INCH-POUND

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12 March 1993
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19 December 1967

MILITARY STANDARD

TEST FACILITY FOR DETERMINING PERCENT AGENT RECOVERY

AMSC N/A

FSC 1330

F O R E W O R D

1. This military standard is approved for use by all Departments and Agencies of the Department of Defense.

2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to : Commander, U.S. Army, Edgewood Research, Development and Engineering Center, ATTN: SCBRD-EN, Aberdeen Proving Ground, MD 21010-5423, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This standard is approved for use by all Departments and Agencies of the Department of Defense in the selecting of items or facilities for application. It is intended to prevent the entry of unnecessary configurations into the Department of Defense logistics system. This document is not intended to restrict state-of-the-art changes from being used.

C O N T E N T S

1. SCOPE

1.1 Scope. This standard covers the requirements for a facility to test CS pyrotechnic munitions with provisions for obtaining burning time of the munition and quantitative samples of the resultant agent cloud.

2. APPLICABLE DOCUMENTS

This section is not applicable to this standard.

3. DEFINITIONS

This section is not applicable to this standard.

4. GENERAL REQUIREMENTS

4.1 Description. The basic facility shall be a dynamic type test tunnel consisting of an inlet plenum, a burning chamber, a sampling chamber, an agent decontaminating chamber, an air moving system, and an exhaust stack. Normal operation shall include moving air past a functioning pyrotechnic munition, into the sampling chamber where aliquots of the agent cloud are collected, then into the decontaminating chamber where the remainder of the agent is destroyed before the cloud is expelled through the exhaust stack.

5. DETAILED REQUIREMENTS

5.1 Design criteria. Although its configuration is not fixed, the test tunnel shall conform to the following design criteria:

a. The test tunnel shall be the dynamic type (once through airflow).

b. The capacity of the test tunnel shall be sufficient to handle 400 grams of pyrotechnic agent per test.

c. The tunnel shall be designed to insure a homogeneous air stream in the sampling chamber.

d. The tunnel shall be capable of successful operation under all environmental conditions.

e. The minimum air dilution volume shall be 28.32 cubic meters per minute per 454 grams of agent.

f. There shall be provisions for remote ignition of the test munition.

g. Two hinged viewing ports, one on each side of sampler compartment shall be provided in the burning chamber. Port openings shall be large enough to permit maximum two-arm access to samplers.

h. The sampling chamber shall have provisions for nine samplers located in one plan equally distributed across the area of the sampling chamber. Each sampler shall have a sampling rate of 1.5 to 5 liters per minute. The sampling rate tolerance shall be $\pm$ 0.03 liter per minute for each sampler.

i. The design shall provide a nominal sampling time of 10 minutes.

j. The air velocity through the chamber shall be constant. Instrumentation for determining the air velocity shall be accurate within 3 percent.

k. The test tunnel shall provide test results with accuracy within 5 percent.

l. The design of the tunnel shall incorporate safety features to prevent injury to personnel during operation and maintenance of the tunnel.

5.2 Calculation of percent yield. Each wind tunnel sampler shall collect a sample of the agent from a known volumetric portion of air in the tunnel thus enabling the calculation of percent yield as follows:

a. Volumetric flow rate through wind tunnel (liters per minute) = Volumetric flow rate through sampler (liters per minute)

Multiplication factor.

b. (Multiplication factor) (Weight in grams of sample collected) =

Weight of agent dispersed in wind stream (grams).

c. $\frac{\text{Weight of agent dispersed in wind stream}}{\text{Weight of agent in munition (grams)}} \times 100 = \text{percent yield}$

5.3 Sampler design. The sampler shall be designed to use a calibrated orifice and a vacuum system for sampling the wind stream at a fixed volumetric flow rate. The vacuum system shall be capable of maintaining a minimum vacuum of 17 inches of mercury while producing the required volumetric flow through nine samplers. The exhaust from the vacuum system should be fed into the decontaminating chamber of the test facility. The sampler design shall include:

a. A method of holding it rigidly in the wind stream.

b. A method of easy removal through a port, including a quick-disconnect fitting on the vacuum line.

A typical sampler shall be as shown in figure 1. Two cones are threaded together at their bases with a filter held between them for collecting the sample. See note 6.1.

5.4 Instrumentation. Instrumentation shall be provided as follows:

a. Equipment for determining and controlling wind stream velocity and volumetric flow rate.

b. Equipment for determining volumetric flow rate through the samplers.

c. Equipment for remote firing of test munitions.

d. Equipment for determining internal temperature, pressure, and humidity.

