NOT MEASUREMENT SENSITIVE

MIL-STD-1316E
10 JULY 1998
SUPERSEDING
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9 APRIL 1991

DEPARTMENT OF DEFENSE DESIGN CRITERIA STANDARD

FUZE DESIGN, SAFETY CRITERIA FOR

AMSC N/A **FSC 13GP**

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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 shall be addressed to: Commander, US Army Tank-Automotive and Armaments Command Research and Development Center, ATTN: AMSTA-AR-QAW-E, Picatinny Arsenal, NJ 07806-5000, by using the self addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter. Comments should be forwarded through the designated Reviewing Activity listed for each Service in 4.9.

3. This standard establishes specific design safety criteria for fuzes. It applies primarily to the safety and arming functions performed by fuzes for use with munitions. The safety and arming requirements specified herein are mandatory fundamental elements of design, engineering, production and procurement of fuzes. Fuzes shall provide safety that is consistent with assembly, handling, storage, transportation, and disposal.

4. Munition fuzes historically have utilized sensitive explosive elements whose output has been physically interrupted until arming. Control of the arming process in these fuzes was accomplished by mechanical means. The advent and rapid advancement in solid state electronics has furnished alternatives for fuze safety design. In recent years, advances in explosive initiation elements have provided an option for eliminating the need for physical interruption of the explosive train. The application of these technology advances is addressed in the Current revision to these standards.

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PARAGRAPH PAGE

1. SCOPE

1.1 Purpose. This standard establishes design safety criteria for fuzes and Safety and Arming (S&A) devices that are subsystems of fuzes.

1.2 Application. This standard applies to the design of fuzes and S&A devices.

1.3 Excluded munitions. This standard does not apply to fuzes and S&A devices for the following:

a. Nuclear weapon systems and trainers.
b. Hand grenades.
c. Flares and signals dispensed by hand-held devices.
d. Manually emplaced ordnance items.
e. Pyrotechnic countermeasure devices.

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 6.3).

SPECIFICATIONS

MILITARY

MIL-T-339	-	Tetryl (trinitrophenylmethylnitramine)
MIL-C-440	-	Compositions A3 and A4
MIL-E-14970	-	Explosive Composition A5
MIL-C-21723	-	Composition CH-6
MIL-I-23659	-	Initiator, Electric, General Design Specification
MIL-P-46464	-	Pellet, Tetryl
MIL-R-63419	-	RDX/Vinyl Chloride Copolymer Explosive Composition (PBX 9407)(For use in Ammunition)
MIL-E-81111	-	Explosive, Plastic-Bonded Molding Powder (PBXN-5)
MIL-E-82903	-	Explosives, HNS-IV

STANDARDS

FEDERAL

FED-STD-595	-	Colors Used in Government Procurement

MILITARY

MIL-STD-331	-	Fuze and Fuze Components, Environmental and Performance Test for

MIL-STD-461	-	Requirements for the Control of Electromagnetic Interference Emissions And Susceptibility
MIL-STD-462	-	Measurement of Electromagnetic Interference Characteristics
MIL-STD-464	-	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-498	-	Defense System Software Development
MIL-STD-1512	-	Electroexplosive Subsystems, Electrically Initiated, Design Requirements and Test Methods
MIL-STD-1751	-	Safety and Performance Tests for Qualification of Explosives
MIL-STD-2169B(U)	-	High Altitude Electromagnetic Pulse (HEMP) Environment

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

2.1.2 Other Government documents, drawings and publications. The following other Government documents, drawings and publications form a part of this document to the extent specified herein. Unless otherwise specified, the issues are those cited in the solicitation.

