

MIL-B-7619A(USAF)
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SUPERSEDING
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MILITARY SPECIFICATION

BLOWER, EXHAUST, ELECTRIC MOTOR DRIVEN, EXPLOSION PROOF, TYPE MA-1

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

1. SCOPE

1.1 Scope. This specification covers one type of electric motor-driven explosion-proof blower, designated Type MA-1, having a minimum delivery of 1500 cfm of free air with 30 feet of 8-inch diameter flexible fabric ducting attached.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

- * 2.1.1 Specifications and standards. Unless otherwise specified (see 6.2), the following specifications and standards of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

- | | | | |
|---|-----------|---|---|
| * | QQ-Z-325 | - | Zinc, Coating, Electrodeposited Requirements for |
| | QQ-P-416 | - | Plating, Cadmium (Electrodeposited) |
| * | TT-E-489 | - | Enamel, Alkyd, Gloss, (For Exterior and Interior Surfaces) |
| | PPP-B-601 | - | Boxes, Wood, Cleated Plywood |
| * | TT-P-664 | - | Primer Coating, Synthetic, Rust and Inhibiting, Lacquer & Resisting |
| * | TT-P-1757 | - | Primer Coating, Zinc Chromate, Low Moisture Sensitivity |
| * | CC-M-1807 | - | Motors; Alternating Current, Fractional and Integral Horsepower |

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|---|------------|---|---|
| | MIL-P-116 | - | Preservation - Packing, Methods of |
| * | DOD-D-1000 | - | Drawing, Engineering, and Associated List |

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: San Antonio ALC/MMEDO, Kelly AFB, Texas 78241 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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- * MIL-M-3171 - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion On
- MIL-C-5541 - Chemical Conversion Coating on Aluminum and Aluminum Alloys
- MIL-C-5756 - Cable and Wire, Power, Electrical, Portable (Asg)
- MIL-W-8005 - Wheels and Hubs, for Industrial Pneumatic Tires
- MIL-A-8625 - Anodic Coating, for Aluminum and Aluminum Alloys
- * MIL-H-18158 - Hose Assembly, Air Duct, Low Pressure, Fabric, Wire Stiffened, Retractable

STANDARDS

FEDERAL

- * FED-STD-595 - Color

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- MIL-STD-129 - Marking of Shipment and Storage
- MIL-STD-130 - Identification Marking of US Property
- * MIL-STD-143 - Standards and Specifications, Order of Precedence for the Selection of
- * MIL-STD-461 - Electromagnetic Emission and Susceptibility Requirements for the Control of Electromagnetic Interference
- * MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of
- * MIL-STD-810 - Environmental Test Methods
- * MIL-STD-1186 - Cushioning, Anchoring, Bracing, Blocking, and Waterproofing, with appropriate test methods

- * (Copies of specifications and standards required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer).

- * 2.2 Other publications. The following document(s) form a part of this specification to the extent specified herein. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS

PERFORMANCE TEST CODES

- PTC - 11 Test Code for Fans
- PTC - 19.5; 4 Measurement of Quantity Materials, Chap 4 Flow Measurements

(Copies of the ASME Test Codes may be obtained from the American Society of Mechanical Engineers, 345 East 47th Street New York, New York 10017).

- * NATIONAL BOARD OF FIRE UNDERWRITERS

PAMPHLET 70 National Electric Code (Electric Wiring and Apparatus)

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* (Copies of the NBFU pamphlet may be obtained upon application to the National Fire Protection Association, 60 Battarymarch Street, Boston Massachusetts 02110).

* 2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Component parts. The blower shall consist of an explosion-proof motor, a fan, fan housing, flexible fabric ducting, dust storage provisions, an integral running gear assembly, and accessories necessary for proper operation of this type of equipment.

3.2 Material.

3.2.1 Specifications and standards. Specifications and standards for all 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-143, except as provided in the following paragraph.

3.2.1.1 Standard parts. AN or MIL standard parts shall be used wherever they are suitable for the purpose, and shall be identified by their part numbers. Commercial utility parts such as screws, bolts, nuts, cotter pins, et cetera, may be used, provided they have suitable properties and are replaceable by the AN or MIL standard parts without alterations, and provided the corresponding AN or MIL part numbers are referenced on the drawings or in the parts lists. In applications for which no suitable corresponding AN or MIL part is in effect on date of invitation for bids, commercial parts may be used provided they conform to the requirements of this specification.

3.2.2 Protective treatment. When materials are used in the construction of the blower that are subject to deterioration when exposed to climatic and environmental conditions likely to occur during service usage, they shall be protected against such deterioration in a manner that will in no way prevent compliance with the performance requirements of this specification. The use of any protective coating that will crack, chip, or scale with age or extremes of climatic and environmental conditions shall be avoided.

