

MIL-C-8179029 December 1972**SUPERSEDING****(See Section 6)****MILITARY SPECIFICATION****CONNECTORS, RECEPTACLE, EXTERNAL ELECTRIC
POWER, AIRCRAFT**

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

1. SCOPE

1.1 Scope. This specification covers the requirements for aircraft external electric power receptacles.

1.2 Classification. Receptacles, covers and shields (hereinafter referred to as items) shall be identified by the MS part numbers shown on the applicable military standard.

- 1.2.1 Types. Three-pin receptacles, for use on 28 Volts DC, (MS3506)
Three-pin receptacles, for use on 28 Volts DC, jet starting (MS25018)
Six-pin receptacles, for use on 115/200 Volts, 400 Hz, (MS90362)

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:

SPECIFICATIONSFederal

QQ-A-250/8	Aluminum Alloy, 5052, Plate and Sheet
QQ-A-596	Aluminum Alloy, Permanent and Semi-Permanent Mold Castings
QQ-A-601	Aluminum Alloy Sand Castings

FSC 5935

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SPECIFICATIONS

Military

MIL-M-14	Molding Plastics and Molded Plastic Parts, Thermo-setting
MIL-P-116	Preservation, Methods of
MIL-C-5541	Chemical Conversion Coatings on Aluminum and Aluminum Alloys
MIL-S-7742	Screw Threads, Standard, Optimum Selected Series, General Specification for
MIL-P-8585	Primer Coating, Zinc Chromate, Low-Moisture-Sensitivity
MIL-A-8625	Anodic Coatings, for Aluminum and Aluminum Alloys

STANDARDS

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-130	Identification Marking of U.S. Military Property
MIL-STD-202	Test Methods for Electronic and Electrical Component Parts
MIL-STD-794	Parts and Equipment, Procedures for Packaging and Packing of
MIL-STD-889	Dissimilar Metals
MS20341	Nut, Plain, Hexagon, Electrical

Air Force-Navy Aeronautical

AN936	Washer, Tooth Lock
AN961	Washer, Flat, Electrical

See Supplement 1 for List of associated standards.

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

3. REQUIREMENTS

3.1 Qualification. Items furnished under this specification shall be products which are qualified for listing on the applicable Qualified Products List (QPL) at the time set for opening of bids (4.2 and 6.5).

3.2 Military standards. Unless otherwise specified, requirements given herein apply to all types listed in 1.2.1. In the event of any conflict between the requirements of this specification and the requirements of the military standards, the latter shall govern.

3.3 Materials. Materials shall conform to the applicable specification as specified and shall be suitable for the performance required herein. Unless suitably protected against electrolytic corrosion, dissimilar metals shall not be employed in intimate contact with each other. Dissimilar metals are defined in MIL-STD-889. All materials shall be non-nutrients for fungi.

3.3.1 Bases. Bases shall be fabricated of an impact resistant fiber filler material conforming to MIL-M-14 Type SDI-30. The use of other materials will be considered by the procuring activity. Such materials must be approved by the procuring activity and they must meet the same test requirements as the material specified above.

3.3.2 Shields. Cast shields shall be 356-T6 aluminum alloy in accordance with QQ-A-596 or QQ-A-601, or shall be die cast aluminum alloy A380 in accordance with QQ-A-591. Shields made from sheet stock shall be 5052 aluminum alloy in accordance with QQ-A-250/8; minimum thickness .060 inch. Shields shall be anodized in accordance with MIL-A-8625 Types I or II, or chemically surface-treated in accordance with MIL-C-5541, Class 2. Coat with one coat of zinc chromate primer in accordance with MIL-P-8585.

3.3.3 Contacts. The small pin contacts shall be tellurium copper, leaded copper, or brass, with a minimum of 0.0002 inch of silver plate. The large pin contacts shall be tellurium copper, or leaded copper or equal with a minimum of 0.0002 inch of silver plate. The conductivity of the alloys used for the large pin contacts shall be limited to a minimum of 90% of the International Annealed Copper Standard (IACS).

3.3.4 Covers. Covers used for protecting the rear of receptacles shall be of a shatterproof synthetic rubber or phenolic compound of 85 to 95 shore hardness and suitable to meet the performance specified herein.

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3.4 Design and construction. Items shall be designed and constructed in accordance with the applicable military standards and as specified herein.

3.4.1 Contacts.

3.4.1.1 Identification. Contact identification shall be permanently and legibly marked on the front and rear of the base.

3.4.1.2 Method of attachment. A positive means shall be provided to anchor contacts in the base.

3.4.1.3 Cross-sectional area. The cross-sectional area throughout each contact shall be no less than the root area of the thread at any point.

3.4.1.4 Hardness of contacts. The hardness at all points on the sides of each pin shall be at least 86 to 100 Brinell or Rockwell B 40-56.

3.4.1.5 Terminal pads. Each terminal shall include an integral or force-fitted pad.

3.4.1.6 Threads on terminals. Threads on terminals shall conform to MIL-S-7742. Each large terminal shall be threaded to within 0.125 inch of its pad and each small terminal shall be threaded to within 0.062 inch of its pad.

3.4.1.7 Terminal hardware. Each base shall be provided with one nut MS20341-616A, one lockwasher AN936B616B, and one flat washer AN961-616 for each large terminal; one nut MS20341-10A, one lockwasher AN936B10B, and one flat washer AN961-10 for each small terminal.

3.4.2 Shields. Each Shield, including all rivets, welds, etc., shall be contained within the maximum dimensions shown on the standard. The inside of each shield shall be smooth and free from protrusions and sharp edges.

