

INCH-POUND

MIL-PRF-32616(USAF)

28-NOV-2018

PERFORMANCE SPECIFICATION

HOSE ASSEMBLY, AIR DUCT – GENERATION 2 HEATER DUCTS

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 defines the requirements for a metallic reinforced, duct assembly, suitable for use in low pressure, 350 °F ground heaters. The Hose Assembly, Air Duct – Generation 2 Heater Ducts, herein referred to as duct assembly; will be utilized primarily in application with aircraft engines and fuselages, portable maintenance shelters and hangars, and related enclosures.

1.2 Classification. The duct assemblies will be of the following types, diameter, and length as specified in Table I.

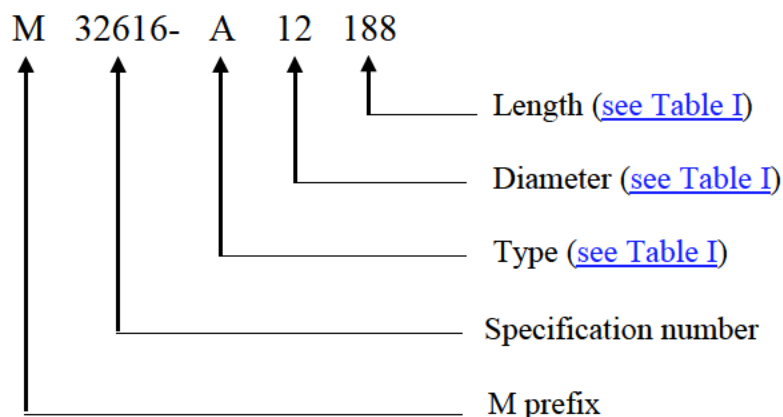
TABLE I. Duct assemblies dimensions

| TYPE | DIAMETER | LENGTH |
|------|-------------------|-------------------------------|
| A | 12 inches nominal | 186 inches ± 6 inches nominal |
| B | 6 inches nominal | 186 inches ± 6 inches nominal |

1.3 Part or Identifying Number (PIN). The PINs to be used for the duct assemblies acquired to this specification are created as follows:

Comments, suggestions, or questions on this document should be addressed to the:
 U.S. AIR FORCE – AFLCMC/WNZ - HVAC, 235 Byron Street, Suite 19A, Robins AFB GA
 31098-1813 or email to SPEC99@us.af.mil . Since contact information can change, you may
 want to verify the currency of this address information using the ASSIST Online database at
<https://assist.dla.mil> .

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NOTE: M32616-A12188 denotes an actual part number.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3 and 4 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

FEDERAL STANDARDS

FED-STD-191 Textile Test Methods

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-130 Identification Marking of US Military Property
 MIL-STD-810 Environmental Engineering Considerations and
 Laboratory Tests
 MIL-STD-1472 Human Engineering

DEPARTMENT OF DEFENSE HANDBOOKS

MIL-HDBK-831 Preparation of Test Reports

(Copies of these documents are available online at <https://quicksearch.dla.mil>.)

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2.3 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

AMERICAN SOCIETY MECHANICAL ENGINEERS (ASME)

| | |
|-------------|--|
| ASME MFC-3M | Measurement of Fluid Flow in Pipes Using Orifice, Nozzle and Venturi |
|-------------|--|

(ASME documents are available on line at <http://www.asme.org/> or from ASME International, 22 Law Drive, P. O. Box 2900, Fairfield, NF 07007-2900)

AMERICAN SOCIETY TESTING MATERIALS (ASTM)

| | |
|------------|--|
| ASTM A764 | Metallic Coated Carbon Steel Wire, Coated at Size and Drawn to Size for Mechanical Springs |
| ASTM D430 | Standard Test Method for Rubber Deterioration-Dynamic Fatigue |
| ASTM D471 | Standard Test Method for Rubber Property-Effect of Liquids |
| ASTM D3951 | Standard Practice for Commercial Packaging |
| ASTM D6193 | Standard Practice for Commercial Packaging |

(ASTM documents are available on line at <http://www.astm.org/> or from ASTM International, 100 Bar Harbor Drive, P. O. Box C700, West Conshohocken, PA 19428-2959)

SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

| | |
|-----------------------|---|
| SAE AMS-QQ-W-428 | Wire, Steel, Carbon (High Carbon, Round, for Mechanical Springs, General Purpose) |
| SAE AS7365/1 | Pin, Female, 12 inch Air Duct |
| SAE AS7365/2 | Coupling, Female, 12 inch Air Duct |
| SAE AS7365/3 | Coupling, Male, 12 inch Air Duct |
| SAE AS7365/4 | Coupling, Female, 6 inch Air Duct |
| SAE AS7365/5 | Coupling, Male, 6 inch Air Duct |
| SAE AS7365/6 | Band, Female Coupling, 12 inch Air Duct |
| SAE AS7365/7 | Band, Male Coupling, 12 inch Air Duct |
| SAE AS7365/8 | Band, Female Coupling, 6 inch Air Duct |
| SAE AS7365/9 | Band, Male Coupling, 6 inch Air Duct |
| SAE AMS-STD-595/24052 | Dark green, Semi-gloss |
| SAE AMS-STD-595/24084 | Dark olive drab |
| SAE AMS-STD-595/37038 | Black |

(SAE documents are available online at www.sae.org or from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096)

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2.4 Order of precedence. Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specified exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified ([see 6.2](#)), a sample shall be subjected to first article inspection in accordance with 4.3.

3.2 Duct assembly description. The duct assemblies covered by this specification shall be designed for use with portable heating equipment. They shall be constructed of strong pliable fabric properly treated with a non-permeable material for continuous use in extreme weather conditions. Quick-disconnect type coupling halves shall be installed on both ends of the duct with a male type coupling ([see 3.3.5.1](#)) on one end and a female type coupling ([see 3.3.5.2](#)) on the opposite end. A continuous metal stiffener, helical form, ([see 3.3.6](#)) extending the entire length of the duct shall be secured to the duct fabric and bonded to the couplings at each end for safe discharge of static electricity. A scuff strip, helically wound over the metal stiffener, shall be attached to the duct as an integral part of the assembly to protect the outside surface against abrasion. A storage device, with a hook on one end and a catch on the opposite end shall be securely attached to the end couplings and protrude inwardly to serve as a guide for retracting the duct and for holding the duct assembly in a retracted hanging and storing position.

3.3 Design and construction. The duct assembly design shall promote cost effective, life-cycle sustainability by addressing considerations such as incorporating open standards, reducing pollutant emissions and wastes; while satisfying the items performance specification requirements specified herein. It shall be designed and constructed so that no parts will work loose in service, and built to withstand the strains, jars, vibrations, and other conditions incident to shipping, storage, installation, and service.

3.3.1 Materials, protective coatings, and finish.

3.3.1.1 Materials. Materials shall conform to the requirements specified herein. Materials, which are not specifically described herein, shall be of the quality for the purpose intended.

3.3.1.2 Recycled, recovered, environmentally preferable, or biobased materials. Recycled, recovered, environmentally preferable, or biobased materials should be used to the maximum extent possible, provided that the material meets or exceeds the operational and maintenance requirements, and promotes economically advantageous life cycle costs.

3.3.2 Duct. The duct shall be designed for continuous use in inclement weather conditions. The duct shall withstand internal pressures ranging from +2 inches Hg (gage) to -1 inch Hg, relative to surrounding atmosphere, while in a fully extended position without rupture or damage to the duct. The construction shall be such that the duct shall be capable of retracting to fit inside of a heater storage area ([see 3.6.3](#)). For Type B, the duct shall retract to fit into an 8"x8"x18.5" storage area ([see 4.8.2](#)). The duct shall be capable of connecting to the heater or other ducts by

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personnel wearing arctic mittens and Mission Oriented Protective Posture (MOPP) Level 4 Chemical Warfare Gear. The duct shall withstand a tensile pull of 250 pounds without rupture or evidence of damage when tested in accordance with 4.5.8. The intergraded storage device and its internal surface shall be constructed so that air friction losses shall not exceed the values specified in 4.5.2 when tested at the atmospheric pressure and temperatures specified in 4.2.1.5.

3.3.3 Fabric. The fabric used in the construction of the duct shall be pliable stripes, coated with a non-permeable material. The fabric shall be of sufficient width to produce a pitch of not more than 8" for a 12" diameter duct and a 6" maximum pitch for a 6" diameter duct when helically wound upon itself with overlapping edges between which the helical stiffener shall be laid. The overlapping edges shall have sufficient width to retain the stiffener and to provide a satisfactory base for attaching the scuff strip. The fabric shall not be severely affected by prolonged exposure to adverse weather conditions. The fabric shall withstand all the applicable tests specified herein.

