30 November 1967

Materiel Test Procedure 8-2-192
Dugway Proving Ground

U. S. ARMY TEST AND EVALUATION COMMAND
COMMODITY ENGINEERING TEST PROCEDURE

COLLECTIVE PROTECTION SYSTEMS, VEHICLES AND VANS

1. OBJECTIVE

The objective of this procedure is to determine and evaluate the technical performance and safety aspects of the test item relative to the criteria cited in applicable Qualitative Materiel Requirements (QMR's), Small Development Requirements (SDR's), Technical Characteristics (TC's), and other pertinent materiel requirements and documents.

2. BACKGROUND

Collective protection systems are added to vehicles or vans to provide internal compartment protection against the ingress of chemical and biological agents.

3. REQUIRED EQUIPMENT

a. Standard Mechanic's Tools
b. Materials Handling Equipment
c. Shock and Vibration Equipment
d. Test Vehicles and vans
e. Fan (wind machine)
f. Calibration Equipment
g. Laboratory Facilities (for analyzing agent samples)
h. Samplers and Impingers
i. Photographic Equipment (Color and black and white)

   1) Motion Picture
   2) Still

j. Meteorological Equipment to measure:

   1) Temperature
   2) Pressure
   3) Wind velocity
   4) Humidity

k. Environmental Test Chambers:

   1) Temperature/Humidity
   2) Fungus
   3) Sunshine
   4) Salt Fog
   5) Altitude
   6) Rain
   7) Snow

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8) Dust

l. Instrumentation (as required in paragraph 6.1.5)
m. For Chemical Challenge:

1) Chemical agents, as required
2) Chemical agent disseminating apparatus
3) Chemical agent alarms
4) Test pigeons

n. For Biological Challenge:

1) Biological materials, as required
2) Collision atomizer
3) Biological agent alarms

o. Penetrometers

4. REFERENCES

A. AR 705-15, Operation of Materiel Under Extreme Conditions of Environment.
B. MIL-STB-282, Filter Units, Protective Clothing Gas Mask Components And Related Products, Performance Test Methods, 28 May 56
C. MIL-STD-810B, Environmental Test Methods, June 1967.
D. HEL-STD-S-1-63B, Maximum Noise Levels for Army Materiel Command Equipment, June 1965.
E. ASTM-D-1230-61, Standard Method of Test for Flammability of Clothing Textiles, Adopted, 1961.
F. American Society for Testing Materials (ASTM) Standards as follows:

1) D-1230-61, Flammability of Clothing Textiles.
2) D-751-66T, Methods of Testing Coated Fabrics (Tentative).

G. AMCP 706-134, Engineering Design Handbook, Maintainability Guide for Design, Headquarters, U. S. Army Materiel Command, August 1967.
H. Report for Engineering Test of Collective Protection Unit for Combat Vehicle, Mechanized Infantry: XM 701 Final Report, Dugway Proving Ground, Utah, March 1966.
I. Edgewood Arsenal Inspection Manual, Penetrometer, Filter Testing, DOP Q76.
J. Chemical Medical Laboratories Research Report No. 62, Micro Determination of Chloropicrin.
K. Edgewood Arsenal Inspection Equipment Manual Penetrometer, Filter Testing, CG Q126.
L. MTP 8-2-500, Receipt Inspection.
M. MTP 8-2-503, Rough Handling and Surface Transport.
N. MTP 7-1-002, Air Portability and Air Drop Service Testing.
O. MTP 8-2-510, Decontamination.
P. MTP 8-2-066, Alarms, Biological.
Q. MTP 8-2-191, Alarms, Chemical.

5. SCOPE

5.1 SUMMARY

This test procedure describes the following tests:

a. Receipt Inspection - An inspection of the test item, as received, to: (1) determine its physical characteristics and condition; (2) locate any defects it might have; and (3) identify damage received during transport.

b. Safety Evaluation - the objective of this procedure is to: (1) ensure that adequate safety features have been incorporated; (2) check the Safety Statement issued by the developing agency; (3) determine the noise level; and (4) obtain data to be included in the Safety Release Recommendation required by USATECOM Regulation 385-6.

c. Performance Test - A study to determine if the test item meets specified reliability criteria.

d. Flammability Test - A study to determine the capacity for combustion of the material used for the protective entrance and liner.

e. Physical Strength Test - A study to determine properties such as tensile strength, tensile stress, ultimate elongation, set, and tear resistance of the material used for the protective entrance and van liner.

f. Agent Penetration Test - A study to determine the toxic agent resistance of the material used for the protective entrance and liner.

g. Simulated Environmental Testing - A study to determine the effects of extreme temperature, humidity, fungus, sunshine, salt fog, water immersion, rain, altitude, snow, and dust on the performance of the test item.

h. Field Operations - A study to determine the technical performance characteristics of the test items in wind and fog-oil smoke at ambient temperatures.

i. Rough Handling and Surface Transportation - A study to determine the effects of rough handling and surface transport on the physical and operational characteristics of the test item.

j. Air Transportability - A study to determine the effects of air transport conditions on the physical and operational characteristics of the test item.

k. Chemical Challenge - A study to determine: (1) if the test item can provide and maintain filtered air under positive pressure at a level which precludes the infiltration of hazardous levels of chemical agents while the test vehicle is stationary or mobile; (2) The degree of contamination associated with personnel exit and entry while under simulated chemical attack; and (3) the time required to purge the interior of the vehicle or van of chemical contamination.

l. Biological Challenge - A study to determine: (1) the degree of protection afforded personnel from viable biological particulate aerosols; (2) the degree of contamination associated with personnel exit and entry while under simulated biological attack; (3) the time required to purge the vehicle or van interior and protective entrance of biological contamination; and, (4) the amount of contamination received within the van or vehicle when traversing a biological cloud.

m. Special "Gas" Tests - A study to determine the performance reliability

of the GPFU using DOP and PS agents.

n. Alarm Tests - A study to determine the operational capabilities of the alarms in the system.

o. Gas Life Test - A study to determine the protective life of the gas filters.

p. Decontamination Aspect - A study to determine the ease or difficulty involved in decontamination of the test item and the effects of the process on the test item.

q. Emergency Adaptability - A study to determine if the occupants of the vehicle or van would have time to don masks should the protective entrance and protective membrane be punctured.

r. Maintainability - A study to determine the maintenance characteristics of the test item.

s. Human Factors - A study to determine if the test item has been designed to achieve effective man-machine intergration and utilization.

