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6 DECEMBER 1982

**DEPARTMENT OF DEFENSE
INTERFACE STANDARD**

**PRECLUSION OF ORDNANCE HAZARDS IN
ELECTROMAGNETIC FIELDS;
GENERAL REQUIREMENTS FOR**



AMSC N/A

AREA EMCS

DEPARTMENT OF THE NAVY
NAVAL SEA SYSTEMS COMMAND
WASHINGTON, DC 20362

PRECLUSION OF ORDNANCE HAZARDS IN ELECTROMAGNETIC FIELDS; GENERAL REQUIREMENTS
FOR

1. This Military Standard is approved for use by the Department of the Navy, and is available 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 the Commanding Officer, Naval Ordnance Station, Standardization/Documentation Division (524), Indian Head, MD 20640-5000, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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1. SCOPE

1.1 General. This standard establishes the general requirements to preclude hazards resulting from ordnance having electroexplosive devices (EED's) exposed to electromagnetic fields. The nominal frequency range covered by this standard is from 200 kilohertz to 18 gigahertz and 33 to 40 gigahertz.

1.2 Application. These requirements apply to all Naval Weapons Systems safety and emergency devices and other ancillary equipment containing electrically initiated explosive, propellant or pyrotechnic components. The trend in radar and communications equipment towards greater radiated power has resulted in growing concern with electromagnetic radiation hazards to ordnance. These hazards stem from the use of EED's which can be initiated spuriously by means of electromagnetic energy. In addition to the hazards that could occur, performance degradation is also considered.

2. REFERENCED DOCUMENTS

The following documents and the documents referenced in the cited documents (first tier) form a part of this standard to the extent specified. All others are for guidance and information only.

2.1 Government documents.

2.1.1 Specifications and standards. Unless otherwise specified, the following specifications and standards of the issue listed in that issue of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation, form a part of this standard to the extent specified herein.

SPECIFICATIONS MILITARY

MIL-I-23659 - Initiators, Electric, General Design Specification For

STANDARDS MILITARY

MIL-STD-1512 - Electroexplosive Subsystems, Electrically Initiated,
Design Requirements and Test Methods

2.1.2 Other Government documents. The following other Government document forms a part of this standard to the extent specified herein.

NAVSEA OD 30393 - Design Principle and Practices for Controlling
Hazards of Electromagnetic Radiation to Ordnance
(HERO Design Guide)

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

2.2 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

3. DEFINITIONS

3.1 Electroexplosive Device (EED). An electrical initiator or other component in which electrical energy is used to initiate an explosive, propellant or pyrotechnic material contained therein.

3.2 Ordnance. Weapon systems, munitions, safety and emergency devices and other equipment, containing one or more EED's.

3.3 Electromagnetic Environment. Environment containing electromagnetic fields from communications and radar equipments.

3.4 HERO. Acronym for Hazards of Electromagnetic Radiation to Ordnance.

3.5 Hazard. A situation in which the spurious initiation of an EED might result in injury to personnel or damage to material.

3.6 Dudding. Dudding is the process of permanently degrading an EED to a state where it cannot perform its designed function.

3.7 Performance Degradation. A condition in which the spurious initiation, or dudding of an EED might result in degradation of ordnance performance beyond design tolerances but without hazardous external effects.

3.8 Maximum No-Fire Stimulus (MNFS). The greatest firing stimulus which does not cause initiation within five minutes of more than 0.1% of all electric initiators of a given design at a level of confidence of 95%. For electric initiators which contain a delay element the firing stimulus shall be applied for 5 minutes but the actuation time shall be extended to include the maximum delay time specified for the delay element.

3.8.1 Maximum No-Fire Current (MNFC). The MNFS applicable to EED's whose normal performance is specified in terms of current.

3.8.1.1 Maximum No-Fire Power (MNFP). The MNFS derived from MNFC, as follows:

$$MNFP = (I_{MNFC})^2 (R_{min})$$

Where:

R_{min} - is the minimum value of the specified bridgewire Resistance of a single bridge at 25°C in ohms.

I_{MNFC} - is expressed in amperes.

3.8.2 Maximum No-Fire Voltage (MNFV). The MNFS applicable to EED's whose normal performance is specified in terms of voltage.

3.8.2.1 Maximum No-Fire Energy (MNFE). The MNFS derived from MNFV as follows:

$$\text{MNFE} = C/2 (\text{MNFV})^2$$

Where:

MNFE - is expressed in Joules

C - is expressed in Farads

MNFV - is expressed in Volts

4. GENERAL REQUIREMENTS

4.1 Ordnance Design.

4.1.1 EED's should not be used in ordnance unless non-electric devices or other electric devices, which are equally reliable and effective, are not available.

