

INCH-POUND

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SUPERSEDING  
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## MILITARY SPECIFICATION

FILTER ELEMENT, INTAKE AIR CLEANER:  
DRY TYPE

This specification is approved for use by the US Army Tank-Automotive Command, Department of the Army, and is available for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope. This specification covers dry type air cleaner filter elements used in single and multi-stage air cleaners with rated airflows of 40 cubic feet per minute (cfm) [1.13 cubic meters per minute ( $m^3/min$ )] to 2000 cfm (56.6  $m^3/min$ ) (see 6.1).

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: US Army Tank-Automotive Command, ATTN: AMSTA-GDS, Warren MI 48397-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 2940

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 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 listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

## SPECIFICATION

## FEDERAL

P-D-245 - Detergent, Laundry and Hand Dishwashing (Granular).

## MILITARY

MIL-A-62048 - Air Cleaners, Automotive: Heavy Duty, Dry-Type (for Internal Combustion Engines).

## STANDARDS

## MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.  
MIL-STD-130 - Identification Marking of US Military Property.

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Naval Publications and Forms Center, ATTN: Standardization Documents Order Desk, Bld 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document forms a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS are the issues of documents cited in the solicitation (see 6.2).

## SOCIETY OF AUTOMOTIVE ENGINEERS (SAE)

SAE J726 - Air Cleaner Test Code, Recommended Practice.

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(Applications for copies should be addressed to the Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096.)

(Nongovernment standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

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. Nothing in this specification, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

### 3. REQUIREMENTS

3.1 First article. When specified (see 6.2), samples shall be subjected to first article inspection (see 6.3) in accordance with 4.4.

3.2 Materials. Materials shall be as specified herein and in referenced drawings, specifications and standards. Materials shall be free of defects and imperfections that might affect the serviceability and function of the finished product (see 4.7.1).

3.2.1 Recycled, virgin and reclaimed materials. There are no requirements for the exclusive use of virgin materials. The use of recycled or reclaimed (recovered) materials is acceptable provided that all other requirements of this specification are met (see 6.4.1).

3.3 Design and construction. Design and construction of the filter element shall assure performance in accordance with the requirements specified herein, when installed in the air cleaner assembly specified in MIL-A-62048 for which it was designed. Design features shall provide for use of the filter element in either gasoline or diesel fueled engines. Construction dimensions and rated airflow shall be in accordance with the applicable drawing or MS standard (see 4.7.1, 4.7.2 and 6.2).

3.3.1 Flame resistance. After the filter media of the filter element is exposed to a flame until it burns or glows, the filter media shall not continue to burn or smolder when the flame is removed (see 4.7.3).

3.3.2 Crush resistance. Unless otherwise specified (see 6.2), the 300 pounds (lbs) [136 kilograms (kgs)] compressive (end to end) static load shall not be applied to the filter element and cap seals which are molded to the filter element ends or/are separately attached. Upon removal of the load, there shall be no physical evidence of structural damage to any part of the filter element or reduction in filter element length (end to end, not including filter element end cap seal height). Deflection under the specified load shall be not less than .040 and not more than 0.06 inch (in) [not less than 0.10 centimeters (cm) and not more than 0.15 cm] (see 4.7.4).

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3.3.3 Seal ozone resistance. The filter element end cap seals shall be capable of withstanding 7 days exposure to air having ozone concentration of 50 plus or minus ( $\pm$ ) 5 parts of ozone per 100,000,000 parts of air by volume at a temperature of  $100 \pm 5^{\circ}\text{F}$  degrees Fahrenheit ( $^{\circ}\text{F}$ ) [ $38 \pm 3^{\circ}$  degrees Celcius ( $^{\circ}\text{C}$ )]. There shall be no evidence of cracks after exposure (see 4.7.5).

3.4 Performance. Unless otherwise specified herein, the filter element shall meet the performance requirements specified below when installed in an air cleaner conforming to MIL-A-62048. The filter element and air cleaner assembly is referred to herein as "assembly." Unless otherwise specified herein, performance requirements shall be met with a clean new element (see 4.7.6f) under the following conditions:

- a. Temperature -  $70.16$  to  $89.96^{\circ}\text{F}$   
( $21.2$  to  $32.2^{\circ}\text{C}$ )
- b. Humidity -  $45 \pm 15$  percent (%).
- c. Density of air -  $1.2$  kilograms per cubic meters ( $\text{kg}/\text{m}^3$ ) at  $27^{\circ}\text{C}$  and  $76$  centimeters of mercury ( $\text{cm}/\text{Hg}$ )
- d. Airflow - The rated airflow shall be as specified in the applicable drawing or MS standard and variable airflow shall be as specified in figure 1.
- e. Dust - The chemical analysis of the test dust shall be as shown in table I. Particle size distribution shall be as shown in table II.
- f. Dust feed rate -  $0.883 \pm 0.176$  gram per cubic meter ( $\text{g}/\text{m}^3$ ) of air.