3.5 Performance. Each item shall perform satisfactorily when subjected to the following conditions applicable to that item.

3.5.1 Temperature cycling. Items shall not crack, fracture, or delaminate when subjected to temperature extremes in accordance with 4.6.4.

3.5.2 Impact. There shall be no fractures or cracks of the receptacle base and no loosening of shields or contacts when items are subjected to impact tests after exposure to -55°C in accordance with 4.6.5.

3.5.3 Dielectric withstanding voltage. Items shall be capable of withstanding a potential of 2,500 volts rms after exposure to humidity conditions in accordance with 4.6.6.

3.5.4 Terminal torque strength. Items shall be capable of withstanding torque in accordance with 4.6.7. As a result of the application of torque there shall be no cracking, delamination or chipping of the base. The contacts shall not shear, crack or rotate.

3.5.5 Flexural strength, receptacle base. Receptacle bases, less center contacts, shields, and other accessories, shall not break when subjected to a force of 1,300 pounds for three-pin receptacles, and 3,500 pounds for six-pin receptacles.

3.5.6 Pin static bending strength. Items shall be capable of withstanding forces applied to the pins in accordance with 4.6.9. The pins shall not take a permanent set of more than .01 inch at the mating end. There shall be no cracking, delamination or chipping of the base and the contacts shall not come loose in the base.

3.5.7 Shield and attachment static strength. Items shall be capable of withstanding forces applied to the shield in accordance with 4.6.10. The sides of the shield shall not be displaced greater than the amount specified while the forces are applied. After the forces are removed, the shield shall conform to the dimensions shown on the applicable standard. There shall be no cracking, delamination or chipping of the base and the shield shall not come loose from the base.

3.6 Weight. The weight of each item shall not exceed the value specified on the applicable standard.

3.7 Identification of product. Items shall be permanently and legibly marked for identification in accordance with MIL-STD-130 with the following information:

Nomenclature
MS Part Number
Manufacturer's Name or Trademark
Manufacturer's Part Number

3.7.1 Location of markings. Identification markings shall be located as follows:

- a. Three-pin receptacles. Identification markings shall be located on the shield.
- b. Six-pin receptacles. Identification markings shall be located on the pin side of the base a minimum of 5/8" from the perimeter.
- c. Shield, six-pin receptacles. Identification markings shall be located on the shield.
- d. Cover, six-pin receptacles. Identification markings shall be located on the raised center portion of the cover.

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3.8 Workmanship. Items shall be fabricated, constructed and assembled in accordance with the best practice for high quality electric equipment to produce an item free from all defects which would affect proper functioning in service. Particular attention shall be given to freedom from chips, dirt, grit and other foreign material; also to freedom from defects, burrs, sharp edges, corners and points. The cleaning methods used shall not be injurious to any of the parts nor shall any of the parts be contaminated by the cleaning agents employed.

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 in the contract or order, the supplier 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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

- a. Qualification inspection. Qualification inspection shall be performed on items submitted for approval as a qualified product prior to any procurement action.
- b. Quality conformance inspection. Quality conformance inspection shall be performed on items which have been submitted for acceptance under contract.

4.3 Qualification inspection. The qualification inspection sample shall consist of at least two items of each manufacturer's part number for which qualification is desired, separately packaged and forwarded to the activity responsible for qualification designated in the letter of authorization. The sample shall in all respects be representative of the manufacturer's production item. Each of the two items shall be subjected to all of the applicable inspections as specified in Table I in the order listed. Samples shall be plainly identified by securely attached durable tags marked with the following information:

Sample for Qualification Test
 Specification MIL-C-81790
 Connectors, Receptacle, External Electric Power, Aircraft
 MS Part Number
 Manufacturer's Part Number
 Name of Manufacturer
 Submitted (date) under authorization (reference
 letter authorizing the test)

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TABLE I. APPLICABLE QUALIFICATION INSPECTIONS

Inspection		Requirement Par. No.	Applicability (indicated by X)		
Title	Par. No.		Receptacle Assemblies	Covers	Shields
Examination of product	4.6.1	3.3, 3.4, 3.7, 3.8	X	X	X
Dimensions	4.6.2	3.4	X	X	X
Weight	4.6.3	3.6	X	X	X
Temperature cycling	4.6.4	3.5.1	X	X	
Pin impact strength	4.6.5.1	3.5.2	X		
Shield impact strength	4.6.5.2	3.5.2	X		X
Cover impact strength	4.6.5.3	3.5.2		X	
Dielectric withstanding voltage	4.6.6	3.5.3	X	X	
Terminal torque strength	4.6.7	3.5.4	X		
Shield and attachment static strength	4.6.10	3.5.7	X		X
Pin static bending strength	4.6.9	3.5.6	X		
Flexural strength	4.6.8	3.5.5	X		
Hardness of contacts	4.6.11	3.4.1.4	X		
Resistance to fungi	4.6.12	3.3	X	X	

4.3.1 Test report. The contractor shall furnish the activity responsible for qualification with a certified test report, in duplicate, showing quantitative results for tests required by this specification. The report shall designate the MS part number of the receptacles submitted. The report shall also include the manufacturer's drawing specifying the dimensions of the receptacle.

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4.3.2 Qualification inspection failure. In the event of a failure of either of either of the two pieces subjected to any one of the qualification inspections, the sample shall be rejected and the item declared unsatisfactory.

4.3.3 Retention of qualification. In order to retain qualification, a summary of sampling plan test results (see 4.4.1) shall be furnished to the qualifying activity at three-year intervals and shall cover the results of sampling plan tests performed during that period. The summary shall also include the number and type of any part failures and shall be forwarded via the Government inspector to the activity responsible for qualification. Failure to furnish the summary shall result in loss of qualification for that product.

