

MIL-R-52447C  
26 January 1976  
SUPERSEDING  
MIL-R-52447B(EL)  
23 September 1969

## MILITARY SPECIFICATION

REFLECTOR, PARABOLIC,  
22 1/2 INCH,  
FOR  
SEARCHLIGHT, INFRARED,  
28-VOLT, 110-AMPERE

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

### 1. SCOPE

1.1 This specification covers one type of a primary reflector for use with searchlight, infrared, 28 volt, 100 ampere.

### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

## SPECIFICATIONS

### FEDERAL

NN-P-71	Pallet, Materials Handling, Wood, Stringer Construction, 2-Way and 4-Way (Partial)
QQ-S-781	Strapping, Steel, Flat and Seals
PPP-B-585	Boxes, Wood, Wirebound
PPP-B-601	Boxes, Wood, Cleated-Plywood
PPP-B-621	Boxes, Wood, Nailed and Lock Corner
PPP-B-636	Boxes, Shipping Fiberboard
PPP-F-320	Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade), and Cut Shapes
PPP-P-291	Paperboard, Wrapping and Cushioning
PPP-T-45	Tape, Gummed, Paper, Reinforced and Plain for Sealing and Securing
PPP-T-76	Tape, Pressure-Sensitive Adhesive
	Paper, (For Carton Sealing)
PPP-T-97	Tape, Pressure-Sensitive Adhesive Filament Reinforced

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MILITARYMIL-P-116  
MIL-M-10304

MIL-P-11268

MIL-B-43014

Preservation-Packaging Methods of  
Meters, Electrical Indicating, Panel Type,  
Ruggedized, General Specification for  
Parts, Materials, and Processes Used in  
Electronic Equipment  
Boxes, Water Resistant Paperboard, Folding,  
Set-up, and Metal-Stayed

## STANDARDS

MILITARY

MIL-STD-105

MIL-STD-129  
MIL-STD-130

MIL-STD-147

MIL-STD-810

Sampling Procedures and Tables for  
Inspection by Attributes  
Marking for Shipment and Storage  
Identification Marking of US Military  
Property  
Palletized and Containerized Unit Loads  
40 Inch x 48 Inch Pallets Skids, Runners,  
or Pallet Type Base  
Environmental Test Methods

## DRAWINGS

ELECTRONICS COMMAND

SC-DL-613956

Reflector Assembly, Primary

(Copies of specifications, standards and drawings required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

## ILLUMINATING ENGINEERING SOCIETY

Illuminating Engineering, Vol. LVII, No. 3, March 1962.

Application for copies should be addressed to the, Illuminating Engineering Society, 1860 Broadway, New York, New York 10023.

## 3. REQUIREMENTS

3.1 Construction. The reflector shall be in accordance with Drawing SC-DL-613956 and all provisions of this specification.

3.2 First article. When specified in the contract or purchase order, the contractor shall furnish first article units in accordance with 4.3.

**3.3 Parts and materials.** Parts and materials shall be as specified herein and as shown on the applicable drawings. Materials not specified shall be selected by the contractor and shall be subject to all provisions of this specification and shall conform to MIL-P-11268.

**3.4 Mechanical shock.** The reflector shall not be damaged after being subjected to shocks of 3.5 g's minimum, perpendicular to the optical axis, with a sustained pulse duration of 8.5 milliseconds, plus or minus 0.5 millisecond and shocks of 12 g's minimum, parallel to the optical axis, with a sustained pulse duration of 42 milliseconds, plus or minus 1.0 millisecond.

**3.5 Spectral reflectivity.** Spectral reflectivity of the reflector shall be not less than 86 percent at 1,000 millimicrons and not less than 76 percent at 550 millimicrons.

**3.6 Circle of confusion.** The circle of confusion of the reflector shall be not greater than 1 millimeter in diameter with an energy transmission of not less than 88 percent. The reflector shall meet the circle of confusion requirement after the environmental tests specified herein.

**3.7 Vibration.** The reflector shall not be damaged (see 6.3) by sustained vibration in any direction at frequencies varying from 10 to 55 Hertz (Hz) at a g level (see 6.3) as described in Figures 1, 2 and 3.

**3.8 Storage temperature.** The reflector shall not be damaged by storage in any ambient temperature from minus 62°C to plus 68°C.