TABLE I. Chemical analysis of test dust.

Substance	Percent by weight
Silicone dioxide ( $\text{SiO}_2$ )	67 to 69
Ferric oxide ( $\text{Fe}_2\text{O}_3$ )	3 to 5
Aluminum oxide ( $\text{Al}_2\text{O}_3$ )	15 to 17
Calcium oxide ( $\text{CaO}$ )	2 to 4
Magnesium oxide ( $\text{MgO}$ )	0.5 to 1.5
Total alkalis as sodium oxide ( $\text{Na}_2\text{O}$ )	3 to 5
Ignition loss	2 to 3

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TABLE II. Particle size distribution.

Particle size (Microns)	Percent of total weight	
	Coarse grade	Fine grade
0 - 5	12 ± 2	39 ± 2
5 - 10	12 ± 3	18 ± 3
10 - 20	14 ± 3	16 ± 3
20 - 40	23 ± 3	18 ± 3
40 - 80	30 ± 3	9 ± 3
80 - 200	9 ± 3	-----

3.4.1 Efficiency. The assembly's dust filtration efficiency at rated air flow shall be not less than 99.5% after 30 minutes of operation when fed with fine grade dust (see 4.7.6.1).

3.4.2 Dust capacity. Unless otherwise specified on the applicable drawing or MS standard, the time for the assembly to reach load capacity (see 6.4.3) shall be not less than 4 hours for single stage air cleaner design and 20 hours for a multi-stage air cleaner design. During dust capacity test an accumulative efficiency will be measured. The accumulated efficiency after completion of dust capacity test shall not be less than 99.9%. This requirement shall be met when the assembly is operated at variable airflows and fed course grade dust (see 4.7.6.2).

3.4.3 Post service airflow restriction. After one operation to load capacity (see 6.4.3) in accordance with 3.4.2, and followed by a cleaning, the assembly's air flow restriction shall have not increased by more than 1 in. [2.48 pascal (Pa)] of water (see 4.7.6.3).

3.4.4 Washing durability. The assembly shall evidence no damage and shall meet the requirements of 3.4.1, after the filter element has been loaded to capacity (see 6.4.3), then washed with soap conforming to P-D-245, and cleaned and dried (see 4.7.6.4).

3.4.5 Backfire. Unless otherwise specified (see 6.2), the filter element shall withstand, without damage, the stresses resulting from an air gage pressure ranging from 10 to 100 pounds per square inch gage (psig) [69 to 690 kilopascals (kPa)] (see 4.7.6.5).

#### 3.4.6 Environmental.

3.4.6.1 Vibration. The filter element shall show no evidence of structural or assembly damage after being subjected to vibration for 8 hours in the vertical axis and 4 hours in each of the horizontal axes. The amplitude shall be 0.03 inch (.08 cm) [0.08 inch (.2 cm) maximum total excursion] and the frequency range shall be from 10 to 55 to 10 hertz (Hz) (see 4.7.6.6.1).

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3.4.6.2 Efficiency after vibration. The assembly shall meet the requirements of 3.4.1 before and after being subjected to vibration in accordance with 3.4.6.1 at an ambient temperature of  $80 \pm 5^{\circ}\text{F}$  ( $27 \pm 3^{\circ}\text{C}$ ) (see 4.7.6.6.2).

3.5 Marking. Marking shall be in accordance with MIL-STD-130 and shall include the maximum airflow capacity in cfm ( $\text{m}^3/\text{min}$ ) (see 4.7.2).

3.6 Workmanship. Workmanship shall be such that the air cleaner filter element shall be free of cracked end caps, surfaces out of alignment or out of contour and missing portions of material. Sheet metal parts shall be free of burrs, blisters, tears and excessive thinning at drawn sections; or any condition that might present a safety hazard to operating or maintenance personnel (see 4.7.2).