4.4 Quality conformance inspection. Quality conformance inspection shall consist of the sampling tests and examinations shown in Table II.

4.4.1 Sampling inspection. Sampling shall be in accordance with MIL-STD-105, AQL 1% for major defects and 4% for minor defects (see Table III for classification of defects). The samples shall be subjected to the applicable sampling inspections as specified in Table II in the order listed.

TABLE II. APPLICABLE QUALITY CONFORMANCE INSPECTIONS

Inspection			Requirement Par. No.	Applicability (indicated by X)		
Title	Inspection Level	Par. No.		Receptacle Assemblies	Covers	Shields
Examination of product	II	4.6.1	3.3, 3.4, 3.7, 3.8	X	X	X
Dimensions		4.6.2	3.4	X	X	X
Weight		4.6.3	3.6	X	X	X
Temperature cycling	S-1	4.6.4	3.5.1	X	X	
Pin impact strength	S-2	4.6.5.1	3.5.2	X		
Cover impact strength		4.6.5.3	3.5.2		X	
Dielectric withstanding voltage		4.6.6	3.5.3	X	X	
Terminal torque strength		4.6.7	3.5.4	X		
Flexural strength		4.6.8	3.5.5	X		
Hardness of contacts		4.6.11	3.4.1.4	X		
Resistance to fungi		4.6.12	3.3	X	X	

TABLE III. CLASSIFICATION OF DEFECTS

Major	Minor
Incorrect contact construction	Poor exterior finish
Poor contact finish	Molding flash
Incorrect dimensions which affect mating	Incorrect materials that have complied under performance tests
Burrs capable of cutting personnel or affecting mating	Incorrect exterior or outline dimensions not preventing engagement or mounting
Non-permanent or illegible marking	
Material incorrect	
Other design and construction not listed minor	
Other workmanship not listed minor	
Failure of any test specified under 4.6	

4.5 Inspection conditions.

4.5.1 Mating. Whenever it is specified that items shall be mounted, receptacles shall be mounted on a suitably fabricated aluminum panel 0.125 ± 0.005 inch thick, with one panel on the back (terminal side) of the receptacle, by means of suitable round-head mounting screws, with the heads of the screws on the front (pin side) of the receptacle; parts being qualified or procured separately shall be assembled with other qualified parts as necessary to form a receptacle which shall then be mounted as described above. The panel shall be secured in such a way that the front and back of the receptacle shall be free of interference.

4.5.2 Ambient conditions. Unless otherwise specified, tests and examinations required by this specification shall be conducted under any combination of conditions within the ranges below. Any specified condition shall not affect the other two ambient ranges.

- a. Temperature: 20° to 30°C
- b. Relative humidity: 30 to 80 percent
- c. Barometric pressure: 24 to 31 inches of mercury

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4.6 Inspection methods.

4.6.1 Examination of product. Receptacle assemblies and covers shall be examined to insure conformance with all requirements of this specification not covered by performance requirements of 3.5, and with all requirements of the applicable military standard that can be determined visually without measurement.

4.6.2 Dimensions. Receptacle assemblies and covers shall be measured for conformance to the dimensions shown on the applicable military standard.

4.6.3 Weight. Items shall be weighed for conformance to the applicable military standard.

4.6.4 Temperature cycling test. Receptacle assemblies and covers shall be subjected to a temperature cycling test in accordance with MIL-STD-202, Method 102. The following details and exceptions shall apply:

- a. There shall be no special mounting.
- b. Covers shall be subjected to Test Condition D Method 102A of MIL-STD-202.
- c. All other items shall be subjected to Test Condition D except that the high temperature shall be 200°C instead of 85°C.
- d. No measurements need be made before or after the test. Items shall meet the requirements of 3.5.1.

4.6.5 Impact. Receptacle assemblies and covers shall be mounted and placed in a test chamber and subjected to a temperature of $-55 \pm 2^{\circ}\text{C}$ for 24 hours. At the end of this time the items shall be removed from the chamber and subjected to the following impact tests, as applicable (Tables I and II). The tests shall be completed within five (5) minutes of removal from the chamber. The items shall meet the requirements of 3.5.2.

4.6.5.1 Pin impact strength. Receptacle assemblies shall be mounted with the pins pointing upward, and an impact of 20 ± 2 foot-pounds shall be applied downward to the spherical end of each large pin, in accordance with Figure 1. An impact of 10 ± 1 foot-pounds shall then be similarly applied downward to the spherical end of each smaller pin.

4.6.5.2 Shield impact strength. Receptacle assemblies shall be mounted. An impact of 5 ± 0.5 foot-pounds shall be applied downward to the inner edge of each straight side of the open end of the shield, within 0.1 inch of the center of the side, and with each edge horizontal while it is being subjected to the impact in accordance with Figure 2.