**3.9 Thermal shock.** The reflector shall not be damaged by thermal shock from minus 54°C to plus 68°C.

**3.10 High temperature and humidity.** The reflector shall not be damaged when subjected to temperatures between plus 23°C and plus 52°C with a relative humidity of 95 percent.

**3.11 Salt fog.** The reflector shall not be damaged by exposure to salt-sea atmosphere.

**3.12 Identification marking.** The reflector shall be identified in accordance with MIL-STD-130.

**3.13 Workmanship.** Reflectors shall be uniform in quality and shall be free from defects such as scratches, chips, crazing, sharp edges, discoloration, or other defects that may adversely affect the intended function of the reflector.

#### **4. QUALITY ASSURANCE PROVISIONS**

**4.1 Responsibility for inspection.** Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified by the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified

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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 assure suppliers and services conform to prescribed requirements.

4.2 Classification of inspection. Inspection shall be classified as follows:

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.5).
- c. Inspection of preparation for delivery (see 4.7).

4.3 First article. Unless otherwise specified in the contract or purchase order, the first article inspection shall be performed by the contractor.

4.3.1 Inspection. Each reflector shall be examined in accordance with Table I. One or more defects shall be cause for rejection of that reflector.

TABLE I Inspection

Defects	Requirement paragraph
<u>MAJOR</u>	
101. Absence of any part or component	3.1
102. Any dimension not as specified	3.1
103. Misalignment of parts or components	3.1
104. Material not as specified	3.3
105. Absence or incorrectness of identification markings	3.12
106. Workmanship not as specified	3.13

MINOR

Defects not listed as major shall be classified as minor.

4.3.2 Tests. Upon successful completion of the examination specified in 4.3.1 the first article reflector shall be subjected to the tests in Table II. Tests shall be conducted in the order listed. Failure of any tests shall be cause for rejection.

TABLE II Inspection

Tests	Requirement paragraph	Test paragraph
Mechanical shock	3.4	4.6.1
Spectral reflectivity	3.5	4.6.2
Circle of confusion	3.6	4.6.3
Vibration	3.7	4.6.4
Low temperature storage	3.8	4.6.5.1
High temperature storage	3.8	4.6.5.2
Thermal shock	3.9	4.6.5.3
High temperature and humidity	3.10	4.6.5.4
Salt fog	3.11	4.6.6

4.4 Inspection covered by subsidiary documents. The reflector shall be inspected under the applicable subsidiary documents as part of the inspection required by this specification and the inspection requirement specified in the contract or purchase order (see 4.3.1, Table I).

#### 4.5 Quality conformance inspection.

4.5.1 Examination. Each reflector shall be inspected as specified in Table I. Presence of one or more defects shall be cause for rejection.

#### 4.5.2 Tests.

4.5.2.1 Group A Inspection. Each reflector shall be tested in accordance with Table III. Failure of any test shall be cause for rejection.

TABLE III Group A Inspection

Test	Requirement paragraph	Test paragraph
Circle of confusion	3.6	4.6.3

4.5.2.2 Group B Inspection. Group B inspection shall be conducted on reflectors selected from units which have passed the examination and tests in 4.5.1 and 4.5.2.1. Sampling shall be in accordance with MIL-STD-105, AQL 6.5 percent defective, inspection level S-2. Test shall be conducted in accordance with Table IV.

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TABLE IV Group B Inspection

Test	Requirement paragraph	Test paragraph
Spectral reflectivity	3.5	4.6.2

4.5.2.3 Group C Inspection. This inspection shall consist of the tests specified in Table V and shall be performed in sample units that have been subject to and met Group A and B inspection. Sample units shall be selected in accordance with 4.5.2.3.1.

4.5.2.3.1 Sampling for inspection. One sample reflector shall be selected at random for all inspections in Table V from the monthly specified quantity produced or each 100 reflectors, whichever occurs first. The sample selected shall be at the start of the contract from the first quality conformance inspection production lot.

TABLE V Group C Inspection

Test	Requirement paragraph	Test paragraph
Mechanical shock	3.4	4.6.1
Low temperature storage	3.8	4.6.5.1
High temperature storage	3.8	4.6.5.2
Thermal shock	3.9	4.6.5.3
High temperature and humidity	3.10	4.6.5.4

4.5.2.3.2 Group C failures. Actions required relative to Group C failures shall be as specified in the contract or order, (see 6.2).