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order (see 6.2), the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order (see 6.2), 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 inspections set forth in this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

##### 4.1.2 Special test equipment.

4.1.2.1 Piezometer tubes, adapters, manometer, and flowmeter. Piezometer tubes conforming to SAE J726 and equal to, or the next size larger [maximum of 0.5in (1.3cm) larger] than, shall be installed at the inlet and outlet of the air cleaner. Transition ducts (if required) shall be installed between the flanges of the air cleaner inlet (or outlet) and the piezometer tubes. Transition ducts shall have sides at angles no greater than 7 degrees as measured from the centerline of the transition piece. A smooth approach (ideal flow orifice), (see SAE J726 and figure 2) shall be installed on the front of the inlet piezometer tube. Adapters installed after the outlet piezometer tubes shall have sides at angles no greater than 7 degrees, as

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measured from the centerline of the transition piece. A water type manometer shall be installed between the two piezometer tubes, as applicable. A flowmeter of adequate capacity shall be connected to the outlet of the adapter.

4.1.2.2 Absolute filter. The absolute filter shall consist of a 0.5 in (1.3 cm) batt of fiberglass installed in a circular frame in such a manner as to filter all air passing through the outlet of the air cleaner. The absolute filter shall be as specified in SAE J726.

4.1.2.2.1 Preparation of absolute filter. The fiberglass batting shall be placed in an oven and dried for 6 hours at a temperature of 200 to 240°F (93.3 to 115.5°C), and then weighed to the nearest 0.01 gram. It shall then be placed in a container to protect it from dust and moisture until ready for use. After the test, the batting shall be returned to the oven for 6 hours of drying. All weighing shall be done in the oven.

4.1.2.3 Dust feeder. The dust feeder shall be as specified in SAE J726, without the required use of a dust injection nozzle in the dust feeding system.

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

- a. First article inspection (see 4.4).
- b. Quality conformance inspections (4.5).
  1. Examinations (see 4.5.2).
  2. Test (see 4.5.3).
- c. Control tests (see 4.6).

4.3 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 3.4.

4.4 First article inspection. When first article is required (see 3.1), first article samples shall be inspected as specified in table III and the tests shall be conducted in the sequence specified in table IV. Approval of the first article sample by the Government which may include Government testing of the first article sample shall not relieve the contractor of his obligation to supply filter elements that are fully representative of those inspected as a first article sample. Any changes or deviations of the production units from the first article sample shall be subjected to the approval of the contracting officer.



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TABLE III. Classification of inspections.

Title	Requirement	Inspection	First article	Quality conformance		Control
				Examination	Tests	
Materials and construction	3.2 and 3.3	4.7.1	X			
Defects (see 4.7.2 and table V)	3.3, 3.5 and 3.6	4.7.2	X	X		X
Flame resistance	3.3.1	4.7.3	X			
Crush resistance	3.3.2	4.7.4	X			
Seal ozone resistance	3.3.3	4.7.5	X			
Efficiency	3.4.1	4.7.6.1	X		X	X
Dust capacity	3.4.2	4.7.6.2	X			X
Post service airflow restriction	3.4.3	4.7.6.3	X			X
Washing durability	3.4.4	4.7.6.4	X			
Backfire	3.4.5	4.7.6.5	X 1/			
Vibration	3.4.6.1	4.7.6.6.1	X			
Efficiency after Vibration	3.4.6.2	4.7.6.6.2	X			

1/ Not necessary when filter element is to be used on diesel engines exclusively (see 6.2).

TABLE IV. First article test sequence.

Sample number	Tests	Paragraph
1	Efficiency Washing durability Efficiency	4.7.6.1 4.7.6.4 4.7.6.1
2	Efficiency after vibration Backfire 1/ Crush resistance Flame resistance	4.7.6.6.2 4.7.6.5 4.7.4 4.7.3
3	Dust capacity Post service airflow restriction	4.7.6.2 4.7.6.3

1/ Not necessary when filter element is to be used on diesel engines exclusively.



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TABLE IV. First article test sequence. - Continued.

Sample number	Tests	Paragraph
4	Efficiency Vibration Efficiency	4.7.6.1 4.7.6.6.1 4.7.6.1
Material sample	Ozone resistance	4.7.5

4.5 Quality conformance inspections.4.5.1 Sampling.

4.5.1.1 Lot formation. An inspection lot shall consist of all the filter elements of one part number, from an identifiable production period, from one manufacturer, submitted at one time for acceptance.

4.5.1.2 Sampling for examination. Samples for quality conformance examination shall be selected in accordance with general inspection level II of MIL-STD-105.

4.5.1.3 Sampling for tests. Samples for tests shall be selected in accordance with level S-3 of MIL-STD-105 from each lot and have passed the examination specified in 4.5.2.

4.5.2 Examination.

4.5.2.1 Acceptable quality level (AQL). Each sample selected in accordance with 4.5.1.2 shall be examined to determine conformance to the following AQL's.