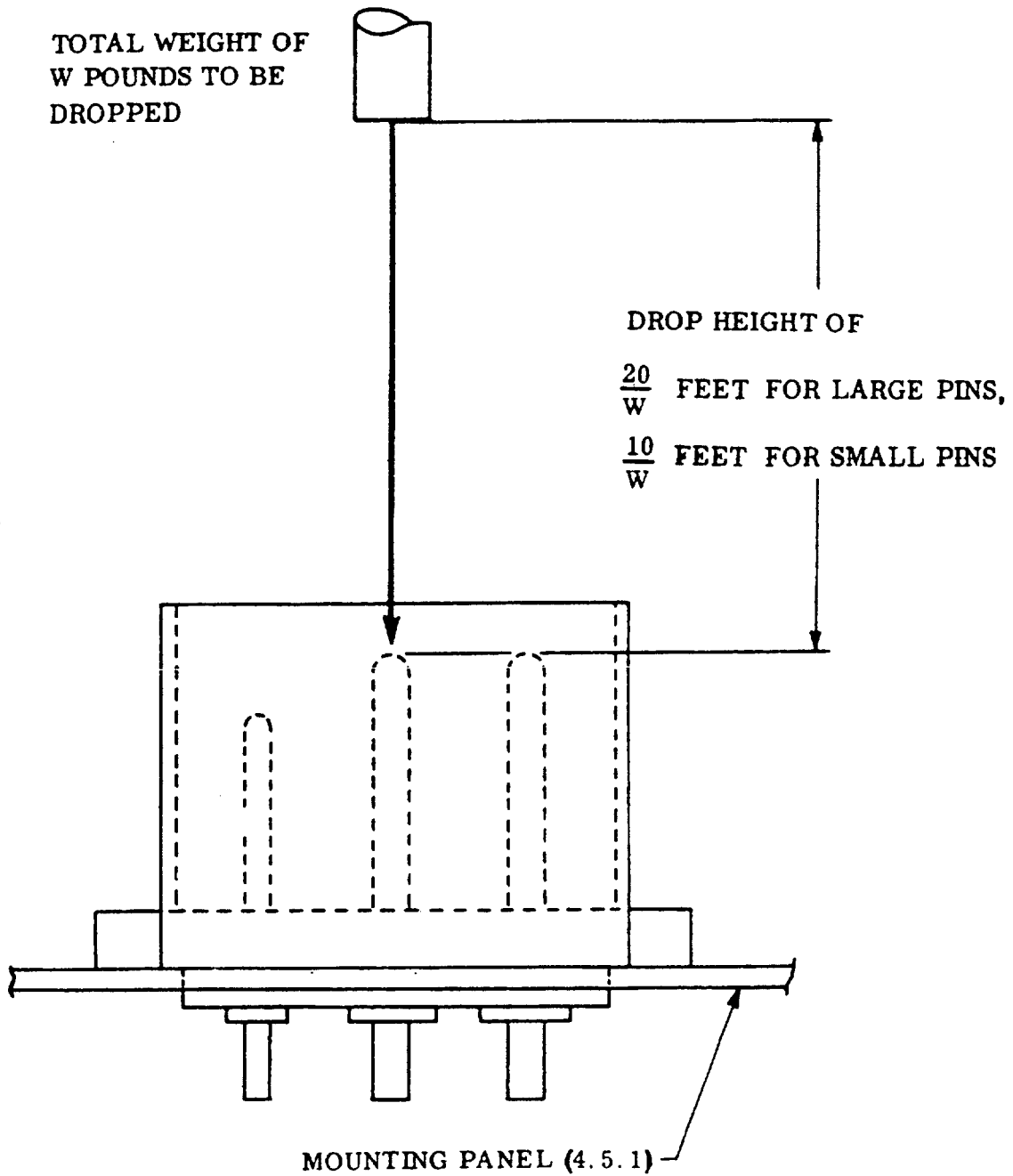


FIGURE 1. METHOD OF PERFORMING PIN IMPACT STRENGTH TEST

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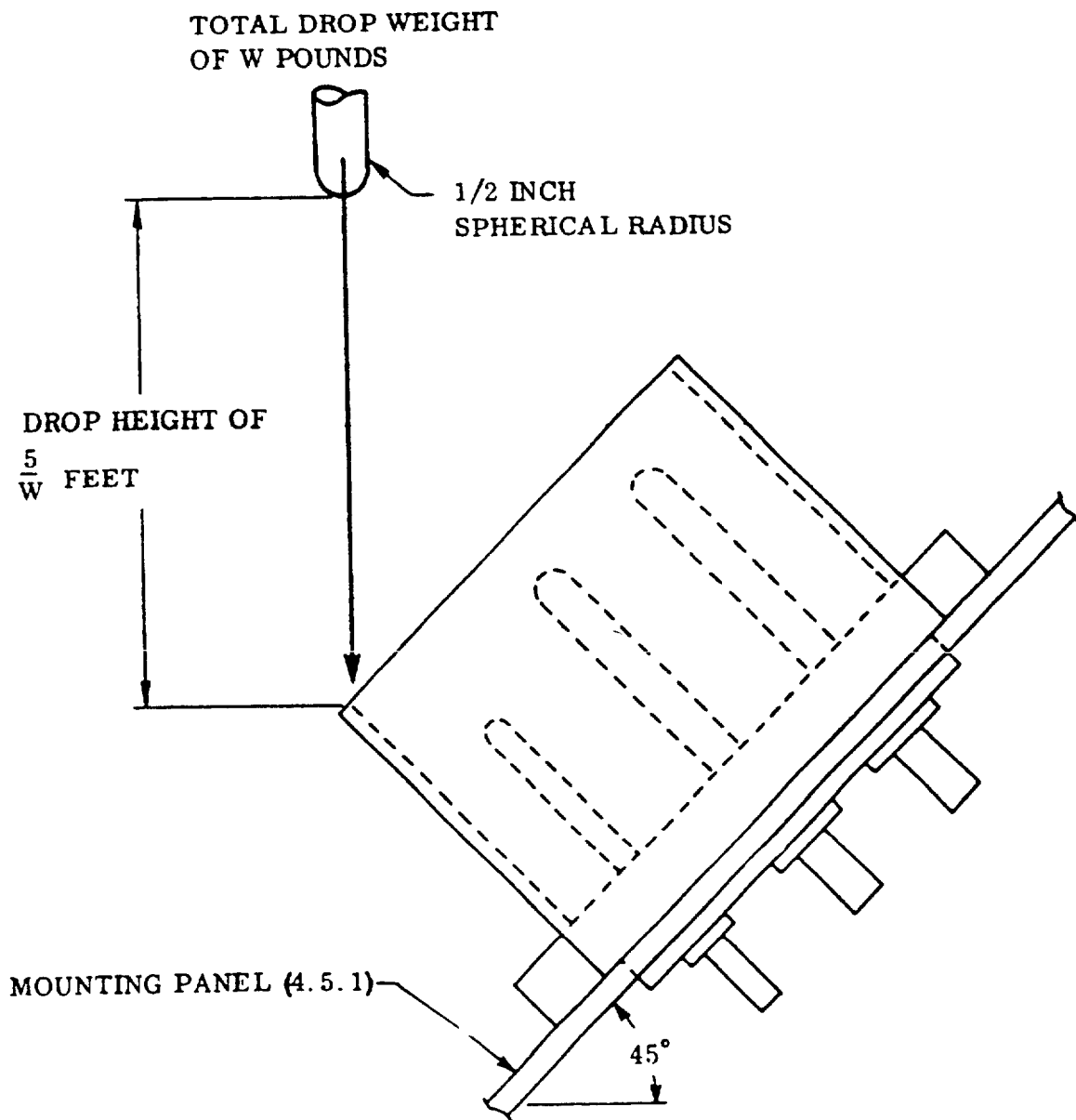


