

DEPARTMENT OF DEFENSE



JOINT ORDNANCE TEST PROCEDURE (JOTP)

GUIDELINE FOR QUALIFICATION OF FUZES, SAFE AND ARM (S&A) DEVICES, AND IGNITION SAFETY DEVICES (ISD)

DoD Fuze Engineering Standardization Working
Group (FESWG)

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FOREWORD

1. Beneficial comments (recommendation, additions, and deletions) and any pertinent data which may be of use in improving this document shall be addressed to:

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2. DoD JOTP-052, Guideline for Qualification of Fuzes, Safe and Arm Devices (S&A), and Ignition Safety Devices (ISD), dated 17 March 2012, supersedes DoD FESWG Document 2008-1, Guideline for Qualification of Fuzes, Safe and Arm Devices (S&A), and Ignition Safety Devices (ISD), dated 07 October 2008.

1. SCOPE

This guideline provides guidance on qualification test plan definition of fuzes, S&As and ISDs. The primary purpose of the qualification guideline is to standardize a minimally acceptable test series, addressing safety and basic suitability for service use. It is expected that other tests and test items would be added, as required, based on unique program specifications and munition lifecycle to further support suitability for service use.

This guideline applies to fuzes, S&As and ISDs. Exclusions include nuclear weapons systems and trainers, flares and signals dispensed by hand-held devices and pyrotechnic countermeasure devices. These tests do not replace the basic munition safety tests of MIL-STD-2105.

This guideline has been developed by the DoD Fuze Engineering Standardization Working Group (DoD FESWG) for use by the Army Fuze Safety Review Board (AFSRB), the Army Ignition System Safety Review Board (ISSRB), the Air Force Nonnuclear Munitions Safety Board (NNMSB), and the Navy Fuze and Initiation System Technical Review Panel (FISTRP). These Service Safety Review Authorities will review fuze, S&A and ISD qualification test plans for compliance with this guideline.

2. APPLICABLE DOCUMENTS

MIL-STD-331	Fuze and Fuze Components, Environmental and Performance Tests for
MIL-STD-461	Requirements for the Control of Electromagnetic Interference Characteristics of Subsystems and Equipment
MIL-STD-464	Electromagnetic Environmental Effects Requirements for Systems
MIL-STD-810	Environmental Engineering Considerations and Laboratory Tests
MIL-STD-1316	Fuze Design, Safety Criteria for
MIL-HDBK-1512	Electroexplosive Subsystems, Electroexplosive Subsystems, Electrically Initiated, Design Requirements and Test Methods
MIL-STD-1901	Munition Rocket and Missile Motor Ignition System Design, Safety Criteria for
MIL-STD-1911	Hand-Emplaced Ordnance Design, Safety Criteria for

MIL-STD-2169 High Altitude Electromagnetic Pulse (HEMP) Environment

(Copies of these documents are available online at <http://assist.daps.dla.mil/quicksearch/> or from the Standardization Document Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

3. REQUIREMENTS

3.1 General. As part of qualification, all fuzes, S&As and ISDs shall be subjected to Sequential Environment (Waterfall) Testing, Miscellaneous Tests, Performance Tests, and Electromagnetic Environmental Effects (E3) Tests. These requirements do not constitute an entire qualification program. Rather, they must be included as part of the qualification program.

3.2 Test Basis. In general, MIL-STD-331 should be used as the test basis for qualification of fuzes, S&As and ISDs. In the case where the Stockpile to Target Sequence (STS) environments are greater than those of MIL-STD-331, the STS environments must be employed. Tests from other standards (i.e., MIL-STD-810) or Test Operations Procedures (TOP) may be employed when there is no similar MIL-STD-331 test or such standards pose more severe test parameters.

3.3 Sequential Environment Testing.

3.3.1 Sequential environment testing representative of fuze, S&A or ISD life cycle will consist of Transportation Vibration (Trans Vib), Temperature and Humidity (T&H), Extreme Temperature (ET), Thermal Shock (TS) and Tactical Vibration (Tac Vib) as a minimum. Non-operating environments should occur prior to operating environments in test series.

3.3.2 There are two methods for conducting Sequential Environment Testing. One of the two test methods shall be employed as part of a fuze, S&A or ISD qualification program. A minimum of thirty test items are required to be subject to all environments in prescribed sequence for either Method.