<u>Classification</u>	<u>AQL</u>
Major	1.0
Minor	2.5

4.5.2.2 Classification of defects. For examinations purposes, defects shall be classified as listed in table V.

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TABLE V. Classification of defects.

Category	Defect	Method of examination
Critical	None	
Major	<u>AQL 1.0% Defective</u>	
101	Dimensions affecting interchangeability out of tolerance (see 3.3).	SIE 1/
102	Nonconformance in design and construction (see 3.3).	Visual
103	Faulty workmanship affecting performance (see 3.6).	Visual
Minor	<u>AQL 2.5% Defective</u>	
201	Dimensions not affecting interchangeability out of tolerance (see 3.3).	SIE
202	Marking improper (see 3.5).	
203	Faulty workmanship affecting appearance (see 3.6).	Visual

1/ SIE = Standard Inspection Equipment.

4.5.3 Tests. Samples selected in accordance with 4.5.1.3 shall be subjected to the quality conformance test specified in table III, using an AQL of 1.0 on the basis of percent defective.

#### 4.6 Control tests.

4.6.1 Sampling. Control test samples shall be selected at the rate of 2 per month, or 2 from each 500 produced, whichever is greater, except that not more than four shall be selected in any given 30-day period. The control test samples shall be examined for the defects specified in 4.5.2.2, and shall be subjected to the tests specified in table III in the following order: 4.7.2, 4.7.6.2, 4.7.6.3 and 4.7.6.1. The Government will have the option to require the bidder to submit up to six (6) production samples from an inspection lot assembled for shipment. These samples will be inspected and tested by the Government. Samples which do not meet requirements when tested by the Government shall be cause for rejection. The Government retains the right to sample production inspection lot assembled for shipment until contract completion.

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4.7 Methods of inspection.

4.7.1 Materials and construction. Conformance to 3.2 and 3.3 shall be determined by inspection of contractor records providing proof or certification that design, construction, processing, and materials conform to requirements. Applicable records shall include drawings, specifications, design data, receiving inspection records, processing and quality control standards, vendor catalogs and certifications, industry standards, test reports, and rating data.

4.7.2 Defects. Conformance to 3.3, 3.5 and 3.6 shall be determined by examination for the defects listed in table IV. Examination shall be visual or by measurement with standard inspection equipment.

4.7.3 Flame resistance. To determine conformance to 3.3.1, one side of the filter element media shall be exposed to a flame until the media burns or glows. Remove the flame and observe the filter element media.

4.7.4 Crush resistance. To determine conformance to 3.3.2, the filter element shall be placed in a device capable of measuring pressure (load) applied to the element from end to end. The element shall be subjected to a static load of 300 lb (128 kg) and filter element physically examined and end to end height recorded both before and after applying static load.

4.7.5 Seal ozone resistance. To determine conformance to 3.3.3, the following test shall be performed:

4.7.5.1 Test specimens. A minimum of two 5 x 2.54 x .16 cm test specimens shall be subjected to the seal ozone resistance test.

4.7.5.2 Apparatus. The apparatus shall include an insulated test chamber, with an ozone-generating source outside the chamber. Means shall be provided for measuring the ozone concentration, for controlling the temperature of air in the chamber and for circulating air. The apparatus shall also include a means for holding and stretching the specimens.

4.7.5.3 Procedure. Specimens shall be elongated 12.5%. The stressed specimens, while still elongated in the stretching apparatus, shall be conditioned at room temperature for not more than 45 minutes; and then exposed for 7 days in the test chamber in which air, having an ozone concentration of  $50 \pm 5$  parts of ozone per 100,000,000 parts of air by volume, is circulated at a temperature of  $100 \pm 5^\circ\text{F}$  ( $38 \pm 3^\circ\text{C}$ ). The specimens shall be examined frequently.

4.7.6 Performance. Unless otherwise specified herein, performance tests shall be conducted on the assembly. Unless otherwise specified herein, test conditions shall be in accordance with 3.4 and the following:

- a. Tests and test setups shall use procedures in accordance with SAE J726 where applicable.
- b. Dust feed rates shall be averaged over the intervals specified in figure 1.

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- c. Measured airflow restriction values shall be corrected to the specified air density (see 3.4c) to an accuracy of 0.25 cm of mercury.
- d. Actual airflow values shall be corrected to the started conditions (see 3.4c) and shall be within  $\pm 2\%$  of the specified values.
- e. The assembly shall be mounted in its normal operating attitude and shall be electrically grounded.
- f. Unless otherwise specified in the test, a clean, unused filter element shall be installed in the air cleaner for each test. An element is not considered "used" after use in a restriction test. Further, the assembly (less the filter element) shall be cleaned thoroughly with compressed air when previously subjected to a test in which dust was fed.

