

INCH-POUND

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SUPERSEDING
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MILITARY SPECIFICATION

LAMPS, INCANDESCENT, AIRCRAFT SERVICE
GENERAL SPECIFICATION FOR

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification provides the general and environmental performance requirements for incandescent lamps intended for use primarily in military aircraft applications.

1.2 Classifications. Lamps covered by this specification will be of the following types, as specified in the applicable specification sheet.

Type I - General purpose lamps suitable for use in applications at ambient temperatures from -55°C (-67°F) up to 85°C (185°F).

Type II - Special purpose lamps suitable for use in applications at ambient temperatures from -55°C (-67°F) and above 85°C (185°F).

1.3 Part identifying numbers. Lamp part identifying numbers shall be as specified in the applicable detail specification (see 6.7).

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications, standards, and handbooks form a part of this 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 supplement thereto, cited in the solicitation (see 6.2).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department (Code SR3), 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.

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SPECIFICATIONS

FEDERAL

A-A-883 Tape, Pressure Sensitive, Adhesive, Masking
 QQ-S-571 Solder, Tin Alloy, Lead-Tin Alloy and Lead Alloy

MILITARY

MIL-C-25050 Color, Aeronautical Lights and Lighting
 Equipment, General Requirements for
 MIL-P-116 Preservation, Methods of

STANDARDS

MILITARY

MIL-STD-129 Marking for Shipment and Storage
 MIL-STD-202 Test Methods for Electronic and Electrical
 Component Parts
 MIL-STD-889 Dissimilar Metals
 MIL-STD-970 Specification and Standards, Order of Preference
 for the Selection of
 MIL-STD-2073-1 DoD Material Procedures for Development and
 Application of Packaging Requirements

2.1.2 Other Government publications. The following other Government publications form a part of this document to the extent specified herein. Unless otherwise specified, the issue is that cited in the solicitation.

SD-6 Provisions Governing Qualification

(Unless otherwise indicated, copies of federal and military specifications, standards, handbooks, and other Government publications are available from the DODSSP Standardization Documents Ordering Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document 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 documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

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AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI C81.61

American National Standard for Electric Lamp Bases

(Application for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)
SAE

SAE AS4156

Color-Coded Incandescent Flange Base T1 and T1-3/4
Lamps for Voltage Identification

(Application for copies should be addressed to SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.)

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) the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Detail specifications. The individual lamp requirements shall be as specified herein and in accordance with the applicable detail specification. The term "detail specification" shall be interpreted to include other specifications, specification sheets, and MS specification sheets which provide detailed and specific requirements for a single lamp or group of similar lamps.

3.2 Qualification. Lamps furnished under this specification shall be products which are authorized by the qualifying activity for listing on the applicable Qualified Products List (QPL) at the time of award of contract (see 4.4 and 6.3).

3.3 Selection of specifications and standards. Selection of specifications and standards for materials, parts and Government certification and approval of processes and equipment which are not specifically designated herein and which are necessary for the execution of this specification, shall be selected in accordance with MIL-STD-970.

3.4 Materials. The materials shall be as specified herein. However, when a definitive material is not specified, a material shall be used which will enable the lamps to meet the performance requirements of this specification and detail specifications.

3.4.1 Metals. Metals shall be corrosion resistant or treated to resist corrosion caused by fuels, salt spray, or atmospheric conditions as may be encountered in storage or normal aircraft service. Lamp base and contact materials shall be suitable to resist electrolytic corrosion when installed in metal sockets and holders.

3.4.1.1 Dissimilar metals. Dissimilar metals as defined by MIL-STD-889 shall not be used in intimate contact with each other unless protected against electrolytic corrosion.

3.4.2 Recycled and reclaimed material. Recycled or reclaimed material may be used provided all requirements of this specification are met and the material does not jeopardize the quality or life of the lamps.

3.4.3 Solder. Solder shall conform to QQ-S-571. The type selected shall be at the manufacturer's option to meet the intended use of the lamp or its application as defined by the detail specification.

3.5 Design and construction. Lamps shall be of the design, color and physical dimensions shown in the applicable detail specification (see 3.1 and 6.2).

3.5.1 Type I lamps. When specified, Type I lamps shall be clear, colored, or reflective coated incandescent lamps for use at ambient temperatures up to 85 C (185 F).

3.5.2 Type II lamps. When specified, Type II lamps shall be clear, colored, or reflective coated incandescent lamps for use at ambient temperatures above 85 C (185 F), or as specified in the applicable detail specification.

3.5.3 Reflector lamps. Reflector lamps shall be fabricated by applying an external reflective coating to a specially shaped globe, or by placing the filament between an internally coated reflector and a cover glass that is permanently sealed to the reflector. In the latter arrangement, the use of an internal lamp within the globe is at the manufacturer's option.

3.5.4 Coatings. The exterior coating on lamps (both reflective and colored) shall be such that it will withstand the rigors of normal handling, service use and storage.

3.5.5 Colored lamps. The lamps shall be uniformly colored with no perforations or openings through which non-colored light can be emitted. All light emitted from colored lamps shall conform to MIL-C-25050 for the color specified. Color may be obtained by use of either colored glass or a coating on the glass.

3.5.6 Internal wiring. Provision shall be made to prevent any type of electrical shorting inside the metal base of lamps.

3.5.7 Filament. The structure and processing of the filament material shall be of a quality to meet the specification performance and environmental requirements. The arrangement of the filament and filament support shall be as designated by the detail specification. When not specified by the detail specification, the filament arrangement and support shall be at the manufacturer's option, to meet the performance and environmental requirements specified herein and in the applicable detail specification.