5.2 LIMITATIONS

None

6. PROCEDURES

6.1 PREPARATION FOR TESTS

6.1.1 Safety Statement

The test officer shall ensure that a Safety Statement has been received from the developing agency and is understood before the test is started. The Safety Statement includes information pertaining to operational limitations and specific hazards peculiar to the test item.

6.1.2 Safety

a. Test and subtest plans and procedures shall ensure performance in the safest manner consistent with accomplishing the mission. The cardinal principal is to limit exposure of a minimum of personnel, for a minimum time, to a minimum amount of hazardous material consistent with safe and efficient operations. Plans shall include safety procedures, precautions, protections, and emergency procedures as necessary. Technical information on the hazards and safety characteristics of the test item as provided by the Safety Statement and other pertinent information shall be included. Such information shall include evaluation of potential hazards, analysis of risks, limitations, and precautions including special test equipment and techniques that should be incorporated in test plans and procedures.

b. A specific individual shall be charged with responsibility for safety. He shall be familar with the construction and operation of the test item and its critical components, shall have full knowledge of the hazards and safety aspects of the test, and shall review test procedures for evaluation of hazards and recommend control measures.

c. All personnel who participate in or observe the tests shall be

briefed on the hazards involved and proper test methods and procedures.

6.1.3 Security

Security considerations shall be adequately determined and provided for as applicable for each subtest.

6.1.4 Logistical Requirements

Prior to the conduct of the test, the test officer shall ensure that all logistical requirements are satisfied.

6.1.5 Test Set-up and Instrumentation

a. Unless directed otherwise, the test item shall be installed in an appropriate vehicle or van.

b. Instrument the test item and vehicle with measuring and recording equipment capable of continuously monitoring and recording the following:

1) Volumetric rate of output of the gas-particulate filter unit (GPFU).
2) Voltage supplied to the test item.
3) Operating current of the test item.
4) Temperature:

   a) Inside the test vehicle or van.
   b) Ambient

5) Pressure:

   a) Within the test vehicle or van.
   b) Within the protective entrance.
   c) Ambient

   NOTE: The ambient pressure measuring device should be placed as near the protective entrance as possible when conducting the mobile tests.

6.2 TEST CONDUCT

6.2.1 Receipt Inspection

The test item shall be subject to the applicable procedures of MTP 8-2-500, following its arrival at the test site with emphasis on the following:

a. Adequacy of packaging - Visually inspect the test item package and record the following:

1) Binding deficiencies such as broken straps, seals, etc.

2) Packaging material deficiencies such as cuts, tears, breaks, etc.

b. Test item inspection:

1) Visually inspect the test item for damages such as dents, cracks, illegible markings, etc.
2) Survey the test item to determine if it has been contaminated by:

a) Liquid contaminant
b) Solid contaminant

c. Determine the weight, length, width, and height of individual major components, packaged and unpackaged.

d. Serialize and identify each major component for future identification.

e. Photograph the major components.

6.2.2 Safety Evaluation

a. Throughout the conduct of this test, hazardous features shall be specifically observed and noted.

b. Verify the safety aspects included in the Safety Statement issued by the developer.

c. Determine the acoustical noise level at the octave band limits prescribed in HEL-STD-S-1-63b at the positions prescribed.

d. The data to be included in the Safety Release Recommendation required by USATECOM Regulation 385-6, shall be obtained.

6.2.3 Performance Test

a. Ensure that the requisite instrumentation (as per paragraph 6.1.5) is properly emplaced.

b. Operate the test item for the length of time specified in the test plan in order to check the system performance against performance requirements and record the following:

1) Number of hours operated
2) Malfunctions, if any

c. Operate the heater and air conditioner for the length of time specified in the test plan to check their performance against performance requirements and record the following:

1) Number of hours operated
2) Malfunctions, if any

d. Record data indicated in paragraph 6.1.5b.

6.2.4 Flammability Test

a. Obtain a sample piece of each material type used for the protective entrance and van liner and record each material type nomenclature.

b. Test the sample(s) for flammability in accordance with the criteria described in ASTM-D-1230-61 (reference 4E).

c. Compare results of flammability to known standardized materials of similar nature.

6.2.5 Physical Strength Test

a. Obtain a sample of each material used for the protective entrance and van liner, and subject them to the applicable mechanical tests in accordance with ASTM-D-751-66T.

b. Record the following for each test conducted:

1) Test material nomenclature
2) Test specimen size (if "non-standard")

NOTE: Test sample preparation shall be recorded if die-cut samples are used in tear-resistance tests.

6.2.6 Agent Penetration Test

a. Obtain a sample piece of each material type used for the protective entrance and van liner.

b. Determine the liquid agent resistance of the test sample according to test methods devised by the cognizant laboratory at U. S. Army Edgewood Arsenal using the following agents:

NOTE: Appendix A contains a sample type of test.

1) GF
2) VX
3) Distilled mustard (HD)

c. Record the temperature (in °F) and relative humidity of the test room.

6.2.7 Simulated Environment Testing

6.2.7.1 Extreme Temperature Tests

Unless otherwise directed in the test plan, the test item shall be subject to the following temperature tests:

6.2.7.1.1 Low Temperature Tests - Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3 to the following procedures:

a. Place the test items in a temperature chamber. Reduce the chamber temperature to -80°F (-62.2°C), maintain it at -80°F for a period of 72 hours, and then visually inspect the test item and record any damages.

b. Raise the chamber temperature to -65°F (-53.9°C), or the minimum operating temperature of the test item, and maintain this temperature until stabilization is reached. If stabilization is obtained in less than 24 hours, maintain the temperature for a complete 24-hour interval. Perform the following:

NOTE: Stabilization, unless otherwise specified, is considered to be reached when the temperature of the test item does not change more than 3.6°F (2.°C) per hour.

1) Visually inspect the test items and record damages.
2) Remove 1/2 of the test items and verify operability as described in paragraph 6.2.3.