4.7.6.1 Efficiency. To determine conformance to 3.4.1, the filter element shall be mounted in the test setup. An absolute filter shall be installed as specified in 4.1.2.2 and the air flow started and adjusted to the rated airflow. Fine test dust shall be fed into the air cleaner inlet for a period of 30 minutes. The absolute filter shall be removed, taking care to retain all entrapped dust. When determining the efficiency all measurements shall be accurate to the nearest 0.1 gram, and whenever possible, to the nearest 0.01 gram. The efficiency shall be obtained by using the following formula:

$$\text{Dust Efficiency (\%)} = \frac{W_1 - (W_2 - W_3)}{W_1} \times 100$$

Where W1 - Weight of dust fed.  
 W2 - Weight of absolute filter and entrapped dust.  
 W3 - Original weight of absolute filter.

4.7.6.2 Dust capacity. To determine conformance to 3.4.2, after pretest preparations (see 4.7.6), an absolute filter of proper size shall be installed between the air cleaner and the flow meter. Airflow shall be started and adjusted to rated flow of the element. Restriction at start of test and at the intervals, in accordance with figure 1, shall be recorded. After obtaining the initial restriction at rated air flow, the air flow shall be varied as shown in figure 1. Coarse dust shall be fed at the rate specified in 3.4.f. This rate is (F) grams dust per hour where (F) = .530 times the rated air flow in cubic meters per hour (m<sup>3</sup>/hr). Observations made during the test shall be recorded. A fiberglass batting shall be installed in the absolute filter frame at all times. It shall be replaced with a clean fiberglass batting when the net static pressure drop across the absolute filter reaches 10 in (24.8 Pa) of water above the original restriction. All batting shall be weighed before and after testing as specified in 4.1.2.2.1. The dust capacity test shall be terminated when the air flow restriction reaches 20 in (59.6 Pa) of water, at rated air flow of the element. Whenever the test setup is required to be shut down, the filter element shall be viewed through the air cleaner outlet for visual signs of dust tracking on the clean side of the seal or the filter media. Any visual

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signs of dust tracking shall be cause for rejection. The absolute filter shall be removed, taking care to remove all entrapped dust, when determining efficiency, all measurements shall be accurate to the nearest 0.1 gram and whenever possible to the nearest 0.01 grams. The efficiency shall be obtained by using the following formula:

$$\text{Dust Efficiency (\%)} = \frac{W_1 - (W_2 - W_3)}{W_1} \times 100$$

Where W1 - Weight of dust fed.

W2 - Weight of absolute filter and entrapped dust.

W3 - Original weight of absolute filter.

Unless otherwise specified on the applicable drawing or MS standard, verify that the operational time was at least 4 hours for single stage air cleaner assembly design and 20 hours for multi-stage air cleaner assembly designs.

4.7.6.3 Post service airflow restriction. To determine conformance to 3.4.3, following the dust capacity test, the filter element shall be removed from the air cleaner. The filter element shall be cleaned, by using compressed air with 700 kPa line pressure and a nozzle inside diameter of not more than 1/8 in (0.3 cm) to remove the dust. The air hose nozzle shall be inserted into each pocket or serration of the filter element to blow out the deposited dust, using a back and forth motion along the length of each serration and a direct flow into each pocket from the inside out. After cleaning, the element shall be reassembled into the air cleaner. Airflow shall be started and adjusted to the rated flow of the element. The restriction shall be noted.

4.7.6.4 Washing durability. To determine conformance to 3.4.4, the filter element shall be installed in the air cleaner. The efficiency at rated airflow shall be determined and recorded in accordance with 4.7.6.1. After completing the initial efficiency test, dust shall be fed at a rate of 1.7657 g/m<sup>3</sup> of constant airflow until a restriction of 20 in (59.6 Pa) water is reached. The filter element shall be removed from the housing and immersed and agitated for 6 hours in a solution of warm water 90 ± 10°F (32 ± 5.5°C) and soap conforming to P-D-245. The filter element shall then be removed from the solution and flushed with cool water 35°F to 49°F (1.6 to 9.6°C) at low pressure, from inside to outside for 3 minutes, or until all solution and dirt are removed. The rinse water shall be flowing clean. Excess water shall be allowed to drain from the filter element for 1 hour. The filter element shall then be placed in a circulating oven at 225 ± 5°F (107 ± 3°C) and dried for 45 minutes. Efficiency at rated airflow shall be determined in accordance with 4.7.6.1.