4.5.3 Reinspection of Group B and Group C sample units. Unless otherwise specified, sample units which have been subjected to and passed both Group B and Group C reinspection may be accepted on contract or order provided all damage is repaired and the sample units are resubjected to and pass Group A inspection.

4.6 Test Methods. Tests required to determine compliance with the requirements of this specification shall be conducted in accordance with the test procedures specified herein. All meters used during tests shall have been calibrated within 30 days prior to the start of testing, and thereafter as required, and at intervals not to exceed 6 months. Ambient and operating temperatures during environmental testing, vibration frequency and amplitude, and mechanical shock forces shall be recorded using recording instruments, accurate within 3.0 percent with a damping factor not greater than 3 as defined in MIL-M-10304. All tests shall be conducted at room temperature (see 6.3) unless otherwise specified in the individual test procedure. Test facilities, chambers and apparatus used in conducting tests specified herein shall meet the requirements of MIL-STD-810.

**4.6.1 Mechanical shock.** The reflector shall be mounted vertically on a rigid, nonresonant fixture. The mounting of the reflector to the fixture shall be such that the 22 1/2 inch dimension shall be in the horizontal plane and the reflector shall be supported only at the center mounting hole. An accelerometer shall be attached to the fixture immediately adjacent to the reflector. The reflector shall be examined for damage after each of the following test procedures:

a. Six shocks shall be applied parallel to the optical axis of the reflector with a pulse duration of 42 milliseconds, plus or minus 1 millisecond at a force of 12 g's minimum.

b. Six shocks shall be applied perpendicular to the optical axis of the reflector in a vertical direction with a pulse duration of 8.5 milliseconds, plus or minus 0.5 millisecond at a force of 3.5 g's minimum.

Evidence of any damage shall constitute failure of this test.

**4.6.2 Spectral reflectivity.** The spectral reflectivity shall be measured with a Beckman Model DU Spectrophotometer or an equivalent instrument approved by a representative of the contracting officer. Reflectivity measurements may be made on samples from the circular portion removed to form the center hole. Reflectivity measurements shall be made at wavelengths of 550 and 1,000 millimicrons, plus or minus 20 millimicrons. Values less than 76 percent at 550 millimicrons or less than 86 percent at 1,000 millimicrons shall constitute failure of this test.

**4.6.3 Circle of confusion.** The zero-length searchlight photometry system described in "Illuminating Engineering", Vol LVII, No. 3, March 1962, or an equivalent system approved by the contracting officer shall be used throughout this test. For a circle of confusion measurement, a point source of light (see 6.3) is placed at the focal point of the reflector. This light beam, after being reflected and collimated, is accepted by an integrating sphere positioned at the focal point of the collimator mirror. The aperture of the integrating sphere is adjusted to an opening which by previous calibration corresponds to intercepting 100 percent light output of the reflector. The light output from the integrating sphere is measured by a light cell and recorded as the 100 percent light output of the reflector. At this point, the integrating sphere aperture is adjusted to an opening which also by previous calibration corresponds to the aperture necessary to fulfill a circle of confusion of 1 millimeter at the reflector. The light output (energy) collected by the sphere is again measured, and the percent of energy transmission derived from the ratio of the two measurements constitutes the circle of confusion in terms of percent of energy transmission. A circle of confusion less than 88 percent shall constitute failure of this test.

**4.6.4 Vibration.** The reflector shall be mounted vertically on a rigid non-resonant fixture. The mounting of the reflector to the fixture shall be such that the 22 1/2 inch dimension shall be in the horizontal plane and the reflector shall be supported only at the center mounting hole. An accelerometer shall be attached to the fixture immediately adjacent to the center mounting hole. The reflector shall be examined for damage after each of the following procedures:

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a. Vibrate the reflector in a horizontal direction parallel to the optical axis of the reflector with the frequency varying between 10 and 55 Hz at the maximum g level as described in Figure 3. The frequency shall change uniformly from 10 to 55 Hz and return to 10 Hz. The acceleration or deceleration shall not exceed plus or minus 10 percent. The reflector shall be vibrated in this plane for a period of 90 minutes. The resonant frequencies shall be determined during this time and at the conclusion of the 90 minutes, the reflector shall be vibrated at each resonant frequency for 15 minutes.

b. Repeat a. with the direction of vibration in a horizontal plane perpendicular to the optical axis of the reflector. Figure 2 shall apply to acceleration values.

c. Repeat a. with the direction of vibration in a vertical plane perpendicular to the optical axis of the reflector. Figure 1 shall apply to acceleration values.

d. Repeat a. through c. at minus 54°C after cold soaking at minus 54°C for 2 hours.