3.5.8 Lamp bases. Where applicable, lamp base configuration and dimensions shall conform to the base type designation of ANSI C81.61 as specified in the detail specification. Where a lamp base is required that is not covered by ANSI C81.61, the configuration and dimensions shall conform to those specified in the detail specification.

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3.5.9 Optional design. Design details not specified or specifically dimensioned are optional within the maximum design envelope specified for the applicable lamp configuration. Minor variations will be permitted provided the performance requirements are met and the lamp is totally interchangeable with lamps which use the identified design details. Any changes in design which affect form, fit or function of the lamp shall be approved by the qualifying activity.

3.6 Performance. The applicable performance requirements are defined by the detail specification if not defined herein.

3.6.1 Ratings. When operating at rated voltage, lamps shall conform to the current, power, and light output ratings specified in the applicable detail specification (see 4.6.4 and 6.5).

3.6.1.1 Light output.

3.6.1.1.1 Initial candlepower. Lamps furnished under this specification shall have an initial candlepower output within the range specified in the detail specification when tested as specified (see 4.6.4).

3.6.1.1.2 Candlepower maintenance. Unless otherwise specified in the detail specification, the average candlepower output of sample group lamps shall not fall below 80 percent of the initial candlepower output at 70 percent of average rated life. The exterior coating of lamps (if so furnished, both reflective and colored) shall not be damaged or discolor, crack, fade, blister or peel (see 4.6.6 and 6.5).

3.6.2 Life. Life requirements for lamps furnished under this specification shall be average rated laboratory life, as specified in the detail specification. The sample group lamps shall operate satisfactorily for the average rated life shown in the detail specification for the specific lamp part number. The average rated life shall be based on the average life of groups of lamps operated at rated voltage under controlled laboratory conditions when tested as specified (see 4.6.5 and 4.6.5.1).

3.6.3 Coating adhesion. When tested for adherence to the glass bulb, the exterior coatings (both reflective and colored), shall be such that they shall not be damaged or blister, crack, or peel from the globe when tested as specified (see 4.6.7, 4.6.9 and 6.5).

3.6.4 Solderability. Unbased lamps having tinned lead terminals shall have the leads tested for solderability. The solder dipped surface of the terminals shall be at least 95 percent covered with a new, smooth solder coating. The remaining 5 percent of the terminal surface may contain small pinholes, voids or rough spots not concentrated in any one area. Bare base metal and areas where the new solder dip failed to cover the original coating are indications of poor solderability. The solderability test shall be performed as specified (see 4.6.15).

3.6.5 Environmental. Lamps shall perform satisfactorily within the specified rating limits when subjected to the following environmental requirements for the following specified times, temperatures and environmental conditions, unless otherwise specified in the detail specification.

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3.6.5.1 High temperature. When operating at rated voltage, the lamps shall perform satisfactorily for a minimum of 70 percent of the average rated life specified in the detail specification (up to 1000 hours maximum test time) while exposed to the specified maximum temperature for the type lamp being tested. Lamps shall show no evidence of burn-out or damage to any lamp component as a result of exposure to temperature extremes. Exterior coated lamps (both reflective and colored) shall show no evidence of damage, discoloration, cracking, fading, blistering or peeling of the coating (see 4.6.9 and 6.5).

3.6.5.2 Thermal shock. When operating at rated voltage, the lamps shall perform satisfactorily when subjected to severe changes in thermal conditions. Lamps shall show no evidence of burn-out or damage to any lamp component as a result of exposure to temperature extremes. Exterior coated lamps (both reflective and colored) shall show no evidence of damage, discoloration, cracking, fading, blistering or peeling of the coating (see 4.6.10 and 6.5).

3.6.5.3 Random vibration. When operating at rated voltage, the lamps shall perform satisfactorily when subjected to random vibrations in a frequency range from 5 to 2000 Hz. Lamps shall show no evidence of damage to any lamp component, or loose parts due to the vibration tests (see 4.6.11 and 6.5).

3.6.5.4 Shock. When operating at rated voltage, the lamps shall perform satisfactorily when subjected to a shock test using peak "g" load values as specified in the detail specification. If no "g" load value is specified, the shock test shall be performed using a minimum of 30 "gs" peak load. Lamps shall show no evidence of burn-out, damage to any lamp component, or loose parts due to the shock test (see 4.6.12 and 6.5).

3.6.5.5 Humidity. After extended, non-operating exposure to a hot, humid atmosphere, the lamps shall be visually inspected for globe to base integrity and any evidence of atmospheric leakage into the lamp. The lamps shall then be operated at rated voltage to determine conformance to the ratings (current, power and light output) specified in the detail specification (see 4.6.13 and 6.5).

3.6.5.6 Salt spray. After extended, non-operating exposure to a hot, humid, salt atmosphere, the lamps shall be visually inspected for signs of corrosion. The lamps shall then be operated at rated voltage to determine conformance to the ratings (current, power and light output) specified in the detail specification (see 4.6.14 and 6.5).

3.7 Identification of product. Unless otherwise specified, all lamps shall be marked for identification in accordance with the marking specified in the detail specification. Markings shall be clear, legible and durable (see 4.6.1).

3.7.1 Color coding for voltage identification. When specified in the detail specification, lamp base insulators shall be color coded in accordance with SAE AS4156 in order to identify voltage ratings of subminiature lamps.

3.8 Examination of product. Lamps shall be dimensionally inspected for conformance to the applicable detail specification and visually examined for conformance to workmanship and identification of product (see 4.6.1).

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3.9 Packaging inspection. Inspection of packaging for shipment of lamps shall be accomplished as required (see 4.6.2 and section 5).

