

MIL-STD-1440(MU)  
19 December 1967

MILITARY STANDARD  
TEST FACILITY FOR DETERMINING  
PERCENT AGENT RECOVERY

FSC 1330

## MIL-STD-1440(MU)

## 1. SCOPE

1.1 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. REFERENCED DOCUMENTS

(None.)

## 3. DEFINITIONS

(None.)

## 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. DETAIL 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 an 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.

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(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 plane 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:

$$(a) \frac{\text{Volumetric flow rate through wind tunnel (liters per minute)}}{\text{Volumetric flow rate through sampler (liters per minute)}} =$$

Multiplication factor.

$$(b) (\text{Multiplication factor}) (\text{Weight in grams of sample collected}) =$$

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 for easy removal through a port, including a quick-disconnect fitting on the vacuum line.

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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. Type A glass fiber filters obtained from Gelman Instrument Company, Chelsea, Michigan have been found to be suitable for collecting the sample.

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.

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 an 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. 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.

Note. A suitable mixture of agent and solvent to use for calibration is 50 to 70 grams of agent per liter of methylene chloride, dispersed into the air stream using a No. 2A spray system obtainable from Spraying Systems Company, Bellwood, Illinois.

Custodian:

Army - MU

Preparing activity:

Army - MU (EA)

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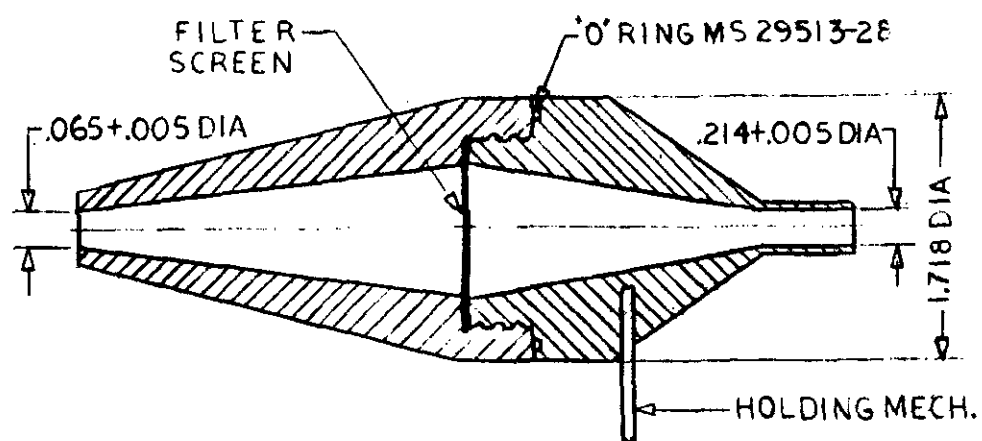
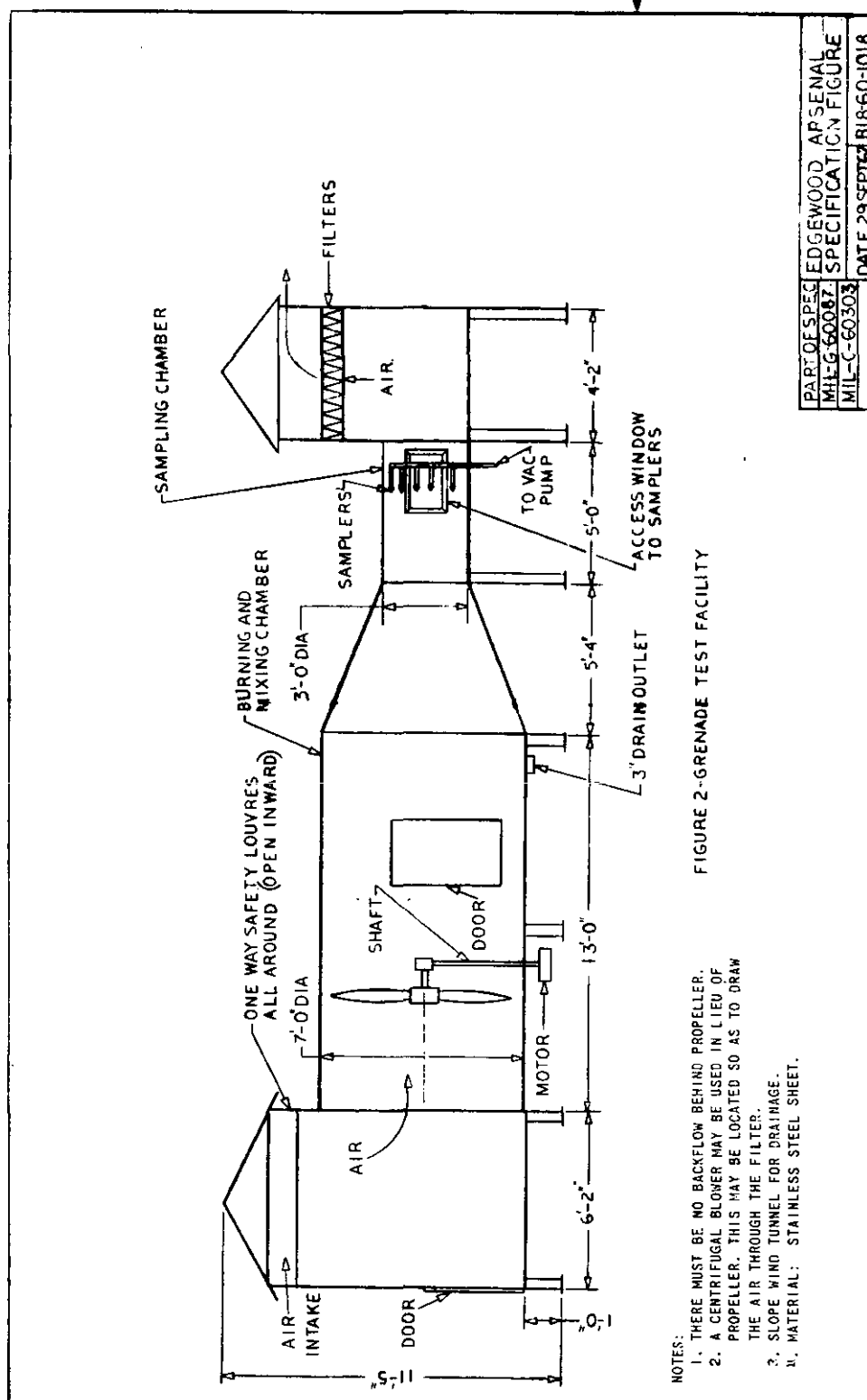


FIG 1 - SAMPLER

PART OF SPEC	EDGEWOOD ARSENAL
MIL-G-60087	SPECIFICATION FIGURE
MIL-C-60303	DATE: 29 SEP 67 A18-60-1017

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PART OF SPEC	EDGEWOOD ARSENAL
MIL-G-60087	SPECIFICATION FIGURE
MIL-C-60303	DATE 29 SEPT 64
	BIB 60-1018

FIGURE 2--GRENADE TEST FACILITY