TABLE III. Classification of Characteristics

PARAGRAPH 4.3.5	TITLE Filter, gas*		Sheet 1 of 1	DRWG NO.
CATEGORY	**CHARACTERISTIC**	**SAMPLING**	**REQUIREMENT PARAGRAPH**	**INSPECTION METHOD**
Critical	Leakage	100%	3.4.2	4.3.6.3
Major				
101	Airflow resistance	100%	3.4.1	4.3.6.2
102	Gas life, CK**	See 4.3.6.4	3.4.3	4.3.6.4
103	Gas life, DMMP** after rough handling	Table II, Level XI	3.4.4	4.3.6.5
104	Moisture content	See 4.3.6.10	3.6.1	4.3.6.10
106	Safety	Table II, Level IX	3.6.3.1	VI & D
Minor				
201	Identification markings	Table II, Level IX	3.6.2	VI
202	Finish	Table II, Level IX	3.6.3.2	VI
203	Appearance	Table II, Level IX	3.6.3.3	VI

NOTES:
CE – Commercial inspection equipment
COC – Certificate of Compliance
VI – Visual inspection
D – Demonstration

*For required characteristics of the particulate filter, see MIL-PRF-51526
**Failure may be considered a critical defect

4.3.6 Test.

4.3.6.1 Interface checks. Determine whether each sample filter complies with interface requirements in 3.3 by inspection of dimensions and commercial inspection equipment. Perform installation/removal demonstrations of sample filter sets with the filter housing if filter housing is Government furnished (see 6.2).

4.3.6.2 Airflow resistance (pressure drop). The airflow resistance shall be determined at the rated airflow of 340 cmh (200 cfm). The measured pressure drop across the particulate filter, when corrected to standard conditions of 21° C (70° F) and 1 atm (1013 mbar), shall be no greater than that specified in 3.4.1. The up–stream and down–stream static pressure measuring tubes shall be as close as possible to the filter and shall not be on a section of duct that has a changing cross sectional area. Test for airflow resistance as follows:

(a) Connect the filter to a source of forced air.
(b) Set the radially outward flow of air through the filter to 340 cmh.
(c) Record the barometric pressure.
(d) Measure and record the air stream temperature. This temperature should be no higher than 52° C (125° F).
(e) Determine and record the difference between up-stream and downstream static pressure.

If the recorded air stream temperature and barometric pressure is different than 21° C (70° F) and 1 atm, calculate and record the air flow resistance (ΔP (cal)) using the equation below to correct the measured airflow resistance to airflow resistance at standard conditions:

$$\Delta P\ (cal) = \Delta P\ (measured) \times P\ (test) \times 86.21 \div [(492 + 1.8T)^{1.768}]$$

where:

Δ P (cal)	–	air flow resistance corrected to standard conditions in millimeters of water gage (mm wg).
P (test)	–	barometric pressure at time of test in millimeters of mercury (mm Hg).
Δ P (measured)	–	air flow resistance from test measurement in millimeters of water.
T	–	temperature of air stream flowing through the filter in degrees C.

Note: Correction for nonstandard conditions is not required when it is clear that the passage or failure of the filter is not in doubt.

4.3.6.3 Leakage. Rigidly position the sample gas filter in the test fixture. Orient the filter in the fixture with the cylindrical axis in the horizontal direction and end faces in the vertical direction. Use R–134a refrigerant that conforms to the characteristics of ARI STANDARD 700. Connect the filter to a source of forced air and place a mixing chamber at the influent side. Regulate the flow of air from the blower to $1/5^{th}$ the rated airflow of the filter (68 cmh). Introduce R–134a into the intake of the blower; monitor and maintain a concentration of 1000

ppm by volume of R–134a in airflow of 68 cmh on the influent side of the filter at 24± 5° C (75 ± 9° F) and relative humidity of no higher than 50 percent. Leakage shall be determined using a suitable leak detector (see 6.4) for sampling and detecting R–134a at the effluent side of the filter. Monitor the effluent airstream for at least 2 minutes. Determine whether the effluent concentration exceeds 1 ppm within 2 minutes after the introduction of the refrigerant at the inlet of the filter. Purge the filter by passing clean air in the reverse direction through the filter at rated flow for 3 minutes. Keep the exposure of the filter to air to a minimum.

4.3.6.4 Gas life, CK. Perform CK life testing on each carbon sample placed in tubes in accordance with procedures, conditions and parameters in EA–DTL–1704.