3.10 Workmanship. Each lamp, including all parts and accessories, shall be fabricated and finished, free of blemishes and defects which will adversely affect its life, form, fit or function. Soldering, welding, brazing, cementing and wiring shall be thorough and alignment of parts shall be accurate. Each lamp shall be thoroughly cleaned. Loose, spattered, or excess solder, metal chips, flux, and other foreign material shall be removed (see 4.6.1 and 6.5).

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 facilities 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. Unless otherwise specified, all items shall meet all requirements of sections 3 and 5. The inspections 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 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.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

- a. Qualification inspection (see 4.4)
- b. Quality conformance inspection (see 4.5)

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in section 2, MIL-STD-202.

4.3.1 Light output criteria. Unless otherwise specified, light output criteria shall be as specified in the detail specification. The test procedure for determining the change in light output before and after burning shall be the same for any one type lamp.

4.3.2 Lamp operation. Unless otherwise specified, lamps shall be operated at the rated voltage specified in the applicable detail specification. Voltage tolerance shall be within \pm one-half percent of the rated voltage (unless otherwise specified in the detail specification).

4.3.3 Lamp mounting. Unless otherwise specified, lamps shall be tested in a lampholder or fixture suitable for the lamp under test. The lampholder or fixture shall be rigidly mounted with no special provisions for absorbing or isolating the effects of shock, vibration or temperature. When testing directional beam lamps which require light distribution measurements to be made relative to a specified reflector for flight axis, provision shall be made in the test fixture for rotation of the mounted lamps to provide the required measurement axis. Care shall be taken to ensure that the light output measurements for each directional beam lamp is made on the same mechanical angle each time so that changes in the beam axis can be detected.

4.3.4 Precautions. The following precautions shall be observed when performing the high temperature tests:

- a. The test chamber shall be capable of maintaining the specified temperature within $\pm 5^{\circ}\text{C}$ ($\pm 10^{\circ}\text{F}$). The test chamber shall be operated for 1 hour prior to installation of lamps to ensure that the temperature has stabilized.
- b. Temperature measurements shall be made with thermocouples having leads at least 20 inches long within the oven. This will minimize the conduction of heat away from the junction.
- c. Baffles shall be placed within the oven so as to shield the lamps and thermocouple junctions from direct radiation from the heating elements and surfaces of the oven.
- d. The lamps shall be mounted so that there is a clear space between the lamps equal to at least the width of one lamp. The lamps shall be mounted so that the flux from any lamp does not directly strike any other lamp.

4.4 Qualification inspection. Qualification inspection shall be performed at a laboratory acceptable to the Government qualifying activity (see 6.3), on sample lamps produced with equipment and procedures normally used in production. The samples may be selected at random from recent production or fabricated, if lamps of recent production are not available. Qualification inspection shall be classified as follows:

- a. Full qualification - Lamp samples shall be subjected to and pass all inspections and tests specified in table I.
- b. Qualification by similarity - Lamp samples shall be subjected to and pass all inspections and tests specified in table II.

4.4.1 Extension of qualification by similarity. Unless otherwise specified, qualification of similar lamps from the same or different detail specifications may be extended from a previous fully qualified lamp, provided the following conditions are met and the required data and samples are supplied to the qualifying activity.

4.4.1.1 Conditions for qualification by similarity. Primary lamp(s) for full qualification, as designated by the detail specification, must pass full qualification for additional lamps of similar structure to be considered for qualification by similarity. Satisfactory performance of the primary lamp(s) to the operating characteristics and environmental tests specified

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herein will qualify the basic generic design, construction, manufacturing processes and quality controls for the family style. Additional lamps submitted for qualification by similarity must be products manufactured at the same manufacturing plant location, under the same manufacturing processes and quality controls as the fully qualified primary lamp(s). Unless otherwise specified, additional lamps must be of the same generic design and construction as the qualified primary lamp(s).

4.4.2 Data and test samples to be submitted to the qualifying activity.

4.4.2.1 Application for qualification shall be by letter addressed to the Commanding Officer, Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department, Code SR3, Lakehurst, NJ 08733-5100. The application shall provide the following data in accordance with publication SD-6 Provisions Governing Qualification.

- a. Identification of all lamps being submitted for both full qualification and qualification by similarity (military detail specification number and part identification numbers).
- b. Actual manufacturer's name and plant location, including complete address.
- c. Applicant's brand designation for the lamp(s). Where applicable, certification from the actual manufacturer to rebrand and distribute the lamp(s) under a distributor's own brand and designation.
- d. Test reports and data from manufacturer indicating conformance to the applicable specifications.
- e. Technical literature illustrative of the scope of the manufacturing facilities.
- f. Certification that the manufacturer has a documented quality control program in effect.

4.4.2.2 At the time of the application for qualification, test samples shall also be submitted to the qualifying activity as follows:

- a. Sample for full qualification. Unless otherwise specified, the test sample shall consist of 25 lamps of each specific part number for which full qualification is desired. For purposes of qualification testing, the qualifying activity will divide the twenty-five lamps into 6 sample groups: one sample group of 10 lamps (Sample Group 1), and 5 sample groups of 3 lamps (sample groups 2 through 6). Sample Groups 1 through 5 shall be subjected to and must pass the test series in table I for the group number indicated. The sixth group of samples shall be used for spares to replace unrelated failures (see 6.5).
- b. Samples for qualification by similarity. Unless otherwise specified, the test sample shall consist of 10 lamps of each specific part number for which qualification by similarity is desired. For purposes of qualification testing, 3 lamps of each

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part number shall be subjected to and must pass the tests specified in table II. Three lamps of each part number will be used as spares to replace unrelated failures (see 6.5).