3.3 Design and construction. The blower shall be designed and constructed so that no parts will work loose in service. It shall be built to withstand the stresses, jars, vibrations, and other conditions incident to shipping, storage, installation, and service.

3.3.1 The blower shall be designed and constructed for use either as a blower or an exhauster, depending upon the attachment of the ducts.

3.3.2 The blower shall be constructed so that adjustments and repairs can be easily made by the personnel of operating units and overhaul bases.

3.3.3 Accessories. The blower shall be equipped with all necessary accessories for proper performance, safety, and operation relative to its intended function.

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3.3.4 Mounting. All items shall be mounted as a compact and self-contained unit. The blower shall be designed to make operation and servicing convenient for personnel wearing heavy arctic clothing.

3.3.5 Duct storage. Means shall be provided for storing the retracted flexible ducting and the 60-degree angle section, specified herein, on the blower when not in use.

3.3.6 Locking devices. All screws, pins, bolts, et cetera, where practicable, shall be furnished with standard locking devices. Safety wire, self-locking nuts, cotter pins, lock washers, et cetera, are acceptable.

3.3.7 Tie down. A "D" ring shall be provided on each lower corner of the blower frame to permit the blower to be secured for air transportation. The inside radius shall be not less than 1 3/4 inches. The rings shall be capable of holding the blower when the acceleration forces specified in 3.3.8 are applied.

3.3.8 Acceleration forces. All components of the blower shall be capable of withstanding 3 g along each of the three major axis in either direction and shall be capable of operating in all respects according to all the requirements specified herein after such exposure.

3.3.8.1 The blower shall be constructed so that all components will be entirely restrained from causing any external damage in the event that acceleration forces of 8 g along either horizontal axis or 4 1/2 g downward are encountered. The tiedown provisions shall not fail under these forces, however the blower need not be operational after such exposure. Ability to withstand the above acceleration loadings shall be demonstrated by supporting engineering data.

3.3.9 Bearings. All bearings used in the blower shall be of the sealed antifriction type and shall contain a lifetime supply of lubrication suitable for operation under all conditions specified herein.

3.4 Performance.

3.4.1 Output. The blower shall have a minimum free air delivery of 1500 cfm with 20 feet of 8-inch diameter flexible fabric ducting connected to the inlet side, and the 60-degree angle and 10 feet of 8-inch diameter flexible fabric ducting connected to the discharge side, when operating against surrounding atmospheric pressure at the end of the ducts specified herein.

3.4.2 Tilt. The blower shall be capable of functioning satisfactorily when its normal operating plans is at an angle of 8 1/2 degrees in any direction from true horizontal.

3.4.3 Life. The blower shall be designed so that it will have a life expectancy of at least 2000 hours, and will be capable of at least 500 hours operation without failure of any major part.

3.4.4 Environmental.

3.4.4.1 The blower shall operate satisfactorily throughout a temperature range of -65° to +130° F and an altitude range from 0 to 15,000 feet pressure altitude. No harmful condition shall result from operation of the blower without ducts attached.

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* 3.4.4.2 The blower shall be capable of withstanding environmental conditions of high and low temperatures, rain, fungus, and salt spray, and shall be capable of satisfactory operation and shall meet all requirements specified herein after being exposed to such environmental conditions.

3.4.5 Noise level. The maximum overall noise level shall not exceed 85 db within 10 feet distance from the blower, when tested without the air ducts.

* 3.4.6 Radio interference. The blower shall be shielded against radiated radio interference in such a manner that the radiated interference shall not exceed the limits established by MIL-STD-461, when tested as specified in MIL-STD-462.

3.5 Details of components.

* 3.5.1 Motor. The motor shall be a 3-phase, 220/440V, 60 cycle, totally enclosed class B motor conforming to CC-M-1807. It shall be of sufficient rating to power the blower at all operating conditions specified herein. The motor shall be of explosion-proof design in accordance with Class 1, Division 1, Group D of Pamphlet 70.

3.5.1.1 Input leads. A 50-foot, 4-wire input cable of sufficient size to carry the motor current and conforming to the requirements of Specification MIL-C-5756 shall be provided.

3.5.1.1.1 A plug, as specified in 3.5.1.1.2, shall be installed on the end of the input lead. One conductor of the four conductor lead shall be firmly connected to the frame of the blower and the other end of the conductor shall be connected to the ground terminal of the plug.