4.3.6.5 Gas life, DMMP. DMMP gas life tests will be performed on filters that have previously undergone tests for airflow resistance, leakage, shock and vibration.

a. If sample item is a Type I or II gas filter, install gas filter in test tunnel in its service orientation with the identification label on the upper half of the filter. Adjust airflow to rated flow. Determine the DMMP gas life (the total time from the start of the DMMP challenge until the breakthrough concentration is reached) of the filter at the following test conditions:

   Challenge concentration of DMMP: 5000± 400 mg/m^3
   Breakthrough concentration of DMMP: 0.04 mg/m^3
   Relative humidity: less than or equal to 50 %
   Airstream and filter temperature: 47± 5 ° C (116± 9 ° F)

b. The DMMP challenge concentration in the air shall be monitored to ensure uniform mixing of the DMMP vapor with the air once it reaches the test item.

c. While the challenge concentration is permitted to vary within the stated range during the course of the test, the breakthrough time measured must be normalized to the 5000 mg/m^3 concentration by the following calculation:

$$\text{Corrected breakthrough time} = \text{Measured breakthrough time} * \text{Average concentration during test} \div 5000\ \text{mg/m}^3$$

4.3.6.6 Resistance to hot/cold temperature. Condition each filter set at ambient, (21± 2° C) (70± 3.5° F); high, (71± 2° C) (160± 3.5° F); and low, (–51± 2° C) (–60± 3.5° F) temperature for 4 hours at each temperature setting. After removal from the environmental chamber, inspect filter set for temperature related damage such as ignition, charring and discoloration. Then test each gas filter for airflow resistance and leakage in accordance with 4.3.6.2 and 4.3.6.3, respectively, and test each particulate filter for filtration efficiency in accordance with MIL–PRF–51526.

4.3.6.7 Structural integrity.

4.3.6.7.1 Resistance to structural deformation. The particulate and gas filters (Type I and II) shall be subjected to a quasi-static mechanical load as specified in 3.5.2.1 in the axial direction for 3 cycles of one minute per cycle. Then test gas filters for airflow resistance and leakage in accordance with 4.3.6.2 and 4.3.6.3, respectively, and test particulate filters for filtration efficiency in accordance with MIL-PRF-51526.

4.3.6.7.2 Resistance to shock.

4.3.6.7.2.1 Type I filters. The particulate and gas filter shall be subjected to simulated bench handling in accordance with Method 516.4, Procedure VI of MIL-STD-810.

4.3.6.7.2.2 Type II filters. Shock testing shall be performed on gas-particulate filter sets when fully loaded in either the U.S. Navy CPS Filter System (53711-6263500), or the U.S. Navy SACPS Filter System (53711-6573697). The CPS system has a flow capacity of 1,020 cmh (600 cfm), and the SACPS system has a flow capacity ranging from 340 cmh (200 cfm) to 1700 cmh (1000 cfm). Filters shall be installed per the operation and maintenance manual for the tested system: SS200-AG-MMM-010 for the CPS system and SS200-AL-MMM-010 for the SACPS system. The filter housing shall be filled to capacity. The filter system (housing with particulate and gas filters) shall be shock tested per MIL-S-901 using an approved mounting fixture.

4.3.6.7.3 Resistance to vibration.

4.3.6.7.3.1 Type I filters. Vibration testing shall be performed on the gas and particulate filter MIL-STD-810, Method 514.4, category 8 using the levels and frequencies in Table 514.4-AII. For operational tests that follow shock and vibration, see Figure 2.

4.3.6.7.3.2 Type II filters. Vibration testing shall be performed on gas-particulate filter sets when loaded in either the U.S. Navy CPS Filter System (53711-6263500), or the U.S. Navy SACPS Filter System (53711-6573697). The CPS system has a flow capacity of 1,020 cmh (600 cfm), and the SACPS system has a flow capacity ranging from 340 cmh (200 cfm) to 1700 cmh (1000 cfm). Filters shall be installed per the operation and maintenance manual for the tested system: SS200-AG-MMM-010) for the CPS system and SS200-AL-MMM-010 for the SACPS system. The filter housing shall be filled to capacity. The filter system (housing with filter sets) shall be vibration tested per MIL-STD-167-1 using an approved mounting fixture. For operational tests that follow shock and vibration, see Figure 2.

4.3.6.7.4 Resistance to rough handling. Perform rough handling testing on separate gas and particulate filters that have not previously undergone shock and vibration testing. Clamp each filter to a steel plate such that the cylindrical axis of the filter will be parallel to the direction of movement. Perform rough handling consisting of 200 19-millimeter drops per minute for 15 minutes in accordance with procedures in Method 105.11 of MIL-STD-282. For operational tests that follow shock and vibration, see Figure 2.