3.3.4 Fire resistance. All materials used in the construction of duct assemblies shall be fire resistant when tested as specified ([see 4.5.10](#)).

3.3.5 Couplings. Each section of the duct shall have a male type coupling on one end and a female type coupling on the opposite end, securely attached as an integral part of the duct assembly. The duct fabric shall be attached to the outside diameter of the couplings and secured with protector bands conforming to AS7365/6 and AS7365/7 for the Type A duct and AS7365/8 and AS7365/9 for the Type B duct. The distance from the end of the duct fabric and protector band to the extreme end of the male coupling shall be no less than 1.125 inches.

3.3.5.1 Male type coupling. The dimensions, configuration, and material requirements for the male type couplings shall be in accordance with AS7365/3 for the Type A duct and AS7365/5 for the Type B duct.

3.3.5.2 Female type coupling. The dimensions, configuration, and material requirements for the female type couplings shall be in accordance with AS7365/2 for the Type A duct and AS7365/4 for the Type B duct. The female couplings shall have three pins, conforming to AS7365/1, riveted at three equally spaced intervals around the circumference and protruding inwardly for receiving the connecting slots on the male couplings.

3.3.6 Helical stiffener. Unless otherwise specified, the stiffener shall be made of wire conforming to AMS-QQ-W-428, Type 1 or ASTM A764. The stiffener shall be helically wound to a diameter equal to the specified duct Type. The stiffener wire shall be of sufficient size and resilience to prevent transverse collapsing, and excessive area reduction, in the duct during sharp bends. The stiffener wire shall return the duct to at least 70% of its original diameter after flattening the duct to 50% of the diameter. The duct shall be flattened at least 2 feet away from the duct coupler ends. The helical pitch shall be sufficiently greater than the seam pitch on the duct to exert the required axial tension to extend the duct to its full length, when placed on a flat horizontal surface, and to maintain the duct in a fully extended position. However, the rigidity of the stiffener shall not interfere excessively with the retraction of the duct to its storage position. The stiffener

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shall have closed ends, square with the duct center line and securely bonded to the couplings at both ends to insure safe discharge of static electricity.

3.3.7 Scuff strip. The scuff strip shall be made of tough pliable material, helically wound around the outside diameter of the duct over the helical stiffener to protect the duct against abrasion and securely attached to withstand the test described in 4.5.9. The scuff strip shall not prevent or interfere excessively with retracting the duct to the storage position. The scuff strip color shall be chosen from the following list of AMS-STD-595: dark green, Color Number 24052, dark olive drab, Color Number 24084, or any variation color chip number for a black color.

3.3.8 Storage device. A built-in storage device shall be internally located in each section of the duct assembly and serve as a guide for retracting the duct and for retaining the duct in a retracted storage position. The device shall be free from burrs, sharp edges, and rough surfaces, which could abrade or damage the internal surface of the duct during extension and retraction. All welding shall be of the fusion type and the welded areas shall be properly treated, to resist corrosion. In the event cleats are used for attaching the device to the couplings, two rivets shall be used on each end of the cleats.

3.3.9 Seams and stitching. Seams and stitching shall be in accordance with ASTM D6193. The seam shall be Type LSa-2 and the stitching shall be Type 301. The distance from the edge of the seam and the space between the rows of stitching shall be not less than 0.125 inch. No more than two bobbin breaks will be allowed in a 90 foot length of seam and where breaks occur, the break shall be backed stitched for a distance of no less than 1 inch.

3.3.10 Seams cemented. Cement may be used to join the overlapping edges of the duct fabric provided that the facilities and process employed for cementing the first article samples will be the same facilities and process employed in the manufacture of production run ducts. The cemented duct assemblies shall be subjected to the first article tests specified herein and the samples submitted to the Government for approval before commencing the production run.