Evidence of any damage shall constitute failure of this test.

#### 4.6.5 Environmental conditions.

4.6.5.1 Low temperature storage. The reflector shall be stored in the test chamber at an ambient temperature of minus 62°C for a period of 8 hours. At the conclusion of the storage period, the reflector shall be examined. Any evidence of damage shall constitute failure of this test.

4.6.5.2 High temperature storage. The reflector shall be stored in the test chamber at an ambient temperature of plus 68°C with maximum humidity of 90 to 98 percent for 8 hours. At the conclusion of the storage period the reflector shall be examined. Any evidence of damage shall constitute failure of this test.

4.6.5.3 Thermal shock. The reflector shall be placed in an ambient temperature of minus 54°C for a period of not less than 6 hours. The reflector shall be removed from the chamber while at minus 54°C and immediately placed in an ambient temperature of not less than plus 68°C. After remaining at this temperature for 1 hour, the reflector shall be examined. Any evidence of damage shall constitute failure of this test.

4.6.5.4 High temperature and humidity. The reflector shall be placed in a test chamber and subjected to three 12 hour cycles of exposure with a relative humidity maintained between 90 and 98 percent at all times. Each cycle shall consist of the following:

- a. Two hours at plus 52°C.
- b. Decrease temperature within 1 hour to plus 23°C.
- c. Maintain plus 23°C for 1 hour.
- d. Increase temperature within 1 hour to plus 52°C.



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- e. Maintain plus 52°C for 2 hours.
- f. Decrease temperature to plus 23°C within 1 hour.
- g. Maintain plus 23°C for 1 hour.
- h. Increase temperature within 1 hour to plus 52°C.
- i. Maintain plus 52°C for 2 hours.

Immediately upon completion of the 3 cycles the reflector shall be examined. Any evidence of damage shall constitute failure of this test.

4.6.6 Salt fog. The reflector shall be subjected to test method 509 of MIL-STD-810. Discoloration, deterioration or loss of reflectivity of the reflecting surface shall constitute failure of this test.

4.7 Inspection of preparation for delivery. Preparation for delivery shall be inspected in accordance with MIL-P-116 to determine conformance to the requirements of Section 5.

## 5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Preservation and packaging shall be level A or C, as specified (see 6.2).

### 5.1.1 Level A.

5.1.1.1 Cleaning. The reflector shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.1.2 Drying. The reflector shall be dried in accordance with the applicable procedure of MIL-P-116.

5.1.1.3 Preservation applications. None required.

5.1.1.4 Unit packaging. Each reflector shall be individually packaged, Method III in accordance with MIL-P-116 as follows: Cushion each item by wrapping in paperboard conforming to PPP-P-291, type I and secure wrap with tape conforming to PPP-T-45, Type III, grade A. Place the cushioned item within a close-fitting box conforming to MIL-B-43014, form 1, style II, type A. Closure shall be in accordance with the appendix of the box specification.

5.1.1.4.1 Intermediate container. The reflector packaged as specified in 5.1.1.4, shall be placed in intermediate container conforming to MIL-B-43014, form 1, style II, type A in multiples of four, not to exceed 4 unit packages or 50 pounds. Box closure shall be in accordance with the appendix of the box specification.

5.1.2 Level C. The reflector shall be preserved and packaged in a manner that will afford adequate protection against physical and environmental damage during shipment, handling and limited in-transit storage.

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5.2 Packing. Packing shall be level A, B or C as specified. Shipping containers for all levels shall be capable of stacking and supporting superimposed loads during shipment and storage without damaging the container(s) or its contents.

5.2.1 Level A.

5.2.1.1 Consolidation. A quantity of reflectors packaged as specified in 5.1, shall be packed within a close-fitting fiberboard box conforming to PPP-B-636, type CF, class weather-resistant. Box closure shall be as specified in the appendix of the box specification. To facilitate palletization, fiberboard boxes shall be uniform in size and contain equal quantities of the packaged items to the greatest extent practicable.