4.7.6.5 Backfire. To determine conformance to 3.4.5, the filter element used in the efficiency test shall be cleaned, soaked for 5 hours in water, then removed from the water and allowed to drip for 5 minutes. The element shall be installed in the air cleaner and the assembly shall be set up as shown in figure 3. The capacity of the compressed air chamber shall equal 1 cubic inch (in<sup>3</sup>) for each cfm (579 cm<sup>3</sup> to each m<sup>3</sup>/min) of rated

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airflow of the element. Starting at 10 psig (69 kPa) in the chamber, the compressed air shall be released instantly to the assembly. The air pressure in the chamber shall be increased in increments of 10 psig (69 kPa) until 100 psig (690 kPa) is reached, or until structural damage occurs. The test shall be repeated 5 times at each pressure.

4.7.6.6 Environmental.

4.7.6.6.1 Vibration resistance. To determine conformance to 3.4.6.1, the filter element shall be mounted on a vibrating machine in a manner simulating intended use when installed in an air cleaner. The filter element shall be subjected to simple harmonic motion having an amplitude of 0.03 in (.08 cm) [0.06 in (0.15 cm) maximum total excursion], the frequency being varied uniformly between the approximate limits of 10 to 55 hertz (Hz). The entire frequency range, from 10 to 55 Hz and return to 10 Hz, shall be traversed in approximately one minute. The duration of the vibration shall be eight hours in the vertical axis and 4 hours in each of the horizontal axis. The test shall be conducted first in an ambient temperature of  $150 \pm 5^{\circ}\text{F}$  ( $65.5 \pm 3^{\circ}\text{C}$ ), then repeated in an ambient temperature of  $-54 \pm 3^{\circ}\text{C}$ . Upon completion, the filter element shall be examined.

4.7.6.6.2 Efficiency after vibration. To determine conformance to 3.4.6.2, the tests shall be conducted as follows:

- a. Efficiency test shall be conducted and the efficiency determined as specified in 4.7.6.1.
- b. Without cleaning the element, the vibration resistance test shall be conducted in accordance with 4.7.6.6.1, but at a temperature of  $80 \pm 5^{\circ}\text{F}$  ( $27 \pm 3^{\circ}\text{C}$ ) only.
- c. The filter element shall be cleaned as specified in 4.7.6.3 and efficiency test of 4.7.6.1 shall be conducted. The efficiency shall be not less than 99.5%.

5. PACKAGING

5.1 Preservation, packaging, packing, and marking. Preservation, packaging, packing, and marking for the desired level shall be in accordance with the applicable packaging requirements specified by the contracting authority (see 6.2).

## 6. NOTES

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

6.1 Intended use. Filter elements covered by this specification are intended for use in intake air cleaners conforming to MIL-A-62048 used with internal-combustion engines for automotive applications.

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6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- c. If first article inspection is required (see 3.1).
- d. Applicable drawing or standard title, number, and date (see 3.3).
- e. If crush resistance data should be other than as specified (see 3.3.2).
- f. If first article sample should be subjected to backfire inspection (see 3.4.5 and tables III and IV).
- g. If responsibility for and place of inspection shall be other than specified (see 4.1).
- h. Selection of applicable level and packaging requirements (see 5.1).