* 3.5.1.1.2 Plug and receptacle. A 3-wire, 4-pole, explosion-proof receptacle and plug shall be provided. The receptacle and plug shall be of a type suitable for Class 1, Division 1, Group D hazardous locations as defined in Pamphlet 70. The receptacle shall be of the interlocking plug, series switch type of sufficient capacity to carry the load. All explosion-proof equipment shall be approved by the Underwriters' Laboratories, Incorporated (see 6.2.).

* 3.5.1.1.3 Control. An explosion-proof control in accordance with Class 1, Division 1, Group D of Pamphlet 70 shall be provided on the blower for starting and stopping the motor.

* 3.5.1.1.3.1 Means shall be incorporated in the controls to automatically disconnect the motor from the line in case the line voltage exceeds 125 percent of the motor manufacturer's rated voltage.

* 3.5.1.1.3.2 An automatic device shall be provided in the control system to protect the motor from overload. This device shall disconnect the motor from the line when the line current is in excess of 130 percent of normal full-load current. The device shall not operate during the transient current surge encountered during starting.

3.5.2 Fan. The fan shall be fabricated of nonferrous material to reduce the possibility of sparking when struck by foreign objects.

3.5.2.1 The fan shall be directly driven by the motor.

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3.5.3 Fan housing. The fan housing shall be fabricated of aluminum, or another metal of equivalent low sparking qualities.

3.5.3.1 The intake and discharge openings of the housing shall be provided with wire guards having a maximum of 1/2 inch mesh for protection of the fan and operating personnel.

3.5.3.2 The fan housing shall contain provisions for quick attachment of the 60-degree angle section or the flexible fabric ducts to the intake and discharge openings.

3.5.3.3 The fan housing shall discharge and receive air horizontally.

3.5.3.4 All components within the fan housing such as the shaft, straightener vanes, motor housing, et cetera, shall be of nonsparking materials, or shall be adequately protected by components made of nonsparking materials from being struck by foreign objects.

3.5.4 Ducting. Three 10-foot lengths of 8-inch diameter flexible fabric ducting and one short rigid 60-degree angle duct shall be provided with each blower.

3.5.4.1 Each 10-foot length of ducting and the rigid angle section shall be provided with rigid fittings on both ends so that any section may be attached directly to the blower, or to any other section of duct, specified in 3.5.4.

3.5.4.2 Provision shall be made for grounding all ducting to the blower via the stiffener cores and couplings specified herein.

3.5.4.3 The flexible ducting shall incorporate a single continuous helical stiffener core to prevent transverse collapsing. The core shall be grounded to the fittings on both ends of the duct, and shall be designed so that it will have a tendency to keep the duct fully extended when released from the retainer. The helical core shall have a pitch not exceeding 0.75 times duct diameter.

3.5.4.3.1 All metals which are exposed to the air stream within the duct shall be of nonsparking types.

3.5.4.4 The flexible ducting shall be constructed so as to permit handling in any direction with a minimum crimping of fabric.

3.5.4.5 Each section of the flexible duct shall be capable of being easily retracted to a length not to exceed 18-inches, and shall have built-in provisions for aid in retracting and retaining the duct in the retracted position.

* 3.5.4.6 The flexible ducts shall incorporate a strong fabric which is coated with an oil and gasoline resistant material. The coated fabric shall be nonpermeable and, in addition to meeting the requirements specified herein, shall comply with the following additional requirements and tests specified in Specification MIL-H-18158.

- * (1) Fire resistance before and after accelerated weathering.
- (2) Pliability following dry heat aging.

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3.5.4.7 The flexible ducts shall be easily repairable in case of inadvertent damage. At points where dragging causes rapid wear or failure of the ducts, an extra layer of material of high abrasion-resistant qualities shall be provided.

3.5.4.8 Angle section. A 60-degree angle section of rigid duct with smooth radius shall be provided with each blower. It shall provide for coupling the ducting to the intake and the discharge openings of the blower, as applicable.

3.5.4.8.1 The angle section shall be rotatable throughout 360 degrees when attached to the blower housing. Means shall be provided for securely locking the rotating section in any position.

3.5.5 Running gear. The blower shall be mounted on an integral two-wheel running gear assembly, suitable for manual movement of the blower over paved areas. The assembly shall be equipped with wheel locks, parking stand support, and a handle.

3.5.5.1 Wheels and hubs. Wheels and hubs with tires and tubes shall be size 3.50-6 and shall conform to Specification MIL-W-8005.

3.5.5.2 Parking stand. A parking stand which may be lowered into position shall be provided to stabilize and level the blower during operation. It shall be connected so that provision is made for locking the wheels when the parking stand is in the park position. Approximately 20 percent of the blower weight shall rest on the parking stand when the blower is positioned on a horizontal plane.