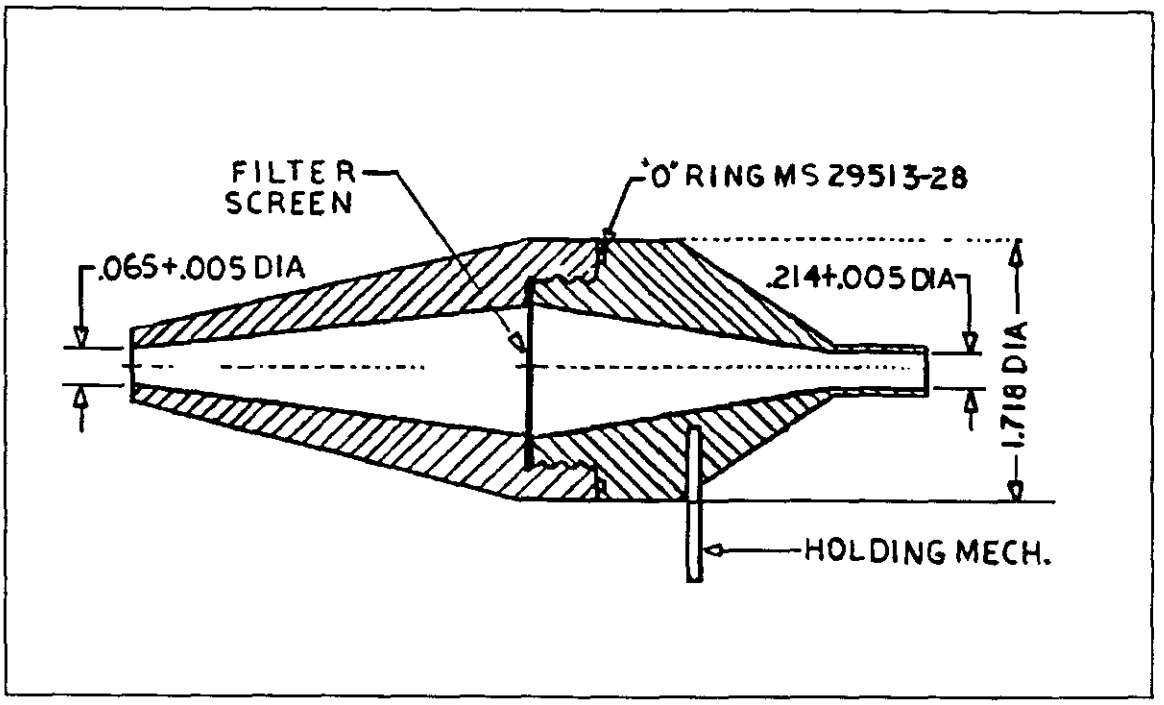

FIGURE 1. Sampler.

5.5 Typical test facility.

5.5.1 Principle of operation. A typical test facility shall be as shown in figure 2. A three-bladed propeller located behind the burning munition blows the agent cloud into the sampling chamber. Thorough mixing of the air and agent occurs and a homogeneous agent cloud is formed. The cloud is moved into the sampling chamber, past the samplers which remove agent at a specified rate, and then into the decontamination chamber. Decontamination is accomplished by passing the agent cloud through aerosol filters (for this facility six filters are placed in parallel).

5.5.2 Calibration of the facility. The test facility shall be checked and calibrated by dispersing a measured quantity of agent into the air stream and quantitatively analyzing the agent collected in the samplers. The dispersion of the agent is accomplished by mixing the agent with a highly volatile solvent (e.g., methylene chloride) and spraying the solution into the tunnel (see note 6.3). The rapid evaporation of the solvent leaves

the agent particles suspended in the air stream. The operating conditions of the test facility are the same as used when testing actual munitions. The calibration procedure is repeated several times to provide an accurate measure of the efficiency of the facility.