The qualifying activity reserves the right to perform any tests or inspections on the untested lamp samples deemed necessary to verify qualification of additional lamps for extended qualification. The requirements for latent failures (see 4.4.3.2) and retention of qualification (see 4.4.4) apply to additional lamps qualified by similarity and limited testing.

- c. All test samples submitted for qualification shall be identified as to the applicant and the detail specification and part identification number.

TABLE I. Qualification inspection.

Inspection/Test	Number of Sample Units	Requirement Paragraph	Test Method
All sample groups	All	3.8	4.6.1
Examination of product		---	4.6.3
Burn-in/seasoning			
Sample Group 1	10		
Ratings (current, power, initial light output)		3.6.1	4.6.4
Life <u>1</u> /		3.6.2	4.6.5
Light output maintenance <u>2</u> /		3.6.1.1.2	4.6.6
Coating adhesion*		3.6.2	4.6.7
Solderability*		3.6.4	4.6.15
* Where applicable			
Sample Group 2	3		
High temperature		3.6.5.1	4.6.9
Sample Group 3	3		
Thermal shock		3.6.5.2	4.6.10
Sample Group 4	3		
Random vibration		3.6.5.3	4.6.11
Sample Group 5	3		
Shock		3.6.5.4	4.6.12
Humidity		3.6.5.5	4.6.13
Salt spray		3.6.5.6	4.6.14
Sample Group 6	3		
Spares only to replace unrelated failures (see 6.5)		---	---

1/ For average rated life specified in the detail specification up to 1000 hours maximum. For longer life lamps, the qualifying activity reserves the right to satisfy the life requirement by Government verification and acceptance of manufacturer's data from in-process quality conformance tests.

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2/ Unless otherwise specified, for 70 percent of average rated life specified in the detail specification up to 1000 hours maximum life.

TABLE II. Qualification inspection by similarity.

Inspection/Test	Number of Sample Units	Requirement Paragraph	Test Method
Burn-in/seasoning	3	---	4.6.3
Ratings (current, power, initial candlepower)		3.6.1	4.6.4
Random vibration		3.6.5.3	4.6.11
Colored lamps (color, high temp, coating adhesion)		3.5.5	4.6.8
		3.6.5.1	4.6.9
	3 (spares only)	3.6.3	4.6.7
Solderability (where applicable)		3.6.4	4.6.15

4.4.3 Failure.

4.4.3.1 Test sample failures. Failure of any lamp in the test sample to conform to the requirements specified herein shall be cause for not granting qualification approval. The qualifying activity shall be notified when an unrelated failure (see 6.5) occurs and reserve lamps are used, prior to the continuance of testing.

4.4.3.2 Latent failures. Lamps which can be identified to a specific manufacturer, and through field service usage fail significantly premature to an established baseline of normal ratings and requirements, may at the discretion of the qualifying activity, be required to be retested and requalified as meeting all of the requirements, or be removed from the QPL.

4.4.4 Retention of qualification. To retain qualification, the manufacturer shall complete and forward a certification of qualified products (DD Form 1718) at 24 month intervals to the qualifying activity (see 6.3). Failure to complete and return this form is cause for removal of product(s) from QPL-6363. The qualifying activity shall establish the initial reporting date.

4.5 Quality conformance inspection.

4.5.1 Quality control and production. The manufacturer shall have a documented quality control system approved by the Government. Complete and accurate records of the inspections and tests performed under this system shall be maintained. Inspections shall be performed throughout the manufacturing process to assure that lamps produced will be capable of meeting

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the requirements of this specification and associated detail specifications. Examination of product, ratings, and operating life testing shall be normal requirements of the manufacturer's in-process quality conformance procedures.

4.5.2 Inspection lot. An inspection lot shall consist of all lamps of one designation and size, from an identifiable production period, from one manufacturer and one plant location, submitted for acceptance and delivery under contract or purchase order. When production lots are fractionalized for acceptance and partial delivery under contract or purchase order, each partial quantity shall be considered a separate inspection lot.

4.5.3 Inspection of product for delivery.

4.5.3.1 Group A and B inspection. Inspection of product for delivery under contract or purchase order shall include Group A and B inspections (see table III). Random sampling for Groups A and B inspections shall be accomplished throughout the complete production lot manufacturing process in accordance with the sampling plan and acceptance level specified in the contract or purchase order (see 6.2).

4.5.3.1.1 Noncompliance. In the event of failure of sample lamps to pass the Group A and B inspections, the inspection lot shall be rejected and the manufacturer shall suspend offering lamps of the same designation until corrective action, as warranted, has been taken and another inspection lot of lamps has been inspected and passed the Group A and B inspections.

4.5.4 Periodic in-process inspection. Periodic in-process inspection shall consist of Group C inspection. Except where the results of these inspections show non-compliance with the applicable requirements (see 4.5.4.1.1), delivery of products which have passed the Group A and B inspections shall not be delayed pending the results of these periodic inspections.

4.5.4.1 Group C inspection. Sample lamps selected from the manufacturer's normal in-process inspection procedure shall be subjected to the Group C inspections specified in table III. The manufacturer's normal sampling, based upon production quantity or time periods, shall be used, and samples shall have passed the applicable Group A and B inspections. Group C inspection samples shall be representative of production.

4.5.4.1.1 Noncompliance. If a lamp sample fails to pass Group C inspection, the manufacturer shall notify the qualifying activity representative and the cognizant inspection activity of such failure and take corrective action on the materials and processes, or both, as warranted, and on all lamps or product which can be corrected and which are manufactured under essentially the same materials and processes, and which are considered subject to the same failure. Acceptance and shipment of lamps shall be discontinued until corrective action, acceptable to the qualifying activity representative or cognizant inspection activity has been taken. After the corrective action has been taken, Group C inspection shall be repeated on additional sample lamps (all tests and examinations, or the test which the original sample lamp failed) at the option of the qualifying activity representative or the cognizant inspection activity. Groups A and B inspections may be re-instituted; however, final acceptance and shipment shall be withheld until Group C inspection has shown that the corrective action was successful. In the event of failure after reinspection,

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TABLE III. Quality conformance inspection.