3.5.5.3 Handle. A horizontal bar-type handle shall be provided to facilitate manual movement of the blower. The handle shall be removable, and shall collapse within the dimensions of the blower for shipment. With the parking stand retracted, the load borne by the operator shall not exceed 30 pounds. The handle shall be rigid and shall permit a two-handed grip by the operator.

* 3.6 Interchangeability. All parts having the same manufacturer's part number shall be directly and completely interchangeable with each other with respect to installation and performance. Changes in manufacturer's part numbers shall be governed by the drawing number requirements of Specification DOD-D-1000.

3.7 Dimensions and weights. The dimensions and weights of the blower shall be as compact and low as practical to aid in handling and shipments, yet shall be consistent with the best commercial engineering practice covering this class of equipment.

3.8 Finishes and protective coatings.

* 3.8.1 Magnesium alloy parts. Magnesium base alloy parts shall be pre-treated in accordance with Specification MIL-M-3171, followed by one coat of zinc-chromate primer in accordance with Specification TT-P-1757. Internal surfaces shall be coated with one coat of enamel conforming to TT-E-489. Surfaces exposed directly to the elements or to wear by handling shall be coated with two coats of the enamel specified herein.

3.8.2 Aluminum alloy parts shall be covered with an anodic film conforming to a Specification MIL-A-8625, except as follows:

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3.8.2.1 Aluminum alloys which do not anodize satisfactorily shall be coated with a chemical film in accordance with Specification MIL-C-5541.

3.8.2.2 Where the primary purpose of the treatment is to afford a suitable paint base, chemical treatments in accordance with Specification MIL-C-5541 may be used in lieu of anodizing.

3.8.2.3 Castings containing nonaluminum alloy integral inserts may be treated with a chemical film in accordance with Specification MIL-C-5541 in lieu of anodizing.

3.8.2.4 When abrasion resistance is a factor, chemical films in accordance with Specification MIL-C-5541 shall not be used in lieu of anodizing.

3.8.3 Aluminum alloy surfaces not exposed directly to the elements shall be coated with one coat of enamel in accordance with TT-E-489 following the treatment specified in 3.8.2.2.

3.8.4 Aluminum alloy surfaces exposed directly to the elements or to wear by handling shall be coated with two coats of the enamel specified herein.

3.8.5 Ferrous parts.

* 3.8.5.1 While it is desirable to minimize the use of cadmium plated bolts and parts, those that are required shall be processed in accordance with Specification QQ-P-416 Type II or III as applicable, and of a class that is adequate to achieve the degree of protection required. Where possible, zinc plating per Specification QQ-Z-325 Type II and of a suitable class shall be used.

* 3.8.5.2 Surfaces of ferrous parts that are directly exposed to the elements or to wear shall be sand blasted or pickled to produce a clean surface, primed with one coat of primer conforming to TT-P-664 and coated with two coats of enamel conforming to TT-E-489.

* 3.8.5.3 Surfaces of ferrous parts not exposed directly to the elements or wear shall be sand blasted or pickled to produce a clean surface, primed with one coat of primer conforming to TT-P-664 and coated with one coat of enamel conforming to TT-E-489.

* 3.8.5.4 All unprotected surfaces and steel sheets shall be processed with commercial rust inhibitor.

* 3.8.6 The color of enamel specified herein shall be yellow, Color No. 13655 in accordance with Federal Standard 595.

3.9 Identification of product. Equipment, assemblies, and parts shall be marked for identification in accordance with MIL-STD-130.

3.10 Instruction plate. A permanent, weather-resistant, instruction plate giving brief instructions for operation of the blower shall be provided and mounted in a readily visible location on the blower.

* 3.11 Warning plate. A warning notice, entitled "Danger" lettered in red, and containing the following information shall be stenciled on the blower in full view of the operator.

"DANGER; GASOLINE VAPOR! GROUND THE BLOWER AND THE AIRCRAFT TO A COMMON GROUND BEFORE PLACING THE DUCTING INTO THE AIRCRAFT FUEL TANK"

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3.12 Workmanship.

3.12.1 General. The blower, including all parts and accessories, shall be fabricated and finished in a thoroughly workmanlike manner. Particular attention shall be given to freedom from blemishes, defects, burrs, and sharp edges; accuracy of dimensions, radii of fillets, and marking of parts and assemblies; thoroughness of soldering, welding, brazing, painting, wiring, and riveting; alignment of parts and tightness of assembly screws and bolts, et cetera.

3.12.2 Riveting. Riveting operations shall be carefully performed to insure that the rivets are tight and satisfactorily headed.

