

MIL-STD-1466
25 March 1983

MILITARY STANDARD
SAFETY CRITERIA AND QUALIFICATION REQUIREMENTS
FOR PYROTECHNIC INITIATED EXPLOSIVE (PIE) AMMUNITION



NO DELIVERABLE DATA
REQUIRED BY THIS DOCUMENT

FSC 13GP

MIL-STD-1466
25 March 1983

DEPARTMENT OF DEFENSE

Washington, DC 20301

Safety Criteria and Qualification Requirements for Pyrotechnic Initiated Explosive (PIE) Ammunition

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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 Armament Research and Development Command, Attn: DRDAR-TST-S, Dover, NJ. 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter. Comments shall be forwarded through the designated Reviewing Activity listed for each Service in 6.1.

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1. SCOPE.

1.1 Purpose: This standard establishes the design safety criteria and qualification requirements for the generic family of pyrotechnic initiated explosive (PIE) ammunition.

1.2 Application: This document applies specifically to PIE configurations 40mm and below. While the ammunition is qualified as a cartridge, the primary emphasis of this document pertains to the specific interactions of the pyrotechnic initiation train in the projectile and the environmental conditions required for initiation.

2. REFERENCE DOCUMENTS.

2.1 Issues of documents. The following documents of the issue in effect on the date of the invitation of bids or request for proposal form a part of this standard to the extent specified herein.

STANDARDS

MILITARY

MIL-STD-331	- Fuze and Fuze Components, Environmental and Performance Tests for
MIL-STD-444	- Nomenclature and definitions in the Ammunition Area
MIL-STD-650	- Explosive, Sampling, Inspection Testing
MIL-STD-810	- Environmental Test Methods
MIL-STD-882	- System Safety Program Requirements
MIL-STD-1316	- Fuze Design, Safety Criteria for
DOD-STD-2105	- Hazard Assessment Tests for Navy Non-Nuclear Ordnance

2.2 Other publications. The following documents form a part of this standard to the extent specified herein. Unless otherwise indicated, the issue in effect on the date of the invitation for bids or request for proposal shall apply.

DLAR 8220.1	Department of Defense Explosive Hazard Classification Procedures
AFSC DH 1-6	Design Handbook, System Safety
NAVORD OD 44942	Weapon System Safety Guidelines Handbook
ADA-086259	Joint Services Safety and Performance Manual for Qualification of Explosives for Military Use

(Copies of specifications, standards, drawings, and publications required by contractors in connection with, specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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3. DEFINITIONS.

3.1. The definitions of MIL-STD-444 generally apply to ammunition terms used in this standard and the definitions of ADA086259 apply to the explosive terms. For interpretation of this standard, the following specific definitions apply:

3.1.1 Pyrotechnic Initiated Explosive (PIE) Ammunition - PIE ammunition is any ammunition in which the main charge is initiated by the effects of combustion of incendiary mixes that are initiated upon target impact.

3.1.2 Incendiary Mixes - Pyrotechnic formulations which upon initiation rapidly convert to high temperature gases and hot particles.

3.1.3 Booster Explosives - are compounds or formulations such as Teteryl or CH-6 which are used to transmit and augment the detonation reaction with sufficient energy to initiate a stable detonation in the Main Charge explosive.

3.1.4 Main Charge Explosives - are compounds or formulations such as TNT, Composition B, or H-6 which are used as the final charge in any explosive application. These explosives, because of their insensitivity, ordinarily require initiation by a booster explosive.

4. GENERAL REQUIREMENTS.

4.1 Cartridge cases, primers and propellants must be safe throughout the intended logistic cycle and be compatible with their prespective gun systems. The data required for evaluation of such shall be addressed in the System Safety Program (see 5.2.2).

4.2 Incendiary mixes used in the assembly of the PIE projectiles shall be qualified in accordance with the test procedures specified herein.

4.3 The explosive compositions used in the assembly of the PIE projectiles shall be either:

- a. A qualified in-line explosive as defined in MIL-STD-1316.
- b. Materials meeting the requirements of ADA-086259 as a booster or main charge explosive.

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NOTE: A booster explosive may be used as a main charge explosive if the proposed projectile application has been approved by the developing service(s) cognizant safety authority.

5. SPECIFIC REQUIREMENTS.

5.1 Safety Qualification Tests. The safety tests enumerated below are designed to qualify small caliber PIE ammunition (40mm and below) throughout the life cycle. Accordingly, the test matrix includes safety qualification/verification tests, logistic handling and storage tests, as well as ammunition development tests. A specific test program should not be limited to or include all tests described in this document. The selection of the tests and test parameters shall be based on PIE initiation mechanism and the measured or analytically forecast logistic cycle environmental profile of the test item. No individual test or group of tests can be evaluated in isolation and the final assessment must consider the results of the developmental as well as safety qualification tests.

5.2. Safety Test Methods.

5.2.1 Classification of Test Methods. Testing of the PIE ammunition shall be classified as development or qualification tests.

5.2.1.1 Development Tests. Sufficient testing should be conducted during ammunition development to assure that the final design passes the qualification tests below. The initiation mechanism should be determined to aid in formulating the total development test spectrum. Energetic materials safety tests shall include those specified in Table I as well as those tests deemed applicable based upon a review of the System Safety Program as required in 5.2.2.