NAVY WEAPON SPECIFICAITONS

WS-4660	-	Dipam Explosive
WS-5003	-	HNS Explosive
WS-12604	-	Explosive Plastic-Bonded Molding Powder (PBXN-6)

OTHER PUBLICATIONS

OD 44811	-	Safety and Performance Tests for Qualification of Explosives

(Unless otherwise indicated, copies of Navy Weapon Specifications are available from Commander, Indian Head Division, Naval Surface Warfare Center, Data Control Team, (Code 8410P), Indian Head, MD 20640-5035)

(Source for OD's is: Commander, Port Hueneme Division, Naval Surface Warfare Center, Code 6001E, Port Hueneme, CA 93043-4307)

2.2 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, in which case the exception will be identified in the text and cited in the solicitation.

3. DEFINITIONS

3.1 General. The definitions of OD 44811 apply to the explosive terms. For interpretation of this standard, the following specific definitions apply:

3.2 Armed. A fuze is considered armed when any firing stimulus can produce fuze function.

a. A fuze employing explosive train interruption (see 5.3.3) is considered armed when the interrupter(s) position is ineffective in preventing propagation of the explosive train at a rate equal to or exceeding 0.5 percent at a confidence level of 95 percent.

b. A fuze employing a non-interrupted explosive train (see 5.3.4) is considered armed when the stimulus available for delivery to the initiator equals or exceeds the initiator's maximum no-fire stimulus (MNFS).

3.3 Arming delay. The time elapsed, or distance traveled by the munition, from launch to arming (see 3.27 and 4.2.2).

3.4 Assembled fuze. The completed fuze with all component parts put together; a fuze requiring no added components or parts to prepare it for installation into the munition in which it is to function. Assembling the fuze is the process of putting the parts and components together.

3.5 Booster and lead explosives. Booster and lead explosives are compounds or formulations, such as those explosives listed in Table I of 5.3.2, which are used to transmit and augment the detonation reaction.

3.6 Common mode failures. Multiple failures that result from, or are caused by, seemingly unrelated failures or an adverse environment. Examples include the failure of two gates on a single digital integrated circuit due to loss of the ground lead to the chip or failure of two transistors due to exposure to a high temperature environment.

3.7 Credible environment. An environment that a device may be exposed to during its life cycle (manufacturing to tactical employment, or eventual demilitarization). These include extremes of temperature and humidity, electromagnetic effects, line voltages, etc. Combinations of environments that can be reasonably expected to occur must also be considered within the context of credible environments.

3.8 Credible failure mode. A failure mode resulting from the failure of either a single component or the combination of multiple components, that has a reasonable probability of occurring during a fuzing system's life cycle.

3.9 Dud. A munition which has failed to function, although functioning was intended.

3.10 Enabling. The act of removing or activating one or more safety features designed to prevent arming, thus permitting arming to occur subsequently.

3.11 Environment. A specific physical condition to which the fuze may be exposed.

3.12 Environmental stimulus. A specific stimulus obtained from an environment.

3.13 Explosive ordnance disposal. The detection, identification, field evaluation, rendering safe, recovery, and final disposal of hazardous unexploded explosive ordnance.

3.14 Explosive train. The detonation or deflagration train (i.e., transfer mechanism), beginning with the first explosive element (e.g., primer, detonator) and terminating in the main charge (e.g., munition functional mechanism, high explosive, pyrotechnic compound).

3.15 Fail-safe design. A characteristic of a fuze system or part thereof designed to prevent fuze function when components fail.

3.16 Firmware. The combination of a hardware device and computer instructions or computer data that resides as read only software on the hardware device. The software cannot be readily modified under program control.

3.17 Function. A fuze "functions" when it produces an output capable of initiating a train of fire or detonation in an associated munition.

3.18 Fuze (Fuzing System). A physical system designed to sense a target or respond to one or more prescribed conditions, such as elapsed time, pressure, or command, and initiate a train of fire or detonation in a munition. Safety and arming are primary roles performed by a fuze to preclude ignition of the munition before the desired position or time.

3.19 Fuze installation. The act of installing or inserting the assembled fuze into the munition in which it is to function.

3.20 Fuze safety system. The aggregate of devices (e.g., environment sensors, launch event sensors, command functioned devices, removable critical items, or logic networks, plus the initiation or explosive train interrupter, if applicable) included in the fuze to prevent arming and functioning of the fuze until a valid launch environment has been sensed and the arming delay has been achieved.