NOTE: Operability checks should be accomplished within 15 minutes of removing the test items from the chamber.

c. Increase the chamber temperature to local ambient temperature and perform the following:

1) Visually inspect the test items and record damages.
2) Verify the operability of the test items by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.1.2 High Temperature Tests - Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3, to the following procedures:

a. Place the test item in a temperature chamber. Adjust the chamber to a temperature of 155°F (88.3°C) and an absolute humidity of 13 grains/ft^3, and maintain these conditions for a minimum of four hours, then visually inspect the test items and record any damages.

b. Adjust the chamber to a temperature of 120°F (48.9°C) and a relative humidity of no greater than 15% and maintain these conditions for a minimum of 24 hours and perform the following:

1) Visually inspect the test items and record any damages.
2) Remove 1/2 of the test items and verify the operability of the test items by subjecting them to the procedures of paragraph 6.2.3.

c. Adjust the chamber to local ambient temperature and humidity and perform the following:

1) Visually inspect the test items and record any damages.
2) Verify the operability of the test items by subjecting the test items to the procedures of paragraph 6.2.3.

6.2.7.2 Humidity Test

a. Subject a minimum of four test items, which have successfully

passed the performance test of paragraph 6.2.3, to the humidity cycling prescribed by reference 4C (MIL-STD-810), Method 507.

b. At the completion of the cycling period, perform the following:

1) Visually inspect the test items and record any signs of corrosion.
2) Disassemble 1/2 of the test items and inspect the components for corrosion and/or deterioration.
3) Verify the operability of the test items by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.3 Fungus Test

a. Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3, to the fungi exposure prescribed by reference 4C, (MIL-STD-810), Method 508.

b. At the completion of the exposure period, perform the following:

1) Visually inspect 1/2 of the test items (if applicable, disassemble them) and record if any fungus was present on the test item components.
2) Verify the operability of the test items by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.4 Sunshine Test

a. Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3, to the solar radiation exposure prescribed by reference 4C (MIL-STD-810), Method 505.

NOTE: The surface and interior temperatures shall be monitored by thermocouples.

b. At the completion of the exposure period, perform the following:

1) Visually inspect the test items and record any surface damages noted.

NOTE: Sunshine causes heating of equipment and fading of fabric colors, checking of paints, and deterioration of natural rubber and plastics.

2) Verify the operability of the test item by subjecting it to the procedures of paragraph 6.2.3.

6.2.7.5 Salt Fog Test

a. Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3, to the conditions prescribed by Method 509 of reference 4C (MIL-STD-810).

b. At the completion of the salt fog spray exposure, perform the following:

1) Rinse the test item with clear water.
2) Visually inspect the test item for, and record the presence of corrosion.
3) If applicable, disassemble 1/2 of the test items and inspect the components for; and record:

a) Evidence of water penetration
b) Presence of corrosion

4) Verify the operability of the test item by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.6 Altitude Tests

a. Subject a minimum of four test items, which have successfully passed the performance test of paragraph 6.2.3, to the conditions prescribed by reference 4C (MIL-STD-810B), Method 500.

b. At the conclusion of the altitude testing, perform the following:

1) Inspect the test items and record any evidence of damage.
2) Disassemble 1/2 of the test items and inspect the components for damage.
3) Verify the operability of the test item by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.7 Water Immersion Tests

a. Immerse a minimum of four test items, packed in their original containers, in water to a predetermined depth.

NOTE: This water depth and temperature, and duration of immersion shall be in accordance with applicable criteria and quality control system requirements and stipulated in the test directive.

b. Record the following with the test items immersed:

1) Depth of water over container
2) Temperature of water
3) Presence of bubbling to indicate container leakage
4) Immersion time until bubbling occurs
5) Total immersion time

c. At the completion of the immersion test, remove the test items from their containers and perform the following:

1) Visually inspect the test items for, and record the presence

of, corrosion.

2) Disassemble 1/2 of the test items and inspect the components for, and record:

a) Evidence of water penetration
b) Presence of corrosion

3) Verify the operability of the test item by subjecting the remaining test items to the procedures of paragraph 6.2.3.

6.2.7.8 Rain Test

a. Subject a minimum of four of he test items to a simulated rain test while the unit is in the process of pressurizing the test vehicle or van with the protective entrance erected.

NOTE: The rain should be produced by use of a spray nozzle of such design so as to emit droplets having a minimum diameter of 1.5 millimeters. The spray should be centered on the van and protective entrance for the length of time and at the rate specified. The rain should contain a fluorescein dye to aid in identification.

b. At the termination of the rainfall, open the protective entrance and inspect it visually and with aid of ultraviolet light. Record any indications of water entrance and damage to the protective entrance and to:

1) Filters
2) Motor section
3) Dust collector
4) Unit housing

d. Determine the efficiency of the filters using the procedures of paragraph 6.2.13.

e. Retain all data recorded by instruments cited in paragraph 6.1.5.

6.2.7.9 Snow Tests

a. Prepare the test item for testing as instructed in paragraph 6.1.5.

b. Subject a minimum of four of the test items, while in operation, to snow produced by an artificial snow maker. The snow shall be of sufficient depth to produce the pressure specified in the test plan on top of the protective entrance and van.

c. While still under the snow load, inspect and record any indications of damage to the protective entrance, filters, motor section, dust collector and unit housing.

d. Remove the snow and inspect and record indications of damage to the protective entrance and filter unit.

e. Test the filters using the procedures of paragraph 6.2.13.

f. Repeat steps b through f with the snow deposited on different

areas of the system as specified in the test plan.

g. Retain all data recorded.

6.2.7.10 Dust Removal Test

a. Measure and record the weight of the filters to the nearest gram.

b. Place the instrumented (as per paragraph 6.1.5) test item in operation.

c. Subject a minimum of four of the test items, while in operation, to a dust test in a sand and dust chamber, using the rate at which the dust is introduced, the dust concentration to be maintained, and the length of exposure as specified in the test plan.

NOTE: The criteria for the dust or silica flour used for this test is described in MIL-STD-810C, Method 510.

d. At the completion of the test, measure and record the weight of the filters to the nearest gram.

e. Inspect the dust collector for damage.

f. Record the ambient temperture.

g. Disassemble 1/2 of the test items and inspect for indications of dust penetration and damage.

h. Record time at which the particulate filter warning light comes ON.

i. Verify the operability of the remaining test items by subjecting them to the procedures of paragraph 6.2.3.

j. Retain all data recorded.

6.2.8 Field Operations

Perform field operation tests at the prevailing temperature of the test site.

6.2.8.1 Wind Test

a. Subject a minimum of four test items to wind velocities produced by fans or other wind-making machines, up to the mazimum limit specified by the QMR with the test vehicle facing into the wind.

b. Perform the operability tests as described in paragraph 6.2.3 during the wind challenge.

c. Test personnel shall make a minimum of six entries and exits during the test.

d. Repeat the wind test with the wind directed at each of the other three sides and each of the corners of the test vehicle.

e. Determine and record the following for each wind challenge.

