NOTE: The cover page of this standard has been changed for administrative reasons. There are no other changes to this document.

METRIC

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DEPARTMENT OF DEFENSE
TEST METHOD STANDARD

HAZARD ASSESSMENT TESTS FOR NON-NUCLEAR MUNITIONS

AMSC N/A

AREA SAFT

FOREWORD

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, Indian Head Division, Naval Surface Warfare Center, Standardization Branch (Code 8420), Indian Head, MD 20640-5035, by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

3. This document contains a description of tests for the assessment of munition safety and insensitive munitions (IM) characteristics of non-nuclear munitions. Historically, this standard was used primarily for the assessment of explosive safety. The standard was later revised to add additional IM tests as called out by the Joint Service Requirement for Insensitive Munitions (JSRIM). This revision makes a distinction between explosive safety tests and the IM tests as contained in the JSRIM even though it is recognized that these tests may often be contained in the same system hazard assessment test program.

4. Three sets of tests are commonly used to assess munitions with respect to hazards: IM tests as contained in this standard; hazard classification tests used to classify munitions for transportation and storage purposes; and system specific tests used to assess the role of munition response on system vulnerability. In order to best utilize limited resources and avoid test redundancy, IM test plans should be tailored, to the maximum extent possible within the guidelines contained in this standard, so that all three sets of tests can be addressed in one coordinated test program with the minimum number of samples. Therefore, it is recommended that test plans be coordinated with the appropriate service hazard classifier and the Department of Defense Explosives Safety Board (DDESB), 2461 Eisenhower Avenue, Alexandria, VA 22331-0600, when a DOD hazard classification for an item is to be obtained in accordance with TB 700-2[1].

5. Additional or modified hazard testing may be required to fully assess the tactical and logistical vulnerability of the given weapon system against the probable threats to which the system may be subjected. Accordingly, project managers and munition developers will conduct a threat hazard assessment to determine the adequacy of IM tests as specified in this standard. If the assessment indicates that different environmental hazards or threats to the weapon system pose additional vulnerability problems, then the IM tests will be tailored to meet those requirements and a rationale to support the assessment will be provided.

6. Program managers are responsible for planning and executing a hazard assessment test program. The hazard assessment test program includes a test plan based on a

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[1] TB 700-2, "Department of Defense Ammunition and Explosives Hazard Classification Procedures," is also known as NAVSEAINST 8020.8, TO 11A-1-47, and DLAR 8220.1.

realistic life cycle environmental profile. Program managers should establish safety design goals for the test plan and these goals should be approved by the service review organization within the applicable department. Program managers should generate a test report for submission to their service review organization.

7. The service review organization should review the test plan and test report and examine the results of the hazard assessment test program to ensure that safety and insensitive munitions requirements are met. The service review organization should produce a final recommendation for or against service use of the weapon system. For joint programs, all affected service review organizations should conduct this review and examination and develop a final recommendation.

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1. SCOPE

1.1 Scope. This standard covers tests and test procedures for assessment of safety and insensitive munitions (IM) characteristics for all non-nuclear munitions, munition subsystems and explosive devices.

1.2 Purpose. The purpose is to provide a framework for the development of a consolidated safety and IM assessment test program for non-nuclear munitions. The tests are to characterize the munitions and provide the service review organization information with which to make a decision.

1.3 Application. This standard applies to all non-nuclear munitions (i.e., all-up missiles, rockets, pyrotechnics), and munitions subsystems (e.g., warheads, fuzes, cartridge actuated devices, propulsion units, safe and arm devices, pyrotechnic devices, chemical payloads), and other explosive devices. In all likelihood, it may not be possible to test against all threats. In this case, the most probable event that causes the greatest damage to life, property, or combat effectiveness should govern.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

STANDARDS

MILITARY

MIL-STD-167-1	Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II-Internally Excited)
MIL-STD-210	Climatic Information to Determine Design and Test Requirements for Military Systems and Equipment
MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Tests for
MIL-STD-453	Inspection, Radiographic
MIL-STD-810	Environmental Test Methods and Engineering Guidelines
MIL-STD-882	System Safety Program Requirements
MIL-STD-1670	Environmental Criteria and Guidelines for Air-Launched Weapons

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI Y14.3	Multi and Sectional View Drawings (DOD Adopted)

(Application for copies should be addressed to the American National Standards Institute, 11 West 42nd Street, New York, NY 10036.)

ELECTRONIC INDUSTRIES ASSOCIATION (EIA)

EIA 170	Electrical Performance Standards - Monochrome Television Studio Facilities
EIA 330	Electrical Performance Standards for Closed Circuit Television Camera 525/60 Interlaced 2:1

(Application for copies should be addressed to the Electronic Industries Association, 2001 Eye Street, NW, Washington, DC 20006.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. DEFINITIONS

3.1 All-up-round (AUR). This refers to the completely assembled munition as intended for delivery to a target or configured to accomplish its intended mission. This term is identical to the term all-up-weapon.

3.2 Bare round or configuration. A munition with no external protection or shielding from the environment such as a container, barrier or shield.

3.3 Explosive. An explosive is a solid or liquid substance (or a mixture of substances) which is in itself capable, by chemical reaction, of producing gas at such temperature, pressure and speed as to cause damage to the surroundings. Included are pyrotechnic substances even when they do not evolve gases. The term explosive includes all solid and liquid materials variously known as high explosives and propellants, together with igniter, primer, initiation and pyrotechnic (e.g., illuminant, smoke, delay, decoy, flare and incendiary) compositions.

3.4 Explosive device. An item that contains explosive material(s) and is configured to provide quantities of gas, heat, or light by a rapid chemical reaction initiated by an energy source usually electrical or mechanical in nature.

3.5 Exudation. A discharge or seepage of material. The material may be a component of a chemical payload, a component of an explosive/propellant payload, or a reaction product from incompatibility or aging of munition components.

3.6 Hazardous fragment. For personnel, a hazardous fragment is a piece of the reacting weapon, weapons system or container having an impact energy of 79 N•m (58 lbf•ft) (see 6.8) or greater.

3.7 Insensitive munitions (IM). Munitions which reliably fulfill (specified) performance, readiness and operational requirements on demand, but which minimize the probability of inadvertent initiation and severity of subsequent collateral damage to the weapon platform (including personnel) when subjected to unplanned stimuli.

3.8 Munition. An assembled ordnance item that contains explosive material(s) and is configured to accomplish its intended mission.

3.9 Munition subsystem. An element of an explosive system that contains explosive material(s) and that, in itself, may constitute a system.

3.10 Propulsion. A reaction whereby adequate force is produced to impart flight to the test item in its least restrained configuration as determined by the life cycle analysis.

3.11 **Reaction types.**

a. **Type I (Detonation Reaction).** The most violent type of explosive event. A supersonic decomposition reaction propagates through the energetic material to produce an intense shock in the surrounding medium, air or water for example, and very rapid plastic deformation of metallic cases, followed by extensive fragmentation. All energetic material will be consumed. The effects will include large ground craters for munitions on or close to the ground, holing/plastic flow damage/fragmentation of adjacent metal plates, and blast overpressure damage to nearby structures.

b. **Type II (Partial Detonation Reaction).** The second most violent type of explosive event. Some, but not all of the energetic material reacts as in a detonation. An intense shock is formed; some of the case is broken into small fragments; a ground crater can be produced, adjacent metal plates can be damaged as in a detonation, and there will be blast overpressure damage to nearby structures. A partial detonation can also produce large case fragments as in a violent pressure rupture (brittle fracture). The amount of damage, relative to a full detonation, depends on the portion of material that detonates.

c. **Type III (Explosion Reaction).** The third most violent type of explosive event. Ignition and rapid burning of the confined energetic material builds up high local pressures leading to violent pressure rupturing of the confining structure. Metal cases are fragmented (brittle fracture) into large pieces that are often thrown long distances. Unreacted and/or burning energetic material is also thrown about. Fire and smoke hazards will exist. Air shocks are produced that can cause damage to nearby structures. The blast and high velocity fragments can cause minor ground craters and damage (breakup, tearing, gouging) to adjacent metal plates. Blast pressures are lower than for a detonation.

d. **Type IV (Deflagration Reaction).** The fourth most violent type of explosive event. Ignition and burning of the confined energetic materials leads to nonviolent pressure release as a result of a low strength case or venting through case closures (loading port/fuze wells, etc.). The case might rupture but does not fragment; closure covers might be expelled, and unburned or burning energetic material might be thrown about and spread the fire. Propulsion might launch an unsecured test item, causing an additional hazard. No blast or significant fragmentation damage to the surroundings; only heat and smoke damage from the burning energetic material.

e. **Type V (Burning Reaction).** The least violent type of explosive event. The energetic material ignites and burns, non-propulsively. The case may open, melt or weaken sufficiently to rupture nonviolently, allowing mild release of combustion gases. Debris stays mainly within the area of the fire. This debris is not expected to cause fatal wounds to personnel or be a hazardous fragment beyond 15 m (49 ft).

3.12 Service review organization. The various organizations within the services which are responsible for the assessment of explosive safety and IM characteristics (see 6.5).

3.13 Sympathetic detonation. The detonation of a munition or an explosive charge induced by the detonation of another like munition or explosive charge.

3.14 Threat hazard assessment (THA). An evaluation of the munition life cycle environmental profile to determine the threats and hazards to which the munition may be exposed. The assessment includes threats posed by friendly munitions, enemy munitions, accidents, handling, etc. The assessment shall be based on analytical or empirical data to the extent possible.

3.15 Weapon system. A munition and those components and equipment required for its operation and support.

4. GENERAL REQUIREMENTS

4.1 General. A hazard assessment test program shall comprise a test plan generated in concert with an environmental profile and a THA. Rationale for not including any hazards or tests identified in the THA shall be presented to the service review organization for review and approval prior to executing the test program.

4.1.1 Test plan. A test plan shall be developed (see 6.3), and shall be based on the life cycle environmental profile. The test plan shall include provisions for the conduct and sequence of tests and any environmental conditioning as illustrated on figure 1 (see 6.3). The appropriate service review organization shall review and concur with the test plan prior to conduct of the tests and may authorize deviations to the tests and procedures in this document when justified. The test plan may include additional tests selected from other sources or devised to investigate hazardous conditions and environments identified by hazard analyses performed as part of the system safety program described in MIL-STD-882.

4.1.2 Environmental profile. A life cycle environmental profile shall be developed using the guidance available in other documents for establishing such profiles, e.g., MIL-STD-1670 for air launched weapons. The profile shall establish the worst case environmental conditions and limits the munitions will encounter throughout the life cycle, such as temperature, humidity, and vibration. MIL-STD-210 contains information to assist in developing the climatic portion of an environmental profile. The environmental profile shall be used in performing the THA and shall be cited in the test plan. The service review organization shall review and concur with the environmental profile prior to conduct of the tests. Also, the THA shall be submitted to the service review organization for approval.

4.1.3 Threat hazard assessment (THA). A THA shall be developed (see 6.3) and shall contain an analysis of the munition life cycle. The assessment shall identify potential hazards, both qualitatively and quantitatively, and their causes and effects.