5.2.1.2 Palletized load. A quantity of containers, packed as specified in 5.2.1.1, shall be placed on a pallet, load type 1, conforming to MIL-STD-147, except that the pallet shall be softwood conforming to NN-P-71, type IV, size 2. A fiberboard cap shall be employed over the load having two sides extending down the stacked load at least 12 inches to accommodate marking requirements. The cap shall be fabricated of fiberboard conforming to PPP-F-320, class weather resistant, W5s or V3c. The load shall be "bonded" to the pallet by strapping conforming to QQ-S-781, type I, finish A or shrink film.

5.2.1.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.1.1 shall be waterproofed with tape conforming to PPP-T-76, in accordance with the taping requirements of the appendix of the box specification. A quantity of the waterproofed containers shall be packed within a close fitting box conforming to PPP-B-601, overseas type; PPP-B-621, style 4, class 2; or PPP-B-585, style 2 or 3, class 3. When the gross weight exceeds 200 pounds, or the container length and width is 48 x 24 inches or more and the weight exceeds 100 pounds, 3 x 4 inch skids, laid flat, shall be applied in accordance with the requirements of the container specification, or if not specified in the specification in a manner which will adequately support the item and facilitate the use of material handling equipment. Closure and strapping shall be in accordance with the applicable container specification or appendix thereto except that metal strapping shall conform to QQ-S-781, type 1, finish A.

5.2.2 Level B.

5.2.2.1 Consolidation. A quantity of reflectors packaged as specified in 5.1, shall be packed as specified in 5.2.1.1.

5.2.2.2 Palletized load. A quantity of containers, packed as specified in 5.2.2.1, shall be palletized as specified in 5.2.1.2.

5.2.2.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.2.1 shall be reinforced by pressure-sensitive filament tape conforming to PPP-T-97, type IV as specified in the appendix of the box specification. No further packing shall be required.

5.2.3 Level C.

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5.2.3.1 Consolidation. A quantity of reflectors packaged as specified in 5.1, shall be packed as specified in 5.2.1.1, except that the fiberboard boxes shall be class domestic.

5.2.3.2 Palletized load. A quantity of containers, packed as specified in 5.2.3.1, shall be palletized as specified in 5.2.1.2, except that the fiberboard cap shall be class domestic.

5.2.3.3 Less than palletized load. When quantities per destination are less than a pallet load, the containers packed as specified in 5.2.3.1 shall be used as the shipping container. No further packing shall be required.

5.3 Marking. In addition to any special marking required by the contract or order, interior packages and exterior shipping containers shall be marked in accordance with MIL-STD-129.

## 6. NOTES

6.1 Intended use. The reflector is intended for use in a searchlight conforming to MIL-S-52444.

6.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this specification.
- b. Quantity and schedule for first article testing for all line items (see 4.3).
- c. Production delivery schedule (see 4.5.2.3.1).
- d. Level of preservation and packaging and the level of packing required (see 5.1 and 5.2).
- e. Actions required relative to Group C failure (see 4.5.2.3.2).

6.3 Definitions. For the purpose of this specification, the following definitions apply.

6.3.1 Damage. Damage is defined as deformation, corrosion, loosening of parts, or cracks.

6.3.2 "g". g is defined as an acceleration or deceleration of 32.17 feet per second per second.

6.3.3 Room temperature. Room temperature is defined as 23°C, plus or minus 3°C.

6.3.4 Point source of light. A point source of light is defined as the light emanating from a No. 71-71-44 Bausch & Lomb or equal Ophthalmic Lamp.