3.3.11 Protective coatings. Materials that deteriorate when exposed to sunlight, weather, or normal operational conditions shall not be used, or; shall have means of protection against such deterioration that does not prevent compliance with the performance requirements specified herein. Protective coatings that chip, crack, or scale with age or extremes of climatic conditions or when exposed to heat shall not be used. If needed, exposed surfaces or fasteners, handles, and fittings shall also be primed and painted. Commercial items used as components of the duct assembly (but not the duct itself) may be prepared and coated in accordance with the manufacturer's standard practice, provided it is compatible with the exterior finish color. See 3.4.2 for prohibited hazardous materials.

3.3.12 Finish. Unless otherwise specified, the exterior finish color and fabric of the duct, Type A and B shall be dark olive drab, color number 28084 of AMS-STD-595.

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3.4 Environment, Safety, and Occupational Health (ESOH).

3.4.1 System safety. The design of the duct assembly shall not contain any system safety mishap risk categories greater than medium, as defined in MIL-STD-882.

3.4.2 Hazardous material. The design of the duct assembly shall minimize and control hazards associated with the inclusion or use of hazardous or toxic materials and the generation of toxic or noxious gases. The duct shall not generate or use Class I or Class II Ozone Depleting Substances (ODS) during operation, maintenance, or disposal. Class I ODS and hazardous materials shall not be used in any system, component, or process. The duct shall not contain or use either hexavalent chromium or cadmium without written approval by the procuring activity. Hazardous materials are defined in AFI 32-7086; Class I and Class II ODS are defined in the Code of Federal Regulations, 40CFR82.

3.4.3 Foreign object damage (FOD). All loose metal parts, such as pins or connector covers, shall be securely attached to the duct with wire ropes or chains. "Dog tag" style beaded chains shall not be provided.

3.4.4 Electrostatic discharge (ESD). The design of the duct assembly shall preclude equipment damage due to ESD, protect personnel from electrical shock due to static charging, and prevent ignition of explosive atmospheres due to sparking.

3.4.5 Human system integration. The duct assembly shall be designed in accordance with MIL-STD-1472 for ease of operation, inspection, and maintenance, including the use of arctic mittens and Mission Oriented Protective Posture (MOPP) Level 4 Chemical Warfare Gear. Chemical Warfare Gear is not required for preventive maintenance or major corrective maintenance.

3.5 Environmental conditions.

3.5.1 Operating temperature range. The duct assembly shall be capable of delivering hot air subject to ambient temperatures ranging from -30 to +50 °F without evidence of scorching or other harmful effects ([see 4.5.4](#) and [4.5.5](#)).

3.5.2 Exposure conditions. The duct assembly shall be subject to the following conditions without detrimental effects to the normal operating requirements:

- a. Exposure to salt spray ([see 4.5.6.1](#))
- b. Fungus growth as encountered in tropical climates ([see 4.5.6.2](#))
- c. Radiant energy as found under natural conditions ([see 4.5.6.3](#))
- d. Exposure to fuels and lubricants ([see 4.5.11](#))

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3.6 Weight and dimensions.

3.6.1 Weight. The duct assembly shall not exceed the following weight:

- a. Type A maximum weight 25 pounds
- b. Type B maximum weight 15 pounds

3.6.2 Extended length. The diameter and length of the duct assembly shall conform to the following dimensions when in a fully extended position:

- a. Type A inside diameter, 12 inches +0.25 inch, -0 inch. Length 186 inches \pm 6 inches
- b. Type B inside diameter, 6 inches +0.25 inch, -0 inch. Length 186 inches \pm 6 inches

3.6.3 Retracted length. The diameter, length, and weight of the duct assembly shall not exceed the following dimensions when in a fully retracted storage position:

- a. Type A outside diameter, 14 inches, Length 21 inches
- b. Type B outside diameter, 10 inches, Length 21 inches

3.7 Interchangeability. All parts having the same manufacturer's part number shall be functionally and dimensionally interchangeable. The male and female couplings shall be interchangeable between heaters, adapters, and ducts.

3.8 Workmanship. The duct, including all parts and accessories, shall be constructed and finished in a thoroughly workmanlike manner. The fabric shall be free from irregular thread count, filling breaks and defective surface coating. All seams and stitching shall conform to the requirements specified herein. Couplings and the storage device shall be free from burrs, sharp edges and surface roughness which could result in injury to personnel or cause damage to the duct fabric. The coupling shall be sufficiently round to rotate and completely engage at 120° intervals. All corrosive type materials shall be properly treated to resist corrosion when subjected to the exposure conditions specified herein.