4.2 Test parameters. The safety and sensitivity characteristics of the item shall be determined under conditions that simulate or duplicate the hazards of credible normal, abnormal or combat situation(s) identified by the THA (see 6.3). The test parameters shall be selected to reflect maximum stress levels forecasted by the THA, e.g., bullet impact velocity.

4.2.1 Test item temperature. Unless otherwise specified (see 6.4), all ambient temperature test items shall be at 25 ± 10 degrees Celsius (°C) (77 ± 18 degrees Fahrenheit (°F)).

4.3 Passing criteria. Passing criteria for the tests are in section 5. Failure to meet all predetermined test criteria is not necessarily grounds for automatic rejection of that weapon system for service use.

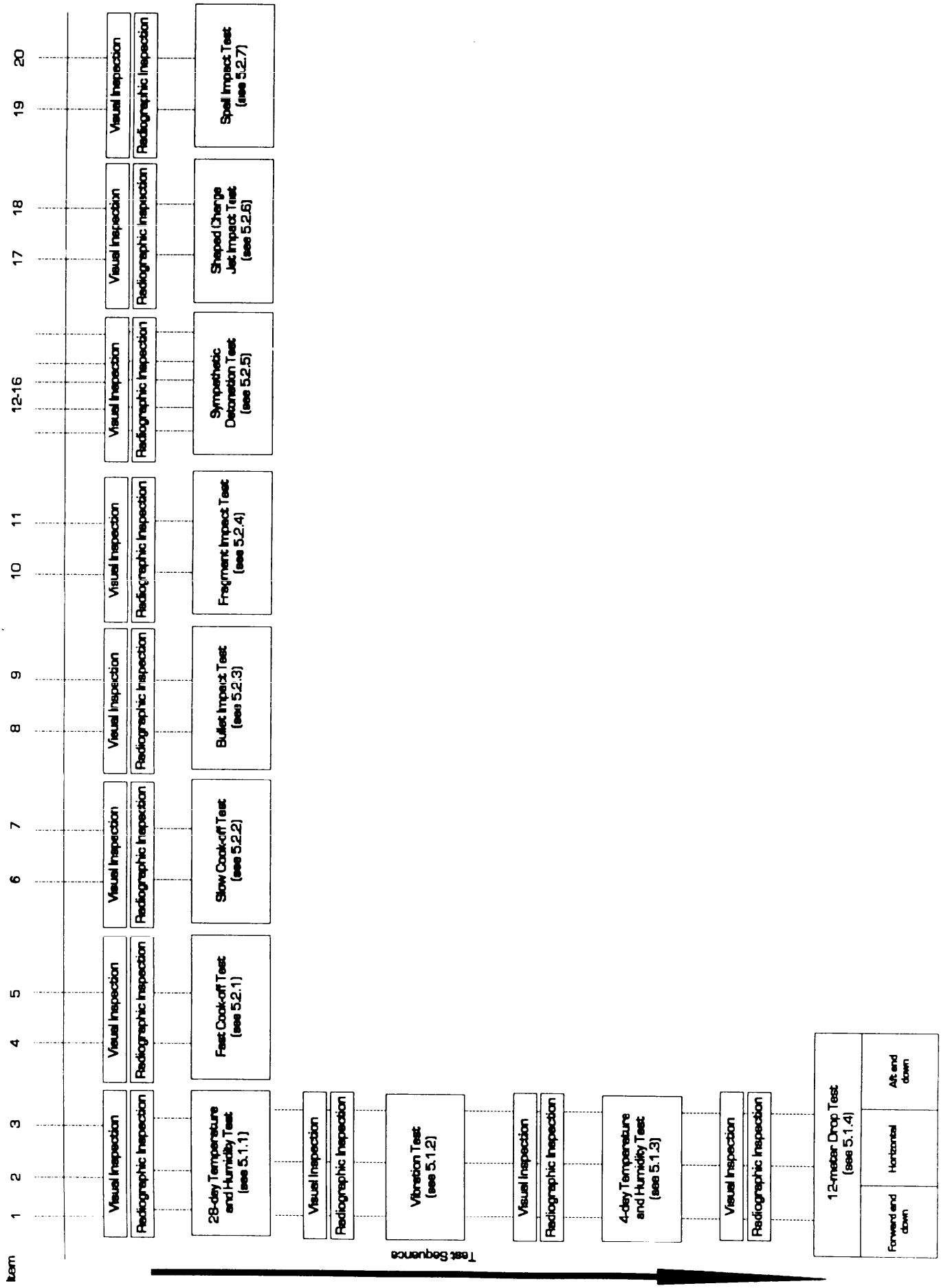


FIGURE 1. "Typical" item number and test sequence.

4.4 Hazard assessment test report. A hazard assessment test report shall be developed (see 6.3), shall contain detailed information specified herein (see section 5), and shall be consistent with the test plan (see 4.1.1). It shall address rationale for deviations from the test plan and shall include test item configuration and identification, test date, test results, and safety and vulnerability related conclusions that may be drawn from the test results. The test results shall be described using the definitions listed in section 3.

4.5 Hardware. The item to be tested shall either be production hardware or a representative of production hardware. Use of simulated components for non-explosive components is acceptable providing they accurately simulate the thermal and confinement characteristics of their counterparts. When the item differs from production hardware, the test plan shall so indicate.

4.6 Test equipment. Test equipment or test fixtures used shall not interfere with the test stimulus being imposed on the test item. Unless otherwise specified, tolerances of test conditions and instrumentation calibrations shall be in accordance with MIL-STD-810.

4.6.1 Witness plates. Witness plates are used to "witness" a reaction by providing an impact surface for fragments and shock waves. Witness plates shall be designed to survive a reaction and provide post-test physical evidence of its severity. Information regarding the degree of test item fragmentation may be obtained by locating witness plate(s) away from the test item. Plates selected for this application should be relatively thin to permit sufficient data collection of impacting fragments. Alternatively, information regarding the shock pressure produced by the reacting explosive(s) may be obtained by placing witness plate(s) in direct contact with the test item. The plates selected for this application shall be of sufficient thickness, hardness, and strength to withstand detonation of the test item without fracturing. Determination of the specific number, types, sizes, and location of the witness plates is the responsibility of the testing activity. However, the testing activity shall ensure that the witness plates are integrated into the test setups in a manner that will not influence the response of the test item and does not compromise the collection of other required data while accurately collecting data.

4.7 Configuration. The test item configuration shall accurately represent the configuration of the item in the life cycle phase being duplicated by the test. Temperature and humidity, bullet impact, fragment impact, slow cook-off, shaped charge jet and shaped charge jet spall impact tests may be done on the major munition subsystem level. For fast cook-off, the warhead and propulsion section may be tested separately in a simulated AUR configuration. The electronic or other sections not containing explosives may be mechanically, geometrically and thermally simulated for any test. The test item configuration to be used shall be specified in detail in the test plan and approved by the service review organization. Test items shall be mounted so they do not affect the munition response to the given test.

4.8 Pre-test examination. Unless otherwise specified (see 6.4), prior to each test (see figure 1), the test item shall undergo visual and radiographic inspection, in accordance with MIL-STD-453, to assure that no unusual conditions exist that might invalidate the tests. All unit safety mechanisms and devices shall be set or otherwise adjusted to a safe condition. Photographs of the test setup shall be taken (see 6.3), and shall include identification information (MK, MOD, test facility, date, etc.) in the field of view.

4.9 Post-test requirements. A complete description of significant post-test remains of the munition is required. The location (distance from original test position), dimensions and weight of each significant recovered part shall be documented on the appropriate test data sheet. The estimated reaction level (Type I, II, etc.) (see 3.11) may be recorded on the test data sheet if marked "unofficial." The official reaction violence level shall be determined by the appropriate service review organization. The data sheets shall be provided with the test report (see 6.3). Photographs of the test remains shall be taken (see 6.3), and shall include identification information (MK, MOD, test facility, date, etc.) in the field of view.

4.10 Photographic requirements. The photographic media to be used shall be selected from the following (see 6.3):

4.10.1 Still photograph coverage. Still photography shall be done in black and white or color, as specified in the contract. The film format size and the number of original prints and negatives shall be specified in the contract. When negative color material is used, the original color negative and one matching positive color transparency shall be included. All negatives shall be placed in negative preservers.

4.10.2 Video coverage. The video quality shall be as described in EIA 170 and EIA 330. The video media shall be a video tape recorder utilizing magnetic video tape. Normal speed video coverage shall have a frame rate of 18 to 30 frames per second and shall include synchronous sound recording. High speed video coverage shall have a frame rate of 400 frames per second, minimum.

4.10.3 Motion picture coverage. Motion picture coverage shall utilize professional quality footage. All footage shall be unedited. Normal speed motion picture coverage shall have a frame rate of 18 to 30 frames per second and shall include synchronous sound recording. High speed motion picture coverage shall have a frame rate of 400 frames per second, minimum, or as required by the test plan (see 4.1.1). The sympathetic detonation test shall be recorded using high speed motion picture cameras capable of photographing 32,000 images per second, minimum, or as required by the test plan (see 4.1.1).

4.10.4 Instrumentation photography. Instrumentation photography shall utilize professional quality color positive film with a time base recorded on the film preferably in the sprocket area rather than the image area. Video tape closed circuit color television shall also be used.

5. DETAILED REQUIREMENTS

5.1 Basic safety tests. All of the following tests shall be considered for inclusion in the hazard assessment test program. Unless otherwise specified (see 6.4), three test items shall be tested sequentially as shown on figure 1.

5.1.1 28-day temperature and humidity (T&H) test.

5.1.1.1 Description of test. The 28-day T&H test consists of exposing the test item to alternating 24-hour periods (no period lasting less than 24 hours) of high and low temperatures for a total of 28 days. The temperature range and relative humidity shall be derived from the environmental profile of 4.1.2. A minimum of three test items shall be tested.

5.1.1.2 Test procedure. Test procedures shall be developed (see 6.3) and shall reflect the temperature and humidity conditions measured or forecast. Each test item shall be visually examined prior to testing and the appropriate critical dimensions recorded. Unless otherwise specified (see 6.4), prior to testing, test items shall be radiographically examined in accordance with MIL-STD-453 to determine material condition.

5.1.1.2.1 Test equipment. Equipment shall be capable of producing the temperatures and humidity over the time spans specified in 5.1.1.1. Equipment design shall be such that it will not obstruct the free flow of air in contact with the item under test. Separate equipment is recommended for each test environment extreme specified.

5.1.1.2.2 Temperature cycling. The test shall commence by subjecting the test item to either the high or low temperature environment for the specified 24-hour period. At the end of this period, the test item shall be transferred to the other environment. Test item transfer time shall not exceed 30 minutes. Transfer time exceeding 30 minutes shall be documented in the test data report (see 5.1.1.5 and 6.3). At the end of each high and low temperature cycle change, the test item shall be inspected for damage and the exudate (if any) collected for chemical analysis. Testing and inspections shall continue for the number of periods specified for the test.

5.1.1.2.3 Test interruptions. Interruptions of the test shall be held to a minimum. If the test is interrupted by slack labor periods (weekends, holidays), the last test environment encountered prior to the slack period shall be maintained during the slack period. The test period shall be extended as necessary to complete at least 20 temperature changes (hot/cold) or 10 full cycles. A full cycle shall consist of two temperature changes, e.g., hot-to-cold-to-hot.