4.1.2 Alternating power sources with frequency greater than 10 kilohertz shall not be used for the normal initiation of EED's.

4.1.3 Ordnance systems shall be designed to preclude hazards and performance degradation in the electromagnetic environment specified in Table I.

4.1.4 Methods and techniques to be incorporated in designs in order to comply with this standard are given in OD 30393.

5. DETAILED REQUIREMENTS

5.1 Government-Controlled Evaluation Tests. Conformity with this standard will normally be demonstrated by means of Government-controlled evaluation tests conducted in the electromagnetic environment specified in paragraph 4.1.3. Whether the spurious initiation or dudding of an EED presents a hazard or causes performance degradation will be determined by government safety authority.

TABLE I. Electromagnetic environment levels

<u>FREQUENCY</u> <u>(MHz)</u>	<u>FIELD INTENSITY</u> <u>Volts (RMS)/Meter</u>	<u>AVERAGE POWER DENSITY</u> <u>Milliwatts/Square Centimeter</u>
<u>Communications</u>		
0.2 - 0.6	300	
0.6 - 1.5	200	
1.5 - 32	200	
32 - 100		1.0
100 - 200		1.0
200 - 790		1.0
<u>Radars/Other</u> <u>Electronic Equipment</u>		
150 - 225		20
225 - 790		15
790 - 850		100
850 - 950		100
950 - 1400		100
1400 - 2700		100
2700 - 3600		400
3600 - 5400		100
5400 - 5900		400
5900 - 7900		100
7900 - 8400		175
8400 - 8500		400
8500 - 11000		400
11000 - 14000		100
14000 - 18000		100
33000 - 40000		4

5.1.1 When electromagnetic radiation sources associated with the ordnance are capable of producing fields in excess of those specified in Table I, these higher fields shall apply. The requirement to meet the higher fields shall be detailed in the system procurement specifications.

5.1.2 For purpose of quality assurance the evaluation will normally include the procedures for packaging, handling, storage, transportation, checkout and loading/unloading of the ordnance.

5.1.3 The ordnance shall be considered adequately designed in accordance with this standard if, in the specified environment, the appropriate stimuli do not exceed the following in any EED in the system:

For Hazards:

0.15 MNFC or 0.15 MNFV,
(0.15)² MNFP or (0.15)² MNFE.

For Performance Degradation:

0.45 MNFC or 0.45 MNFV,
(0.45)² MNFP or (0.45)² MNFE.

5.2 Quality assurance provisions. Unless otherwise specified by the procuring activity, all EED's shall pass the applicable tests specified herein.

5.2.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the standard where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

5.2.2 EED Direct Current sensitivity measurements. The direct current sensitivity of all EED's in the system under test shall be established by one of the following methods:

a. For EED's having a MNFS rating of 1 ampere/1 watt, the verification shall be in accordance with 4.4.3.1 Power/Current of MIL-I-23659.

b. For EED's that have a MNFS rating other than 1 ampere/1 watt, the verification shall be in accordance with test method 203 of MIL-STD-1512.

5.2.2.1 Test results. EED MNFS data generated during the direct current sensitivity measurements should be supplied as part of the system safety assessment report or EMC control plan (see 6.2).

6. NOTES

6.1 International standardization agreements. Certain provisions of this standard (e.g. paragraph 1.1, 1.2 and 4.1.3 including Table I) are the subject of North Atlantic Treaty Organization (NATO) Standardization Agreement (STANAG) 1307. When amendment, revision, or cancellation of this standard is proposed which will modify the international agreement concerned, the preparing activity will take appropriate action through international standardization channels including departmental standardization offices to change the agreements or take other appropriate action.

6.2 Test reports. When an acquisition requires a Safety Assessment Report, DI-SAFI-80102 or an Electromagnetic Interference Control Plan, DI-R-7061, the test results from 5.2.2 should be included.

6.3 Subject term (key word) listing

Design, ordnance
Device, electromagnetic
Electromagnetic fields
Environment, electromagnetic
HERO
International standardization agreements
Ordnance hazards
Radars
Radiation, electromagnetic
Safety
Standards
Tests
Weapons systems, Naval

6.4 Changes from previous issue. Asterisks or vertical lines are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodian:
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Preparing activity:
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(Project No. EMCS-N113)

Review activity:
Navy - EC

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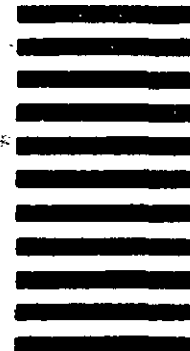
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1. DOCUMENT NUMBER MIL-STD-1385B(NAVY)		2. DOCUMENT TITLE PRECLUSION OF ORDNANCE HAZARDS IN ELECTROMAGNETIC FIELDS; GENERAL REQUIREMENTS FOR	
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