3.3.2.1 Method I. Method I is intended to be the baseline test series and includes full duration tests outlined in 3.3.1. Figure 1a depicts the environmental test sequence for Method I. Figure 1b depicts an expanded notional example of the sequential test flow for Method I.

3.3.2.2 Method II. Method II requires the same sequential environment tests as in Method I, but allows for lesser T&H and ET test duration in the sequential path. However, additional, full duration T&H and ET tests must be conducted in parallel to the sequential tests. This allows for a reduced test schedule, but an increase in test items in comparison to Method I. Figures 2a and 2b depict the environmental test sequence

for Method II. Figure 2c depicts an expanded notional example of the test flow for Method II. A minimum of three test items are required for each full duration ET and T&H tests conducted in parallel with the sequential environment tests in Method II.

3.3.3 Sequence of Environments. The sequence of environments for Test Methods I & II depicted in Figures 1a, 1b, 2a, 2b and 2c is the preferred sequence. Deviations from this should be considered on a case by case basis.

3.4 Miscellaneous Tests

3.4.1 As part of the qualification program for fuzes, S&As and ISDs, the following safety tests shall be conducted on the fuze, S&A or ISD: Primary Explosive Component Safety/Out-of-Line, Jolt, Jumble One-and-a-half Meter (5 foot) Drop, Transportation Handling, Transportation Vibration and Twelve Meter (Forty Foot) Drop. (One-and-a-half Meter Drop test not required here if conducted as part of Sequential Environment Tests.)