5.1.1.3 Instrumentation. The temperature and humidity levels of the test chamber shall be continuously monitored and recorded.

5.1.1.3.1 Photography. Still photographs shall be used to record the condition of the test item and test setup prior to and after the test (see 6.3).

5.1.1.4 Passing criteria. These criteria are based on the final observation.

a. No reaction of the explosive.

b. No exudation containing explosive material.

c. Explosives shall not crack or separate in a manner which would create a hazardous condition.

d. All safety devices shall remain in the safe position or safe condition.

e. The structural integrity of the item shall not be compromised by corrosion, loosening of joints or other physical distortions.

5.1.1.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.1.2 Vibration test.

5.1.2.1 Description of test. The vibration test consists of exposing the test item to the most intense vibration environment that it will normally encounter during the life cycle as determined by the THA. A minimum of three items which have undergone testing in accordance with 5.1.1 shall be tested.

5.1.2.1.1 Vibration orientation. Vibration test shall be conducted along the appropriate mutually perpendicular axes, and may consist of one or a combination of the following: random vibration, vibration cycling and resonant dwell.

5.1.2.1.2 Vibration schedule. The vibration schedule shall be selected from the environmental profile of 4.1.2.

5.1.2.1.3 Changes in vibration schedule. Changes in the selected schedule of vibration levels, frequency ranges, and time duration of the test can be effected by the program manager or the procuring activity with the approval of the service review organization.

5.1.2.1.4 Test temperatures. Vibration tests shall be conducted at low and elevated temperatures rather than ambient temperature if the anticipated environment so dictates.

5.1.2.2 Test procedures. Test procedures shall be developed (see 6.3), and shall reflect vibration modes and temperatures anticipated in the item's environment. A minimum of three items which have undergone testing in accordance with 5.1.1 shall be tested. Vibration environments as specified in MIL-STD-167-1 and MIL-STD-810 shall be considered including one or more of the following:

5.1.2.2.1 Transportation vibration. If the item is always containerized when transported, then the item shall be vibrated in the container. Vibrate the item in the

normal configuration as shipped. The item may be vibrated in the bare configuration if it can be shown that testing in the bare configuration produces an equivalent environment. If the item is stowed in a ready service configuration, then the item shall be vibrated in a fixture and orientation representative of that configuration.

5.1.2.2.2 Aircraft vibration. The item shall be vibrated in the configuration utilized for aircraft combat carriage.

5.1.2.2.3 Shipboard vibration. The item shall be vibrated in its shipboard stowage configuration. Should the item be carried on a launcher or in a ready service configuration, then the item shall be vibrated in a fixture and orientation representative of that configuration also.

5.1.2.3 Instrumentation. Recordings of the test equipment inputs and test item responses are required. Temperature recordings of the test item shall be made at both the skin and internal free space.

5.1.2.3.1 Photography. Still photographs shall be used to record the condition of the test item and setup prior to and after the test (see 6.3).

5.1.2.4 Passing criteria. These criteria are based on the final observation.

a. No reaction of the explosive.

b. No exudation containing explosive material.

c. Explosives shall not crack or separate in a manner which would create a hazardous condition.

d. All safety devices shall remain in the safe condition.

e. The structural integrity of the item shall not be compromised by corrosion, loosening of joints or other physical distortions.

5.1.2.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.1.3 4-day temperature and humidity (T&H) test.

5.1.3.1 Description of test. The 4-day T&H test is a 4-day version of the 28-day T&H test and consists of exposing the item to alternating 24-hour periods of temperature range and relative humidity as derived from the environmental profile of 4.1.2. All data relative to the 28-day T&H test is required for the 4-day T&H test (see 5.1.1 and 6.3). A minimum of three items which have undergone testing in accordance with 5.1.1 and 5.1.2 shall be tested. The test items shall be subjected to two complete cycles.

5.1.3.2 Passing criteria. These conditions are based on the final observation.

a. No reaction of the explosive.

b. No exudation containing explosive material.

c. Explosives shall not crack or separate in a manner which would create a hazardous condition.

d. All safety devices shall remain in the safe condition.

e. The structural integrity of the item shall not be compromised by corrosion, loosening of joints or other physical distortions.

5.1.3.3 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.1.4 12-meter (40-foot) drop test.

5.1.4.1 Description of test. The 12-m (40-ft) drop test is a field test designed to evaluate the safety response of the test item to the stress loads associated with a free-fall impact onto a striking plate in various attitudes. The 12-m (40-ft) drop test procedures governed by other documents, such as MIL-STD-331, may be utilized if suitable and approved by the service review organization.

5.1.4.2 Test procedures. The item shall be dropped from a minimum height of 12 m (40 ft) (measured from the lowest point of the item to the point of impact) complying with each of the orientations specified in 5.1.4.2.1.

5.1.4.2.1 Impact surface and orientation. The test consists of free-fall drops of the environmentally preconditioned items (if appropriate) (see figure 1) in the configuration of the item in the life cycle phase being duplicated by the test (one drop per item) onto the striking plate. The striking plate shall be made of steel with a minimum thickness of 76 mm (3 in) and a Brinell hardness of not less than 200. It shall have a reasonably smooth surface and a length and width of at least one and one-half times the maximum dimensions of the unit being tested. The plate shall be solidly supported over its horizontal plane and bearing surface by a concrete or crushed stone foundation. The foundation shall have a minimum thickness of 610 mm (24 in). The item impact attitudes for each drop are:

a. Longitudinal axis horizontal
b. Longitudinal axis vertical (aft-end down)
c. Longitudinal axis vertical (forward-end down).

The angular deviation of the test item from the above three attitudes at the moment of impact shall be ± 10°.

5.1.4.2.2 Guidance. One or more guiding devices may be used to assure that the item impacts at the desired striking angle. These devices shall not decrease the striking velocity of 15 m/s (49 ft/s) by more than 1.5 m/s (4.9 ft/s), nor shall they impede the item rebound after impact.

5.1.4.2.3 Examination and documentation. A safety waiting period prescribed by the test activity shall be observed after each drop. All safety precautions shall be observed while handling the dropped item. The item shall be examined, and visible damage documented.

5.1.4.3 Instrumentation. Photographic or other instrumentation shall be utilized to verify striking orientation. Recommended instrumentation for the test includes motion picture photography or video tape closed circuit color television (see 6.3). Still photographs shall be used to record the condition of the test item and setup prior to and after the test (see 6.3).

5.1.4.4 Passing criteria. No reaction of the explosives in the item. No rupture of the test item which dislodges or disrupts explosive material. The item shall be safe to handle and be disposed by normal explosive ordnance disposal (EOD) procedures. All safety devices shall remain in a safe condition.

5.1.4.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.2 Insensitive munitions (IM) tests. The tests contained in this section provide a basis to test munitions against meaningful potential threats and evaluate munition response against criteria which reflect the services IM vulnerability and hazard reduction goals. Tests shall be conducted on munitions in either the storage/transport (logistical) configuration or the operational (tactical) configuration, or both. Threats and acceptance criteria have not been fully standardized for all operational configuration tests since the threat and acceptable level of munition response may be different for each weapon platform. In all cases, the THA and a system threat analysis should be used to determine particular test and test parameters for the operational configuration test.

5.2.1 Fast cook-off test.

5.2.1.1 Description of test. The fast cook-off (FCO) test consists of engulfing the test item in the flame envelope of a fire and recording its reaction as a function of time.

5.2.1.2 Test procedure.

5.2.1.2.1 Fuel basin. The fuel basin shall be large enough to ensure complete engulfment of the item by the fire for the duration of the test. The dimensions of the fuel basin shall be determined by the size and shape of the test item and the type of fuel to be used.

5.2.1.2.2 Test configuration. The test item configuration shall be determined by the THA. Items shall be restrained to avoid launching due to a propulsive reaction. The restraining and suspension method shall not interfere with heating of the item. A minimum of two items shall be tested separately. Where practical, the test should be designed to address both IM and hazard classification requirements.

5.2.1.2.3 Position. The item shall be positioned with its major axis horizontal or in the attitude most probable as determined by the item's THA. The distance of the test item's surface to the fuel should be sufficient to allow full combustion to take place without unduly increasing the chance of occasional emergence of the test item out of the flame envelope. In order to ensure that the test item is not positioned in a cooler, fuel-rich area of the flame, the position shall satisfy the temperature requirement of 5.2.1.2.6. For air-launched weapons, the centerline of the item will be 914 mm (36 in) above the surface of the liquid fuel basin. Methods shall be employed to prevent the test item from falling into and being quenched by the fuel.

5.2.1.2.4 Fuel. Sufficient wood or hydrocarbon fuel, JP-4, JP-5, JP-8, JET A-1 for example, shall be used to ensure that the item reacts while engulfed in the fire. Alternate fuels, such as propane, or natural gas may be used if testing verifies that the overall test item heating rate, uniformity of spatial heating to the item, and type of radiation heat transfer duplicates those of the hydrocarbon fuel fire. The quantity of fuel required is a function of the size of the test site and the characteristics of the item being tested.

5.2.1.2.5 Flame temperature rise time. The time until flame temperature, as measured by any two thermocouples defined in 5.2.1.2.7, reaches 540°C (1,000°F) shall be recorded.

5.2.1.2.6 Average flame temperature. The average flame temperature should be at least 870°C (1,600°F) as measured by all valid thermocouples defined in 5.2.1.2.7 at the test item without contribution of the burning ordnance. This temperature is determined by averaging the temperature from the time the flame reaches 540°C (1,000°F) until all ordnance reactions are completed.

5.2.1.2.7 Thermocouples. Four thermocouples with time constants of 2.0 s or less shall be located 102 to 203 mm (4 to 8 in) outside the ordnance skin for each item tested. The thermocouples shall be positioned on each end and side of the ordnance skin in a horizontal plane through the ordnance center line. Thermocouple readings shall be recorded at least once every second until the test is completed.

5.2.1.3 Instrumentation. Measurement of the fire flame temperature as a function of time is required. Internal munition temperatures may be required if specified in the test plan. If internal sensors are used, they shall not alter or damage the test munition to an extent which would invalidate the test results. Bore pressure measurements can be taken on propulsion units to aid in determining thrust.

shown

5.2.1.3.1 Photography. Still photographs shall be used to record the condition of the test item and test site prior to and after the test (see 6.3). The cook-off event shall be recorded using video or motion picture sound photography (see 6.3).

5.2.1.4 Passing criteria. No reaction more severe than Type V. All safety devices shall remain in a safe condition.

5.2.1.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.2.2 Slow cook-off test.