5.2.1.2 Qualification Tests. Qualification testing shall be mandatory prior to safety release of the PIE ammunition for production or service use. The qualification tests for safety release do not address performance and reliability requirements. Qualification tests shall consist of test methods as specified in Table II unless waivers/deviations are authorized by the sponsoring service based upon review of the system safety program.

5.2.2 System Safety Program. The requirements for system safety programs are given in MIL-STD-882, System Safety Program for System and Associated Subsystem and Equipment, Requirements for. The system safety criteria developed in,

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accordance with MIL-STD-882A may impose additional requirements or objectives on the ammunition design or test program.

5.3 Development and qualification Test Reporting. The developer shall compile a data package which documents the test methods and results obtained during development and qualification tests. Safety anomalies evidenced during performance and reliability testing shall be reported for use in the safety assessment. Guidelines are provided in MIL-STD-882 and AFSC HD 1-6 or NAVORD OD 44942. In addition, this data package shall contain technical design information, functional description and safety analysis results which are necessary to verify the adequacy of the qualification test program.

6. NOTES.

6.1 Reviewing Activity. Designs which do not meet the requirements of this standard, or which operate on new principles, and for each new application, shall be presented to a review board for a safety evaluation and certification of compliance or appropriate waiver considerations as follows.

6.1.1 For Army: Commander
US Army Armament Research & Development Command
ATTN: Army Product Manager for Fuzes
Dover, New Jersey 07801

6.1.2 For Navy: Commander
US Naval Sea Systems Command
ATTN: Code 06H
Washington, DC 20362

6.1.3 For Air Force:
Non-Nuclear Munitions Safety Board
ATTN: AD/SES
Eglin Air Force Base
Eglin, Florida 32542

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TABLE I

ENERGETIC MATERIALS SAFETY TESTS FOR THE EXPLOSIVE MATERIALS IN
PIE AMMUNITION

Development testing shall be done in accordance with
ADA-086259.

a. Explosive development testing for Main Charge and
Booster Explosives shall be done in accordance with ADA-086259.

b. Incendiary safety test requirements are:

- (1) Friction sensitivity
- (2) Electrostatic sensitivity
- (3) Impact sensitivity
- (4) Vacuum Thermal stability (VTS)
- (5) Differential thermal analysis (DTA)
- (6) Hazard classification DLAR 8220.1
- (7) Reactivity (MIL-STD-650/M-50A)
- (8) Thermogravimetric Analysis (TGA)
- (9) Growth and Exudation
- (10) Thermomechanical Analysis (RMA)

c. Compatibility Test (VTS and/or DTA). Incendiary mix(es)
explosive fills, and projectile materials of construction must be compatible.

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TABLE II SAFETY QUALIFICATION/VERIFICATION TESTS

<u>TEST DESCRIPTION</u>	<u>TEST METHOD</u>	<u>NOTES</u>
Jolt	MIL-STD-331, Test 101	1
Jumble	MIL-STD-331, Test 102	1
High Temperature	MIL-STD-810, Test 501	2
Low Temperature	MIL-STD-810, Test 502	2
Rain Sensitivity	TECOM TDP 4-2-016	3
1.5 Meter Drop	MIL-STD-331, Test 111	2
Impact Shock	MIL-STD-810, Test 516, Procedure III	2
Explosive Decompression	MIL-STD-810, Test 500, Procedure I	4
Brush Sensitivity	TECOM TDP 4-2-016	3
Rough Handling	MIL-STD-331, Test 114	4
Temperature and Humidity (28 Day)	DOD-STD-2105	2,4,5
Transportation/ Vibration	MIL-STD-810, Test 514 Procedure X	5
Mechanical Shock (Aircraft/Vehicle)	MIL-STD-810, Test 514 (Schedules as applicable)	5,6
Acoustic Shock	MIL-STD-810, Test 515 (Schedules as applicable)	5,7
Temperature and Humidity (4 Day)	DOD-STD-2105	5,6
12 Meter Drop	MIL-STD-331, Test 103	5,8
Propagation	DLAR 8220.1 Test A,B & C	9
Bullet Impact	DOD-STD-2105	10
Slow Cook-Off	DOD-STD-2105	4

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TABLE II (CONT.)

<u>TEST DESCRIPTION</u>	<u>TEST METHOD</u>	<u>NOTES</u>
Fast Cook-off	DOD-STD-2105	6
Hot Gun Cook-off	Using service to supply	11
Impact - Safe Distance	MIL-STD-331, Test 208.1	3
Double (Ram) Feed	Using service to supply	12

NOTES

1. Test conducted on projectiles.
2. Test conducted on complete cartridges.
3. Firing test from a single shot test fixture.
4. Test conducted on cartridge packed in an appropriate shipping container.
5. This test is part of an environmental test series, container is subject to all tests in the test series.
6. Test can also be conducted on cartridges that are loaded into an appropriate ammo drum/feed system.
7. Depending upon the logistics environment that the cartridge will be subjected to, test may not be required.
8. Test is conducted on both cartridges and containers that have been subjected to the environmental test series.
9. DOD Hazardous Material Classification Tests.
10. 7.62mm and 20mm projectiles are fired into a shipping container.
11. Cartridge is chambered into a hot barrel to determine the time to cook-off and as to whether the propellant or the explosive cooked-off first.
12. Test weapon will be determined by the developing service.

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Custodians:

Army - AR

Navy - OS

Air Force - 99

Preparing activity:

Army - AR

Project Number:

13GP-0006

☆U.S. GOVERNMENT PRINTING OFFICE: 1983-605-034/2140

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