3.21 Independent safety feature. A safety feature is independent if its integrity is not affected by the function or malfunction of other safety features.

3.22 Initiator. A device capable of directly causing functioning of the fuze explosive train.

3.23 Interrupted explosive train. An explosive train in which the explosive path between the primary explosives and the lead and booster (secondary) explosives is functionally separated until arming.

3.24 Launch cycle. The period between the time the munition is irreversibly committed to launch and the time it leaves the launcher.

3.25 Main charge. The explosive charge which is provided to accomplish the end result in the munition; e.g., bursting a casing to produce blast and fragmentation, splitting a canister to dispense submunitions, or producing other effects for which it may be designed. Main charge explosives are compounds or formulations such as TNT or Composition B, which are used as the final charge in any explosive application. These explosives, because of their relative insensitivity, ordinarily require initiation by a booster explosive.

3.26 Maximum No-Fire Stimulus (MNFS). The stimulus level at which the initiator will not fire or unsafely degrade with a probability of 0.995 at a confidence level of 95 percent. Stimulus refers to the characteristic(s) such as current, rate of change of current (di/dt), power, voltage, or energy which is (are) most critical in defining the no-fire performance of the initiator.

3.27 Premature function. A fuze function before completion of the arming delay.

3.28 Primary explosives. Primary explosives are sensitive materials, such as lead azide or lead styphnate, which are used to initiate detonation. They are used in primers or detonators, are sensitive to heat, impact or friction and undergo a rapid reaction upon initiation.

3.29 Safe separation distance. The minimum distance between the delivery system (or launcher) and the launched munition beyond which the hazards to the delivery system and its personnel resulting from the functioning of the munition are acceptable.

3.30 Safety and arming device. A device that prevents fuze arming until an acceptable set of conditions has been achieved and subsequently effects arming and allows functioning.

3.31 Safety feature. An element or combination of elements that prevents unintentional arming or functioning.

3.32 Safety system failure. A failure of the fuze safety system to prevent unintentional arming or functioning.

3.33 Sensor, environmental. A component or series of components designed to detect and respond to a specific environment.

3.34 Sterilization. A design feature which permanently prevents a fuze from functioning.

4. GENERAL REQUIREMENTS

4.1 General. The following general requirements apply to all fuzes and fuze components within the scope of this document.

4.2 Fuze safety system. In order to preclude unintended fuze arming, the fuze safety system shall:

a. not initiate the arming sequence except as a consequence of an intentional launch.

b. not be susceptible to common-mode failures.

c. not contain any single-point failure mode prior to or at the initiation of the arming cycle.

d. reduce to a minimum single-point failure modes during the arming cycle. The time window associated with these single-point failures shall be reduced to a minimum and shall exist only at or near the expiration of the intended arming delay.

In addition, the fuze design shall prohibit premature fuze arming or functioning if any or all electrical safety or energy control features fail in any given state or credible mode. These failure modes include both random and induced failures which occur prior to, during, or after application of electrical power to the fuze.

4.2.1 Safety redundancy. The safety system of fuzes shall contain at least two independent safety features, each of which shall prevent unintentional arming of the fuze. The stimuli enabling a minimum of two safety features shall be derived from different environments. Utilization in the fuze design of environments and levels of environmental stimuli to which the fuze may be exposed prior to initiation of the launch cycle shall be avoided. Operation of at least one of these safety features shall depend on sensing an environment after first motion in the launch cycle, or on sensing a post-launch environment. An action taken to initiate launch may be considered an environment if the signal generated by the action irreversibly commits the munition to complete the launch cycle.

4.2.2 Arming delay. A safety feature of the fuze shall provide an arming delay which assures that a safe separation distance can be achieved for all defined operational conditions.

4.2.3 Manual arming. An assembled fuze shall not be capable of being armed manually.

4.2.4 Electronic logic functions. Any electronic logic related to safety functions performed by the fuze shall be embedded as firmware or hardware. Firmware devices shall not be erasable or alterable by credible environments which the fuze would otherwise survive.