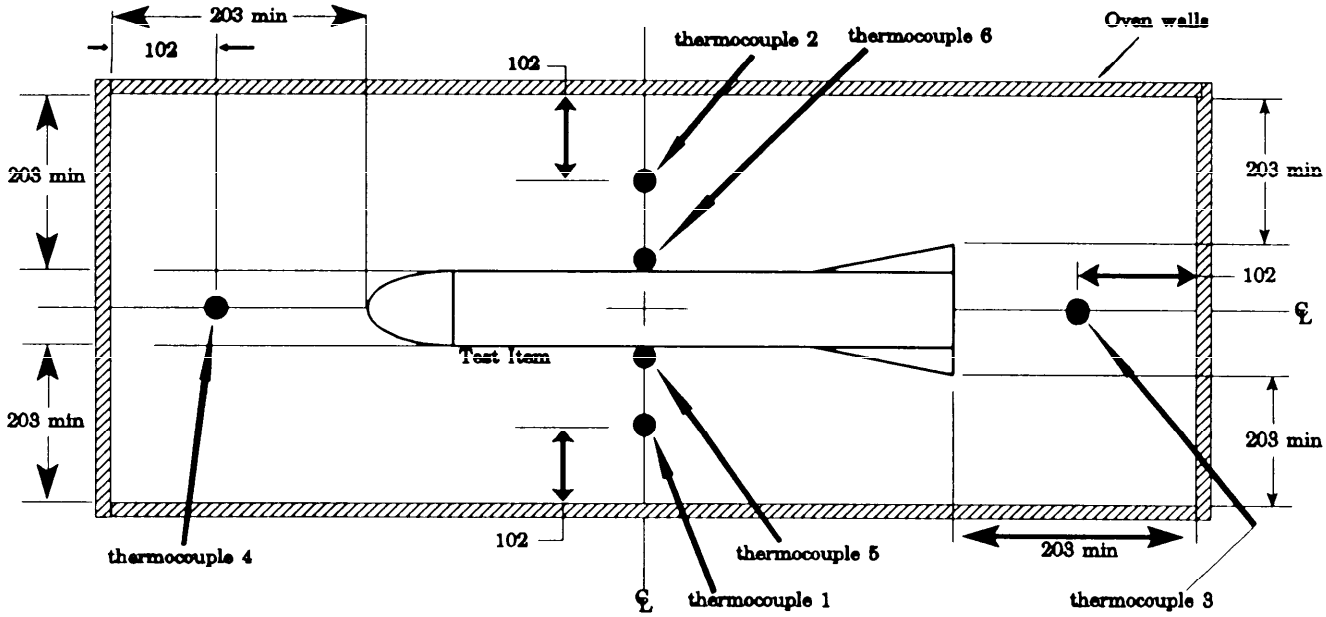
5.2.2.1 Description of test. The slow cook-off (SCO) test consists of subjecting the test item to a gradually increasing temperature until reaction occurs or as directed by the test plan. The determination of the applicability of this test shall be based on the THA.

5.2.2.2 Test procedures. The test item may be preconditioned at the munition's upper environmental temperature limit for eight hours prior to the start of the test. The temperature is gradually increased linearly at a rate of 3.3°C (6°F) per hour until reaction occurs. A higher rate of temperature increase may be used if determined to be a credible threat by the THA. Temperatures and elapsed test time shall be observed and measured continuously. A minimum of two items shall be tested separately.

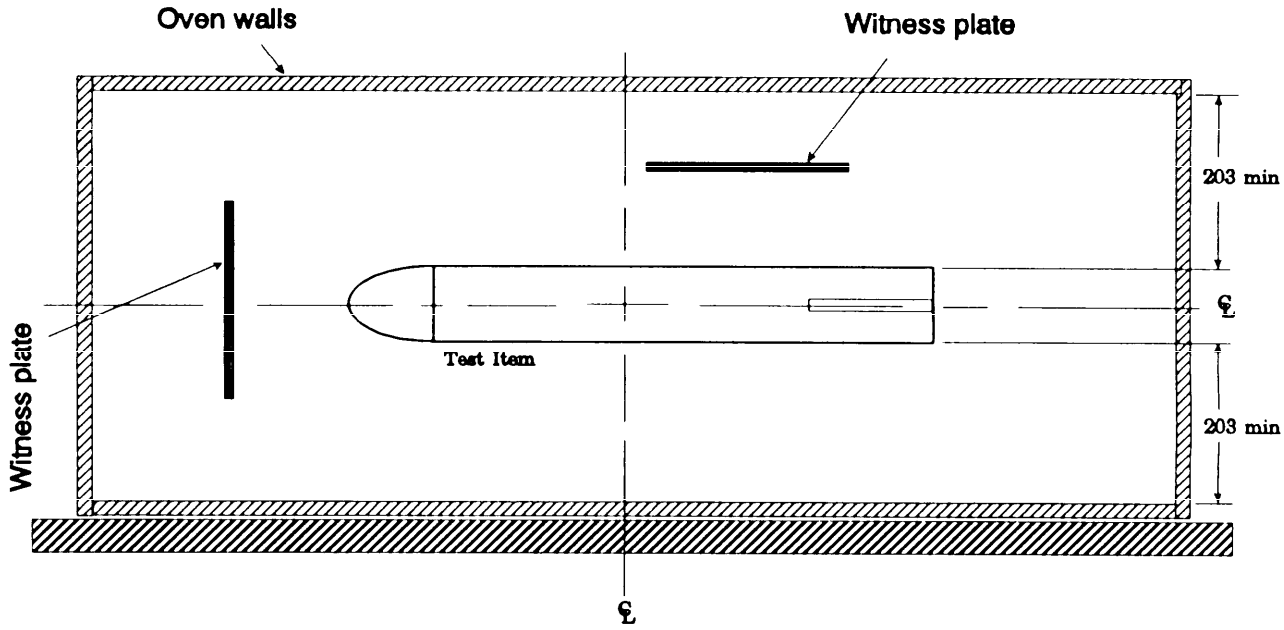
5.2.2.2.1 Test equipment. Test equipment shall be capable of providing a controlled thermal environment and of increasing the oven air temperature, with the test item inside the oven, at a linear rate of 3.3°C (6°F) per hour, or a determined higher rate, throughout the temperature operating range. Its design shall minimize hot spots and ensure by circulation (or other means) a uniform thermal environment to the item under test. The oven shall be designed to minimize the possibility of secondary reactions such as those caused by exudate contacting the heating element(s). A means of relief shall be provided for the increased air pressure that will be generated by the test due to heating. A minimum of 203 mm (8 in) separation distance between all outer surfaces of the test item and the inner walls of the oven is required. Oven materials, wall thickness, placement, etc., shall be designed to minimize confinement of the test item reaction. Figure 2 provides a typical oven sketch with thermocouple locations shown in the top view.

5.2.2.3 Instrumentation.

5.2.2.3.1 Temperature recording. Temperature recording devices (permanent record type) shall be used to record temperatures. A minimum of four oven internal air temperature-measuring thermocouples shall be installed. These thermocouples shall be located as shown on figure 2 (thermocouples 1 through 4). Either thermocouple number 1 or 2 on figure 2 can be used as the oven control thermocouple. A minimum of two test item reaction temperature thermocouples shall be attached to the test item external surface located as shown on figure 2 (thermocouples 5 and 6). Thermocouple sampling rates shall be at least once per minute.



Top View (witness plates not shown)



Elevation View

NOTES: All dimensions are in millimeters; all measurements are taken from internal oven walls. Interpret views in accordance with ANSI Y 14.3.

FIGURE 2. "Typical" slow cook-off oven.

5.2.2.3.2 Witness plates. Witness plates shall be positioned to provide evidence of the severity of the test item reaction (see figure 2).

5.2.2.3.3 Photography. Still photographs shall be used to record the condition of the test item and test site prior to and after the test (see 6.3). The cook-off event shall be recorded using video or motion picture sound photography (see 6.3).

5.2.2.4 Passing criteria. No reaction more severe than Type V.

5.2.2.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3).

5.2.3 Bullet impact test.

5.2.3.1 Description of test. The bullet impact test is conducted to determine the reaction of the test item when impacted by one to three caliber .50 type M2 armor-piercing (AP) projectiles (based on the THA) aimed at a common point at a velocity of 850 ± 60 m/s (2,800 ± 200 ft/s). Items (small arms, explosive charges, etc.) may be tested in their stowage configuration if justified by their THA.

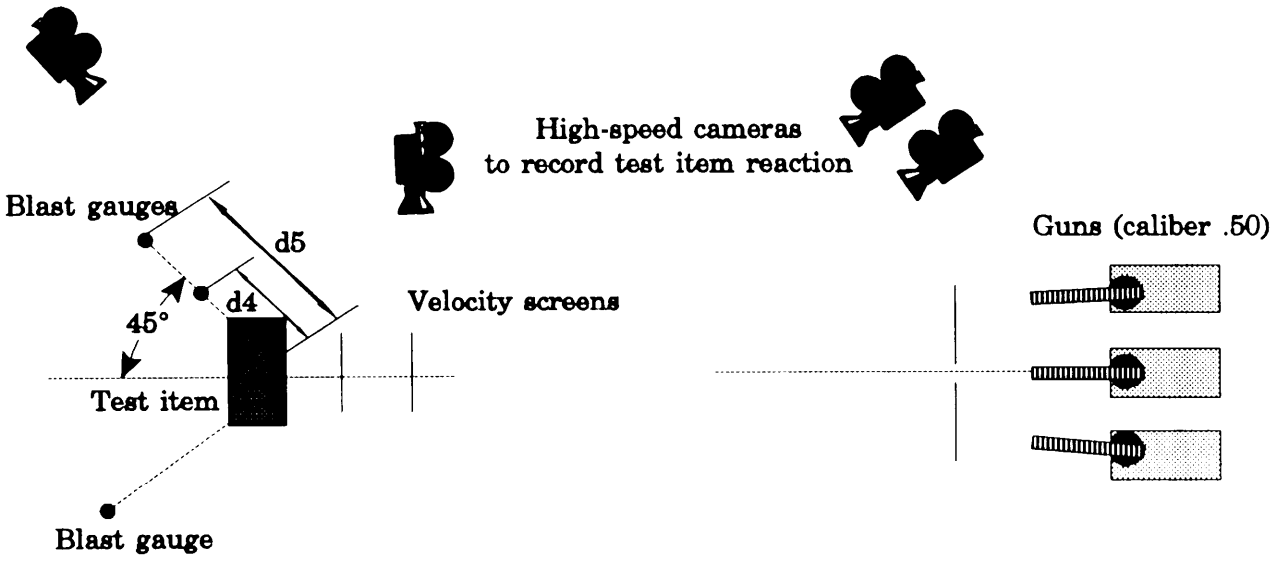
5.2.3.2 Test procedure. Figure 3 provides a schematic of a typical test configuration. The locations of instrumentation (blast gauges, cameras, etc.) are provided for information only. The exact positions and types of equipment used shall be selected by the test activity based on the size of the test item and its expected response. The firing interval shall be 80 ± 40 milliseconds (ms). A minimum of two test items shall be tested with the impacting bullets penetrating the most sensitive material(s) that is not separated from the main explosive charge by barriers or other safety devices in one test item and the bullets aimed at the most shock-sensitive location (typically the ignition/initiation system) of the other test item.