1) Wind velocity and direction
2) Number of entries and exits made
3) Deleterious effects on test item operability
4) Evidence of damage to the test item and components

5) Duration of wind challenge

6.2.8.2 Fog-Oil Smoke Test

a. Subject a minimum of four test items to fog-oil-smoke for the length of time specified in the test plan.

b. Perform the operations of paragraph 6.2.3 during the fog-oil smoke challenge.

c. Determine and record the following:

1) Fog-oil smoke density
2) Duration of fog-oil smoke challenge
3) Wind velocity and direction.
4) Deleterious effects on the test item operability
5) Evidence of damage to test item

6.2.9 Rough Handling and Surface Transportability

6.2.9.1 Packaged Test Items

a. Subject a minimum of six test items in their original containers, to the applicable MIL-STD-810 (reference 4C) shock and vibration procedures described in MTP 8-2-503.

b. At the completion of testing, perform the following:

1) Visually examine the test item's package for, and record the presence of, cracks, breaks, undone binding, etc.
2) Visually examine the test items for, and record the presence of, damages and/or deformations.
3) Verify the operability of the test items using the procedures of paragraph 6.2.3.

6.2.9.2 Operating Test Items

a. Subject a minimum of six test items, properly installed and in an operational mode, to the applicable MIL-STD-810 (reference 4C) shock and vibration procedures as described in MTP 8-2-503.

b. At the completion of testing, repeat the procedures of paragraph 6.2.9.1.b.2 and b.3.

6.2.10 Air Transportability

Determine the effects of pressure-altitude and vibration, similar to that which will be experienced by the test item in flight and in the handling during loading and unloading operations.

NOTE: Background information on air transportability is contained in MTP 7-1-002.

6.2.10.1 Loading/Unloading

a. Load the test items, in their shipping containers, aboard aircraft, or simulated aircraft facilities as indicated in the test plan loading schedule using normal loading equipment and record the following:

1) Type of aircraft used/simulated
2) Shipping container length, width, height, weight, and material
3) Equipment used for loading
4) Difficulties encountered while loading
5) Method of tie-down
6) Damage incurred to the package while loading

b. Unload the test item from the aircraft/simulated aircraft and record:

1) Equipment used in unloading
2) Difficulties encountered while unloading

6.2.10.2 Simulated Flight Test

a. Subject a minimum of 10 test items, in their shipping containers, to the following simulated conditions simultaneously:

1) Ambient pressure of the maximum altitude the test item is expected to be flown
2) Flight vibration conditions as directed in the procedures of Equipment Category g (Shipment by Common Carrier) of Method 514 of reference 4C (MIL-STD-810)

b. At the completion of the simulated pressure-altitude/vibration testing, subject the test items to the procedures of paragraph 6.2.9.1.b.

6.2.11 Chemical Challenge

6.2.11.1 Non-Entry Exit Test

6.2.11.1.1 Preparation for Test - Perform the following:

a. Obtain the use of a building of suitable size in which to conduct the test.
b. Position and prepare for operation an appropriate chemical agent disseminating device.
c. Position air samplers both inside and outside the test vehicle and record their location.
d. Instrument the test vehicle as directed in paragraph 6.1.5.
e. Position chemical agent alarms in selected positions and record their location.
f. Place pigeons in selected locations within the test vehicle and record locations.
g. Place a fan facing the protective entrance.

NOTE: This fan shall be operated throughout each trial to provide

the air flow required.

6.2.11.1.2 Test Conduct - Perform the following:

a. Pressurize the test vehicle with the protective entrance erected.
b. Place all measuring and recording instruments in operation.
c. Disseminate the chemical agent GB (or other selected agent) at a rate required to produce the degree of concentration specified in the test plan.
d. Operate the test item in the contaminated atmosphere for the length of time specified in the test plan.
e. Sample the contaminated atmosphere and the atmosphere of the test vehicle during the test at the times directed in the test plan.
f. Retain all recorded data.
g. Upon completion of the test, open and ventilate the building, decontaminate the equipment, analyze the samples, record condition of chemical agent alarms, and examine the pigeons for agent symptoms.

6.2.11.2 Entry Exit Test

6.2.11.2.1 Preparation for Test - Perform the procedures of paragraph 6.2.11.1.1 less e and f.

6.2.11.2.2 Test Conduct - Perform the following:

a. Pressurize the test vehicle with the protective entrance erected.
b. Place all measuring and recording instruments in operation.
c. In an atmosphere contaminated with MAA (methylacetoacetate of the concentration specified in the test plan), have the crew members perform the following using procedures as specified and included in the test plan.

NOTE: Crew members shall be assisted by a CBR sentinel, if required.

1) Make a minimum of six entries and exits
2) Remove contaminated clothing
3) Decontaminate the vehicle interior
4) Ventilate and decontaminate the test building.

d. Perform the following for each of the operations in step c:

1) Sample the contaminated atmosphere and the atmosphere of the test vehicle at the times specified in the test plan and at the completion of the test, analyze these samples.
2) Retain all recorded data.
3) Record the operations using colored motion pictures.

6.2.11.3 Purge Trial

6.2.11.3.1 Preparation for Test - Perform the operations of paragraph 6.2.11.1.1 less steps e and f.

6.2.11.3.2 Test Conduct - Perform the following:

a. Ensure that the protective entrance of the test vehicle is erected.
b. Place all measuring and recording devices in operation.
c. Disseminate sufficient Phosgene (CG) to produce the level of interior atmospheric contamination required by the test plan. Dioctyl Phthalate (DOP) may also be used for this test.
d. Operate the filter unit as directed in the test plan and sample the external and vehicle atmospheres as directed by the test plan.
e. Upon completion of the test, open and ventilate the building, decontaminate the equipment, and analyze the samples taken.
f. Record the purge time.
g. Retain all recorded data.

6.2.11.4 Mobile Trials

6.2.11.4.1 Preparation for Test - Perform the following:

a. Secure the use of a test area in which the test vehicle can travel the distance specified in the test plan in an upwind direction.
b. Obtain a dissemination vehicle with appropriate MAA dissemination device.
c. Position air samplers at selected points along the course and within the test vehicle and record the location of the samplers.
d. Position measuring and recording instruments as directed in paragraph 6.1.5.