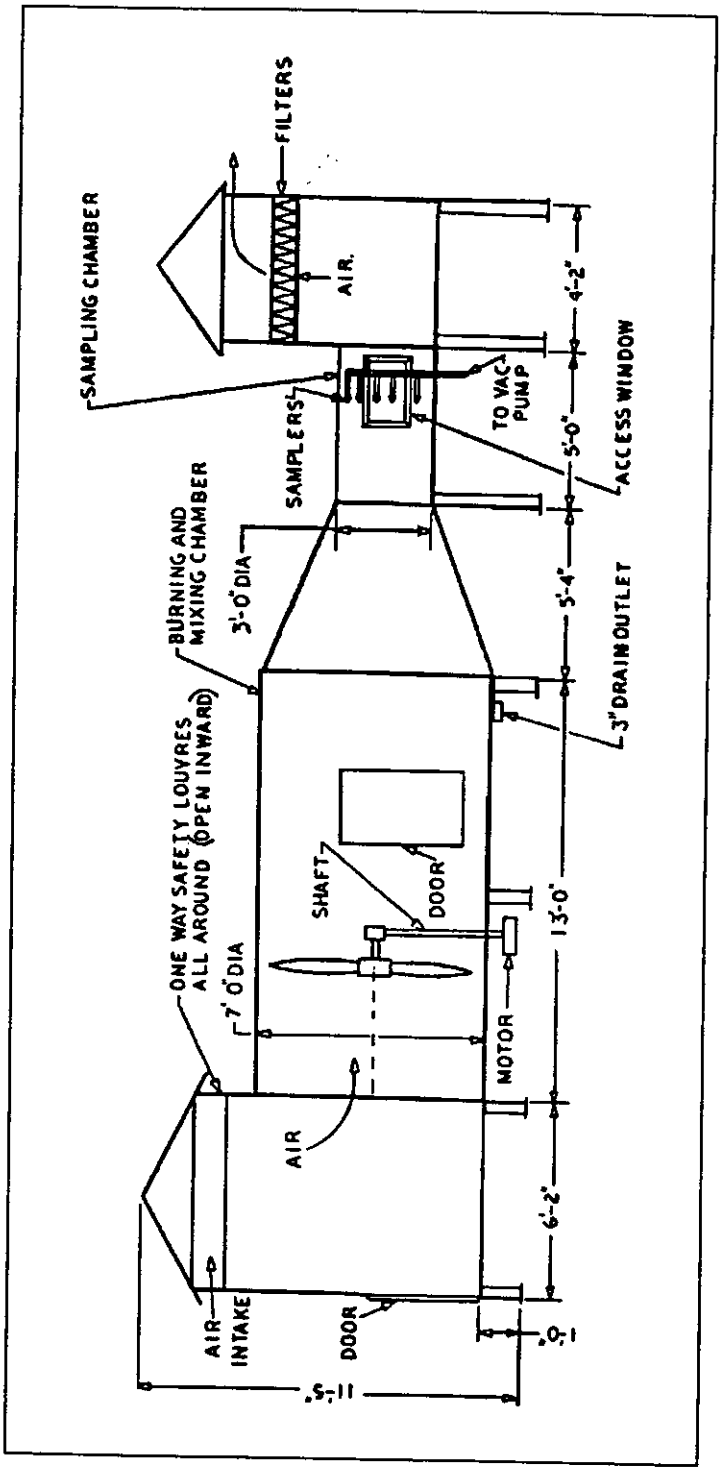

Figure 2. Grenade Test Facility.

6. NOTES

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

6.1 Intended use. This standard contains requirements for the design of a test facility for determining percent agent recovery of CS pyrotechnic munitions.

6.2 Glass fiber filters. Type A/E glass fiber filters available from Gelman Sciences, Ann Arbor, Michigan have been found to be suitable for collecting samples.

6.3 Calibration mixture. A suitable mixture of agent and solvent to use for calibration is 50 to 70 grams of agent per liter of methylene chloride. A No. 2A spray system obtainable from Spraying Systems Company, Wheaton, Illinois has been found suitable for dispersing the mixture into the air stream.

6.4 Subject term (key word) listing.

Chamber, sampling
Munitions, pyrotechnic
Sampler

6.5 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

CONCLUDING MATERIAL

Custodian:

Army - EA

Preparing activity:

Army - EA

Project No. 1330-A373

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-STD-1440A(EA)	930312

3. DOCUMENT TITLE

Test Facility For Determining Percent Agent Recovery

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME (Last, First, Middle Initial)	b. ORGANIZATION	
c. ADDRESS (Include Zip Code)	d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (If applicable)	7. DATE SUBMITTED (YYMMDD)

8. PREPARING ACTIVITY

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c. ADDRESS (Include Zip Code) Tech Dir, U.S. Army ERDEC ATTN: SCBRD-ENE-S (Stds/Specs/Pkg) Aberdeen Proving Ground, MD 21010-5423	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	