FIGURE 2. METHOD OF PERFORMING SHIELD IMPACT STRENGTH TEST

4.6.5.3 Cover impact strength. Covers shall be mounted. An impact of 2 ± 0.2 foot-pounds shall be applied downward to the cover through a one-half inch spherical radius at each of ten places chosen at random in accordance with Figure 3.

4.6.6 Dielectric withstanding voltage. Receptacle assemblies and covers, as applicable (Tables I and II), shall be mounted and subjected to humidity conditions in accordance with MIL-STD-202, Method 106. After step 6 of the tenth and final cycle, the chamber shall be maintained at the end-of-cycle conditions for the period necessary to make final measurements as follows. Items shall meet the requirements of 3.5.3 when subjected to $2,500 \pm 100$ volts rms in accordance with MIL-STD-202, Method 301 and with the following conditions:

- a. The panel on which the items are mounted shall be grounded.
- b. In addition to the other specified conditions, the top surface of covers shall be in solid contact with another panel which is also grounded.
- c. The potential shall be applied between each terminal and all other terminals together; and between all terminals together and all other exposed metal parts together including the mounting hardware but excluding the pins.

A current leakage in excess of 1.0 milliamperc shall be cause for rejection.

4.6.7 Terminal torque strength. Receptacle assemblies (Tables I and II), shall be mounted, except that the covers shall not be installed on six-pin receptacles. The flat washer, lockwasher and nut shall be installed on each terminal in accordance with the applicable standard. The nut on each larger terminal shall be tightened to a torque of 14 ± 1 pound-feet. The nut on each smaller terminal shall be tightened to a torque of $3 \pm 1/4$ pound-feet. The nuts shall then be loosened. This procedure shall be repeated nine more times. Items shall meet the requirements of 3.5.4.

4.6.8 Flexural strength. Receptacle bases shall be tested pin side (front face) down with shields removed and the threaded terminals of the center pins sawed flush with the pads to accommodate the center anvil. (See Figure 4). If applicable, the barrier between the pins may be removed to facilitate the sawing. The receptacle base shall be placed with its end mounting holes across two adjustable anvils in a suitable compression testing machine. All anvils shall be the full width of the sample or greater and shall have a $1/8$ -inch radius at the point of contact. The top anvil shall apply a force at the center of the receptacle at the rate of 0.05 inch per minute. The flexural strength of the receptacle will be considered the maximum force sustained by the receptacle base at the instant of breakage.