3.12.3 Cleaning. All parts of the blower shall be thoroughly cleaned of loose, spattered, or excess solder, metal chips, and other foreign material, during and after final assembly, prior to application of protective coatings. Burrs and sharp edges shall be removed.

* 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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Classification of tests. The inspection and testing of blowers shall be classified as follows:

4.1.2 Preproduction tests. Preproduction tests are those tests accomplished on a sample representative of the production blower to determine that the production blower meets the requirements of this specification.

4.1.3 Inspection tests. Inspection tests are those tests accomplished on blowers submitted for acceptance under contract.

4.2 Test conditions.

4.2.1 Apparatus. Apparatus used in conjunction with testing specified herein shall be, insofar as is practicable, of laboratory precision type and shall be calibrated at intervals properly spaced to assure laboratory accuracy.

4.2.1.1 Revolutions per minute. Rotational speed shall be determined whenever practicable by means of a directly coupled positive counter which will actually count the revolutions for a period of not less than 1 minute. A combination unit which counts the revolutions while measuring the time required in connection with other data is preferred. Strobotachometers may be used provided calibration data can be furnished to attest to their accuracy. The use of hand tachometers shall not be acceptable.

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* 4.2.1.2 Air flow. The air delivery shall be measured as shown in The American Society of Mechanical Engineers Test Code for Fans, No PTC 11. Test setup No. 4 shall be used, with the inlet duct of the blower connected to the test plenum chamber, and the plenum chamber maintained at surrounding atmospheric pressure. Actual airflow measurements shall be made in the test duct located between the auxiliary blower and the test plenum, either by use of the pitot tube as shown in No. PTC 11, or by use of a smooth approach nozzle or a flat plate orifice as shown in ASME Performance Test Code No. 19.5 Chapter 4.

* 4.2.1.3 Barometric pressure. Barometric pressure shall be measured by means of a mercury barometer, and shall be corrected for the temperature of the scale and the mercury and for the location of the barometer with regard to altitude and latitude. Readings obtained from aneroid barometers shall not be acceptable.

4.2.1.4 Temperature. Temperatures shall be measured by means of appropriately located thermocouples and properly calibrated potentiometers, or laboratory thermometers. Thermocouples shall be insulated from contact with other metals, insofar as practical. Temperatures shall be expressed in degrees Fahrenheit.

4.2.1.5 Pressure. Pressures and pressure differentials shall be measured by means of liquid manometers, insofar as practicable.

4.2.1.6 Standard atmospheric conditions. Whenever the pressure and temperature are not specified for a given test, it shall be conducted at 70° to 80° F and at approximately standard sea level atmospheric pressure.

4.2.2 Running-in. Necessary running-in of the blower to be tested shall be accomplished prior to submission of the blower for test.

4.2.3 Data.

4.2.3.1 Readings. During the endurance testing specified herein, at least the following data shall be recorded at intervals not greater than 30 minutes:

- Time
- Fan rpm
- Motor frame temperature
- Input voltage
- Current
- Power factor
- Ambient temperature
- Bearing temperature

4.2.3.2 During tests other than the endurance test, applicable readings shall be taken at 15-minute intervals after conditions have stabilized. In no case shall test data include less than two sets of readings.

4.2.4 Inspection, servicing, and adjustments. Planned stops shall be made at 25-hour intervals during the endurance test for inspection, servicing, and adjustments.

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4.2.5 Test time. Endurance test time shall be credited in 1/2 hour intervals.

4.3 Preproduction test.

4.3.1 Preproduction test samples. Two complete blowers with ducts and samples of duct material as necessary to complete tests specified herein shall be tested for approval. One blower shall be subjected to tests specified in 4.3.6.10 and 4.3.6.10.1 while the other blower completes the remaining tests.

4.3.1.1 Preproduction tests conducted by an agency other than the procuring agency shall be witnessed by a Government inspector or a representative of a disinterested accredited testing agency.

4.3.2 Samples submitted for test shall be accompanied by the applicable parts list and manufacturer's drawings, complete operating instructions and adequate spare gaskets, locking devices, seals, et cetera, to provide replacements which may be necessary for the complete disassemblies and reassemblies required during the testing outlined herein. The operating instructions shall contain specific information regarding lubricants to be used at the various test conditions specified herein, special precautions necessary for operation of the blower, and procedures to be followed in operating the blower under adverse climatic conditions.

4.3.3 Records. Notes of all incidents of the test; such as adjustments made, servicing performed, leaks, vibration, and any other irregular functioning of the blower and corrective measures taken shall be placed on the log sheets.