Inspection	Requirement Paragraph	Inspection Paragraph
Group A Examination of product Packaging	3.8 3.9	4.6.1 4.6.2
Group B Ratings (current, power, initial light output) Solderability (where applicable) Colored lamps	3.6.1 3.6.4 3.5.5	4.6.4 4.6.15 4.6.8
Group C Life Light output maintenance Coating adhesion (where applicable)	3.6.2 3.6.1.1 3.6.3	4.6.5 4.6.6 4.6.7

Information concerning the failure shall be furnished to the qualifying activity and the cognizant inspection activity.

4.5.4.1.2 Disposition of samples. Sample lamps which have been subjected to Group C inspection shall not be delivered to the Government on contract or purchase order.

4.6 Test methods and examinations.

4.6.1 Examination of product. The sample group lamps shall be visually and dimensionally examined for conformance to this specification and the applicable detail specification.

4.6.2 Packaging inspection. The sampling and inspection of the packaging, packing, container and container marking shall be in accordance with level III, MIL-P-116, or as specified in the contract or purchase order.

4.6.3 Burn-in/seasoning. Prior to the start of testing, the sample group lamps shall be seasoned by being operated at the rated voltage for a period of time equal to 1 percent of the rated life specified in the applicable detail specification or a maximum of 10 hours.

4.6.4 Ratings. The sample group lamps shall be mounted on an open rack, locked in a vibration free position and connected to a suitable power source and required instrumentation.

4.6.4.1 Photometric tests. Photometric tests shall be performed using standard lamps traceable to National Institute of Standards and Technology (NIST). Lamp standards should be calibrated on a yearly basis minimum.

4.6.4.2 Initial ratings. After burn-in/seasoning, the sample group lamps shall be energized at rated voltage, and the current, power and initial light output shall be measured, recorded, and compared to ratings specified in the detail specification.

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4.6.4.3 Post test ratings. When required by the specified test procedure, the sample group lamps shall be energized at rated voltage, and the current, power and light output shall be measured, recorded and compared to ratings specified in the detail specification.

4.6.5 Life. The sample group lamps shall be mounted on an open rack, locked in a vibration-free position, and connected to a suitable power source and required instrumentation. The lamps shall be operated at rated voltage to determine that average lamp life conforms to that specified in the applicable detail specification. For qualification purposes, life test shall be performed up to 1000 hours maximum.

4.6.5.1 Life test average determination. The average laboratory lamp life is determined by operation of the lamps at rated voltage. The average represents the number of hours that it would take for 50 percent of the test samples to fail. Lamps are considered as having failed when they burn out or light output decreases by more than 20 percent of initial reading. For qualification purposes, when test samples are exceeding the specification requirement prior to the point of failure of 50 percent of the sample lamps, the life test may be terminated prior to 50 percent sample failure.

4.6.6 Candlepower maintenance. The sample group lamps shall be tested to determine that at 70 percent of the specified average rated life, or as specified in the detail specification, the light output does not fall below 80 percent of the initial light output. For colored lamps, all light emitted shall conform to MIL-C-25050 for the color specified in the detail specification.

4.6.7 Coating adhesion. The sample group lamps shall be tested to determine the coating adhesion by tape stripping using the following procedure. A minimum of 2 inches of a longer piece of pressure sensitive adhesive tape, 0.750 inches in width, conforming to Commercial Item Description A-A-883, Type I, shall be pressed firmly onto a flat or cylindrical coated surface of the sample lamp or as specified in the applicable detail specification, rubbing out all air bubbles under the tape. Ten seconds shall be allowed for the test area to return to room temperature. Then grasping a free end of the tape and in a rapid motion the tape shall be pulled back upon itself at 180 degrees (in such a manner that the tape is folded back to back during the procedure). This test shall be performed both before and after the sample group lamps are operated for 10 percent of the rated life. After testing, the sample group lamps shall be checked for conformance to 3.6.3. Any sample lamp indicating failure shall be cause for rejection of the sample group. When performed as part of the Group C tests, failure of the sample group to meet the coating adhesion requirements shall be cause for acceptance and shipment of lamps to be discontinued until the requirements of 4.5.4.1.1 have been satisfied.

4.6.8 Colored lamps. Colored lamps shall be operated at rated voltage and the light emitted shall be measured for conformance to MIL-C-25050 for the specified color.

4.6.9 High temperature. The sample group lamps shall be mounted on an open rack, locked in a vibration-free position, and operated at rated voltage for a minimum of 70 percent of average rated life or as specified in the detail specification up to a maximum of 1000 hours for qualification testing.

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Lamps designated as Type I shall be operated at 85°C (185°F) and lamps designated as Type II shall be operated at the maximum temperature specified in the applicable detail specification. The time of any individual sample lamp failure and reason for failure shall be reported. After test, lamps shall be checked for conformance to 3.6.5.1.

4.6.10 Thermal shock. The sample group lamps shall be subjected to a thermal shock test using the procedure of Test Method 107, MIL-STD-202, with the exceptions indicated in table IV. This test shall be performed with the lamps operating at rated voltage. Table IV below shall be substituted for table 107-1, Test Method 107, MIL-STD-202. Continue steps 1 through 4 of table IV for 25 cycles. The time of any individual sample lamp failure and reason for failure shall be reported. After test, lamps shall be checked for conformance to 3.6.5.2.