## CUSTODIAN:

Army - EL  
Navy - EC  
User Activity:  
Navy - MC

## PREPARING ACTIVITY:

Army - EL  
Project No. 5855-0011

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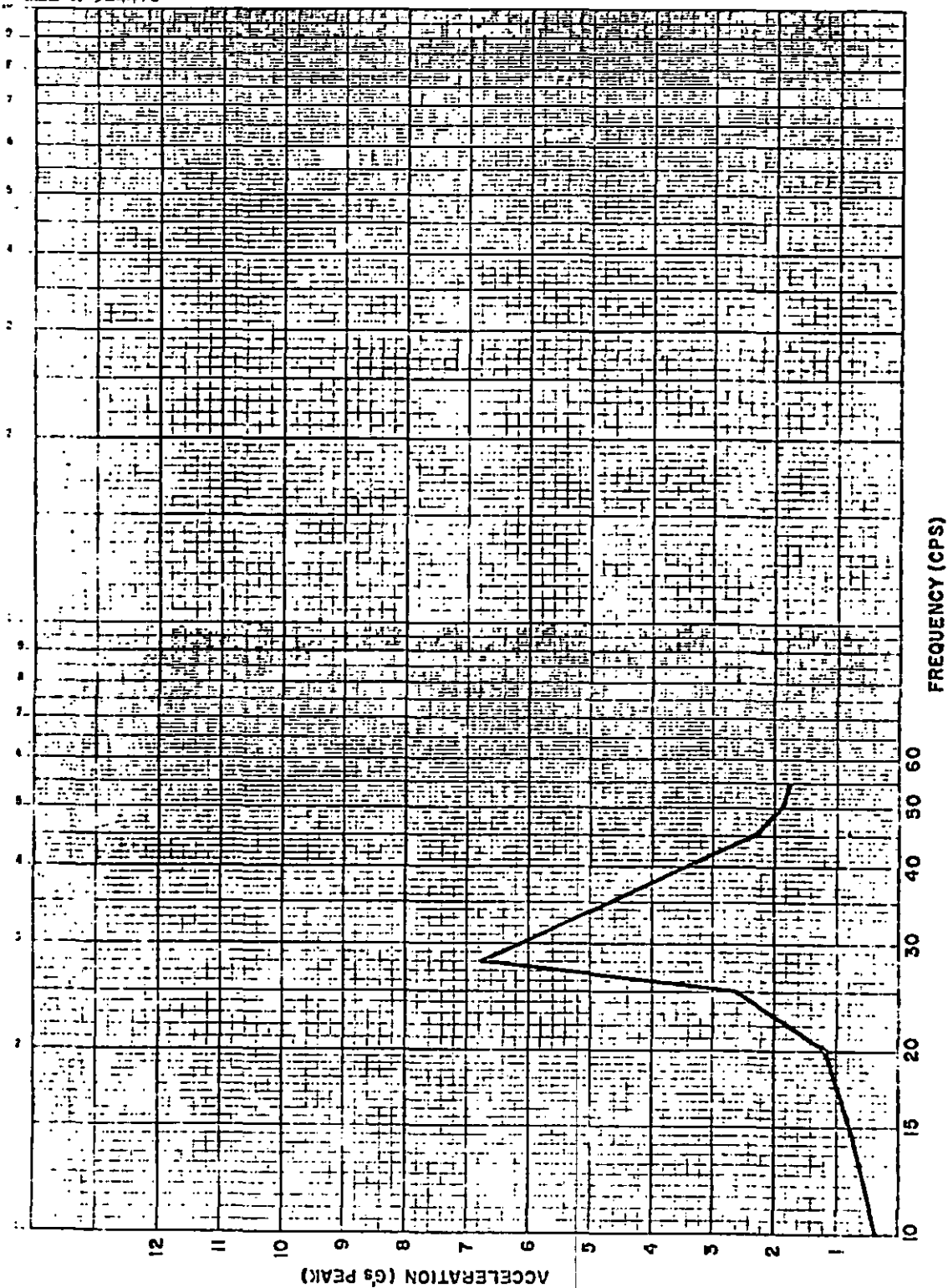