4.3 Safety system failure rate. The fuze safety system failure rate shall be calculated for all logistic and tactical phases from fuze manufacture to safe separation or to the point at which friendly forces and equipment no longer need protection. The safety system failure rate shall be verified to the extent practical by test and analysis during fuze evaluation and shall not exceed the rates given for the following phases:

a. Prior to intentional initiation of the arming sequence: one failure to prevent arming or functioning (irrespective of arming) in one million fuzes.

b. Prior to the exit (for tubed launched munitions): one failure to prevent arming in ten thousand fuzes, and one failure to prevent functioning in one million fuzes.

c. Between initiation of the arming sequence or tube exit, if tube launched, and safe separation: one failure to prevent arming in one thousand fuzes. The rate of fuze functioning during this period shall be as low as practical and consistent with the risk established as acceptable for premature munition functioning.

4.3.1 Analyses. The following analyses shall be performed to identify hazardous conditions for the purpose of their elimination or control.

a. A preliminary hazard analysis shall be conducted to identify and classify hazards of normal and abnormal environments, as well as conditions and personnel actions that may occur in the phases before safe separation. This analysis shall be used in the preparation of system design, test and evaluation requirements. (see 6.5)

b. System hazard analyses and detailed analysis, such as fault tree analyses, and failure mode, effects, and criticality analyses, shall be conducted to arrive at an estimate of the safety system failure rate and to identify any single-point or credible failure modes.

c. For fuzing systems containing an embedded microprocessor, controller or other computing device, the analyses shall include a determination of the contribution of the software (see 4.2.4) to the enabling of a safety feature.

d. Where the software is shown to directly control or remove one or more safety features, a detailed analysis and testing of the applicable software shall be performed to assure that no design weaknesses, credible software failures, or credible hardware failures propagating through the software can result incompromise of the safety features.

4.4 Design for quality control, inspection, and maintenance.

a. Fuzes shall be designed and documented to facilitate application of effective quality control and inspection procedures. Design characteristics critical to fuze safety shall be identified to assure that the designed safety is maintained.

b. The design of the fuze shall facilitate the use of inspection and test equipment for monitoring all characteristics which assure the safety and intended functioning of the fuze at all appropriate stages. The fuze design should facilitate the use of automatic inspection equipment.

c. Embedded computing systems and their associated software (firmware) shall be designed and documented for ease of future maintenance. Software development shall be in accordance with accepted high quality software development procedures, such as MIL-STD-498.

4.5 Design approval. At the inception of engineering development, the developing activity should obtain approval from the cognizant safety authority of both the design concept and the methodology for assuring compliance with safety requirements. At the completion of engineering development, the developing activity shall present a safety assessment to the cognizant safety authority (see 4.9) for review to obtain approval of the design.

4.6 Design features.

4.6.1 Stored energy. Stored energy shall not be employed for enabling or arming when environmentally derived energy, after initiation of the launch cycle, can be practically obtained. Examples of stored energy components are:

a. Batteries
b. Charged capacitors
c. Compressed gas devices
d. Explosive actuators
e. Loaded springs

4.6.2 Compatibility of fuze elements. All fuze materials shall be chosen to be compatible and stable so that under all life-cycle conditions none of the following shall occur in an unarmed fuze:

a. Premature arming.
b. Dangerous ejection of material.
c. Deflagration or detonation of the lead or booster.
d. An increase in the sensitivity of explosive train components beyond the level appropriate for service use.
e. Compromise of safety or sterilization features.

f. Production of unacceptable levels of toxic or other hazardous materials.

4.6.3 Manually enabled safety features. When manually operable safety features critical to fuzing system safety are used, their design shall minimize inadvertent or unintended operation.

4.6.4 Electrical firing energy dissipation. For electrically initiated fuze explosive trains, the fuze design shall include a provision to dissipate the firing energy within 30 minutes of the expiration of the fuze arming life, or a fuze failure. The dissipation means shall be designed to prevent commonmode failures.