4.3.4 Reports. When the preproduction tests are performed by an agency other than the procuring agency, the manufacturer shall submit to the procuring agency a complete engineering report of the tests. This report shall contain, in addition to the conclusions of the testing agency, complete records of the test, including data sheets, performance curves, chronological test records, photographs, sample calculations, complete tear down inspection results, a description of the test apparatus, and procedures in sufficient detail for separate formulation of conclusions by interested parties not witnessing the test. The report shall also contain information which specifically demonstrates compliance with all requirements of Section 3 which are not covered directly by the tests of Section 4. The report shall be signed by the director of the testing agency or a representative authorized to sign for him. Reports covering tests performed by the manufacturer at his own facilities shall be countersigned by a Government inspector or the representative of a disinterested accredited testing agency who witnessed the test. The latter signature shall constitute the verification of the data contained in the report and shall not necessarily indicate concurrence in the conclusions presented therein.

4.3.5 Previous tentative approval of a design or a material by the procuring agency shall in no case be construed as a guarantee of acceptance of the finished product. Acceptance shall be made only upon conformance to the requirements of this specification and satisfactory completion of the preproduction tests.

4.3.6 The preproduction test shall consist of the following tests in the order listed herein:

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4.3.6.1 Performance demonstration. Two 10-foot lengths of the fabric ducting shall be attached to the intake end of the blower; the 60-degree angle, and one 10-foot section shall be attached to the discharge end. The air delivery of the blower shall be measured as specified in 4.2.1.2. The blower shall have a minimum free air delivery of 1500 cfm. The ducts shall be extended straight from the blower inlet and outlet openings, and shall not be placed under abnormal tension in order to reduce duct resistance.

4.3.6.2 Dielectric strength. A test voltage of twice the normal voltage (rms) of the circuit to which the motor is designed to be connected, plus 1000V rms, shall be successively applied for 1 minute between each electric circuit and all other electric circuits and metal parts grounded. All windings, except that under test, shall be connected to ground. The frequency of the test voltage shall be 25 to 60 cycles, and the crest value of the total voltage shall be the square root of two times the specified test voltage. Any damage to the tested circuit constitutes failure of this test.

4.3.6.3 General utility. The blower shall be moved, operated, and utilized in such a manner to demonstrate the utility of the blower in its intended function, and its utility by personnel wearing arctic clothing.

4.3.6.4 Tilted position. The complete blower shall be tilted in four different positions, 90 degrees apart, at an angle of 8 1/2 degrees with the true horizontal plane. The blower shall be started and operated for 30 minutes at maximum output in each of the various positions to determine compliance with the requirements specified in 3.4.2.

4.3.6.5 Noise level. The noise level of the blower shall be tested for compliance with the requirements specified in 3.4.5 at a distance of 10 feet from the test specimen for all operating conditions. Evidence shall be included in the test report substantiating that the maximum noise level on the 10-foot perimeter was located and meets the noise requirement.

* 4.3.6.6 Environmental tests. The blower shall be tested under various environmental conditions in accordance with MIL-STD-810 as follows:

* 4.3.6.6.1 Low temperature. The entire blower shall be placed in a chamber where the temperature is maintained at -65°F for 24 hours. At the conclusion of this time, the unit shall be started and operated, without the use of pre-heat, for a minimum period of 2 hours while still in the test chamber. Components shall be operable and ducts shall be sufficiently flexible for proper extension and retractility. Duct flexibility at low temperatures shall be demonstrated by extending one 10-foot section to full length and retracting it to the storage position at least 10 times. No cracking or splitting of the duct fabric shall occur. Speed and input readings shall indicate that ample power is available from the motor to operate the blower at low temperature, with and without the ducts attached, without creating a harmful condition. After completion of the extended exposure and subsequent operation, the blower shall be stopped and allowed to cool down until the blower temperature has stabilized at -65°F throughout. The blower shall again be started and operated for a 2-hour period and the ducts extended and retracted 10 times. This procedure shall be repeated at -65°F until a total minimum of 4 starts and 8 hours of operation at -65°F have been obtained.