5.2.3.3 Instrumentation.

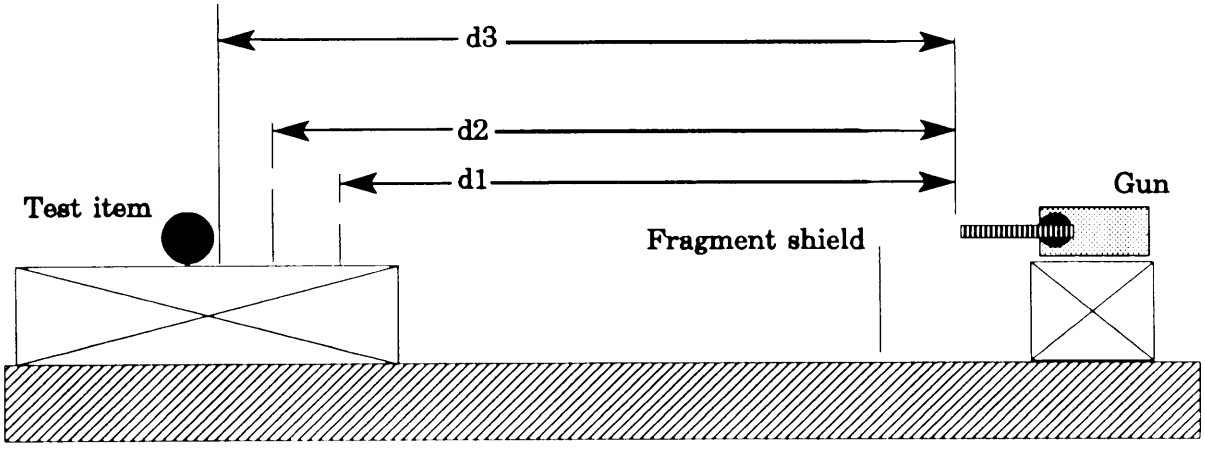
5.2.3.3.1 Airblast overpressure. Measurement of the airblast overpressure produced by the test item is optional. If gauges are used, they shall be capable of recording the pressure as a function of time and have sufficient frequency response to adequately follow the pressure history if the energetic material detonates. The gauges shall be calibrated to record the peak pressure expected from the detonation of the test item energetic material.

5.2.3.3.2 Witness plates. Witness plates shall be positioned to provide evidence of the severity of the test item reaction.

5.2.3.3.3 Bullet velocity. The bullet impact velocity shall be measured using high-speed motion picture cameras, electronic velocity screens, or other means. The system used shall be accurate to measure bullet velocity to within ±15 m/s (±49 ft/s).



Top View



Where:

d1 = Distance to first velocity screen
d2 = Distance to second velocity screen
d3 = Distance to test item
d4 = Distance to first blast gauge
d5 = Distance to second blast gauge(s)

Elevation View

NOTE: Interpret views in accordance with ANSI Y14.3.

FIGURE 3. "Typical" bullet impact test setup.

5.2.3.3.4 Photography. High-speed motion picture photography, motion picture sound photography or video shall be used to record the test item reaction (see 6.3). The type of film used, exposure, and frame rates shall be selected by the test activity to provide the resolution necessary to obtain the required data. Still photographs of the test item shall be taken before and after the test (see 6.3).

5.2.3.4 Passing criteria. No reaction more severe than Type V.

5.2.3.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3) and shall be provided with the final report.

5.2.4 Fragment impact test.

5.2.4.1 Description of test. The fragment impact test is conducted to determine the response of the test item to the impact of high-velocity fragments. Figure 4 presents a typical example of the test configuration. The locations of instrumentation (blast gauges, cameras, etc.) are provided for information only. A minimum of two items shall be tested with fragments aimed at the largest quantity of explosives in one test item and fragments aimed at the most shock-sensitive location in the other test item. Items (small arms, explosive charges, etc.) may be tested in their stowage configuration if justified by their THA.

5.2.4.2 Test procedure. The test procedures include a preferred method with two alternate methods. An alternate method may be used if justified by the munition's life cycle profile and its THA and approved by the appropriate service review organization(s).

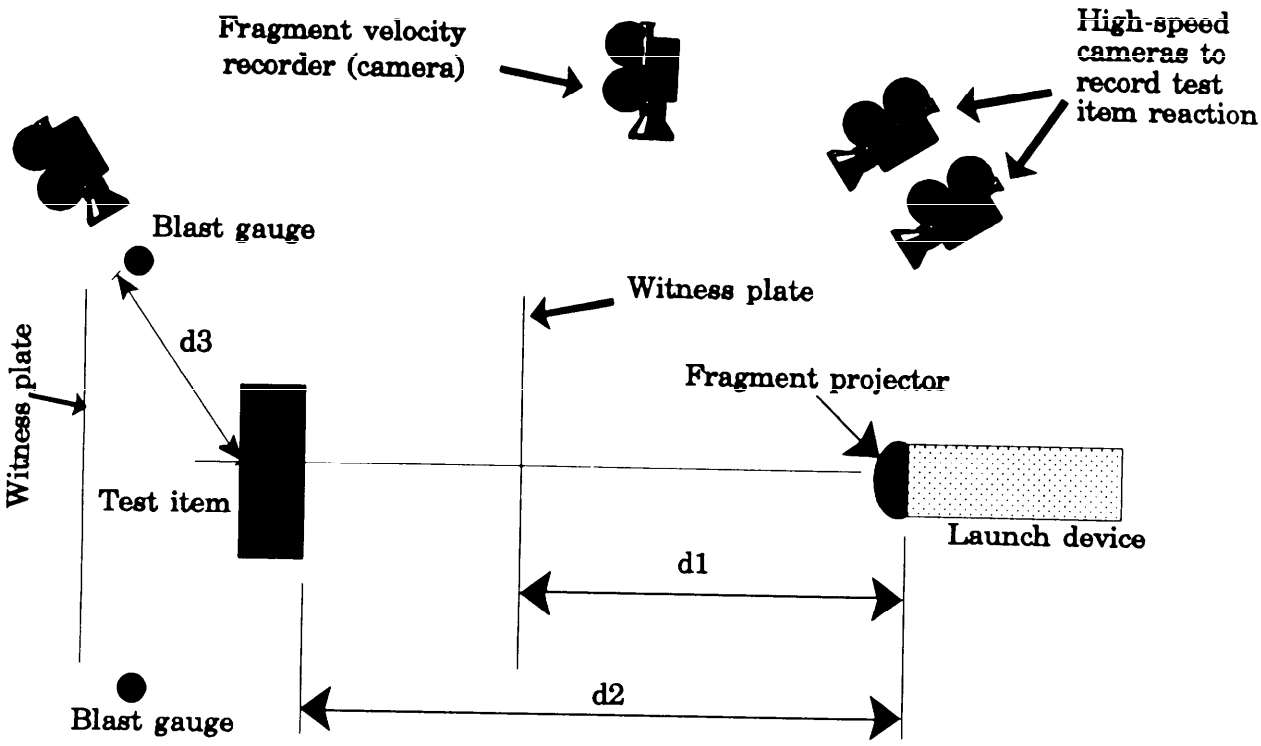
5.2.4.2.1 Preferred test procedure. The fragments shall be 12.7 mm (0.5 in) mild-steel cubes. The fragment projector shall produce fragments traveling at 2,530 ± 90 m/s (8,300 ± 300 ft/s), with an impact of at least two but not more than five upon the test item.

5.2.4.2.2 Alternate test procedure #1. The single fragment shall be mild- steel and conical in shape in accordance with figure 5, and shall travel at a velocity of 1,830 ± 60 m/s (6,000 ± 200 ft/s). The item shall be tested in the stowage/transport configuration.

5.2.4.2.3 Alternate test procedure #2. The test setup, fragment characteristics, and passing criteria shall be designed based on the THA to address fragment threats for tactical situations.

5.2.4.3 Instrumentation.

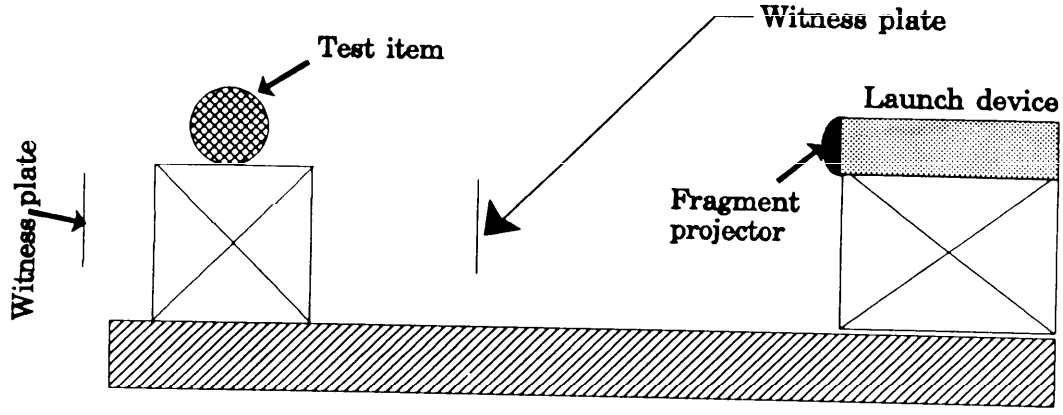
5.2.4.3.1 Airblast overpressure. Measurement of the airblast overpressure produced by the test item is optional. The measurement may not be meaningful if an explosive launching charge is used to accelerate the fragments. If gauges are used, they shall be capable of recording the pressure as a function of time and shall have sufficient frequency response to adequately follow the pressure history if the energetic material detonates. The gauges shall be calibrated to record the peak pressure expected from the detonation of the test item energetic material.



Where:

d1 = Distance from fragment mat to witness plate
d2 = Distance from fragment mat to test item
d3 = Distance from test item to blast gauge(s)

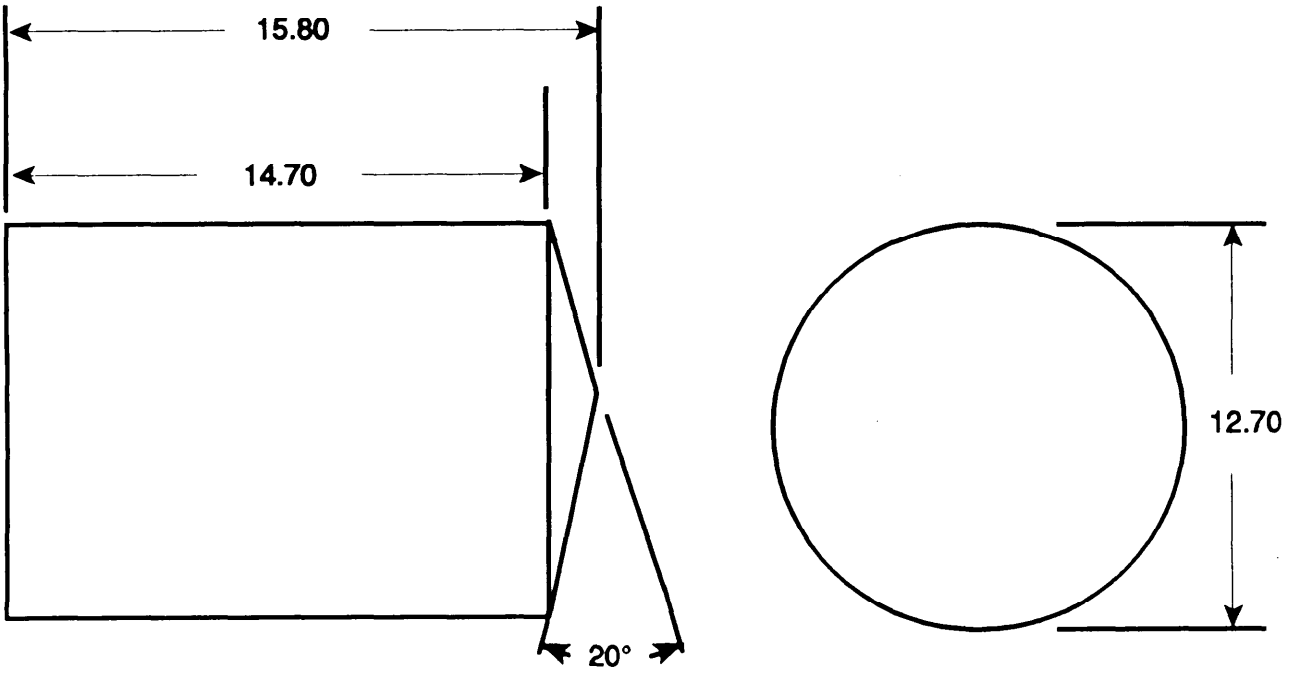
Top View



Elevation View

Note: Interpret views in accordance with ANSI Y14.3.