4. VERIFICATION

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

- a. First article inspection ([see 4.3](#)).
- b. Conformance inspection ([see 4.4](#)).

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4.2 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified below:

4.2.1 Apparatus. The apparatus used for testing shall be of the laboratory precision type and calibrated at properly spaced intervals to assure laboratory accuracy.

4.2.1.1 Airflow. Airflow shall be measured by means of smooth approach orifices or thin plate orifices in accordance with ASME MFC-3M. Apparatus such as pitot tubes, roto-meters, may be used only when specifically approved by the Procuring Activity. The rate of air flow shall be expressed in cubic feet per minute (CFM).

4.2.1.2 Barometric pressure. Barometric pressure shall be measured by means of a mercurial barometer. The barometer pressure shall be corrected according to the temperature of the scale and mercury and the location of the barometer with regard to the altitude and latitude. Readings obtained by aneroid barometers shall not be acceptable.

4.2.1.3 Temperature. Temperature shall be measured by means of appropriately located thermocouples. The thermocouples shall be insulated to prevent contact with other metals. Temperatures shall be expressed in degrees Fahrenheit. Test temperatures shall be within ± 4 °F of those specified herein.

4.2.1.4 Pressure. Pressure and pressure differentials shall be measured by means of water manometers having a scale graduated in 0.01 inch of water. Pressures that exceed the range of conventional water manometers shall be measured by properly calibrated Bourbon Tube gages. Gages shall be laboratory precision type and shall have a dial diameter of not less than 4 inches.

4.2.1.5 Atmospheric conditions. Unless otherwise specified, all tests shall be conducted at prevailing atmospheric conditions and at temperatures ranging from 70 to 80 °F.

4.3 First article inspection. The first article shall be performed on two each of the Type A and Type B duct assemblies; in addition to sufficient samples of new duct fabric, scuff materials, and stitching materials ([see 3.1](#) and [6.3](#)). This inspection shall include all the examinations and test specified herein. Failure of any inspection condition shall be cause for rejection. Any redesign or modification of the contractor's standard product to comply with specified requirements or any necessary redesign or modification following failure to meet specified requirements, shall receive particular attention for adequacy and suitability.

4.3.1 Inspection report. A first article inspection report shall be prepared in accordance with the procedures outline in MIL-HDBK-831 upon completion of the first article inspection.

4.4 Conformance inspection. The conformance inspection shall consist of the following test and examination:

- a. Individual tests ([see 4.4.1](#))
- b. Sampling tests ([see 4.4.2](#))

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4.4.1 Individual tests. Each duct assembly shall be subjected to an examination of product specified in 4.5.1

4.4.2 Sampling tests. The following inspections and tests shall be performed in the order indicated on eight duct assemblies selected at random from each sampling lot. The sampling lot shall consist of approximately, but not more than, 3000 duct assemblies, all of one Type manufactured under essentially the same conditions, but not necessarily during one continuous run. One duct assembly test from each sub lot of 375 duct assemblies is sufficient for protracted or small assembly run conditions.

- a. Pressure test ([see 4.5.7](#))
- b. Storage and flexing test ([see 4.5.15](#))

4.5 Test methods.

4.5.1 Examination of product. Each first article duct shall be examined to verify compliance with the requirements herein prior to accomplishing any other demonstrations or tests listed in 4.5.

4.5.2 Airflow. Airflow tests shall be conducted on full-length ducts with storage racks. With an internal airflow of not less than 2000 cfm through the Type A duct, the air friction loss shall not exceed 0.70 inches of water. With an internal airflow of not less than 500 cfm for the Type B duct, the air friction loss shall not exceed 0.70 inch of water. During testing, the duct shall be extended to full length, but shall not be placed under tension. The inlet end of the duct shall be connected to the airflow and static pressure measuring duct with the outlet of the air duct unrestricted.

4.5.3 Test samples. Two first article duct samples of each Type shall be subjected to the tests specified in 4.5.4 and then 4.5.5. At the conclusion of these tests on duct samples of each Type, one of the first article duct samples shall be subjected to the tests specified in 4.5.6, through 4.5.8 and the other first article duct sample shall be subjected to the test specified in 4.5.9. At the conclusion of these tests specified in 4.5.9, samples shall be cut from both first article duct Types and subjected to the tests specified in 4.5.9 through 4.5.13.