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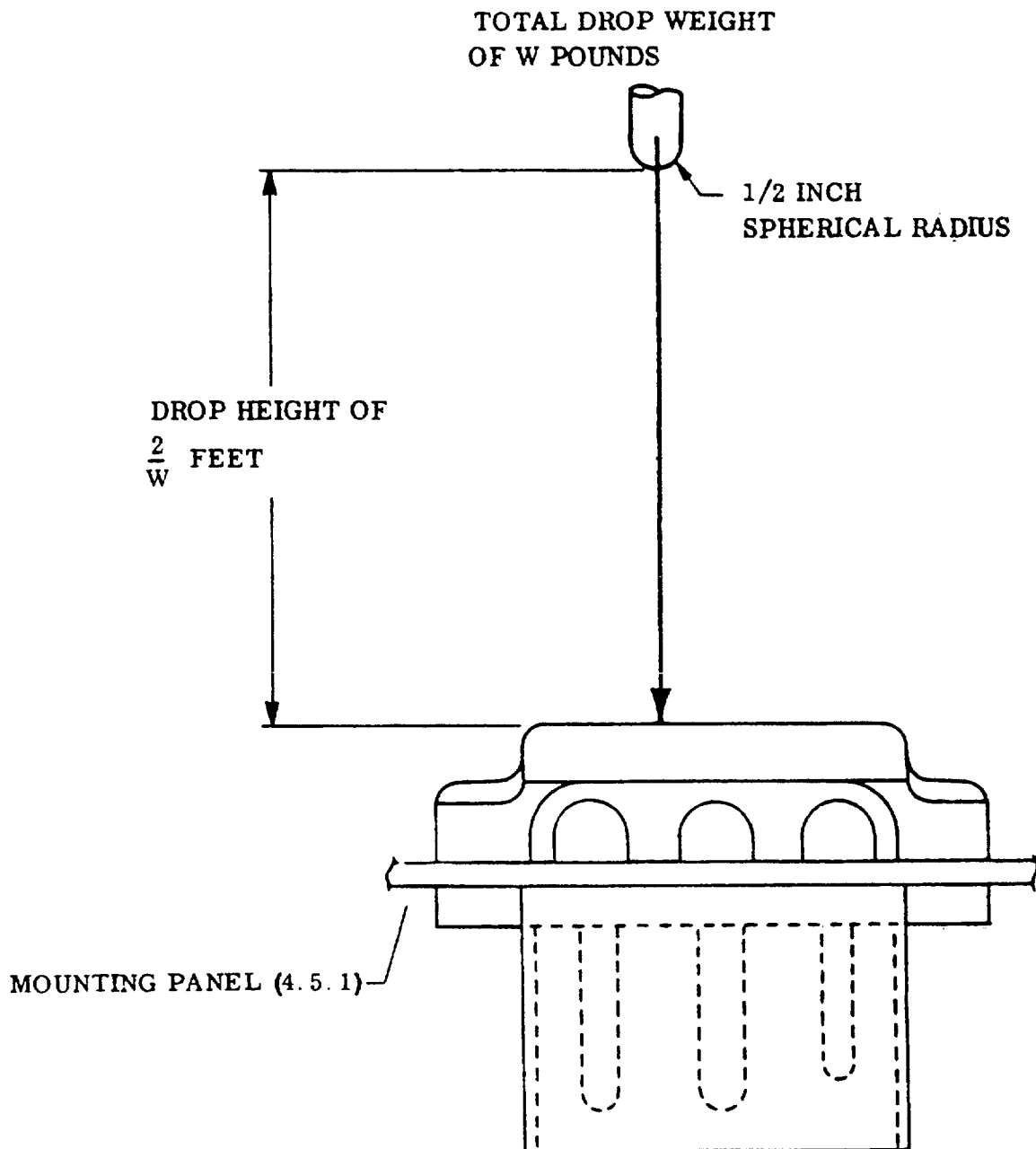