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- * 4.3.6.6.2 High temperature. The blower with retracted ducts shall be subjected to the high temperature test, MIL-STD-810, Method 501.1, Procedure I, with the following exception: The blower shall be exposed to 160°F ambient temperature, but the operation shall be at 130°F. Following exposure at 160°F, the blower and ducts shall be checked for distortion, softening, paint chipping, and other general damage which would be detrimental to continued operation or life expectancy. The blower shall then be operated at rated capacity at an ambient temperature of 130°F for 1 hour, or until motor frame temperatures stabilize. No harmful condition shall result.
- * 4.3.6.6.3 Rain. The blower shall be subjected to the rain test in accordance with MIL-STD-810, Method 506.1 Procedure II. Immediately following this test, the blower shall be removed from the test chamber, checked for proper operation, and shall satisfactorily complete the test specified in 4.3.6.2. It shall be permissible to wipe electrical components dry, apply lubricants to external moving parts, or clean components manually if necessary to start the blower.
- * 4.3.6.6.4 Fungus. The blower with ducts shall be subjected to the fungus test in MIL-STD-810, Method 508.2 for 48 days. Phase III of this test shall be completed as follows: Following the exposure, the blower and ducts shall be examined for fungus damage which would be detrimental to continued operation or life expectancy, and without intervening reconditioning. The blower shall be checked for proper operation and shall satisfactorily complete the test specified in 4.3.6.2.
- * 4.3.6.6.5 Salt spray. The blower shall be exposed to the salt fog test described in MIL-STD-810, Method 509.1, Procedure I except that the test shall last 60 hours. Upon completion of the exposure, the salt accumulations shall be rinsed off, and the blower, including ducts, shall be visually inspected for damage caused during the exposure period which would be detrimental to continued operation or life expectancy. It shall then be checked for satisfactory operation and shall satisfactorily complete the test specified in 4.3.6.2.
- 4.3.6.7 Endurance. The blower shall be subjected to a 500-hour endurance test at full capacity. Ten hours shall be run without ducts attached and the remainder shall be run with the set of ducting attached as specified in 4.3.6.1. There shall be no failure of any major part during the endurance test. At the end of the test, the blower shall be in such condition that it can be returned to continued service by reconditioning.
- * 4.3.6.8 Performance check. Immediately following the endurance test and without intervening reconditioning, the blower shall satisfactorily complete the tests specified in 4.3.6.1 and 4.3.6.2. Failure to satisfactorily complete these tests constitutes failure of the entire preproduction test.
- * 4.3.6.9 Radio interference. The blower, less ducts, shall be tested and comply with the applicable limits set in MIL-STD-461 including those for conducted (tests CE04 and CE05) and radiated emission (Test RE02). These tests shall be performed in accordance with techniques established in MIL-STD-462.
- * 4.3.6.10 Explosion. The electrical components of the blower shall be subjected to and successfully complete the explosion test described in MIL-STD-810, Method 511.1, Procedure I for ground support equipment.

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* 4.3.6.10.1 Blower. The blower with ducts shall be subjected to and successfully complete the explosion test described in MIL-STD-810, Method 511.1, Procedure I for ground support equipment. In this instance the source of spark shall be small sharp edged pieces of hard stone with nominal diameters between 1/8 inch and 1/4 inch introduced directly into the blower wheel.

4.3.6.11 Mobility. Convenience in handling shall be demonstrated by moving the blower by hand over 200 yards of level concrete with minor obstructions approximately 3/4 inch high spaced at 3-foot intervals. (A series of passes over a short course shall be acceptable). Normal walking speed shall be used. No failure of the wheel assembly, or damage to the blower shall occur. The blower or accessories shall not interfere with normal walking of the operator.

4.3.6.12 Duct tests. In addition to the above tests in which the ducts are tested with the blower, the following additional tests shall be conducted on the flexible ducts and samples of the duct material.

4.3.6.12.1 An extended duct, with special plugs attached to each end, shall be subjected to an internal air pressure of 25 inches water gage. No blowout of the fabric or tearing of stitching shall occur. There shall be no perceptible air leakage through the fabric or the seams.

4.3.6.12.2 An extended duct shall be subjected to a tension of 150 pounds. No detrimental effect shall occur.

4.3.6.12.3 One flexible duct shall be dragged behind a vehicle at walking speed for 2500 feet over a smoothly paved dry concrete surface. The duct shall be connected at one end in such manner that it will have a tendency and will be permitted to roll slowly. At the end of this test, the duct fabric shall not be damaged to the extent that duct performance would be adversely affected. The abrasion-resistant material specified in 3.5.4.7 shall not be worn through.

4.3.6.12.4 Duct continuity. A continuity tester shall be used to demonstrate that the end bands of the inlet and outlet ducts when setup as specified in 3.4.1 are satisfactorily grounded to the frame of the blower.

* 4.3.6.12.5 Suitable samples of the flexible duct fabric shall be subjected to the following tests as outlined in Specification MIL-H-18158 to demonstrate conformance to 3.5.4.6 herein:

- (1) Accelerated weathering
- (2) Pliability following dry heat aging
- (3) Fire resistance

4.3.6.12.6 Suitable samples of duct fabric, stitching, and scuff strips used in the flexible ducting shall be soaked 24 hours in aircraft reciprocating engine gasoline, jet fuel, and lubricating oil. After the exposure, their strength shall not be adversely affected and coatings used shall not be adversely affected.