4.5.4 High temperature operation test. Two complete Type A ducts and two complete first article Type B ducts shall be separately subjected to a high temperature test. The duct shall be attached to a source of air, which has a minimum temperature of 300 °F, and shall be so arranged as to be supported only by the floor of the test space with the complete length of the duct in contact with the floor. The airflow through the 12 inch diameter duct shall be approximately 1200 cfm \pm 50 cfm and through the 6 inch diameter duct approximately 400 cfm \pm 25 cfm. The air shall consist of not more than 90% recirculated air. The male connection of the duct shall be connected to the source of heated air. The ambient air temperature of the test chamber measure at any point 1 foot from the periphery of the duct shall be 50 °F. If air moving devices are used in testing, baffles shall be placed around the duct to prevent air from blowing directly on the duct.

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Each duct shall be tested for 150 hours. At the end of the 150 hour test, the temperature of the air passing through the duct shall be increased to 350 °F and the duct tested at this temperature for a 2 hour period with all other test conditions remaining the same. At the conclusion of the test, the duct shall exhibit no evidence of scorching or other harmful effects.

4.5.5 Low temperature operation test. Following the exposure specified in 4.5.4 (High temperature operation test), two complete Type A ducts and two complete Type B ducts shall be placed in a cold chamber and maintained at a temperature of -30 °F or a period of 24 hours. After the 24 hour period with the chamber and the duct at -30 °F, the duct shall be fully extended and retracted to storage position 20 times. The flexibility and retract ability of the duct shall be observed and recorded. The time required to retract the duct to storage position shall not exceed 1 minute. At the conclusion of this test, the materials shall exhibit no quantifiable effects due to flexing or exposure

4.5.6 Environmental tests. One Type A duct and one Type B duct shall be subjected to the following tests in accordance with the specified procedures of MIL-STD-810 and as specified herein. There shall be no serious corrosion of metallic parts or other damage that might affect subsequent operation.

4.5.6.1 Salt fog test. The salt spray test shall be conducted in accordance with the specified procedure for a period of 50 hours ([see 4.5.6](#)).

4.5.6.2 Fungus resistance test. The fungus resistance test shall be conducted in accordance with the specified procedure ([see 4.5.6](#)).

4.5.6.3 Sunshine test. The sunshine test shall be conducted in accordance with the specified procedure for a period of 50 hours ([see 4.5.6](#)).

4.5.7 Pressure test. One Type A duct and one Type B duct shall be subjected to the pressure test. Blank fittings shall be connected to the end connections. One fitting shall have provisions for increasing or decreasing the internal pressure and the other shall have provisions for pressure measurement. The duct shall be fully extended when pressurized. The end connections shall be anchored to maintain at least 90% extended duct length when negative pressure is applied. The duct shall withstand internal pressures of a +2 inch Hg and a -1 inch Hg relative to surrounding atmosphere, without rupture.

4.5.8 Tensile load test. One Type A duct and one Type B duct shall be subjected to a tensile load test. In testing the duct, blanks shall be secured to the end connections and the duct subjected to a tensile load of 250 pounds for 30 seconds. All forces shall be applied to the center of the blanks. No rupture or other damage shall occur as a result of this test.

4.5.9 Abrasion resistance test. Samples of materials used in the fabrication of the exterior surface of the duct assemblies shall be tested for abrasion resistance in accordance with FED-STD-191, Method 5306. Failure of this test shall be cause for rejection.

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4.5.10 Fire resistance. Materials shall be tested for fire resistance in accordance with FED-STD-191, Method 5904. New material and pieces of duct taken from those high and low temperature tests ([see 4.5.4](#) and [4.5.5](#)) or under sampling, shall be utilized for the fire resistance test.

4.5.10.1 Fabric samples. Six pieces of fabric 2.75 ± 0.25 inches by 12.50 ± 0.25 inches, representing each condition of duct fabric shall be utilized. Where possible, one half of each set shall be cut with the long dimensions in the direction of the warp and the other half with the long dimension in the direction of the fill. Pieces of stitching material or non-metallic scuff strips shall be 12.50 ± 0.25 inches long.