TABLE IV. Thermal shock test conditions.

Type I Lamps				Type II Lamps		
Step	Temperature		Time per Cycle	Temperature		Time per cycle
	°C	°F		°C	°F	
1	-55 +1	-67 +2	Table 107-2	-55 +1	-67 +2	Table 107-2
2	+25 +2	+77 +5	5 min max	+25 +2	+77 +5	5 min max
3	+85 +2	+185 +5	Table 107-2	See 1/		Table 107-2
4	+25 +2	+77 +5	5 min max	+25 +2	+77 +5	5 min max

1/ High temperature as specified in the applicable detail specification.

4.6.11 Random vibration. The sample group lamps shall be subjected to a random vibration spectrum between 5 and 2000 Hz with power spectral densities as specified in the detail specification for each lamp type.

4.6.11.1 Vibration system control and analysis. The output of the vibration machine shall be presented graphically as power-spectral density (G^2/Hz) versus frequency. The spectral density values shall be as specified in the applicable detail specification. The vibration apparatus control and analysis of vibration shall be in accordance with Test Method 214, MIL-STD-202.

4.6.11.2 Test setup applicable to all lamps. The sample group lamps shall be vibrated for a total of 30 minutes; 7.5 minutes with the lamps nonoperating and 22.5 minutes with the lamps operating at rated voltage. Nonoperating vibration shall be in the "Z" axis as indicated in the applicable detail specification. During the operating mode, the lamps shall be vibrated for 7.5 minutes in each of 3 mutually perpendicular axes as defined in the applicable detail specification. The vibration with lamps operating shall start immediately after lamps are lit without any additional burn-in. Either the fixture or the lamps may be rotated to achieve the positioning of lamps in each of the axes. The time to failure of any

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individual sample lamp and the observed reason for failure shall be reported. After this test, the sample group lamps shall be inspected for conformance to 3.6.5.3.

4.6.12 Shock. The sample group lamps shall be subjected to a shock test using Test Method 213, Test Condition J, MIL-STD-202 with the exceptions indicated herein. This test shall be performed with the lamps operating at the rated voltage. A peak "g" load value as specified in the applicable detail specification, shall be substituted for that specified in Test Condition J, Table 213-1. If no "g" load value is specified in the detail specification, the shock test shall be conducted using a 30 g's peak load. The time of failure of any individual sample lamp and reason for failure shall be reported. After this test, the sample group lamps shall be inspected for conformance to 3.6.5.4.

4.6.13 Humidity. The sample group lamps, nonoperating, shall be subjected to a humidity test using Test Method 103, Test Condition A (240 hours), MIL-STD-202. After this test, the sample group lamps shall be operated to determine conformance to 3.6.5.5.

4.6.14 Salt spray. The sample group lamps nonoperating, shall be subjected to a salt spray test using Test Method 101, Test Condition B (48 hours), MIL-STD-202. After this test, the sample group lamps shall be operated to determine conformance to 3.6.5.6.

4.6.15 Solderability. Sample group unbased lamps having wire lead terminations shall be tested in accordance with Method 208, MIL-STD-202, and evaluated for solderability of wire leads as specified in 3.6.4.

5. PACKAGING

5.1 Packing. Unless otherwise specified in the contract or purchase order, requirements for unit, intermediate, and exterior packing for shipment shall be in accordance with MIL-STD-2073-1 (see 6.2).

5.2 Marking. In addition to any special marking specified in the contract or purchase order, requirements for marking of unit, intermediate, and exterior containers shall be in accordance with MIL-STD-129 (see 6.2).

6. NOTES

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

6.1 Intended use. Lamps acquired to this specification are intended for use primarily in military aircraft lighting applications where equipment and aircraft must operate under severe performance, storage and environmental conditions. Typical lamp usages include applications in instruments and panel illumination, control and signal indicators, anti-collision lights, wing position lights, taxiing and landing lights.

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification, the applicable detail specification, and applicable QPL.

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- b. Part identifying number of lamp required (see detail specification sheet)
- c. Color of lamp required, if not otherwise specified in the detail specification (see 6.6).
- d. Levels of packaging and packing (see Section 5).
- e. Marking of packs and packages (see Section 5).
- f. Sampling plans and acceptance levels for Group A and Group B inspections (see 4.5.3.1).

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are, at the time of award of contract, qualified for inclusion in Qualified Products List (QPL-6363) whether or not such products have actually been so listed by that date. The attention of the contractors is called to these requirements, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or purchase orders for the products covered by this specification. Application for qualification shall be in accordance with publication SD-6, Provisions Governing Qualification. The qualifying activity responsible for the Qualified Products List is the Naval Air Warfare Center Aircraft Division Lakehurst, Systems Requirements Department (Code SR3), Lakehurst, NJ 08733-5100. Information pertaining to qualification of products may be obtained from that activity.

6.4 Rated life. The specified average rated life (see 3.6.2) is based upon operating the lamps at the specified design voltage. Where performance of life testing at rated voltage is considered to be impractical, the use of accelerated life testing based on the 12th power rule is permissible.

$$\text{Accelerated life} = \text{Rated life at design voltage} \left(\frac{\text{Rated Volts}}{\text{Operating Volts}} \right)^{12}$$

Upon application to, and approval of the procuring activity, the manufacturer may provide test results from his in-process quality conformance testing to substantiate the life requirements.

6.5 Definitions. For purposes of defining various types of defects or terminology which is referred to in this specification, the following definitions apply:

Blemish - A visual nonfunctional imperfection of the symmetry of the lamp globe or base.

Blister - A visible separation of a coating from the glass bulb which forms an upraised, unbroken bubble.