FIGURE 1. VERTICAL AXIS NOMINAL INPUT ACCELERATION

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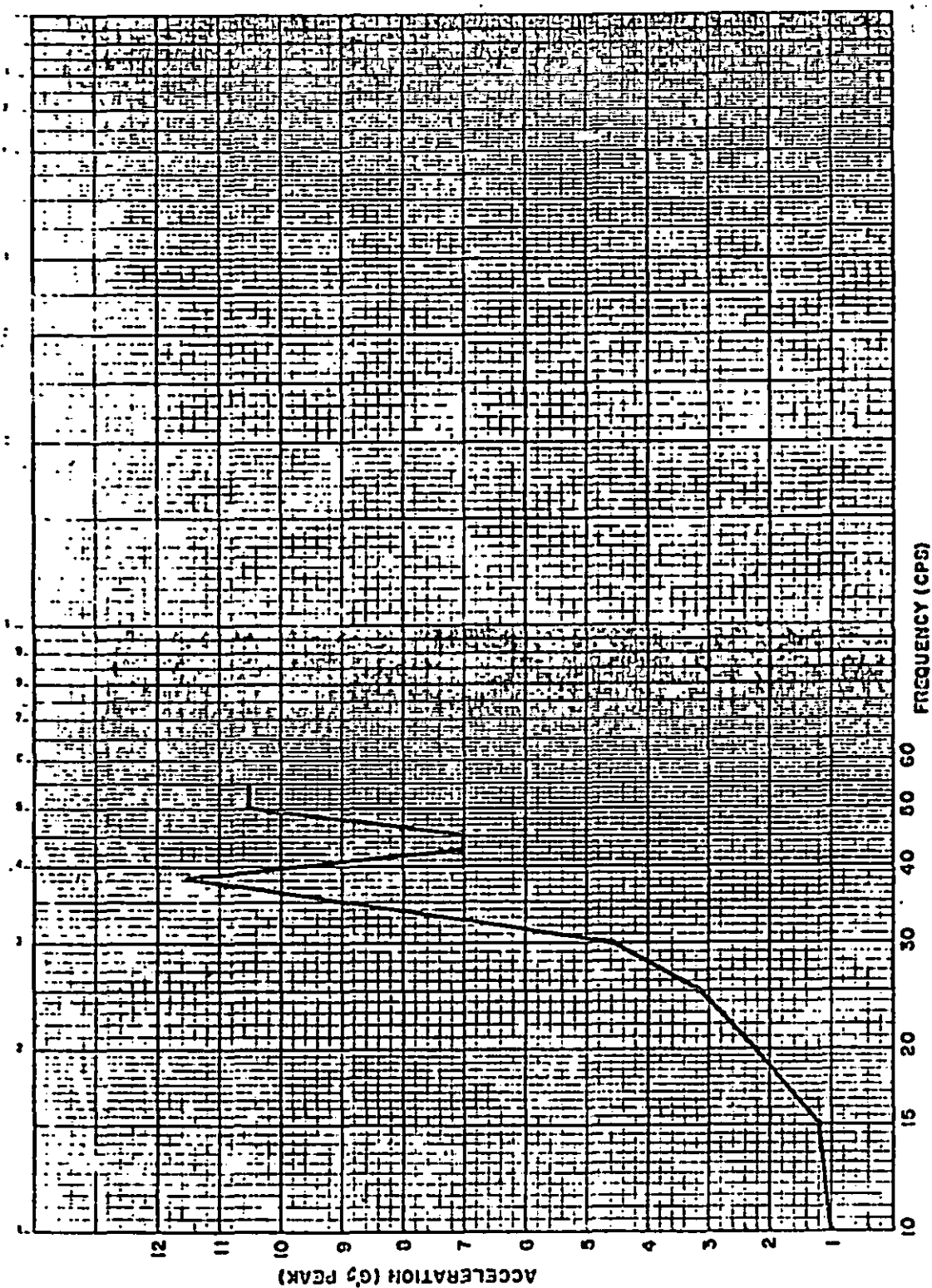