6.2.11.4.2 Test Conduct - Perform the following:

a. Prepare the test vehicle for road travel.
b. Place all measuring and recording equipment in operation.
c. The test vehicle shall follow a suitable distance downwind behind the dissemination vehicle traveling at the speed and for the distance specified in the test plan. The dissemination vehicle shall disseminate MAA in the manner and concentration specified in the test plan.
d. Air samples shall be taken along the course and in the test vehicle as directed in the test plan.
e. Measure and record the wind velocity.
f. Occupants of the vehicle or van shall attempt to detect the presence of agent by sense of smell.

NOTE: If MAA is detected, personnel shall don masks as necessary.

g. Make colored motion pictures of the entire operation.
h. Retain all recorded data.
i. Upon completion of the test, decontaminate the equipment as necessary, and analyze the samples.
j. Repeat steps a through g using clouds of CS disseminated at measured intervals across the course in place of the MAA from the dissemination vehicle.

6.2.12 Biological Challenge

6.2.12.1 Stationary Aerosol Challenge

6.2.11.1.1 Preparation for Test - Perform the following:

a. Obtain the use of a building of suitable size in which to conduct the test.

b. Obtain a disseminator (collision atomizer or similar apparatus) capable of disseminating small particle aerosols (< 5 microns).

c. Position air samplers inside and outside the test vehicle and record their location.

d. Instrument the test vehicle as directed in paragraph 6.1.5.

e. Place a fan facing the protective entrance capable of producing the required air flow.

6.2.12.1.2 Test Conduct - Perform the following:

a. Obtain control samples by performing the following:

1) Place all measuring and recording equipment in operation.
2) Operate the test item in normal atmosphere (no biological contaminants introduced) for the length of time specified in the test plan.
3) During step 2, crew members shall make a minimum of six entries and exits.
4) Take air samples during the test as directed in the test plan.
5) Retain all recorded data.
6) At the completion of the test, analyze samples taken.

b. Determine the effectiveness of the filter unit against a biological aerosol challenge, by performing the following:

1) Place all measuring and recording equipment in operation.
2) With the test item operating, subject the test vehicle to an aerosol challenge using two non-pathogenic biological tracer materials; a spore former, Bacillus globigii (BG), and a vegetative form, Serratia marcescens (SM). The slurry concentrations and number of atomizers used shall be adjusted to provide the aerosol challenge dosage specified in the test. Control samples of the slurry shall be taken prior to the trial and assayed.
3) During step 2, crew members shall make a minimum of six entries and exits.
4) Take air samples during the test as directed in the test plan and return these to the laboratory for an assay of the biological activity.
5) Retain all recorded data.
6) Open and ventilate the test building.

6.2.12.2 Purge Test

6.2.12.2.1 Preparation for Test - Perform the procedures of paragraph 6.2.12.1.1.

6.2.12.2.2 Test Conduct - Perform the following:

a. Ensure that the protective entrance of the test vehicle is erected.
b. Place all measuring and recording equipment in operation.
c. Subject the interior of the protective entrance and the test vehicle to an aerosol challenge of BG in the prescribed spore concentration per liter of air and for the length of time specified in the test plan. Control samples of the slurry shall be taken prior to the trial and assayed.
d. At the termination of dissemination, place the filtering unit in operation and obtain air samples as specified in the test plan, while the purging process is going on.
e. At the completion of the test, decontaminate the building and vehicle, using betapropiolactone (BPL) or other non-residual contaminant.
f. The air samples taken shall be sent to the laboratory for assay.
g. Retain all recorded data.

6.2.12.3 Mobile Test

6.2.12.3.1 Preparation for Test - Perform the following:

a. Secure the use of a test area in which the test vehicle can travel the required distance in a straight upwind direction.
b. Secure an E2 test fixture or equivalent apparatus to the rear of a light open truck.

NOTE: The disseminator shall be adjusted to disseminate BG slurry at the rate prescribed in the test plan. Control samples of the slurry shall be taken prior to the trial and assayed.

c. Place air samplers at selected stations and within the test vehicle and record their location.
d. Position measuring and recording equipment as directed in paragraph 6.1.5.

6.2.12.3.2 Test Conduct - Perform the following:

a. Prepare the vehicle for road travel.
b. Place all measuring and recording instruments in operation.
c. Obtain control (background) samples by performing the following:

1) The test vehicle shall follow another vehicle (not the dissemination vehicle) at the distance specified in the test plan. Both vehicles shall travel at the speed and for the distance specified in the test plan.
2) Obtain air samples as directed in the test plan.
3) Retain all recorded data.
4) Send the air samples to the laboratory for assay.

d. Replace the lead vehicle by a dissemination vehicle, and repeat

the test disseminating BG at the rate specified in the test plan. Perform the following:

1) Record rate of dissemination
2) Collect and return air samples to the laboratory for assay

e. Decontaminate the equipment by driving it a prescribed distance through a clear area to effect air washing and purge.

6.2.13 Special "Gas" Tests

6.2.13.1 Dioctyl Phthalate (DOP) Test

a. The efficiency of the particulate filter shall be determined using the method prescribed by MIL-STD-282, Method 102.9.1. (Reference 4B).
b. The percent of DOP that penetrated the filter and the air resistance of the filter shall be determined.
c. The length of time each filter was exposed to DOP, and any irregularities encountered during the test shall be observed and recorded.

6.2.13.2 Chloropicrin (PS) Test

a. Subject the system, while in operation, to chloropicrin (PS) in a concentration and for the length of time specified in the test plan.
b. Take bubbler samples.
c. Analyze the samples taken according to "Chemical Medical Laboratories Research Report No. 62, Micro Determination of Chloropicrin" or other comparable procedure.

6.2.14 Alarm Tests

Determine the operational capabilities of the chemical and biological alarm system (if a part of the test vehicle system) according to the applicable procedures of MTP 8-2-066 and MTP 8-2-191.

6.2.15 Gas Life Test

a. Determine the chemical protective life of the gas filter using the method prescribed by MIL-STD-282, Method 101.1.2.
b. Determine and record the concentration of CG:

1) By chemical analysis
2) By weight determination

c. Measure and record the air resistance of the filter at the beginning and at the completion of the test.

6.2.16 Decontamination Aspects

a. Test items which become contaminated and require decontamination.

shall be decontaminated as directed in applicable sections of MTP 8-2-510.

b. Verify the operability of the test item after decontamination, by subjecting it to the procedures of paragraph 6.2.3.

c. Buildings or grounds which become contaminated during the conduct of this MTP shall be decontaminated using the appropriate methods.