Crack - A narrow lengthwise opening, split or fissure produced by a partial separation of the coating from the bulb surface.

Damage - Any lamp component defect which prohibits the lamp from conforming to its basic functional and light distribution requirements.

Defect - A fault in workmanship or manufacture which affects the proper functioning of the item.

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Discolor - A distinct change in hue of color or coating which adversely affects the lamp's functional color or reflective qualities and reduces its illumination characteristics to an out of specification condition.

Fade - A loss of brightness or vividness of color such as to adversely affect the lamp's functional color or reflective qualities and reduces its illumination characteristics to an out of specification condition.

Filament - C = single helical coil.
 CC = coiled coil or double helical coil
 F = flat coil.
 S = straight uncoiled wire.

Light center for C-2 shaped filaments - Light center is a point lying in a plane through the axis of the filament coils midway between the "top" and "bottom" of the lighted filament and midway between the outer edges of the filament coils at the horizontal level of the light center.

NOTE: Filament top is the upper extremity of the highest lighted turn (away from base) in either coil segment. Filament bottom is the underside of the lowest lighted turn (toward base) in either coil segment. The lowest lighted turn is considered for this purpose as being the first turn above the first inside angle between turns of the projected filament image.

Light center for C-6 shaped filaments - Light center is a point lying in the axis of the filament coil midway between the end turns of the lighted filament.

Light center length (LCL) - Light center length is the distance from light center to the specified reference point on the lamp.

Reference points on the lamp base for light center length measurement.

Bayonet base - Top of base pins.
 Single contact miniature flanged - Top of bosses in the flange.
 Single contact index - Top of base pin nearer bottom contact.
 SC midget flange - Top of flange.
 Submidget flange - Top of flange.

Peel - Defined as any one of the following conditions for:

a. Colored lamps:

1. No more than 1 area having a coating void not to exceed .0625 inch average diameter.
2. No more than 2 areas having coating voids not to exceed .0312 inch average diameter or combined total of .0625 inch diameter.
3. No more than 5 areas having coating voids of less than .0312 inch average diameter or a combined total of .0625 inch diameter.

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b. Reflector lamps:

With the lamp operating at rated voltage no more than 4 non-adjacent voids shall be visible when the lamp is checked from a distance no closer than 18 inches. Void diameter shall not exceed .050 inch. These requirements do not apply within .050 inch of the glass to base junction and the coating to glass junction.

Unrelated failure - A lamp failure, malfunction, or breakage, occurring during testing, which is not attributable to the effect of the test procedure. Examples:

Lamp inadvertently damaged or broken during handling or fixturing.

Malfunction of test equipment causing lamp under test to fail or malfunction.

6.6 Part or identifying number (PIN). The part or identifying number (PIN) consists of the letter "M," the basic number of the applicable detail specification sheet (not including the revision letter) and an assigned dash number. When required for colored lamps, an additional upper case suffix letter indicating the lamp color will be used. When required for aged and selected tolerance on MSCD, an additional suffix "AS__" indicating the aged and selected tolerance will be used.

Example of part identifying number:

MIL Designation	Specification Sheet Number	Dash No.	Suffix Letter for Color	Suffix for Aged & Selected
M	6363/X	-1	R	AS15

Suffix letter codes for colored lamps:

Suffix Letter	Color
R	Red
G	Green
B	Blue
Y	Yellow
W	White

6.7 Appendix cross-reference. The appendix which follows is a cross-reference listing of MIL-L-6363 detail specification sheet part numbers to similar Industry/ANSI lamp part numbers. This cross-reference is for convenience only and is not intended for use as an interchangeability list to substitute commercial lamp numbers for MIL-L-6363 part numbers.

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6.8 Subject term (keyword) listing.

Aircraft lamps
Aircraft lighting
Bulbs
Illumination
Incandescent lamps
Lighting
Lights

6.9 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Army - AV
Navy - AS
Air Force - 99

Preparing activity:

NAVY - AS

(Project 6240-1119)

Review activities:

DLA - GS
Air Force - 82, 11
Navy - SH

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APPENDIX

CROSS-REFERENCE LIST

10. SCOPE

10.1 Scope. THIS APPENDIX PROVIDES GUIDANCE INFORMATION ONLY AND IS NOT INTENDED TO BE USED FOR PURPOSES OF INTERCHANGEABILITY.

10.2 This appendix provides a listing of part identifying numbers indicated on MIL-L-6363 detail specification sheets cross-referenced to Industry/ANSI lamp numbers for similar lamps. This cross-reference listing is intended for reference use only and is NOT to be used for interchangeability with commercial or other military designated lamps due to unique aircraft applications and qualification requirements of MIL-L-6363 and its associated detail specification sheets.

20. APPLICABLE DOCUMENTS

MIL-L-6363 detail specification sheets as indicated in the following listing.

30. CROSS-REFERENCE LISTING

30.1 Detail specification sheet number assignments for various lamp family types have been preassigned, but not all specification sheets are formally issued at this time. Those issued are so noted. Those still in draft form are so noted, but listed for future convenience of cross-reference information.

30.2 This listing will be revised when additional part numbers are added to the MIL-L-6363 specification sheets listed, or when new MIL-L-6363 specification sheets are drafted or issued.