FIGURE 2. TRANSVERSE AXIS NOMINAL INPUT ACCELERATION



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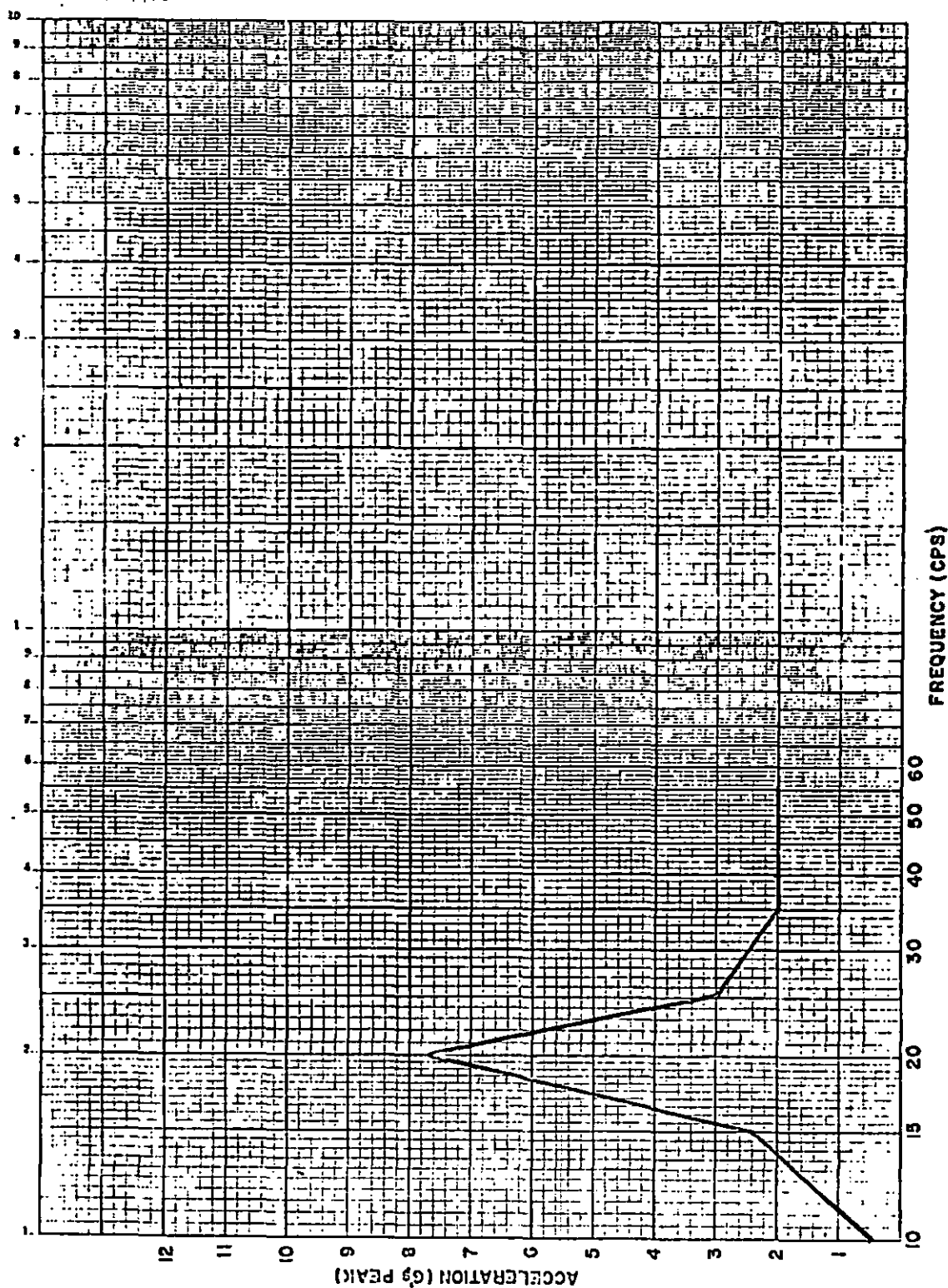


FIGURE 3. LONGITUDINAL AXIS NOMINAL INPUT ACCELERATION

SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 22-R255
<p><b>INSTRUCTIONS:</b> This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.</p>		
<p>SPECIFICATION <b>MIL-R-52047C REFLECTOR, PARABOLIC 22 1/2 INCH, FOR SEARCHLIGHT, INFRARED, 28-VOLT, 110-AMPERE</b></p>		
ORGANIZATION		
CITY AND STATE		CONTRACT NUMBER
<p>MATERIAL PROCURED UNDER A</p> <p><input type="checkbox"/> DIRECT GOVERNMENT CONTRACT      <input type="checkbox"/> SUBCONTRACT</p>		
<p>1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?</p> <p>A. GIVE PARAGRAPH NUMBER AND WORDING.</p>		
<p>B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES</p>		
<p>2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID</p>		
<p>3. IS THE SPECIFICATION RESTRICTIVE?</p> <p><input type="checkbox"/> YES      <input type="checkbox"/> NO (If "yes", in what way?)</p>		
<p>4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)</p>		
SUBMITTED BY (Printed or typed name and activity - Optional)		DATE

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