FIGURE 4. "Typical" fragment impact test setup.



NOTES: Unless otherwise specified, all dimensions are in millimeters.
Fragment mass: 16 grams.
Material: mild steel.
Tolerances: ± 0.05 mm, ± 0°30′.

FIGURE 5. Conical fragment for fragment impact test (alternate test procedure #1).

5.2.4.3.2 Witness plates. Witness plates shall be positioned to provide evidence of the severity of the test item reaction. A witness plate placed behind the test item may be useful in determining the fragment pattern achieved.

5.2.4.3.3 Fragment velocity. The fragment impact velocity shall be measured using high speed motion picture cameras, electronic velocity screens, or other means.

5.2.4.3.4 Photography. High-speed motion picture photography, and either motion picture sound photography or video shall be used to record the test item reaction (see 6.3). Still photographs of the test item shall be taken before and after the test (see 6.3).

5.2.4.4 Passing criteria. No reaction more severe than Type V for the preferred procedure and alternate procedure #1. The passing criteria for alternate procedure #2 shall be based on the THA. The reaction violence of a test item loaded with inert energetic material simulant may be subtracted from the reaction violence of the actual test item to determine the contribution of the energetic material.

5.2.4.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3) and shall be provided with the final test report.

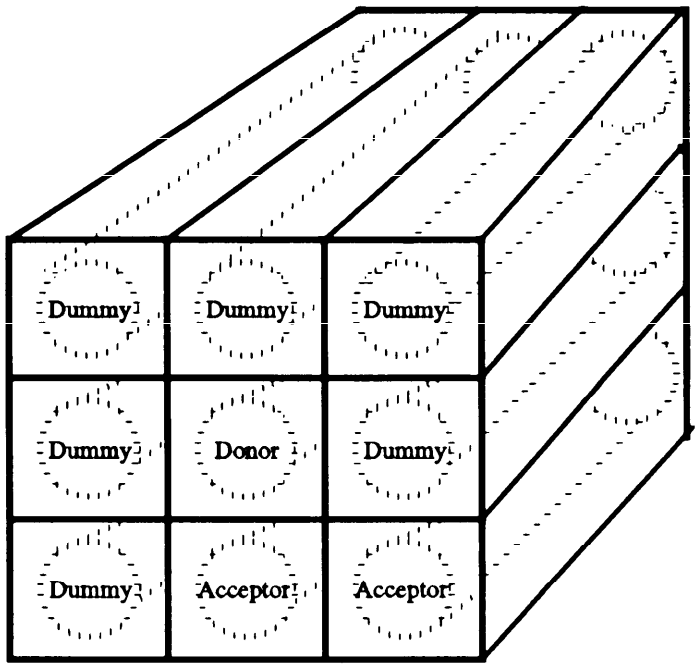
5.2.5 Sympathetic detonation test.

5.2.5.1 Description of test. The sympathetic detonation test consists of detonating one munition (donor) adjacent to one or more like munitions (acceptors). The objective is to evaluate the likelihood that a detonation reaction may be propagated from one unit to another within a group or stack of munitions. Applicability of the test shall be determined based upon the THA. Generally, the test is applicable for munitions containing explosive warheads. However, the test may also be applicable for munitions that incorporate other detonable materials, such as rocket motors containing DOD Class/Division 1.1 propellant.

5.2.5.2 Test procedure. Test procedures shall be developed (see 6.3).

5.2.5.2.1 Test setup. The test setup shall be designed based upon the THA. The test setup shall replicate the packaging conditions and stowage arrangement for the life cycle environment being assessed by the test. The test setup shall incorporate one or more acceptors positioned (relative to the donor) at location(s) deemed most vulnerable to sympathetic detonation. Where appropriate, the test setup shall also incorporate simulated (or dummy) units to provide additional confinement of the donor and the acceptor(s) as illustrated on figure 6. When possible, the test shall be designed to address both IM and hazard classification requirements.

5.2.5.2.2 Test item configuration. The test item configuration shall comply with the requirements of 4.7 except that components containing only non-detonable explosives may be simulated in both the donor and the acceptor(s) using inert components of equivalent structure.



NOTES: For illustrative purposes only. Packaging, arrangement of test items, and number and placement of acceptors shall be determined based upon the THA.

FIGURE 6. Sample arrangement of test items for sympathetic detonation test.

5.2.5.2.3 Donor initiation. The donor may be initiated using an external stimulus that simulates initiation by the threat stimuli most likely to cause detonation of the test item as determined by the THA. Alternatively, if the test item is designed to detonate when functioned, for example, fragmentation warheads, the donor may be initiated using its normal booster system or a booster charge of similar power. For items that are not designed to detonate but contain detonable materials (rocket motors, for example), the donor may be initiated axisymmetrically using a booster charge of sufficient size/output to ensure sustained, stable detonation of the explosive. The donor may be modified to accommodate the required booster provided the modifications are not expected to have a significant effect on the fragmentation or blast of the item.

5.2.5.3 Instrumentation. The test design shall incorporate sufficient instrumentation to ensure that the test results can be assessed conclusively.

5.2.5.3.1 Motion picture photography. High-speed motion picture cameras (32,000 images/s, minimum) may be used to record the reaction(s) of the acceptor(s) (see 6.3).

The film type and exposure shall be selected to minimize the possibility of overexposure (washout) caused by the intense light emitted during the detonation of the donor. The placement of the camera(s) shall be selected to minimize the possibility of obscuration of the acceptor(s) by the expanding gas cloud following detonation of the donor.

5.2.5.3.2 Witness plates. Witness plates may be placed beneath the test items to provide rough indications of the shock pressure within each acceptor relative to the shock pressure within the donor. Alternatively, witness plates may be placed adjacent to the test items to provide rough indications of the size and velocity of the fragments/debris ejected by each acceptor relative to that of the donor. The placement of each witness plate shall be such that (a) it does not shield the acceptor(s) from the donor and (b) it does not focus the fragmentation/blast of the donor.

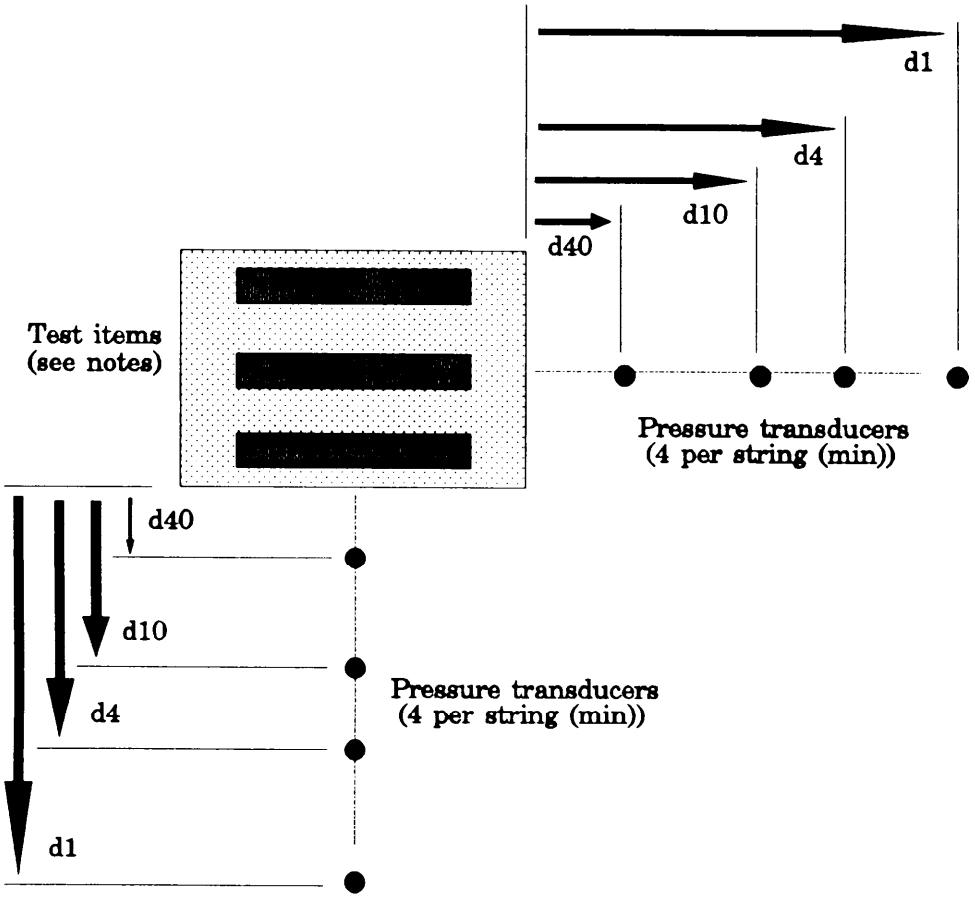
5.2.5.3.3 Airblast overpressure. Pressure gauges (pencil-type) may be used to measure the air shock produced by the reactions of the test items. The pressure measurement system shall be capable of recording overpressure as a function of time and shall have sufficient frequency response, usually 20 kHz minimum, to adequately follow the pressure history if the energetic material detonates. Transducers shall be placed along each of two mutually perpendicular axes as illustrated on figure 7. The transducers shall be mounted flush with the ground surface or in elevated fixtures with the sensing face of each transducer parallel to the direction of flow. The mounting fixtures shall be designed to minimize flow disturbances. Baseline overpressure data shall be obtained by conducting a calibration test firing using either a single test item (if available) or an explosive charge of approximately the same yield as the donor test item. The setup for the calibration test shall closely resemble to the actual test setup with respect to test item mounting, transducer placement, and sensitivity and response of the measurement system.

5.2.5.4 Passing criteria. No Type I Reaction of any acceptor. For ordnance stored in containers, there shall be no acceptor weapon detonations in any other container.

5.2.5.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3) and shall be provided with the final test report.

5.2.6 Shaped charge jet impact test.

5.2.6.1 Description of test. The shaped charge jet impact test is conducted to determine the reaction of the test item when impacted by a shaped charge jet. The applicability of the test and the item test configuration shall be based on the THA. The test procedures include a preferred and an alternate method. The alternate method may be used if justified by the munition's life cycle profile and its THA and approved by the appropriate service review organization(s).