3.4.2 Miscellaneous Tests shall be conducted as described in Figure 3.

3.4.3 Additional Miscellaneous Tests shall be conducted as described in Figure 4.

Sequential Environment Tests Method I^{1,2,3,5,8,9}

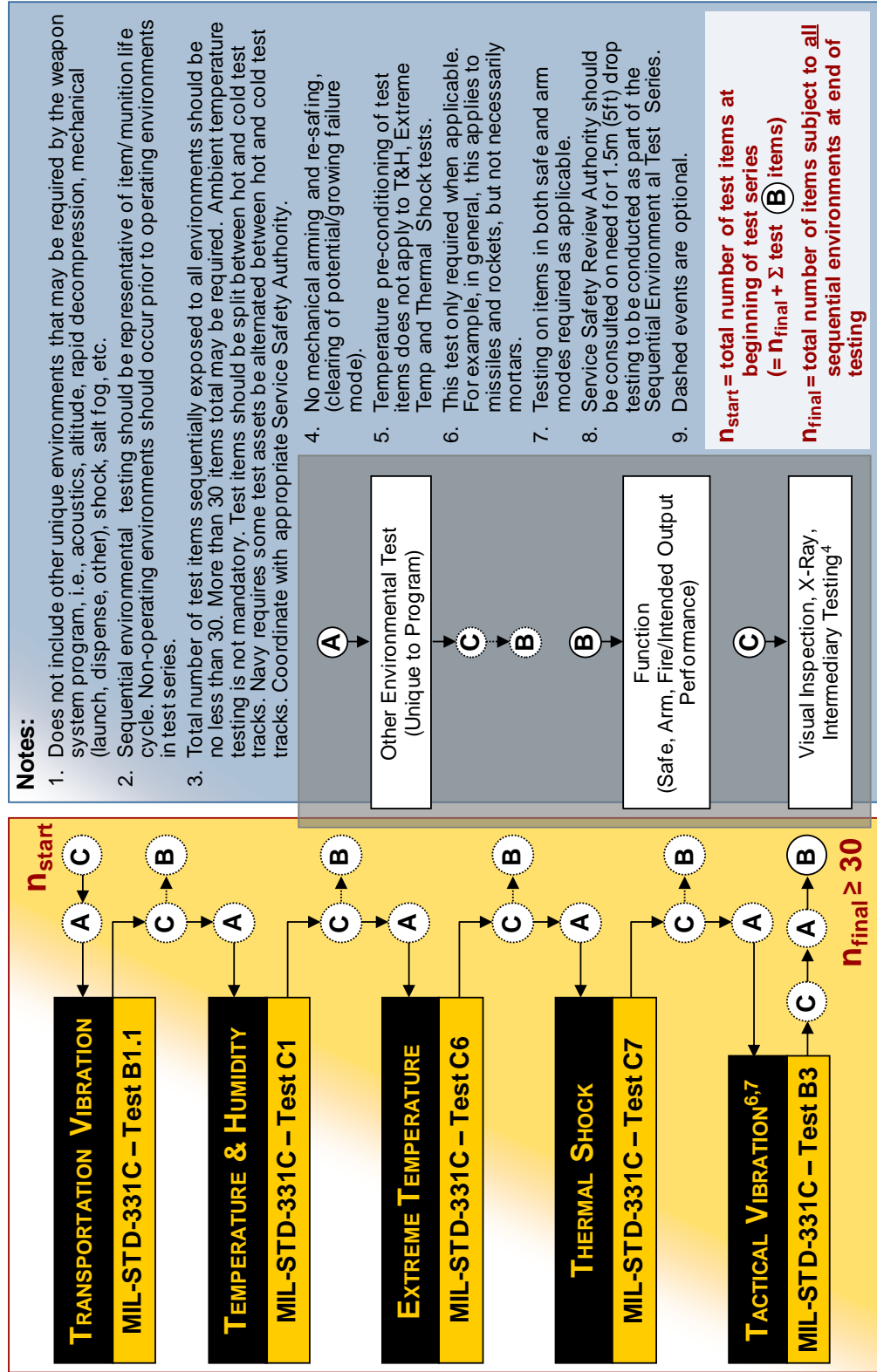


Figure 1a. Sequential Environment Testing Method I

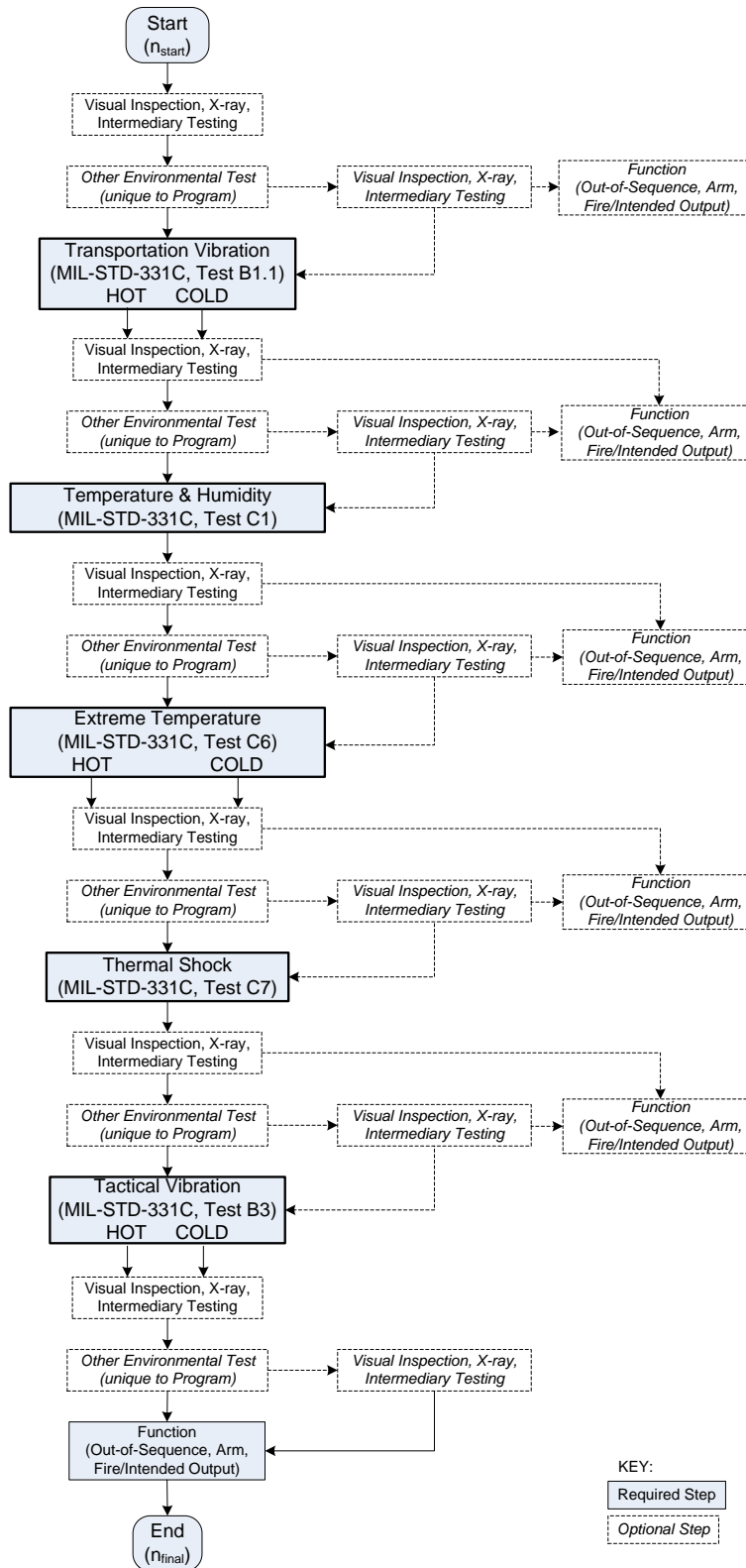


Figure 1b. Method I Test Flow – Expanded

Sequential Environment Tests Method II^{1,2,3,5,10,11,*}

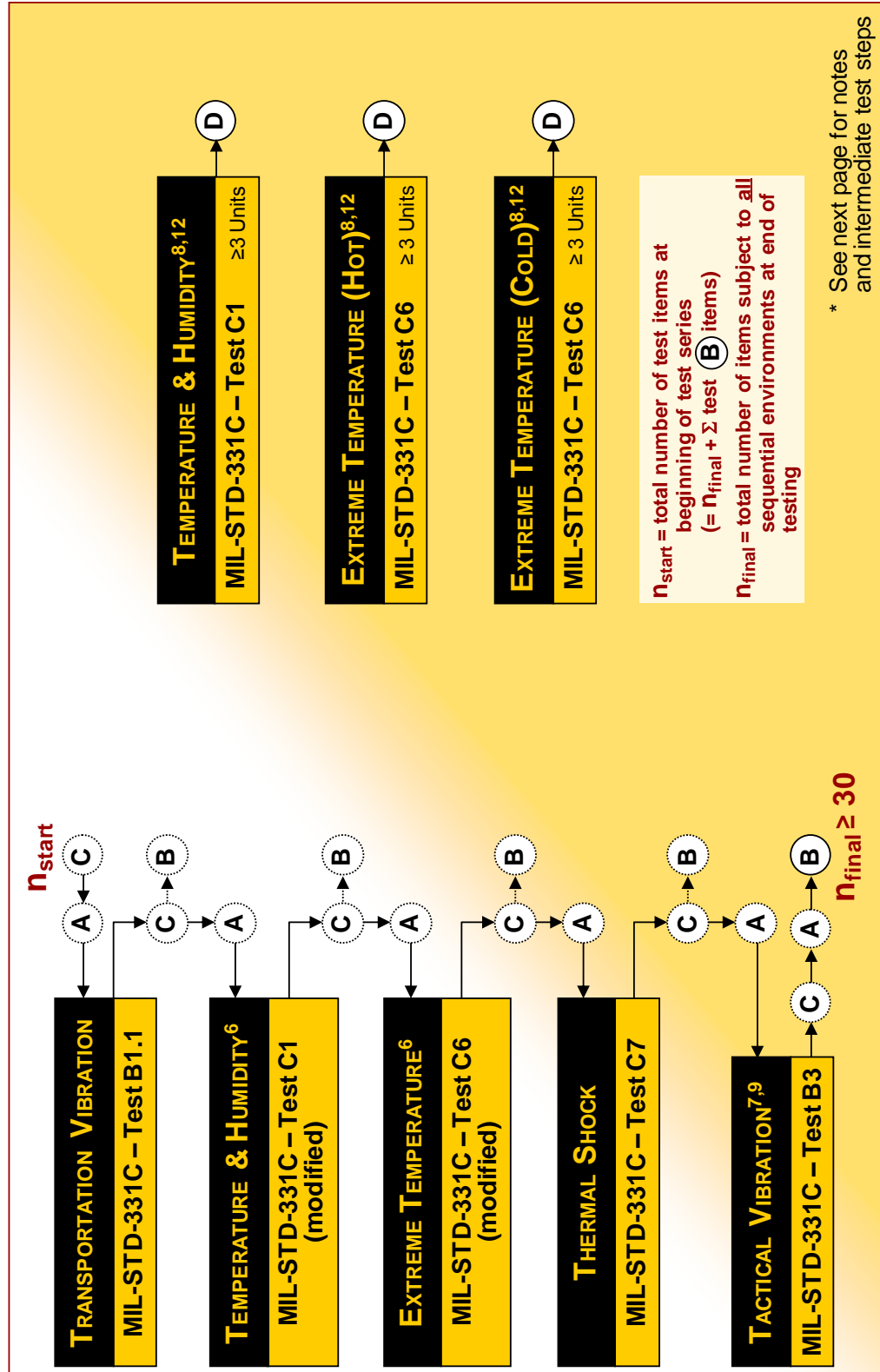
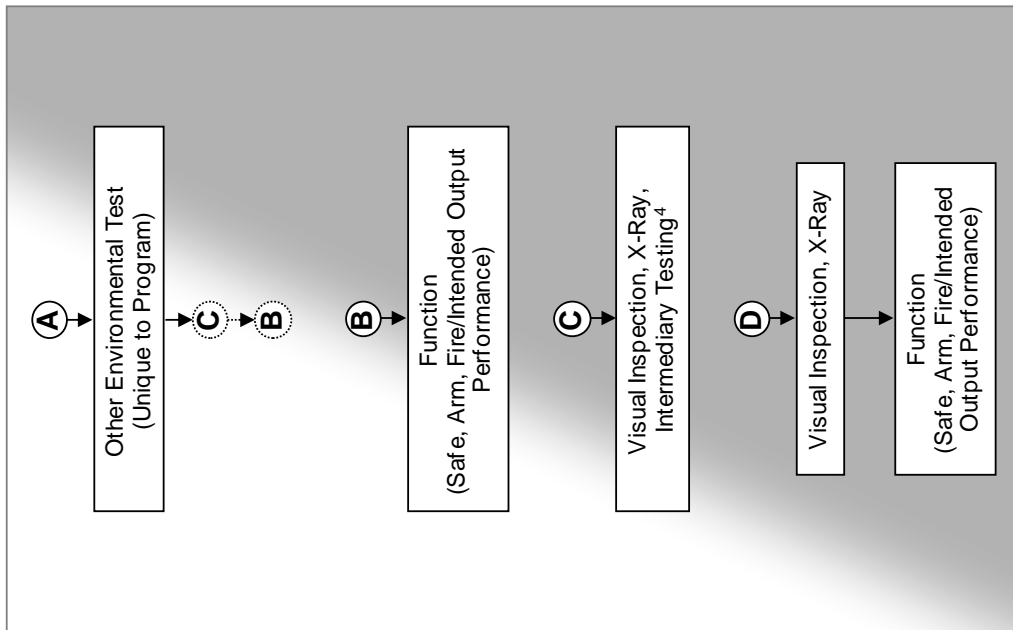


Figure 2a. Sequential Environment Testing Method II

Sequential Environment Tests Method II Notes



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Notes:

1. Does not include other unique environments that may be required by the weapon system program, i.e., acoustics, altitude, rapid decompression, mechanical (launch, dispense, other), shock, salt fog, etc.
2. Sequential environmental testing should be representative of item/munition life cycle. Non-operating environments should occur prior to operating environments in test series.
3. Total number of test items sequentially exposed to all environments should be no less than 30. More than 30 items total for sequential testing may be required. Similarly, more than three test units each for full duration T&H and Temperature Extreme testing may be required. Ambient temperature testing is not mandatory. Test items should be split between hot and cold test tracks. Navy requires some test assets be alternated between hot and cold test tracks. Coordinate with appropriate Service Safety Authority.
4. No mechanical arming and re-safing, (clearing of potential/growing failure mode).
5. Temperature pre-conditioning of test items does not apply to T&H, Extreme Temp and Thermal Shock tests.
6. These tests can be of decreased duration (14 day duration each test, each test temperature).
7. This test only required when applicable. For example, in general, this applies to missiles and rockets, but not necessarily mortars.
8. Full 28-day duration tests.
9. Testing on items in both safe and arm modes required as applicable.
10. Service Safety Review Authority should be consulted on need for 1.5m (5ft) drop testing to be conducted as part of the Sequential Environment at Test Series.
11. Dashed events are optional.
12. Test quantities for these "parallel" tests should be no less than three for each test.