4.5.10.2 Flame and chat test. The duration of flame and glow in the specimen shall be timed. After complete extinction of all flame and glow, the char length shall be measured. No specimen shall support flame more than 3 seconds or glow more than 5 seconds after the burner is withdrawn. Average char length of any set of test specimens shall not exceed 5 inches. Char length shall be the distance from the exposed end of the specimen in which any portion of the material is destructed or transformed from its normal state into an incoherent, softened, or ash-like substance.

4.5.11 Absorption test. All materials shall be tested for resistance to gasoline, oil and water in accordance with ASTM D471. Pieces of duct fabric, scuff strip material, and stitching shall be soaked in Jet A fuel, SAE No. 10 engine oil and water. At the end of 48 hours, the material shall be examined to determine that the increase in thickness, weight and volume does not exceed 10, 15, and 22% respectively.

4.5.12 Tensile strength. Breaking strength of non-metallic materials and tear strength of the duct fabric shall be determined by the cut strip and falling pendulum methods, respectively, as specified in FED-STD-191, Methods 5102 and 5132. Pieces of material cut from air ducts that have been subjected to the high and low temperature tests shall exhibit at least 75% of the strength of the same material when new.

4.5.13 Fabric flex life. Flex life of the duct fabric shall be tested by subjecting six 1 by 6 inch pieces of each material to 10,000 bend flex cycles in a DeMattia Flexing Machine, or equal, in accordance with ASTM D430. If practicable, half of the samples shall be cut in the direction of the warp, and the other half cut in the direction of the fill. The groove described for 0.25 inch thick samples shall not be used. Following the bend flexing, the duct material shall be checked for breaking strength in according with 4.5.12 and shall exhibit at least 75% of the strength of un-flexed fabric.

4.5.14 Reparability test. When torn or punctured, the duct shall be repairable by stitching or cementing of patches. Reparability of the stiffener core shall be determined by flattening samples of Type A and Type B duct, each 2 feet long, to one third of their original diameter and then returning the duct to the approximate original shape without the use of special tools.

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4.5.15 Storage and flexing test. The duct assembly shall be retracted to the storage position and extended to its full length of 20 cycles to assure that the storage device will not damage the fabric and that the hook and catch will secure and retain the duct in a retracted storage position. With the duct in a fully extended position and one end secured to an air source, the duct shall be capable of bending 90° in any direction without restricting the airflow. The duct shall be readily returned to the storage position in accordance with MIL-STD-1472, including the use of artic mittens and Mission-Oriented Protective Posture (MOPP) Level 4 Chemical Warfare Gear.

4.7 Inspection for delivery. The inspection of the preservation, packing, packaging, and marking shall be in accordance with the requirements of Section 5 herein.

4.8 Weight and dimension test.

4.8.1 Weight test. The weight of a first article duct of each Type shall be measured to demonstrate compliance with the weight requirement of 3.6.1.

4.8.2 Dimension measurement. A first article of each duct Type shall be measured to demonstrate compliance with the dimensional requirements of 3.6.2 and 3.6.3. A first article duct shall also demonstrate compliance with the storage area requirements of 3.3.2.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order ([see 6.2](#)). When packaging of materiel is to be performed by DoD or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

6. NOTES

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

6.1 Intended Use. The duct assemblies covered by this specification are intended for use in conjunction with ground heating equipment to deliver the conditioned air from the ground equipment to aircraft engines and fuselages, portable maintenance shelters and hangars, and related enclosures.

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6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification
- b. Part or Identifying Number (PIN) ([see 1.3](#))
- c. Packaging ([see 5.1](#))
- d. First article ([see 3.1](#), [4.3](#) and [6.3](#))

6.3 First article. When a first article inspection is required, the item will be tested and should be a standard production item from contractor's current inventory as specified in 4.1 and 4.3. The first article should consist of two Type A duct, two Type B duct, and samples of new duct fabric, scuff materials and stitching materials. The acquiring activity should include specific instruction in acquisition documents regarding arrangements for examinations, test approval of the documents first article. Whenever a manufacturer is in continuous production of the duct assemblies from one contract to another, submission of additional first article samples for a new contract may be waived at the discretion of the acquiring activity.

6.4 Key words.

Air, ground support
Conditioned air
Duct assembly
Duct, aircraft
Duct, conditioned air
Duct, missile

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Concluding material:

Custodian:
Air Force - 184

Preparing Activity:
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Reviewer:
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NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil> .