4.6.5 Explosive ordnance disposal (EOD). Features shall be incorporated in fuzes that facilitate their being rendered safe by EOD tools, equipment and procedures even if sterilization or self-destruction features are incorporated.

4.6.5.1 EOD reviewing authority. All new or altered designs, or new applications of existing designs shall be presented to the appropriate service's EOD research, development, test and evaluation (RDT&E) authority for technical advice and assistance in determining viable design approaches or trade-offs for EOD as follows:

a. For Army:	Commander US Army ARDEC ATTN: AMSTA-AR-FSX Picatinny Arsenal, NJ 07806-5000
b. For Navy and Marine Corps:	Commanding Officer Naval Explosive Ordnance Disposal Technology Center Code 60 Indian Head, MD 20640-5070
c. For Air Force:	Commander Detachment 63 ASC 2008 Stump Neck Road Indian Head, MD 20640-5070

4.6.6 Non-armed condition assurance. Fuzing system designs shall incorporate one or more of the following:

a. A feature that prevents assembly of the fuzing system in an armed condition.

b. A feature that provides a positive means of determining that the fuzing system is not armed during and after its assembly and during installation into the munition. Where the fuzing system is accessible after installation into the munition, the positive means of determination shall also be available.

c. A feature that prevents installation of an armed, assembled fuzing system into a munition.

If arming and reset of the assembled fuzing system in tests is a normal procedure in manufacturing, inspection, or at any time prior to its installation into a munition, subparagraph a is not sufficient and either subparagraph b or c must also be met.

4.6.6.1 Visual indication. If visual indication of the non-armed or armed condition is employed in the fuze, visible indicators shall be designed to provide a positive, unambiguous indication of condition. Indicator failure shall not result in a false non-armed indication. If color coding is used to represent condition, the colors and coding shall be as follows:

a. Non-armed condition. Fluorescent green background with the letter S or word SAFE superimposed thereon in white. Colors shall be nonspecular.

b. Armed condition. Fluorescent red or fluorescent orange background with the letter A or the word ARMED superimposed thereon in black. Colors shall be nonspecular.

c. Suggested color specifications.

    1) Fluorescent green, Color No. 38901 per FED-STD-595.
    2) Fluorescent red, Color No. 38905 per FED-STD-595.
    3) Fluorescent orange, Color No. 38903 per FED-STD-595.

4.7 Documentation. The evaluation program used as the basis of the safety assessment which is prepared by the developing agency shall be documented in both detail and summary form.

4.8 Electromagnetic environments. Fuzes, in their normal life cycle configurations, shall not inadvertently arm or function during and after exposure to: electromagnetic radiation (EMR), electrostatic discharge (ESD), electromagnetic pulse (EMP), electromagnetic interference (EMI), lightning effects (LE) or power supply transients (PST). In addition, fuzes shall not exhibit unsafe operation during and after exposure to the above environments. Fuzes shall be tested or evaluated for:

a. EMR - per MIL-STD-1512 and MIL-STD-464

b. ESD – per MIL-STD-331

c. EMP – per MIL-STD-2169

d. EMI – per MIL-STD-461 and MIL-STD-462

e. LE - per MIL-STD-464

f. PST - by appropriate test and analysis

4.9 Reviewing authority. All new or altered designs, or new applications of existing designs, shall be presented to the appropriate service safety review authority for a safety evaluation and certification of compliance with this standard:

a. Army:	Chairman, Army Fuze Safety Review Board ATTN: AMSTA-AR-FZ Picatinny Arsenal, NJ 07806-5000
b. Navy and Marine Corps:	Chairman, Weapon System Explosives Safety Review Board Naval Ordnance Center (N71) Indian Head, MD 20640-5555
c. Air Force:	USAF Nonnuclear Munitions Safety Board ATTN: AFTDC/SES 1001 2nd Street, Suite 366 Eglin Air Force Base, FL 32542-5000

5. DETAILED REQUIREMENTS

5.1 General. The following detailed requirements shall apply for specific fuze designs.

5.2 Post-safe-separation safety. When operational requirements necessitate protection of friendly forces in addition to the delivery system and its personnel, one of the following options shall be incorporated in the fuze design:

a. Extension of the arming delay.

b. Control of unintentional functioning after the proper arming delay.