Where:

d40 = Distance at which peak airblast overpressure is expected to be approximately 276 kPa (40 psig) if all test items detonate.

d10 = Distance at which peak airblast overpressure is expected to be approximately 69 kPa (10 psig) if all test items detonate.

d4 = Distance at which peak airblast overpressure is expected to be approximately 28 kPa (4 psig) if all test items detonate.

d1 = Distance at which peak airblast overpressure is expected to be approximately 7 kPa (1 psig) if all test items detonate.

NOTES: For illustrative purposes only; packaging, arrangement of test items, and number and placement of acceptors shall be determined based upon the THA. Interpret view in accordance with ANSI Y14.3.

Top View

FIGURE 7. Sample placement of pressure transducers for sympathetic detonation test.

5.2.6.2 Preferred test procedure. Test procedures shall be developed (see 6.3). Figure 8 provides a typical test configuration. The tests shall be done with a 50-mm Rcckeye-type shaped charge. The exact position and type of equipment used shall be selected by the test activity based on the size of the test item and its expected response. The shaped charge shall be initiated in a manner that ensures proper formation of the shaped charge jet. The shotline shall be selected based on the THA. If, however, the energetic material contains a cavity, such as the center of a rocket motor, the jet should be aimed to pass through this cavity. The initiator shall be avoided. A minimum of two test items shall be used.

5.2.6.2.1 Shaped charge standoff. The 50-mm Rockeye-type shaped charge should be fired from a standoff of a diameter-related distance determined by the THA. The standoff is measured from the outer surface of the shielding material, or from the outer surface of the test item if no shielding is used.

5.2.6.3 Alternate test procedure. The test setup, shaped charge, and passing criteria shall be designed and selected based on the THA.

5.2.6.4 Instrumentation.

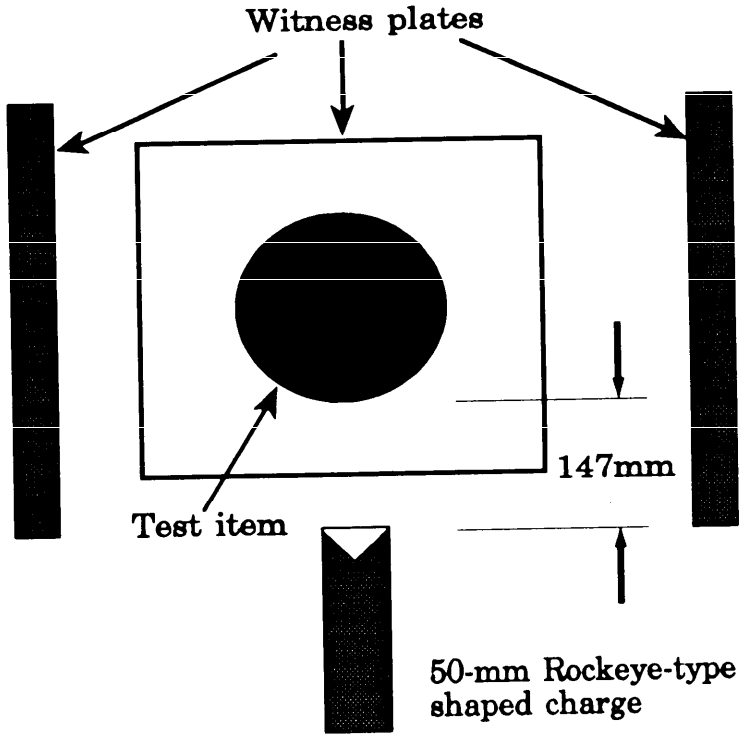
5.2.6.4.1 Airblast overpressure. Measurement of the airblast overpressure produced by the test item may be used to provide evidence of the test item reaction. The gauges shall be capable of recording the pressure as a function of time and have sufficient frequency response to adequately follow the pressure history if the energetic material detonates. The gauges shall be calibrated to record the peak pressure expected from the detonation of the test item energetic material. If the amount of energetic material in the test item is not much greater than the explosive in the shaped charge, it may be necessary to use baffles to delay the pressure wave from the shaped charge so that the pressure wave from the item may be distinguishable.

5.2.6.4.2 Witness plates. Witness plates capable of withstanding the detonation of the test item shall be placed under and on two opposite sides of the test item as witnesses to the degree of reaction.

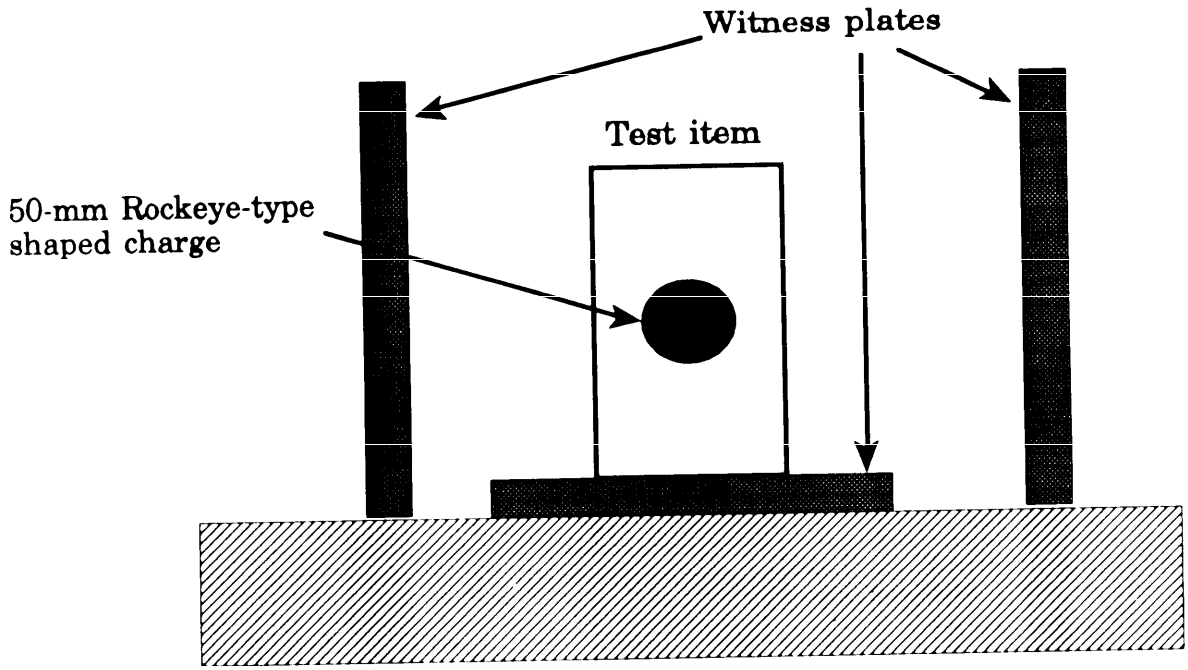
5.2.6.4.3 Photography. High-speed motion picture photography, motion picture sound photography or video shall be used to record the test item reaction (see 6.3). The type of film used, exposure, and frame rates shall be selected by the test activity to provide the resolution necessary to obtain the required data. Still photographs of the test item and test setup shall be taken before and after the test (see 6.3).

5.2.6.5 Passing criteria. There shall be no Type I Reaction as a result of the shaped charge jet impact. For tactical configured test items, the passing criteria shall depend on system vulnerability requirements and the THA.

5.2.6.6 Documentation. A data sheet shall be developed documenting the test results (see 6.3) and shall be provided with the final report.



Top View



Elevation View

NOTE: Interpret views in accordance with ANSI Y14.3.

FIGURE 8. "Typical" shaped charge jet impact test configuration.

5.2.7 Spall impact test.

5.2.7.1 Description of test. The spall impact test is conducted to determine the response of munitions to the impact of hot spall fragments. Applicability of the test shall be determined based upon the THA.

5.2.7.2 Test procedure.

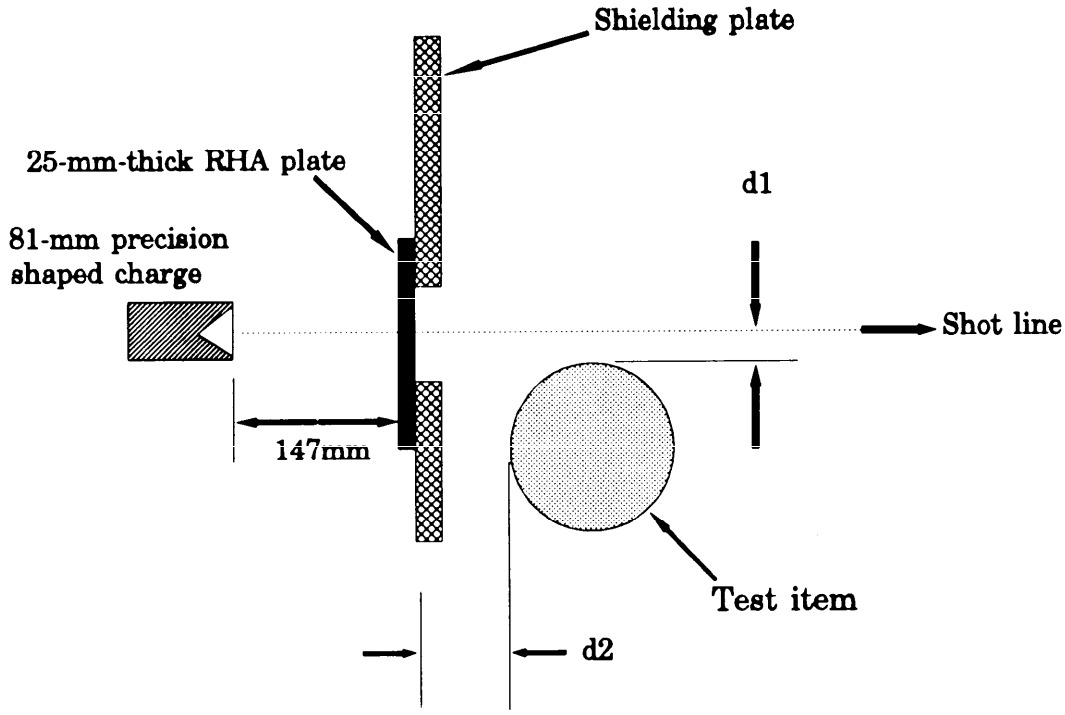
5.2.7.2.1 Test setup. A typical test setup is illustrated on figure 9. The spall fragments are produced by impacting a 25-mm (1-in) thick rolled homogeneous armor (RHA) plate with the shaped charge jet of an 81-mm precision shaped charge. The standoff distance between the shaped charge and the RHA plate shall be 147 mm (5.8 in). The placement of the test item behind the RHA plate shall be selected so that it is impacted by spall fragments only. A minimum of 4 spall fragments/6,450 mm^2 (4 spall fragments/10 in^2) of presented area (up to 40 fragments total) shall impact the test item. The test activity is responsible for calibrating the test setup to determine the placement of the test item (d1 and d2 of figure 9) that will provide the required hit density.