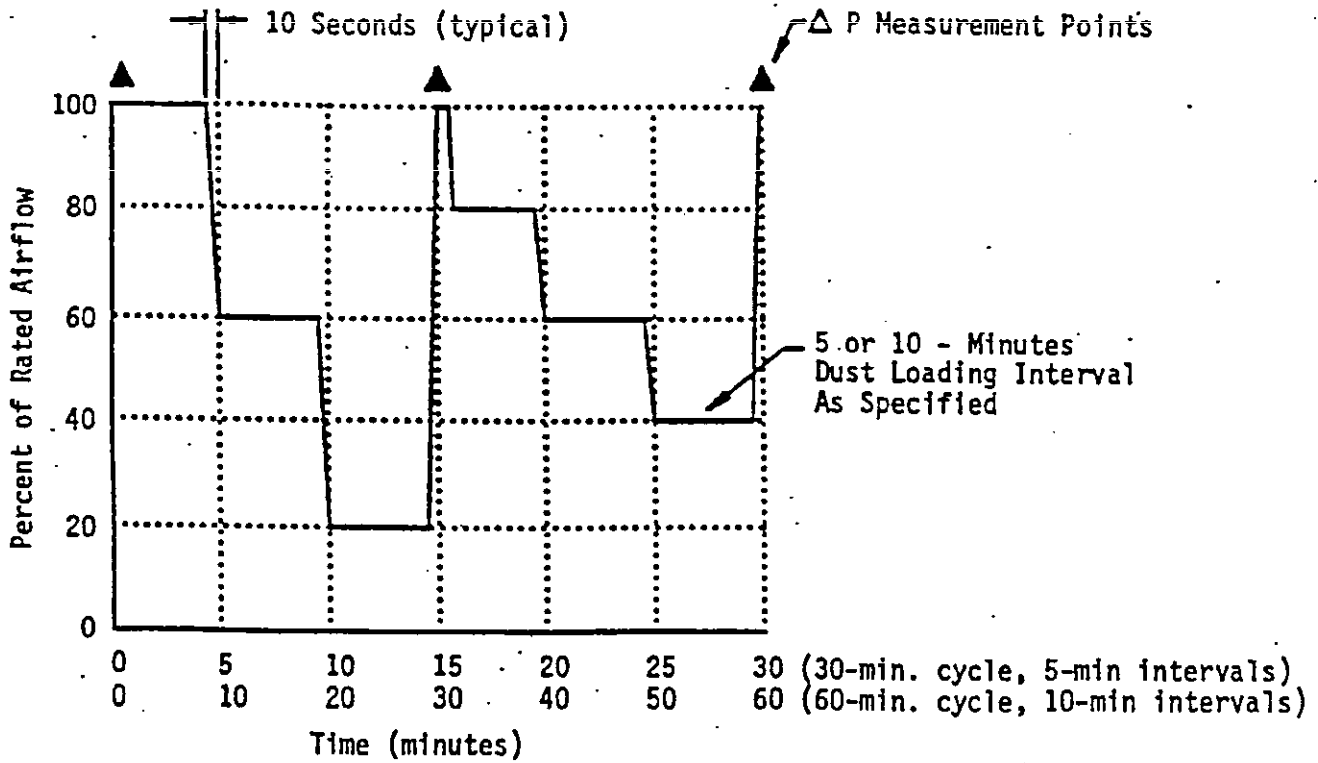
6.3 First article. When first article inspection is required, the contracting officer should provide specific guidance to offerers whether the first article sample(s) should be a preproduction sample an initial production sample, a first production item or a standard production item from the contractor's current inventory; the number of samples to be inspected as specified in 4.4; and (when applicable) the specific tests to be performed on each sample. The contracting officer should also include specific instructions in acquisition documents regarding arrangements for examinations, approval of first article test results, and disposition of first articles. Invitations for bids should provide that the Government reserves the right to waive the requirement for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior Government approval is presently appropriate for the pending contract. In addition the invitation for BID should also require that the Government reserve the right to require the bidders to submit up to two (2) samples for first article inspection and testing by the Government. Samples which do not meet a requirement when tested by the Government or the Governments authorized test agency shall be cause for rejection. Samples may be re-submitted for Government test and re-evaluation. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

6.4 Definitions.

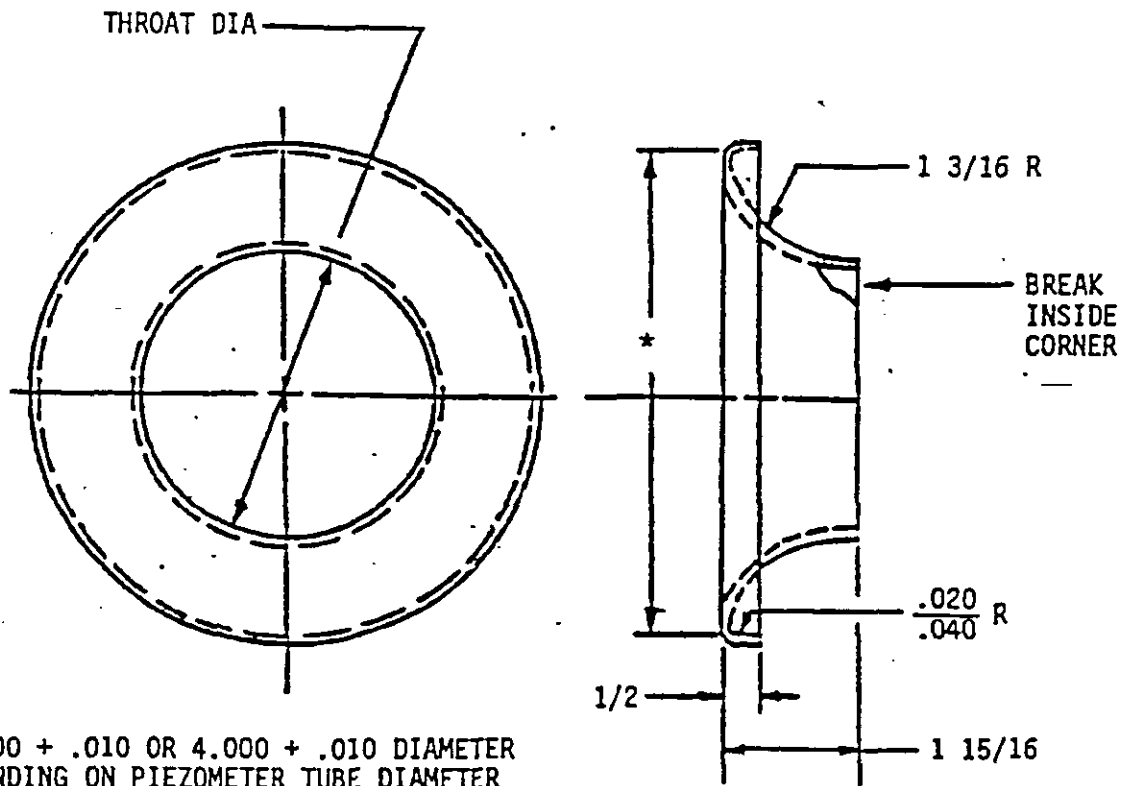
6.4.1 Recovered materials. "Recovered materials" means materials that have been collected or recovered from solid waste (see 6.4.2).