The fuze requirements document shall specify for the selected option a minimum quantitative failure rate for the time frame after safe separation to attainment of the required protection.

5.3 Explosive materials and trains.

5.3.1 Explosive compositions. Explosive compositions in fuzes shall be qualified for use in accordance with OD 44811 or MIL-STD-1751 in their intended roles in explosive train components.

5.3.2 Explosive sensitivity of lead and booster explosive.

a. Only those explosives listed in table I are approved by all services for use in a position leading to the initiation of a high explosive main charge without interruption.

b. Approval by all services must be received by the Chairman, DOD Fuze Engineering Standardization Working Group (see 6.4) before a new explosive can be added to Table I or a listed explosive can be deleted. Approved explosives shall also be qualified in the fuze and certified by the associated safety board of 4.9 as acceptable for that fuze.

c. The explosive material used in fuze systems shall not be altered by any means (precipitation, recrystallization, grinding, density changes, etc.) likely to increase its sensitivity beyond that at which the material was qualified and at which it is customarily used, unless it is requalified.

TABLE I. Approved explosives

Explosive	Specification
Comp A3	MIL-C-440
Comp A4	MIL-C-440
Comp A5	MIL-E-14970
Comp CH6	MIL-C-21723
PBX 9407	MIL-R-63419
PBXN-5	MIL-E-81111
PBXN-6	WS-12604
DIPAM	WS-4660
HNS Type 1 or Type 2 Gr A	WS-5003
HNS-IV	MIL-E-82903
*Tetryl	MIL-T-339
*Tetryl Pellets	MIL-P-46464

*No longer manufactured; not for use in new developments.

5.3.3 Explosive train interruption.

a. When an element of the explosive train contains explosive material other than allowed by 5.3.2, at least one interrupter (shutter, slider, rotor) shall functionally separate it from the lead and booster explosives until the arming sequence is completed as a consequence of international launch. The interrupter(s) shall be directly locked mechanically in the safe position by at least two independent safety features. These safety features shall not be removed prior to initiation of the launch cycle.

b. If the primary explosive is positioned such that omission of the interrupter will prohibit explosive train transfer, a single interrupter locked by the two independent safety features is acceptable.

c. If the primary explosive is positioned such that safety is dependent upon the presence of an interrupter, the design shall include positive means to prevent the fuze from being assembled without the properly positioned interrupter.

d. The effectiveness of interruption for the fuze explosive train in its configuration prior to initiation of the arming sequence shall be determined numerically in accordance with the Primary Explosive Component Safety Test of MIL-STD-331. If the explosive train interruption is removed progressively after intentional initiation of the launch sequence, the relationship between interrupter position and its effectiveness shall be established by a progressive arming test conducted in accordance with the Primary Explosive Component Safety Test, using a test strategy given by the Projectile Fuze Arming Distance Test of MIL-STD-331. The chosen test strategy and results shall be presented and justified to the appropriate service safety authority.

5.3.4 Non-interrupted explosive train control. Explosive train interruption is not required when the explosive train contains only explosive materials allowed by 5.3.2. One of the following methods of controlling fuze arming shall be employed:

a. For systems using techniques for accumulating all functioning energy from the post-launch environment, the fuze shall not permit arming until verification, by the fuze, of a proper launch, and attainment of the required arming delay. Accumulation of any functioning energy shall not occur until as late in the arming cycle as operational requirements permit.

b. For systems using techniques that do not accumulate all functioning energy from the post-launch environment, at least two independent energy interrupters, each controlled by an independent safety feature shall prevent arming until proper launch is verified by the fuze and the required arming delay is attained. Additionally, the fuze shall not be capable of arming in cases of the absence, or malfunction, of any and all energy interrupters.