4.3.6.13 Hoisting and tie down provisions. Provision for hoisting and tie down of the blower within aircraft shall be evaluated.

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4.3.6.14 Teardown inspection. Upon completion of the prescribed testing, the blower shall be completely disassembled for inspection. All parts shall be required to be in acceptable condition. Wear or distortion which requires rework or replacement of the parts affected shall be cause for considering the part affected as having failed to complete the test satisfactorily.

4.4 Inspection tests.

4.4.1 Individual tests. Each blower shall be subjected to the following tests:

4.4.1.1 Running-in. A short run-in shall be accomplished by the manufacturer. The blower shall be examined for proper operation and shall exhibit no malfunctioning, rough operation, excessive vibration, or other irregularities.

4.4.1.2 Examination of product. Each blower shall be inspected to determine compliance with the requirements specified herein with respect to materials, workmanship, marking, and finishes.

4.4.2 Sampling tests. One blower shall be selected at random from every one hundred or fraction thereof produced and subjected to the following tests:

4.4.2.1 When sampling tests are specified on a number of items that are selected from a production run and one or more of this number fails to meet the specified tests, acceptance of all items still on hand and subsequent production will be withheld until the extent and cause of failure is determined. For operational reasons, individual tests may be continued pending investigation of a sampling test failure. However, final acceptance of the items on hand and subsequent production is contingent upon the inspector's decision regarding the overall conformance of the product to specification requirements. When corrective action has been accomplished, all necessary tests shall be repeated. If investigation indicates that the defects may exist in items previously accepted, full particulars concerning the defects, including recommendations for correction, will be furnished to the contracting officer.

4.4.2.2 Performance check. The blower shall be subjected to the test specified in 4.3.6.1.

4.4.2.3 Explosion test. The blower shall be subjected to the tests specified in 4.3.6.10 and 4.3.6.10.1.

4.4.2.4 Dielectric strength. The blower shall be subjected to the test specified in 4.3.6.2.

4.4.2.5 Grounding. The blower shall be tested as specified in 4.3.6.12.4.

4.5 Inspection of the preservation, packaging and packing. The inspection of the preservation, packaging and packing shall be in accordance with the instructions in section 5, or the specifications referenced therein.

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5. PACKAGING

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

5.1.1 Level A. Blower shall be preserved in accordance with MIL-P-116, Method IA.

5.1.2 Level C. Blower shall be preserved and packaged in accordance with the Manufacturer's commercial practice.

5.2 Packing shall be Level A, B or C as specified (see 6.2).

5.2.1 Level A. Blower, preserved and packaged to meet 5.1.1 shall be packed in a container conforming to PPP-B-601, Overseas Type. The closure of the container shall be in accordance with the Appendix of the shipping container specification.

5.2.2 Level B. Same as Level A except the container shall be domestic type.

5.2.3 Level C. Each blower preserved and packaged as specified in 5.1.1 shall be packed in a manner to insure carrier acceptance and safe delivery at destination. Containers shall be in accordance with the Uniform Freight Classification Rules or regulations of other carrier as applicable to the mode of transportation.

5.3 Physical protection. The blower shall be cushioned, anchored, blocked and braced in accordance with MIL-STD-1186. The Freefall Drop Test, Edgewise Drop Test and Cornerwise Drop Test shall be in accordance with Appendix A of MIL-STD-1186. The Tests are not required when Level C packing is specified.

5.4 Marking. In addition to any special marking required by the contract or order (see 6.2) interior packages and exterior containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The Type MA-1 blower covered by this specification is intended for purging aircraft fuel tanks while internal maintenance is being performed.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number and date of this specification.
- b. The bidder will submit proof to the procuring activity that the explosion-proof electrical equipment specified in 3.5 that he proposes to supply under this specification conforms to the standards of the Underwriters' Laboratories, Incorporated as regards fire and casualty hazards. The label or listing of the Underwriters' Laboratories, Incorporated will be accepted as evidence of conforming to the specification requirements.

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In lieu of the label or listing the bidder may submit independent proof satisfactory to the procuring activity that this equipment conforms to the published standards, including methods of tests, of the Underwriters' Laboratories, Incorporated. Compliance with the fire and casualty hazard requirements does not absolve the bidder from complete compliance with other requirements of this specification.

c. Point of inspection (see 4.3.1).

6.3 Data requirements. The contracting officer should include requirements for such data as technical publications, instructional materials, illustrated parts list, and suppliers maintenance and operational manual to be furnished with each blower.

6.4 Changes from previous issue. The margins of this specification are marked with asterisks to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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