<u>MIL-L-6363 Specification Sheet and Part No.</u>	<u>Similar Industry/ANSI Lamp No.</u>	<u>NSN</u>
MIL-L-6363/1 (Issued) - SC Bayonet Candelabra Base, Reflective Coated		
M6363/1-1	7079	6240-01-262-0145
M6363/1-2	617	6240-01-262-0146
M6363/1-3	1687	6240-01-262-5786
MIL-L-6363/2 (Issued) - SC Bayonet Candelabra Base, Reflective Coated		
M6363/2-1	600	6240-01-262-0147
M6363/2-2	7512	6240-01-262-0148
MIL-L-6363/3 (Issued) - SC Bayonet Candelabra Base, Reflective Coated		
M6363/3-1	4174	6240-01-262-0149
M6363/3-2	1163	6240-01-262-5787

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MIL-L-6363 Specification Sheet and Part No.	Similar Industry/ANSI Lamp No.	NSN
<u>MIL-L-6363/4 (Draft) - T-3/4 Submin Unbased Wire Lead Terminals Integral Lighting</u>		
M6363/4-1 AS15	6803AS15	
M6363/4-2 AS15	6833AS15	
M6363/4-3 AS15	7153AS15	
M6363/4-4 AS15	6153AS15	
<u>MIL-L-6363/5 (Draft) - T-1 Submin Unbased Wire Lead Terminals Integral Lighting</u>		
M6363/5-1 AS15	680AS15	
M6363/5-2 AS15	683AS15	
M6363/5-2R	683Red	
M6363/5-3 AS15	715AS15	
M6363/5-4 AS15	3070AS15	
M6363/5-5 AS15	6802AS15	
M6363/5-6 AS15	6832AS15	
M6363/5-7 AS15	7132AS15	
M6363/5-8 AS15	7152AS15	
M6363/5-8R	7152Red	
M6363/5-9 AS15	30702AS15	
M6363/5-10 AS15	7009AS15	
<u>MIL-L-6363/6 (Draft) - T-1 Submidget Flanged Base</u>		
M6363/6-1 AS15	682AS15	
M6363/6-2 AS15	685AS15	
M6363/6-3 AS15	3071AS15	
M6363/6-4 AS15	714AS15	
M6363/6-5 AS15	718AS15	
M6363/6-6 AS15	6839AS15	
<u>MIL-L-6363/7 (Draft) - T-1-1/4 Submin Knurled Screw Base</u>		
M6363/7-1	323	
M6363/7-1R	323Red	
M6363/7-2	8639	
M6363/7-3	8623	
M6363/7-3R	8623Red	
<u>MIL-L-6363/8 (Issued) - T-1-3/4 SC Midget Flanged Base</u>		
M6363/8-1	3150	
M6363/8-1 AS15	3150AS15	
M6363/8-2	328	
M6363/8-2 AS10	328AS10	
M6363/8-2B	328Blue/White	
M6363/8-2R	328 Red	
M6363/8-3	381	
M6363/8-3 AS15	381AS15	
M6363/8-4	8918	

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<u>MIL-L-6363 Specification Sheet and Part No.</u>	<u>Similar Industry/ANSI Lamp No.</u>	<u>NSN</u>
<u>MIL-L-6363/8 (Issued) - T-1-3/4 SC Midget Flanged Base (Continued)</u>		
M6363/8-4 AS15	8918AS15	
M6363/8-5	327	
M6363/8-5 AS15	327AS15	
M6363/8-5R	327Red	
M6363/8-6 AS15	385AS15	
M6363/8-7	387	
M6363/8-7 AS15	387AS15	
M6363/8-7R	387Red	
<u>MIL-L-6363/9 (Draft) - T-3-1/4 SC Min Bayonet Base</u>		
M6363/9-1	316	
M6363/9-1R	316Red	
M6363/9-2	313	
M6363/9-2R	313Red	
M6363/9-3	1819	
M6363/9-3R	1819Red	
M6363/9-4	1829	
<u>MIL-L-6363/10 (Issued) - G-5 SC Bayonet Candelabra Base</u>		
M6363/10-1	301	
<u>MIL-L-6363/11 (Issued) - G-6 SC Bayonet Candelabra Base</u>		
M6363/11-1	89	
M6363/11-2	303	
<u>MIL-L-6363/12 (Issued) - S-8 SC Bayonet Candelabra Base</u>		
M6363/12-1	1680	
M6363/12-2	1683	
M6363/12-3	1141	
M6363/12-4	307	
M6363/12-4R	307Red	
M6363/12-4SB	307Ref1 Coated	
M6363/12-5	315	
M6363/12-6	305	
M6363/12-7	1691	
M6363/12-8	2222	
M6363/12-9	2223	
<u>MIL-L-6363/13 (Issued) - S-11 SC Bayonet Candelabra Base</u>		
M6363/13-1	311	
M6363/13-1R	311Red	
M6363/13-2	3011	

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<u>MIL-L-6363 Specification Sheet and Part No.</u>	<u>Similar Industry/ANSI Lamp No.</u>	<u>NSN</u>
<u>MIL-L-6363/14 (Draft) - T-4-1/2 SC Bayonet Candelabra Base</u>		
M6363/14-1	1495	
M6363/14-2	1495X	
<u>MIL-L-6363/15 (Draft) - PAR 36 and PAR 46 Bulb</u>	Later	
<u>MIL-L-6363/16 (Draft) - PAR 46 Bulb, Aircraft Taxiing</u>	Later	
<u>MIL-L-6363/17 (Draft) - PAR 64 Bulb, Aircraft Landing</u>	Later	
<u>MIL-L-6363/18 (Draft) - PAR 56 Bulb</u>	Later	
<u>MIL-L-6363/19 (Draft) - T-20 Bulb, Medium Bipost Base</u>	Later	

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1. DOCUMENT NUMBER

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2. DOCUMENT DATE (YYMMDD)

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3. DOCUMENT TITLE

LAMPS, INCANDESCENT, AIRCRAFT SERVICE
GENERAL SPECIFICATION FOR

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

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b. ORGANIZATION

c. ADDRESS (Include Zip Code)

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