6.2.17 Emergency Adaptability

a. Determine the pressure drop due to damage of the entrance and protective membrane by performing the following:

1) Puncture the entrance and protective membrane by small arms fire as directed in the test plan and record number of holes and caliber of weapon.
2) Tape the holes from the inside and place the GPFU in operation and operate until pressure stabilization is achieved.
3) Remove the tape from the puncture holes one at a time and measure and record the differential between the interior and exterior of the vehicle before and after each is removed.

b. Record the time required after the pressure has changed until the low pressure warning alarms trip and the pressure differential at which the alarm trips.

c. Determine if the occupants have time to don masks after the puncture, before the contamination would have reached a hazardous level.

6.2.18 Maintenance Aspects

a. Determine the test item maintenance aspects in accordance with AMC Pamphlet 706-134.

NOTE: The features of design which permit or enhance the accomplishment of maintenance by personnel of average skill under environmental conditons, similar to those in which maintenance is to be performed, shall be recorded.

b. Determine and record the following, as required:

1) Ease of maintenance performed.
2) Component interchangeability.
3) Adequacy and accuracy of the maintenance documentation.
4) Maintenance category of the test item.
5) Special tools and ancillary equipment required.
6) Maintenance-free hours of continuous service.
7) Spare parts and expendable materials required.
8) Time required to perform maintenance tasks.
9) Time required to detect and diagnose failures.
10) Causes of malfunctions such as lack of operation, wear, inadequate design tolerances, poor workmanship, etc.

6.2.19 Human Factors

During the conduct of the other subtests, observations shall be made relative to the human factors engineering characteristics of the test item. Observe and record the following:

a. Record any difficulties observed in performing manual operation of the controls.
b. Record comments and observations of the test officer and other individuals participating in the test.
c. Observe the equipment for ease of maintenance including operating personnel equipped with special or protective clothing.

6.3 TEST DATA

6.3.1 Receipt Inspection

a. Record the following:

1) Receipt inspection data collected as described in the applicable sections of MTP 8-2-500.
2) Adequacy of packaging:

a) Binding deficiencies
b) Packaging material deficiencies

3) Damage to the test item, including:

a) Dents
b) Cracks
c) Illegible markings

4) Dimensions of major components, packaged and unpackaged:

a) Length, width, and height, in inches
b) Weight, in pounds

5) Serial numbers of each major component

b. Retain all photographs.

6.3.2 Safety Evaluation

Record the following:

a. Any hazardous characteristics.
b. Any deficiencies and/or recommended conclusions pertaining to the Safety Statement.
c. Acoustical noise level determined as described in HFL-STD-S-1-63B.

6.3.3 Performance Test

a. Record the following:

1) Unit performance:

a) Length of time operated, in hours
b) Malfunctions

2) Heater and air conditioner:

a) Length of time operated, in hours
b) Malfunctions

b. Retain all recordings of data, including:

1) Volumetric output rate of GPFU, in cfm
2) Operating voltage and current
3) Temperature, in °F:

a) Interior
b) Ambient

4) Pressure, in psi:

a) Within van
b) Within protective entrance
c) Ambient

6.3.4 Flammability Test

Record the following:

a. Material being tested
b. Data collected as described in ASTD-D-1260-61.
c. Results of comparisons with standardized materials.

6.3.5 Physical Strength Test

Record data collected as described in ASTM-D-751-66(T) including:

a. Test material nomenclature
b. Test item
c. Sample size and shape, if non-standard

6.3.6 Agent Penetration Test

Record the following:

a. Type of material being tested
b. Test method used
c. Amount of penetration of each of the following:

1) GF

2) VX
3) HD

d. Temperature (in °F) and relative humidity of test room.

6.3.7 Simulated Environmental Tests

6.3.7.1 Extreme Temperature Tests

6.3.7.1.1 Low Temperature Tests -

Record the following:

a. Test item identification number
b. For temperature of -80°F:

1) Damages incurred

c. For temperatures of -65°F:

1) Damages incurred
2) Operability data collected as described in paragraph 6.2.3

d. For ambient temperature:

1) Temperature, in °F
2) Test item damage
3) Operability data collected as described in paragraph 6.2.3

6.3.7.1.2 High Temperature Tests -

Record the following:

a. Test item identification number
b. For temperature of 155°F:

1) Damages incurred

c. For temperature of 120°F:

1) Damages incurred
2) Operability data collected as described in paragraph 6.2.3

d. For ambient temperature:

1) Temperature, in °F
2) Damages incurred
3) Operability data collected as described in paragraph 6.2.3

6.3.7.2 Humidity Test

Record the following:

a. Test item identification number
b. Evidence of corrosion
c. Evidence of corrosion and/or deterioration of components
d. Operability data collected as described in paragraph 6.2.3

6.3.7.3 Fungus Test

Record the following:

a. Test item identification number
b. Presence of fungus
c. Operability data collected as described in paragraph 6.2.3

6.3.7.4 Sunshine Test

Record the following:

a. Test item identification number:
b. Damage to:

    1) External surface
    2) Test item components

c. Operability data collected as described in paragraph 6.2.3

6.3.7.5 Salt Fog Test

Record the following:

a. Test item identification number
b. Evidence of corrosion of test item
c. For disassembled test item:

    1) Evidence of water penetration
    2) Presence of corrosion

d. Operability data collected as described in paragraph 6.2.3

6.3.7.6 Altitude Tests

Record the following:

a. Test item identification number
b. Evidence of damage:

    1) To test item
    2) To test item components after disassembling the test item, if applicable

c. Operability data collected as described in paragraph 6.2.3

6.3.7.7 Water Immersion Test

Record the following:

a. Test item identification number
b. During immersion:

1) Depth of water over container, inches
2) Water temperature, in °F
3) Presence of bubbling, if any
4) Immersion time to bubbling, if any, in minutes
5) Total immersion time, in minutes

c. For the test item:

1) Presence of corrosion:

a) Test item
b) Test item components, after disassembling the test item, if applicable

2) Presence of water penetration
3) Operability data collected as described in paragraph 6.2.3

6.3.7.8 Rain Test

a. Record the following:

1) Test item identification number
2) Length of exposure time, in hours
3) Evidence of water penetration in protective entrances:

a) Visual inspection
b) Under ultraviolet light

4) Evidence of water penetration and damage to components:

a) Visual
b) Under ultraviolet light

5) Condition of filters, data collected as described in paragraph 6.2.13

b. Retain all recorded data.