5.3.4.1 Electrical initiator sensitivity. The initiator for an electrically fired non-interrupted explosive train shall:

a. Meet the appropriate characteristics listed for Class B initiators of MIL-I-23659.

b. Not exhibit unsafe degradation when tested in accordance with MIL-STD-1512.

c. Not be capable of being detonated by any electrical potential of less than 500 volts.

d. Not be capable of being initiated by any electrical potential of less than 500 volts, when applied to any accessible part of the fuzing system after installation into the munition or any munition subsystem.

5.4 Sterilization. Fuzing systems shall incorporate a sterilization feature based on its applicability to system requirements.

5.4.1 Sterilization of torpedoes and sea mines. Fuze systems for torpedoes and sea mines shall provide for sterilization after safe jettison, after specified events and time, or when the munition is no longer capable of functioning reliably.

5.5 Fail-safe-design. Fuzing systems shall incorporate fail-safe design features based on their applicability to system requirements.

5.6 Self-destruction. Fuzing systems shall incorporate a self destruct feature which initiates munition destruction, based on applicability to system requirements. Self-destruction shall not be initiated or enabled prior to launch and attainment of the proper arming delay.

5.7 Fuze setting. If fuze setting is safety critical (e.g. arming time, function time, or proximity broadcast turn-on time), uncontrolled alteration of the set value shall be prevented.

6. NOTES

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

6.1 Intended use. This standard establishes specific design safety criteria for fuzes and safety and arming devices.

6.2 Additional criteria. Individual services components may issue regulations or instructions which impose additional design safety criteria or add clarifying guidelines (e.g., U.S. Army Fuze Safety Review Board Guidelines for Evaluation of Electronic Safety & Arming Systems, WSESRB Technical Manual for Electronic Safety and Arming Devices With Non-Interrupted Explosive Trains).

6.3 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).

6.4 Custodian of service-approvals for lead and booster explosives.

Chairman
DOD Fuze Engineering Standardization Working Group
U.S. Army Armament Research, Development and
Engineering Center
ATTN: AMSTA-AR-CCF-D
Picatinny Arsenal, NJ 07806-5000

6.5 Hazard analyses. Techniques for conducting hazard analyses are described in NAVSEA OD44942, AFSC Design Handbook DH 1-6, Nuc Reg 0492, and MIL-STD-882.

6.6 Subject term (key word) listing.

Delay, arming
Explosive ordnance disposal
Explosive train
Explosive train interruption
Fail-safe
Function, premature
Fuze
Fuze design, safety criteria for
Fuzing system

Non-interrupted explosive train
Safe separation
Safety and arming device

6.7 International Standardization Agreements. Certain provisions of this standard are the subject of International Standardization Agreements (ASCC-AIR-STD-20/9, Design Safety Principles for Airborne Weapon Fuzing Systems, STANAG 4187, Fuzing Systems; Safety Design Requirements, and STANAG 3525, Design Safety Principles and General Design Criteria for Airborne Weapon Fuzing Systems. When change notice, revision or cancellation of this document is proposed which affect or violate the international agreement concerned, the preparing activity will take appropriate reconciliation action through international standardization channels, including departmental standardization offices, if required.

6.8 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

Preparing activity:
Army-AR

Review activities:
Army-MI
Navy-AS
Air Force-99

(Project 13GP-0064)

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 documents(s) or to amend contractual requirements.

I RECOMMEND A CHANGE:	1. DOCUMENT NUMBER **MIL-STD-1316E**	2. DOCUMENT DATE (YYMMDD)

3. DOCUMENT TITLE

FUZE DESIGN, SAFETY CRITERIA FOR

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)*
U. S. Army, TACOM-ARDEC	(1) Commercial **(973) 724-6671** (2) AUTOVON **880-6671**
c. ADDRESS (*Include Zip Code)* **ATTN: AMSTA-AR-QAW-E, B-12** **Picatinny Arsenal, NJ 07806-5000**	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