \text{ F}$  ( $-5^{\circ} \pm 1.1^{\circ} \text{ C}$ ) until cooled to this temperature. Water shall then be introduced by suitable means to cause a layer of ice to form on the filter to a thickness of at least 1/2 inch (12.7mm). After the required thickness of ice has formed, the filter shall be retained in the  $23^{\circ} \text{ F}$  ( $-5^{\circ} \text{ C}$ ) environment for an additional period of at least 30 minutes. With the longitudinal axis of the PAR-56 lamp and filter tilted 25 degrees upward, the lamp shall then be energized and allowed to operate until the ice melts and breaks free of the filter. The lamp shall be de-energized, and the filter removed from its environment and examined for defects (3.6.7).

4.5.4 Temperature Tests. The PAR-56 lamp shall be operated for one hour at the end of the 6-hour test, during the temperature tests in 4.5.4.1 and 4.5.4.2 (3.6.1). The high and low temperature tests shall be conducted sequentially and in cycles as follows:

4.5.4.1 High temperature. The high temperature test shall be conducted in accordance with Procedure II, Method 501.4, extreme induced conditions, of MIL-STD-810F, except the temperature shall be constant,  $158^{\circ} \text{ F}$  ( $70^{\circ} \text{ C}$ ), and maintained for a period of 6 hour minimum duration. The temperature sensors shall be installed around the production model in the test chamber. This test shall be run concurrently with the pressure test.

4.5.4.2 Low temperature. The low temperature test shall be conducted in accordance with Procedure II, Method 502.4 of MIL-STD-810F. The temperature shall be constant at  $-67^{\circ}\text{F}$  ( $-55^{\circ}\text{C}$ ) and maintained for a period of 6-hour minimum duration. The temperature sensors shall be installed around the production model in the test chamber. This test shall be run concurrently with the pressure test.

4.5.5 Humidity test. The humidity test shall be in accordance with Method 507.4, of MIL-STD-810F, except that a total of three complete 48-hour cycles shall be required (3.6.2). The high temperature range shall be as required in 3.6.1.

4.5.6 Salt fog test. The salt fog test shall be performed in accordance with Procedure I, Method 509.4, of MIL-STD-810F. The filter shall be exposed for a period of 96 hours, consisting of 4 consecutive periods of 12 hours wet and 12 hours dry; followed by a 48-hour drying period. At the conclusion of the test, salt buildup or film may be removed with tap water (3.6.3).

4.5.7 Rain test. The rain test shall be performed in accordance with Procedure I, Method 506.4, of MIL-STD-810F. The wind velocity shall be 40 mph (18 m/s), and the rainfall rate shall be 4 in/h (10 cm/h). The test item temperature shall be at least  $50^{\circ} \pm 37^{\circ}\text{F}$  ( $10^{\circ} \pm 3^{\circ}\text{C}$ ) higher than the rain temperature at the beginning (3.6.4).

4.5.8 Sand and dust test. A sand and dust test shall be conducted in accordance with Method 510.4, Procedure I and Procedure II of MIL-STD-810F. The air velocity during blowing sand tests shall be not less than 103.6 mph (90 knots). Failure to meet any requirements due to deterioration of any part or infiltration of sand or dust shall be cause for rejection (3.6.5).

4.5.9 Thermal shock test. The light unit shall be installed as specified in 4.2 and operated at maximum rated current until the temperatures have stabilized. One cup of water at a temperature of from  $32^{\circ}\text{F}$  ( $0^{\circ}\text{C}$ ) to  $41^{\circ}\text{F}$  ( $5^{\circ}\text{C}$ ) shall be sprayed on the top surface. This shall be repeated every 15 minutes for 20 times. There shall be no evidence of cracking of glass or metal (3.6.6).

4.5.10 Solar Radiation (Sunshine) test. The solar radiation (sunshine) test shall be performed in accordance with Procedure II, Method 505.4, of MIL-STD-810F. An irradiance intensity of 1120 Watts per square meter shall be applied to the filter for the equivalent for 630 days using an accelerated solar testing technique. At the end of the test, the filter transmittance shall be within 5 percent of the initial transmittance (3.4)(3.6.8).

4.5.11 Heat resistance test. The heat resistance test shall be performed with the filter mounted in a PAR-56 lampholder and operated for a period of one hour followed by immediate chilling to  $14^{\circ}\text{F}$  ( $-10^{\circ}\text{C}$ ) (3.5.5).

4.5.12 Two-hour test. Production models and production units shall be mounted in standard FAA PAR-56 lampholders with 500 Watt lamps and operated for 2 hours (3.4) at rated current and ambient temperature of  $86^{\circ} \pm 18^{\circ}\text{F}$  ( $30^{\circ} \pm 10^{\circ}\text{C}$ ). After one hour of continuous operation, the filter with lamp shall be subjected to the test described in 4.5.9, except that the water spray

shall be maintained for 5 seconds, and repeated every 15 minutes. Production units selected in accordance with paragraph 4.3.2 shall be retested.

4.6 Test performance. All tests described above shall be performed by the contractor, at the contractor's facility, or at an independent testing laboratory. A FAA representative may witness tests. Tests shall be conducted on the production model and on production units as outlined above to provide compliance with this specification.

## 5. PREPARATION FOR DELIVERY

5.1 General. Unless otherwise specified in the contract, each filter shall be prepared for domestic shipment and extended storage in accordance with 5.2 through 5.4.

5.2 Packaging. Packaging shall be in accordance with ASTM D 3951 and testing shall be in accordance with ASTM D 4169, Assurance Level II, Distribution Cycle 18. Each filter unit shall be packaged in an individual unit container. Packaging and shipping containers shall be capable of multiple handlings and storage cycles under favorable conditions, such as enclosed facilities, for a minimum of one year.

5.3 Palletized shipments. All palletized shipments shall be made on disposable pallets with maximum outside dimensions of 47-1/2 inches by 40 inches. Overall height of the pallet and contents shall be not more than 47 inches. Fork entry of the pallet shall be on the long sides of the pallet. No portion of the load shall overhang or extend beyond the pallet edges. Shrink wrapping to secure intermediate containers is encouraged.

5.4 Marking. Unit and intermediate packages and exterior shipping containers shall be marked in accordance with FED-STD-129m. Each package and/or shipping container shall be marked with bar codes in accordance with FED-STD-129m. Each intermediate package and each shipping container shall be durably and legibly marked with the following information (example in parentheses):

National Stock Number  
 Cage Code & Manufacturer's Part Number  
 Item Description or Nomenclature  
 Quantity & Unit of Issue  
 Contract/Purchase Order Number  
 Level of Protection and Date Packed  
 Manufacturer's Name and Trade Mark  
 Specification Number: (FAA-P-2969)  
 FAA Type Number.

## 6. NOTES

6.1 Government-furnished equipment. It is recommended that PAR-56 lamps and lampholders be provided as government-furnished equipment in any contract purchasing filters.