6.3.7.9 Snow Tests

a. Record the following:

1) Test item identification number
2) Pressure of snow layer, in psi
3) Evidence of damage to protective entrance while under the snow load
4) Indications of damage to protective entrance and GPFU
5) Condition of filters, data collected as described in paragraph 6.2.13

b. Retain all recorded data, including:

1) Temperature, in °F:

a) Within the test vehicle
b) Ambient

2) Pressure, in psi:

a) Within the test vehicle
b) Ambient

3) Volumetric rate of air output of test item, in cfm
4) Operating voltage and current, in volts and amperes

6.3.7.10 Dust Removal Test

a. Record the following:

1) Test item identification number
2) Weight of filters before test, in grams
3) Concentration of dust, in grams per cubic foot
4) Length of exposure, in hours
5) Weight of filters after test, in grams
6) Indications of damage to filter unit
7) Damage to dust collector
8) Time, in seconds, at which the particulate filter warning light came on

b. Retain all recorded data:

1) Temperature, in °F:

a) Within the test vehicle
b) Ambient

2) Pressure, in psi:

a) Within the test vehicle
b) Ambient

3) Volumetric rate of air output of test item, in cfm

1) Operating voltage and current in volts and amperes

6.3.8 Field Operations

6.3.8.1 Wind Test

Record the following:

a. Test item identification number
b. Operability data collected as described in paragraph 6.2.3
c. Number of entries and exits made
d. Wind direction with respect to vehicle
e. Wind velocity, in mph
f. Deleterious effects on test item operability
g. Evidence of damage to test item and components
h. Duration of wind challange, in hours

6.2.8.2 Fog-Oil-Smoke Test

Record the following:

a. Test item identification number
b. Operability data collected as described in paragraph 6.2.3
c. Fog-oil smoke density, in particles per liter of air
d. Duration of challenge, in hours
e. Wind direction and velocity, in mph
f. Deleterious effects on the test item operability
g. Evidence of damage to test item

6.3.9 Rough Handling and Surface Transportation

Record the following, as applicable:

a. Test performed (shock, vibration)
b. Operational status (packaged, installed)
c. Test item identification number
d. For test item container, if applicable:

   1) Presence of cracks, breaks, etc.
   2) Undone binding, if applicable

e. Damage and deformation to the test item's exterior
f. Operability data collected as described in paragraph 6.2.3

6.3.10 Air Transportability

6.3.10.1 Loading/Unloading

Record the following, as applicable:

a. Type of aircraft, used or simulated

b. Shipping container:

1) Length, width, and height, in feet and inches
2) Weight
3) Material

c. Equipment used in loading
d. Difficulties encountered while loading
e. Method of tie-down
f. Damage incurred to the package while loading
g. Equipment used
h. Difficulties encountered while unloading
i. Damaged incurred to the package while unloading

6.3.10.2 Simulated Flight Test

Record the following, as applicable:

a. Altitude simulated, in feet
b. Test item identification number
c. For test item shipping container:

1) Presence of cracks, breaks, etc.
2) Undone binding, if applicable

d. For test item individual package:

1) Presence of cracks, breaks, etc.
2) Undone binding, if applicable

e. Damage and deformation to the test item's exterior
f. Operability data collected as described in paragraph 6.2.3

6.3.11 Chemical Challange

a. For all tests:

1) Record the following for each item tested:

a) Test item identification number
b) Type of test vehicle
c) Location fo samplers, alarms, and pigeons, as applicable
d) Type of agent used (GB, MAA, etc.)
e) Agent concentration in grams per liter of air
f) Length of exposure, in hours and minutes
g) Results of analysis of samples
h) Decontamination method(s) used and effects of decontamination on the test item

2) Retain all recorded data, including:

a) Temperature, in °F:

(1) Within the test vehicle
(2) Ambient

b) Pressure, in psi:

(1) Within the test vehicle
(2) Ambient

c) Volumetric rate of an output of the test item, in cfm
d) Operating voltage and current of test item

3) Retain all photographs.

b. For the non-entry-exit test, record the following:

1) Condition of pigeons
2) Status of gas alarms

c. For the entry exit test, record the following:

1) Number of entries and exits made
2) Vehicle internal contamination due to entry and exit

d. For purge test, record the purge time required, in minutes
e. For the mobile tests, record the following:

1) Dissemination method utilized (dissemination device for MAA; grenades or bulk disperser for CS.)
2) Vehicle velocity, in mph
3) Wind velocity, in mph
4) Detection of agent by vehicle crew

6.3.12 Biological Challenge

a. For all biological tests:

1) Record the following for each item tested:

a) Test item identification number
b) Type of test vehicle
c) Location of samplers, and alarms, as applicable
d) Type of agent(s) used (BG and SM, BG)
e) Concentration of agent, in grams per liter of air
f) Length of exposure, in hours and minutes
g) Results of analysis of air samples
h) Results of slurry sample assay

2) Retain all recorded data, including:

a) Temperature, in °F:

(1) Within the test vehicle
(2) Ambient

b) Pressure, in psi:

(1) Within the test vehicle
(2) Ambient

c) Volumetric rate of air output of the test item, in cfm
d) Operating voltage and current in volts and amperes

3) Retain all photographs.

b. For the stationary aerosol challenge, record the following:

1) Test phase (control or agent aerosol)
2) Number of entries and exits made

c. For the purge trial, record the time required to complete purge, in minutes.

d. For the mobile tests, record the following:

1) Test phase (control or agent aerosol)
2) Vehicle velocity, in mph

6.3.13 Special "Gas" Tests

Record the following, as applicable:

a. Test item identification number
b. Type of "gas" agent (DOP or PS)
c. Concentration of agent in grams per liter of air
d. Length of exposure in minutes
e. Results of sample analysis

6.3.14 Alarm Tests

Record data as required in MTP 8-2-066 and MTP 8-2-191, if applicable

6.3.15 Gas Life Test

Record the following:

a. Data as in MIL STD 282, Method 101.1.2.
b. Concentration of CG:

1) By chemical analysis in grams per liter of air
2) By weight determination in grams per liter of air

c. Air resistance of filter:

1) At beginning of test
2) At completion of test

6.3.16 Decontamination Aspects

Record the following, as applicable:

a. Data as directed in MTP 8-2-510.
b. Data collected as described in paragraph 6.2.3.