FIGURE 3. METHOD OF PERFORMING COVER IMPACT STRENGTH TEST

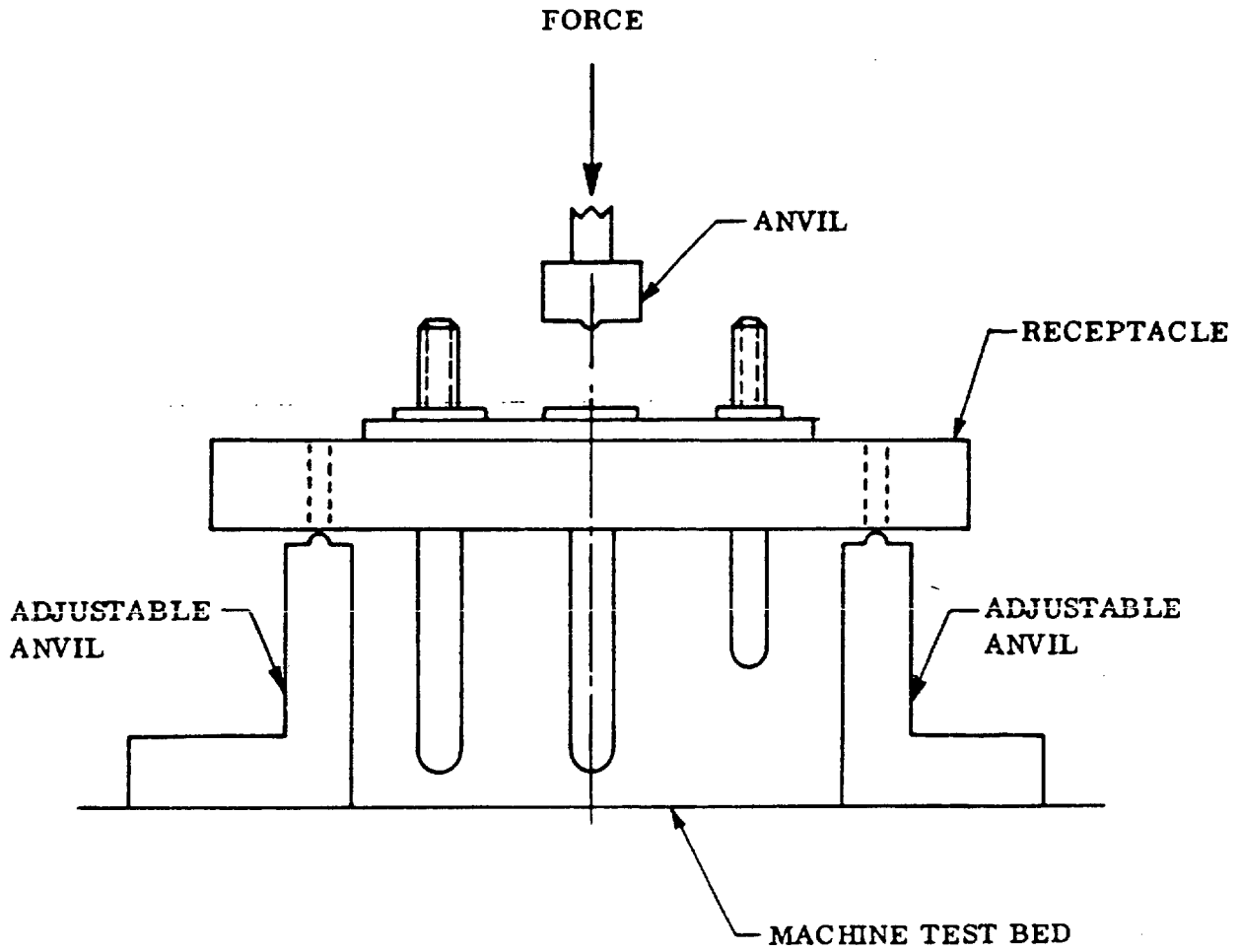


FIGURE 4. TEST SETUP FOR FLEXURAL STRENGTH TEST

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4.6.9 Pin static bending strength. Receptacle assemblies shall be mounted with shields removed. A force of 135 \pm 10 pounds shall be applied to each of the larger pins and a force of 100 \pm 10 pounds shall be applied to each of the smaller pins. The forces shall be applied and held for a minimum of five (5) seconds in each of four directions in turn, upward, downward, to the left and to the right, as nearly perpendicular to the longitudinal axis of the pin as possible, in accordance with Figure 5. The items shall meet the requirements of 3.5.6.

4.6.10 Shield and attachment static strength. Receptacle assemblies shall be mounted and forces shall be applied in accordance with Figure 6 and as specified below.

4.6.10.1 Force on one side. A force of 110 \pm 10 pounds shall be applied, through a 0.125 \pm 0.062 inch spherical radius, to the inner surface of each side of the shield in turn, within 0.1 inch of the centerline of the side and within 0.1 inch of the outer end of the shield, acting outward and perpendicular to the side of the shield. The point on each side of the shield where the force is applied shall not be displaced more than 0.1 inch while the force is applied. The items shall meet the requirements of 3.5.7.

4.6.11 Hardness of contacts. Contacts shall be tested for compliance with the requirements of 3.4.1.4 at a minimum of three (3) points on one pin of each size with a 500 kilogram load and a 10 millimeter ball (for Brinell testing). For Rockwell testing use a standard Rockwell B hardness tester.

4.6.12 Resistance to fungi. In lieu of testing, the manufacturer shall submit to the qualifying activity a certificate of compliance with the requirements of 3.3 with respect to resistance to fungi.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Packaging shall be Level A or C as specified (see 6.2). All terminal hardware shall be separately bagged and packaged with the item.

5.1.1 Level A.

5.1.1.1 Cleaning and drying. Cleaning and drying shall be in accordance with the applicable procedures of MIL-P-116.

5.1.1.2 Preservation and packaging. Preservation shall be in accordance with MIL-P-116, Method 1A-5 or 1C-1 as specified (see 6.2), except that preservative compounds shall not be used. When Method 1A-5 is specified, the metal containers shall be of the reusable type. The quantity of the unit package shall be as specified (see 6.2). Packaging shall be in accordance with MIL-STD-794.