5.2.7.2.2 Test item configuration. The test item configuration shall be a bare munition. A minimum of two test items shall be used.

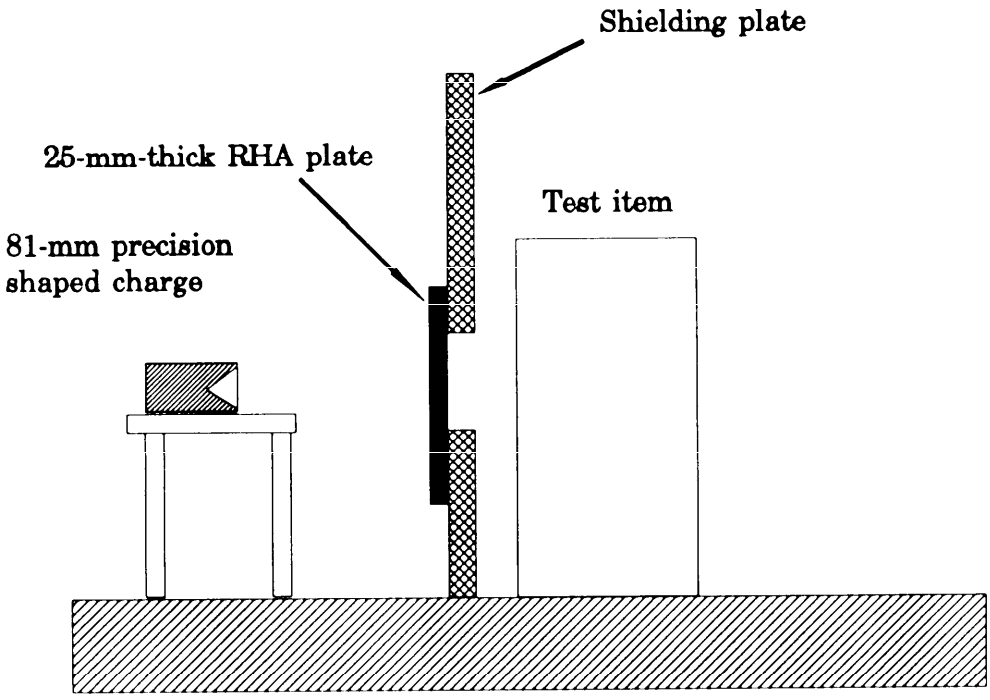
5.2.7.3 Photography. Closed-circuit video, real time motion picture photography (with sound) or both shall be used to document the test events (see 6.3).

5.2.7.4 Passing criteria. No sustained burning shall occur as a result of the spall impact test. For Army test items, the passing criteria shall depend on system vulnerability requirements and the THA.

5.2.7.5 Documentation. A data sheet shall be developed documenting the test results (see 6.3) and shall be provided with the final test report.



Top View



Elevation View

NOTE: Interpret views in accordance with ANSI Y14.3.

FIGURE 9. "Typical" spall impact test configuration.

5.3 Additional tests. In addition to the tests of 5.1 and 5.2, tests are to be developed or selected from other test document sources to form the test plan to assess the safety of the weapon system as determined by the system safety program. The following is a non-inclusive list of factors that should be considered in performing the hazard analyses required as the basis for developing the test plan.

Acceleration
Accidental Release
Acoustical
Aerodynamic Heating
Atmospheric Lightning
Altitude
Catapult and Arrested Landing
Double Feed of Ammunition
Drop
Dust
Electromagnetic Interference
Electromagnetic Radiation
Electromagnetic Pulse
Electromagnetic Vulnerability
Electrostatic Discharge
Explosive Atmosphere
Faulty Unit
Flooding
Fungus
HERO - Hazards of Electromagnetic Radiation to Ordnance
Hot Gun Cook-Off
Humidity
Jettison
Jolt
Jumble
Leak Detection - Halogen-helium
Leakage - Immersion
Materials Compatibility
Muzzle Impact/Impact Safe Distance
Pressurization
Proof Pressure Firings
Radiography
Rain
Salt Fog
Shock
Solar Radiation - Sunshine
Space Simulation - Unmanned Test
Static Detonator Safety
Time to Airburst
Toxicity
Vibration

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 tests described herein are used to assess the safety and insensitive munitions characteristics of non-nuclear ordnance.

6.2 Issue of DODISS. When this standard is used in acquisition, the applicable issue of the DODISS must be cited in the solicitation (see 2.1.1 and 2.2).

6.3 Data requirements. The following Data Item Descriptions (DIDs) must be listed, as applicable, on the Contract Data Requirements List (DD Form 1423) when this standard is applied on a contract, in order to obtain the data, except where DOD FAR Supplement 27.475-1 exempts the requirement for a DD Form 1423.

Reference Paragraph	DID Number	DID Title
4.1.1	DI-T-30714	Master Test Plan/Program Test Plan
4.1.1, 5.1.1.2, 5.1.2.2, 5.2.5.2, 5.2.6.2	DI-NDTI-80603	Test Procedure
4.1.3, 4.2	DI-SAFT-81124	Threat Hazard Assessment
4.4	DI-SAFT-81125	Hazard Assessment Test Report
4.8, 4.9, 4.10, 5.1.1.3.1, 5.1.2.3.1, 5.1.3.1, 5.1.4.3, 5.2.1.3.1, 5.2.2.3.3, 5.2.3.3.4, 5.2.4.3.4, 5.2.5.3.1, 5.2.6.4.3, 5.2.7.3	DI-SAFT-81126	Photographic Requirements
5.1.1.5, 5.1.3.3	DI-SAFT-81127	Temperature and Humidity Test Data
5.1.2.5	DI-SAFT-81128	Vibration Test Data
5.1.4.5	DI-SAFT-81129	40-Foot Drop Test Data
5.2.1.5	DI-SAFT-81130	Fast Cook-Off Test Data
5.2.2.5	DI-SAFT-81131	Slow Cook-Off Test Data
5.2.3.5	DI-SAFT-81132	Bullet Impact Test Data
5.2.4.5	DI-SAFT-81133	Fragment Impact Test Data
5.2.5.5	DI-SAFT-81134	Sympathetic Detonation Test Data
5.2.6.6	DI-SAFT-81135	Shaped Charge Jet Impact Test Data
5.2.7.5	DI-SAFT-81136	Spall Impact Test Data

The above DIDs were those cleared as of the date of this standard. The current issue of DOD 5010.12-L, Acquisition Management Systems and Data Requirements Control List (AMSDL), must be researched to ensure that only current, cleared DIDs are cited on the DD Form 1423.

6.4 Tailoring guidance. To ensure proper application, invitations for bids, requests for proposals, and contractual statements of work should tailor the requirements in sections 4 and 5 of this standard to exclude any unnecessary requirements. Contractual documents must specify the following:

a. Ambient test item temperature if other than as specified (see 4.2.1).

b. When a pre-test examination is not required (see 4.8 and 5.1.1.2).

c. The number of test items to be tested if other than as specified (see 5.1).

6.5 Submission of test reports and results. Copies of test reports and results should be submitted to the following address for storage in the National Insensitive Munitions Information System (NIMIS-II):

Commander
Naval Air Warfare Center
Weapons Division
Attn: C27B
China Lake, CA 93555-6001

6.6 Service review organizations. The following service contacts are responsible for the assessment of explosive safety and IM characteristics:

Army-(for explosive safety):

Director
U.S. Army Technical Center for Explosives Safety
Attn: SMCAC-EST
Savanna, IL 61074-9639

Army-(for IM):

Commander
ARDEC
Army Insensitive Munitions Office
Attn: SMCAR-AEM
Picatinny Arsenal, NJ 07806-5000

Navy/Marine Corps—(for explosive safety):

Chairman
Weapon Systems Explosive Safety Review Board (WSESRB)
Naval Ordnance Center (N71)
Indian Head, MD 20640-5035

Navy/Marine Corps—(for IM):

Commander
NAVSEA Insensitive Munitions Office
Attn: SEA 91WM
Naval Sea Systems Command
2531 Jefferson Davis Highway
Arlington, VA 22242-5160

Air Force - (for explosive safety):

AFSA/SEWV
9700 G Street
Kirtland AFB, NM 87117-5670

Air Force – (for IM):

ASC/YOX
Eglin AFB, FL 32542-6808

6.7 Tests for hazard classification. The following tests described herein have potential application for hazard classification:

12-m (40-ft) drop
Fast cook-off
Slow cook-off
Bullet impact
Sympathetic detonation

With slight alterations, they may be used to satisfy the requirements specified in ST/SG/AC.10/11/Rev 1, Second Edition, "Recommendations on the Transport of Dangerous Goods, Tests, and Criteria," United Nations, New York, 1990.

6.8 Units of measurement and abbreviations. Units of measurement are expressed in metric or SI (Le Système International d'Unités). The corresponding English equivalent follows in parentheses. Standard abbreviations used throughout this document are as follows:

Metric (SI)			English		
°C	-	degrees Celsius	°F	-	degrees Fahrenheit
mm	-	millimeters	in	-	inches
m	-	meters	ft	-	feet
m/s	-	meters per second	ft/s	-	feet per second
N•m	-	newton meter	lbf•ft	-	pound-force foot
kPa	-	kilopascal (gauge)	psig	-	pounds per square inch (gauge)

6.9 Subject term (key word) listing.

Bullet impact test
Drop test
Fast cook-off test
Fragment impact test
Humidity test
Insensitive munitions
Munitions, insensitive
Safety test
Shaped charge jet impact test
Slow cook-off test
Spall impact test
Sympathetic detonation test
Temperature test
Vibration test

6.10 International standardization agreements. Certain provisions of this standard are the subject of international standardization agreements. These are:

MIL-STD-2105B	NATO STANAG
12-m (40-ft) drop test	4375 (draft)
Fast cook-off test	4240
Slow cook-off test	4382
Bullet impact test	4241
Sympathetic detonation test	4396 (draft)
Hazard assessment tests for munitions	4439 (draft)

When change notice, revision, or cancellation of this standard is proposed that will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels, including departmental standardization offices, to change the agreement or make other appropriate accommodations.

6.11 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.

Custodians:
Army - AR
Navy - OS
Air Force - 11

Review activities:
Army - TE
Navy - AS
Air Force - 18

Preparing activity:
Navy - OS
(Project SAFT-0030)

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
2. The submitter of this form must complete blocks 4, 5, 6, and 7.
3. The preparing activity must provide a reply within 30 days from receipt of the form.

NOTE: This form may not be used to request copies of documents, nor to request waivers, or clarification of requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER	2. DOCUMENT DATE (YYMMDD)
	MIL-STD-2105B	940112

3. DOCUMENT TITLE

HAZARD ASSESSMENT TESTS FOR NON-NUCLEAR MUNITIONS

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

a. NAME	b. TELEPHONE (Include Area Code)	
COMMANDER, INDIAN HEAD DIVISION NAVAL SURFACE WARFARE CENTER (CODE 8420)	(1) Commercial 301-743-4358/4510	(2) AUTOVON 354-4358/4510
c. ADDRESS (Include Zip Code) 101 STRAUSS AVENUE INDIAN HEAD, MD 20640-5035	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	

DD Form 1426, OCT 89 *Previous editions are obsolete.* 198-290