6.3.17 Emergency Adaptability

Record the following:

a. Caliber of weapon used
b. Number of holes made in:

1) Protective entrance
2) Protective membrane

c. For each tape removed:

1) Number of tapes already removed
2) Pressure differential between interior and exterior of vehicle, in psi:

a) Before tape is removed
b) After tape is removed

d. Time between puncture and tripping of low pressure warning alarms in seconds, if applicable.
e. Comments on adequacy of time for personnel to don protective masks after puncture has occurred.

6.3.18 Maintenance Aspects

Record the following:

a. Ease of maintenance performed
b. Component interchangeability
c. Adequacy and accuracy of the maintenance documentation
d. Maintenance category of the test item
e. Special tools and ancillary equipment required
f. Maintenance-free hours of continuous service
g. Spare parts and expendable materials required
h. Time required to perform maintenance tasks, in hours and minutes
i. Time required to detect and diagnose failures, in hours and minutes
j. Causes of malfunctions

6.3.19 Human Factors

Record the following:

a. Difficulties observed in performing manual operation of controls.
b. Comments and observations of test officer and other test personnel.
c. Ease of maintenance and various conditions.

6.4 DATA REDUCTION AND PRESENTATION

6.4.1 Receipt Inspection

a. Data collected as a result of this procedure shall be presented as indicated in applicable portions of MTP 8-2-500.
b. The description of the major components, number of major components tested, and condition upon receipt shall be presented in tabular form.
c. Photographs shall be used as required to substantiate conclusions.

6.4.2 Safety Evaluation

a. Forward a Safety Release Recommendation (USATECOM Regulation 385-6) to U. S. Army Test and Evaluation Command within 30 days of the beginning of the test. The Safety Release Recommendation shall contain special safety considerations or hazards to personnel and materiel (including developmental types of equipment as well as standard components used in assemblage of items to be tested).
b. Results of acoustical noise level determination shall be presented in suitable form.
c. Hazards observed and suggestions for improvment of safety shall be presented in convenient form.

6.4.3 Performance Test

Evaluation shall be presented in narrative form, supplemented by drawings, photographs, charts, tables, graphs, or any other suitable means of displaying information. The report shall clearly conclued whether the test item meets the reliability criteria established in applicable specifications. Recommendations relative to further testing and methods to overcome malfunctions shall also be included.

6.4.4 Flammability Test

Comparison data and test data shall be presented in summary form as indicated in the applicable section of ASTM-D-1230-61.

6.4.5 Physical Strength Test

Data collected as a result of this subtest shall be presented in suitable form.

6.4.6 Agent Penetration Test

a. Results of this subtest shall be presented using narrative, drawings,

photographs, and tables.

b. Data on conditions of testing shall be presented in convenient form.

6.4.7 Simulated Environmental Tests

a. The results of the subtests conducted shall be presented in tabular or other suitable form supplemented by motion pictures, where applicable.

b. The results of the operational test performed at the conclusion of the environmental testing shall be presented in narrative or other convenient form.

6.4.8 Field Operations

Data for this subtest shall be presented in suitable form, supplemented by motion pictures.

6.4.9 Rough Handling and Surface Transportation

a. Rough handling and surface transport data shall be presented as prescribed in MTP 8-2-503.

b. Vibration and shock tests data shall be presented in tabular form and indicate test times, distance (dropped), shock levels, vibration frequencies, etc., and significant findings of the test. Include photographs of damage.

c. Present data on the operation of the test item after subjection to rough handling and surface transport conditions, vibration and shock.

6.4.10 Air Transportability

a. Data shall be presented in summary form as indicated in the applicable sections of MTP 7-1-002, and other pertinent testing documentation and include the pressure-altitude and vibration conditions the test item was subject to.

b. Present data regarding any significant aspects of the test item observed during conduct of the air transport testing.

c. Present data on the operation of the test item after subjection to air transport testing.

6.4.11 Chemical Challenge

a. Conditions and results of this subtest shall be presented in tabular or other suitable form.

b. The drawings, tables, charts, and photographs along with narration, as required, to present the data.

6.4.12 Biological Challenge

a. Conditions and results of this subtest shall be presented in tabular or other suitable form.

b. Use drawings, tables, charts, and photographs along with narration, as required, to present the data.

6.4.13 Special "Gas" Tests

Data from this subtest shall be presented in narrative form, supplemented by other required graphical or other form of presentation, to substantiate the conclusions.

6.4.14 Alarm Tests

Present the data as directed in the applicable sections of MTP 8-2-066 and MTP 8-2-191.

6.4.15 Gas Life Tests

Data obtained as a result of this subtest shall be reduced and analyzed as required. It shall be presented in the prescribed form, using tables, charts, graphs, pictures, and narrative comments as applicable.

6.4.16 Decontamination Aspects

Data from this subtest shall be presented as indicated in applicable sections of MTP 8-2-510.

6.4.17 Emergency Adaptability

Data from this subtest shall be presented in narrative form supplemented by plots, graph, and photographs as required to indicate the effects of small arms fire on the protection afforded by the system.

6.4.18 Maintainability

Data from this subtest shall be presented in narrative form, showing what maintenance was required to repair the test item. The report shall be supplemented by photographs, drawings, or other devices to substantiate the conclusion and recommendations.

6.4.19 Human Factors

a. Data collected as a result of considering the human factors aspects of the test item shall, if possible, be submitted to a qualified human engineering analyst for evaluation.

b. Data shall be presented in narrative form, supplemented by drawings, photographs and recommendations relative to improving the human aspect of the test item.

APPENDIX I

TEST METHOD FOR AGENT PENETRATION

1. Test Apparatus

The apparatus consists of a flanged bottom cup and a shallow top cup between which a sample of the test fabric is placed and contaminated with agent. The cups are constructed so that air at approximately 1/2 mph (44 ft/min) is pulled across the contaminated fabric and the agent vapor which penetrates the fabric is swept out of the bottom cup at a low flow rate. One liter of air per minute is pulled through the bottom cup and into an absorbent bubbler.

2. Test Procedure

The fabric sample is sealed between the top and bottom cups with wax or clamps. The outlet is connected to a standard vapor bubbler containing an appropriate solvent. The apparatus is placed in a hood at room temperature. The lid on the top cup is removed and four each 0.5 mg drops of agent are dropped by means of an air aided dropping apparatus onto the test fabric. The lid is immediately replaced and bubbler sampling started. The bubbler sampler will be analyzed enzymatically after six hours test. The analysis of the contents of the bubbler is used to determine the degree of protection afforded by the test fabric.