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FIGURE 1. Variable airflow cycle.

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\*7.500 + .010 OR 4.000 + .010 DIAMETER  
DEPENDING ON PIEZOMETER TUBE DIAMETER

THROAT DIAMETER	CFM	THROAT DIAMETER	CFM
6 5/16	2000	3 1/2	700
6 1/8	1900	3 3/8	600
6.0	1800	3 1/8	500
5 13/16	1700	2 3/4	400
5 5/8	1600	2 3/8	300
5 7/16	1500	1 15/16	200
5 1/4	1400	1 3/4	165
5.0	1300	1 1/2	120
4 13/16	1200	1 3/8	100
4 5/8	1100	1 1/4	85
4 3/8	1000	1.0	55
4 1/8	900	13/16	35
3 3/4	800	5/8	20
		7/16	10

ALL DIMENSIONS IN INCHES

FIGURE 2. Ideal flow nozzle.

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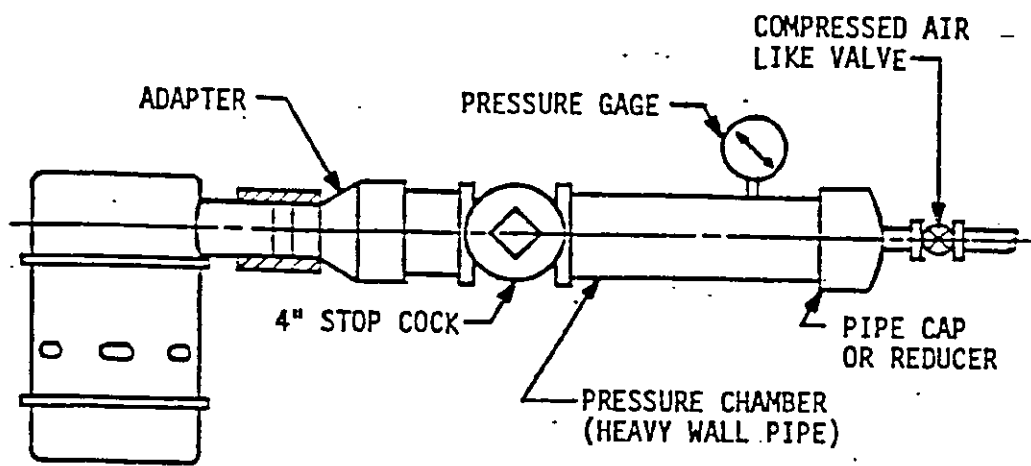


FIGURE 3. Backfire test setup.

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6.4.2 Solid waste. "Solid waste" means (a) any garbage, refuse, or sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility; and (b) other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, and from community activities. It does not include solid or dissolved material in domestic sewage, or solid or dissolved material in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Clean Water Act, (33 U.S.C. 1342 et seq.), or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.) (Source: Federal Acquisition Regulations, section 23.402).

6.4.3 Load capacity and loaded to capacity. "Load capacity" and "loaded to capacity" mean that the dust load has caused the air cleaner restriction to reach 20 inches (51 cm) of water.

6.5 Subject term (key word) listing.

Impurities; Engine, gasoline and diesel.  
Material, porous, purification

6.6 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:  
Army - AT

Preparing activity:  
Army - AT

(Project 2940-A011)