Figure 2b. Sequential Environment Testing Method II – Notes

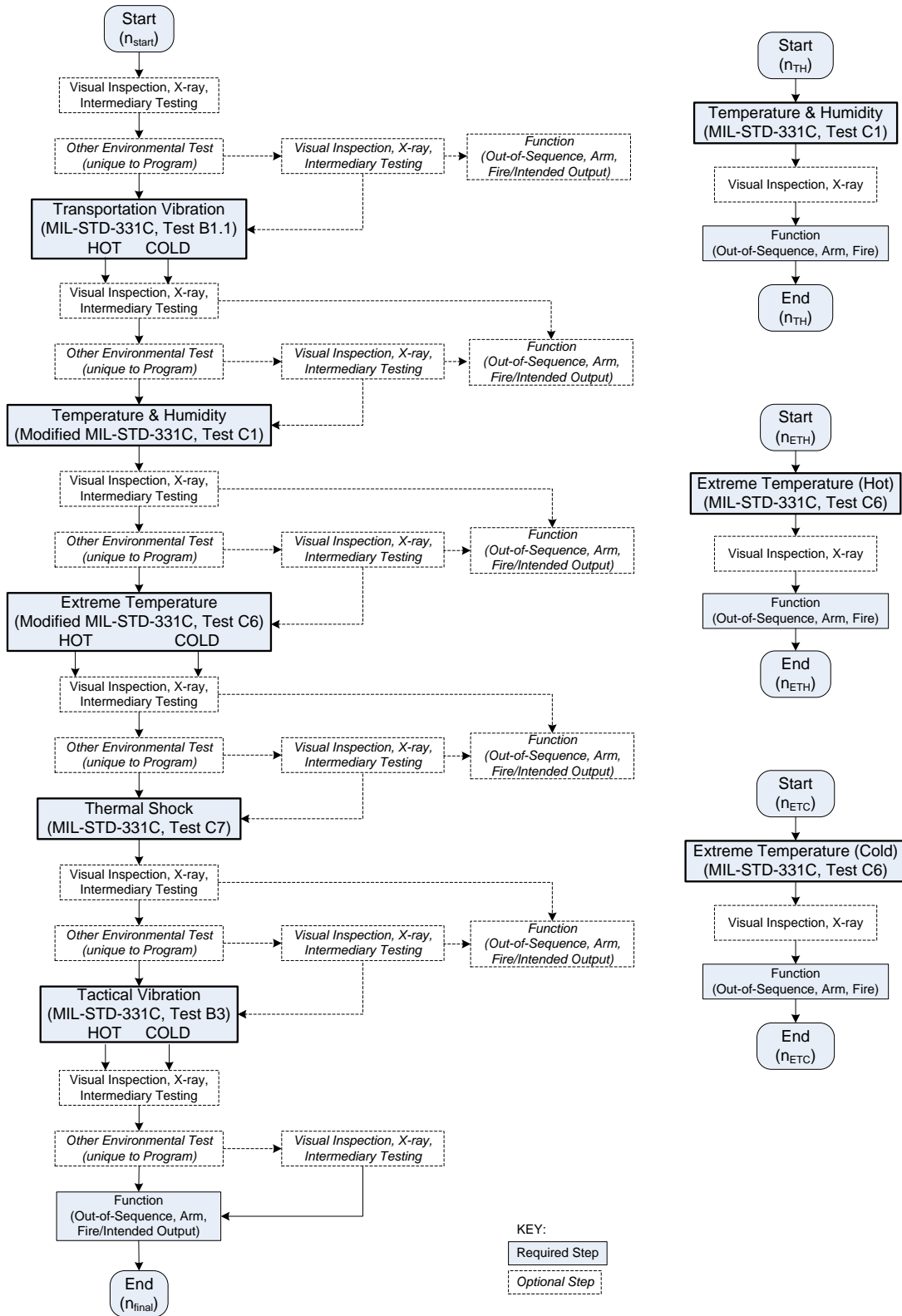


Figure 2c. Method II Test Flow – Expanded