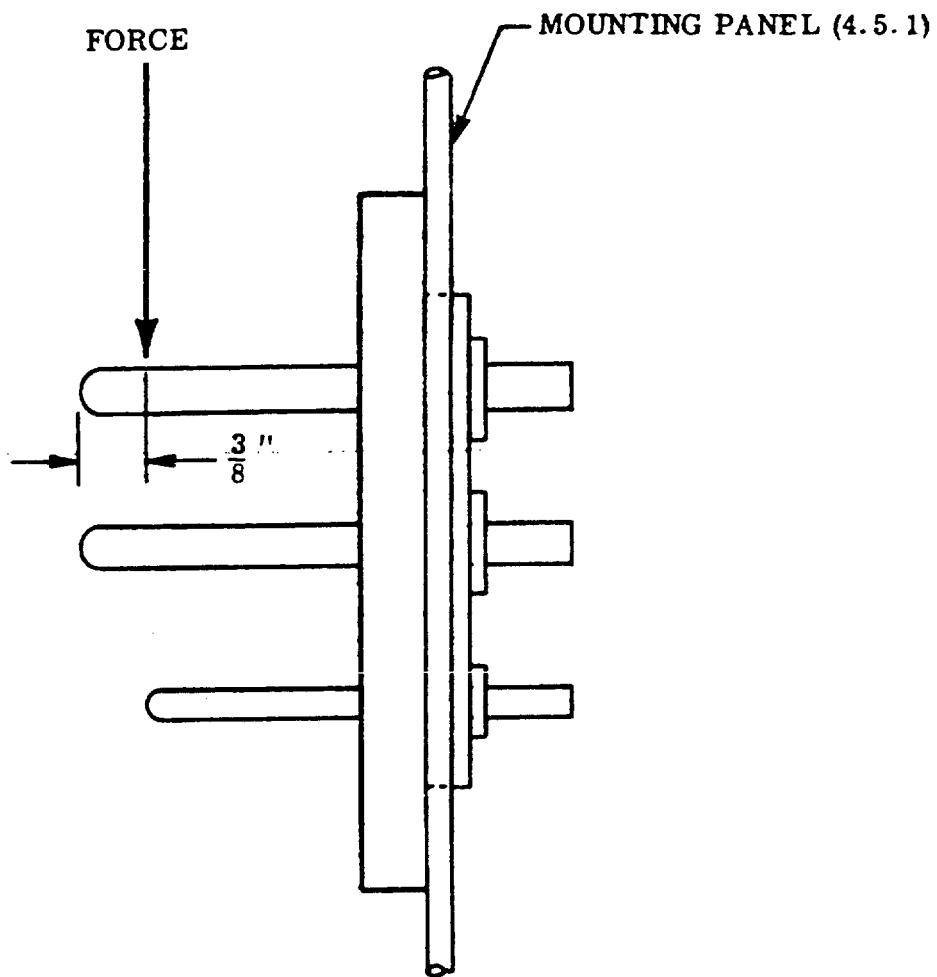


FIGURE 5. METHOD OF PERFORMING PIN STATIC BENDING STRENGTH TEST

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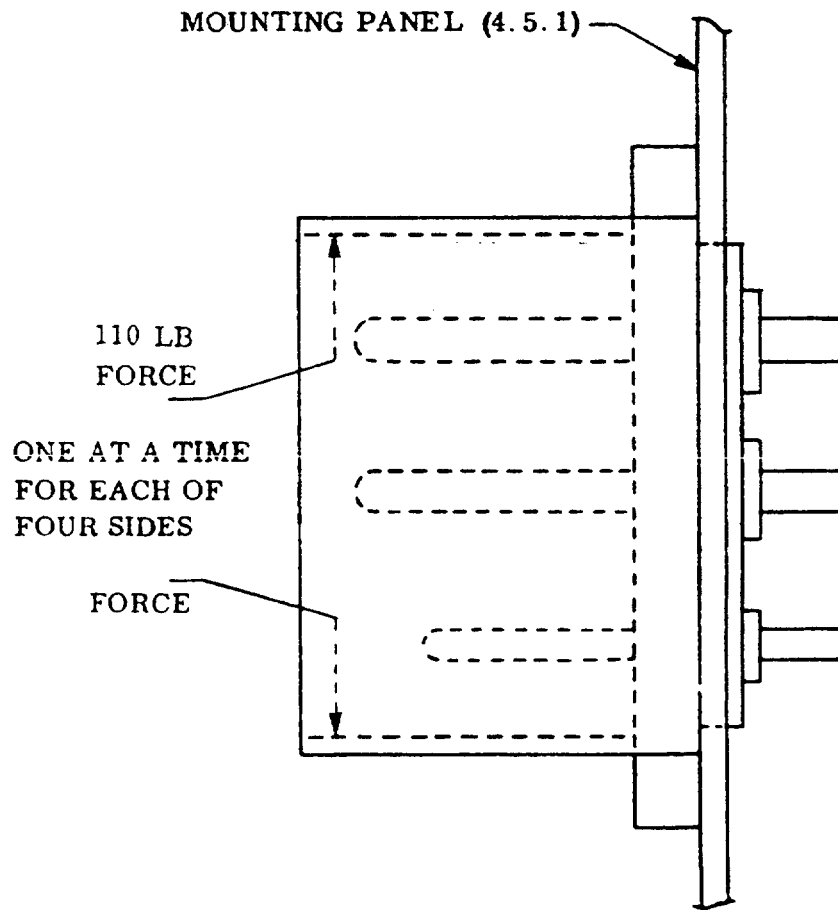


FIGURE 6. METHOD OF PERFORMING SHIELD AND ATTACHMENT STATIC STRENGTH TEST

5.1.2 Level C. Preservation and packaging shall be in accordance with MIL-STD-794. Preservative compounds shall not be used.

5.2 Packing. Packing shall be Level A, B or C in accordance with MIL-STD-794 as specified (see 6.2). Exterior containers shall have, as far as practical, minimum cube and tare consistent with the protection afforded.

5.3 Marking. Interior and exterior containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The receptacles covered by this specification are intended for installation on aircraft for connecting the aircraft to external sources of electric power by means of flexible cables which are plugged into these receptacles.

6.2 Ordering data. Procurement documents should specify the following:

- a. The number, date and title of this specification
- b. The amendment number and date of the latest amendment to this specification, if any
- c. The number(s), including the latest revision letter, if any, the date and the title of the MS standard for the item(s) being ordered
- d. The MS part number(s) and quantity of the item(s) being ordered
- e. The method of preservation, the levels of packaging and packing, and the quantity of the unit package desired

6.3 Supersession data. This specification supersedes the requirements for receptacles contained in MIL-C-7974A dated 27 April 1960.

6.4 Definitions. The term item, as used in this document, refers to receptacles, bases, covers and shields as identified on the standards by individual part numbers and which are being qualified or procured separately.

6.5 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids, qualified for inclusion in the applicable Qualified Products List (QPL) whether or not such products have actually been so listed by that date. The attention of the

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suppliers is called to this requirement, 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 orders for the products covered by this specification.

6.5.1 Application for qualification. The activity responsible for the QPL for MIL-C-81790 is the Naval Air Systems Command. The Naval Air Test Center, Patuxent River, Maryland, has been designated by the Naval Air Systems Command as agent for the establishment of the QPL and for retention of qualification. Requests for information pertaining to and applications for qualification should be addressed to:

Commanding Officer
Naval Air Test Center
Attention: Code WST-33
Patuxent River, Maryland 20670

6.6 International interest. Certain provisions of this specification are the subject of international standardization agreements ASCC Air Standards 12/6, 12/7 and NATO STANAG 3302. When amendment, revision, or cancellation of this specification is proposed, which will affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels including departmental standardization offices, if required.

Custodians:
Army - EL
Navy - AS
Air Force - 11

Preparing activity:
Navy - AS
(Project No. 5935-0937)

Review interest:
Army - AV
Navy -
Air Force - 80