4.3.6.8 Resistance to fungus and mildew. The manufacturer shall provide objective evidence and certify that the materials of construction will not support fungus growth beyond trace levels for at least 28 days. Objective evidence includes historical data on similar construction materials, test data on filter construction materials, or test data on the entire filter system. If testing is conducted, the fungus resistance test shall be performed in accordance with Method 508.4 of MIL-STD-810 and the fungus exposure period shall be 28 days.

4.3.6.9 Resistance to corrosion. The manufacturer shall provide objective evidence and certify that any metallic construction materials will resist corrosion to an extent equal or greater than anodized aluminum or aluminum alloys in the 3000 to 5000 series of ASTM B209. Objective evidence includes test data on entire filter set. If objective evidence does not exist or is disapproved by the Government, perform the following tests: conduct salt fog testing in accordance with Method 509.3 of MIL-STD-810 except the total duration shall be 20 days corresponding to five 96-hour exposure cycles. Each 96-hour exposure cycle is defined as 48 hours of salt fog challenge followed by 48 hours of storage at ambient laboratory conditions with no salt fog challenge. After the five 96-hour exposure cycles, rinse the external surfaces with clear water if desired, dry, install/remove the filter in its housing, and inspect filter for evidence of damage and corrosion. Then test each gas filter for airflow resistance and leakage in accordance with 4.3.6.2 and 4.3.6.3, respectively, and test each particulate filter for filtration efficiency in accordance with MIL-PRF-51526.

4.3.6.10 Moisture content. Determine the moisture content of the adsorbent in accordance with ASTM D2867, Oven-Drying Test Method, except that the oven temperature shall be 103 to 107° C (217 to 224° F) and the drying time shall be 3 hours. The moisture content may also be determined through the use of moisture teller devices (e.g. halogen radiator) if approved by the Government (see 6.5). If the moisture content of the adsorbent exceeds the requirement, the filters represented by the samples shall be rejected.

5. PACKAGING

5.1 Packaging. For acquisition purposes, packaging requirements shall be as specified in the contract or order (see 6.2). When actual packaging of material is to be performed by DOD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department's System Command. Packaging data retrieval is available from the managing Military Department 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 filter set, gas-particulate, 340 cmh (200 cfm) is intended for use as part of a Nuclear Biological Chemical (NBC) air handling system of a collective protection system. The Type I filter set will be used in the AICPS. The Type II filter set may be used in the shipboard CPS, in land-based CPE such as the Modular CPE and Simplified CPE, and in the transportable CPS.

6.2 Acquisition requirements.

(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
(c) First article:
  (1) Time allowed for contractor submission of samples for Government test and evaluation after award of contract when testing is performed by the Government.
  (2) Name and address of test facility and shipping instructions when testing is performed by the Government.
  (3) Time required for the Government to notify the contractor whether or not to proceed with production.
(d) Packaging requirements for the filter set.
(e) Additional identification and marking requirements such as manufacturer's name, serial number, date of manufacture, and contract number must be in the contract and cite the responsibility for the items affected.
(f) Whether the item of acquisition is a Type I filter set, a Type II filter set.
(g) Whether any Government Furnished Equipment is supplied.
(h) Whether publication number 0099 from the American Conference of Government Industrial Hygienists is the latest number for defining Threshold Limit Values

6.3 Design notes. Examples of gas filters are as follows:

Type I gas filter - Drawing 5-19-11704
Type II gas filter - Drawing 53711-6573660 (Navy), 5-19-6368 (Army)

6.4 Leakage detector. A halide leak detector manufactured by Nucon Systems, Inc. has been found suitable for this purpose. When using this detector, the presence of high vapor pressure halogenated contaminants in the refrigerant could interfere with the filter leak test resulting in false indications of filter leakage. Should false leakage indications be suspected, the refrigerant should be checked for the presence of such contaminants.

6.5 Adsorbent media. Although manufacturers may consider using alternate adsorbent media, development tests comparable to or beyond those done on ASZM–TEDA carbon per EA–DTL–1704 would first have to be performed by the contractor and approved for use by the Government. Contractors are forewarned that such testing, which includes gas life capacity testing using a variety of chemical agents before and after open–air environmental exposure, may be lengthy and costly. All development and test costs would be borne by the contractor.

6.6 Subject term (key word) listing.

AICPS
Collective protection
CK
DMMP
Filtered air
Gas filter
MCPE
Particulate filter
SACP
SCPE

Custodian:

Army – EA

Preparing activity:

Army – EA

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