Miscellaneous Tests

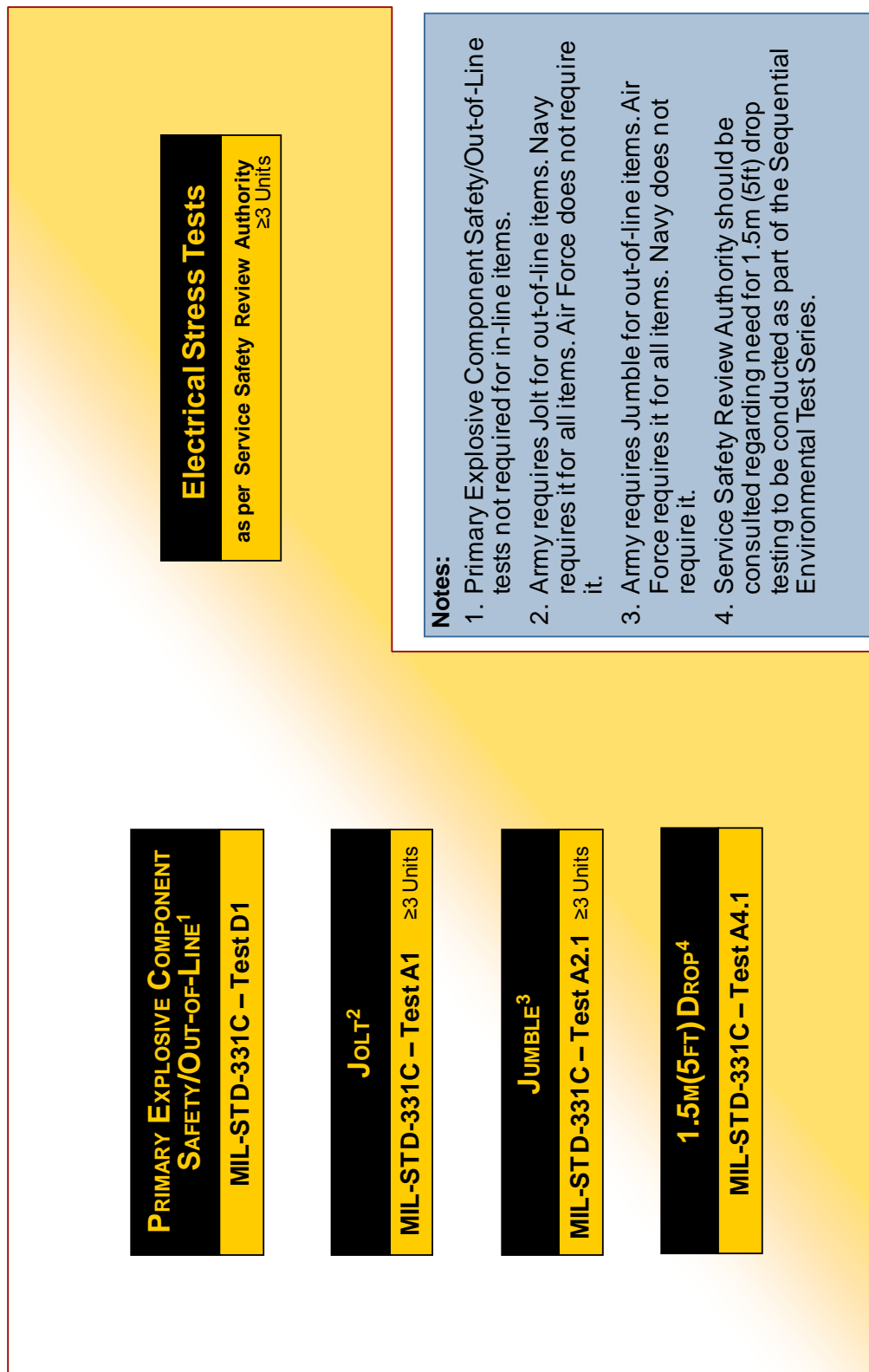


Figure 3. Miscellaneous Tests

Additional Miscellaneous Tests

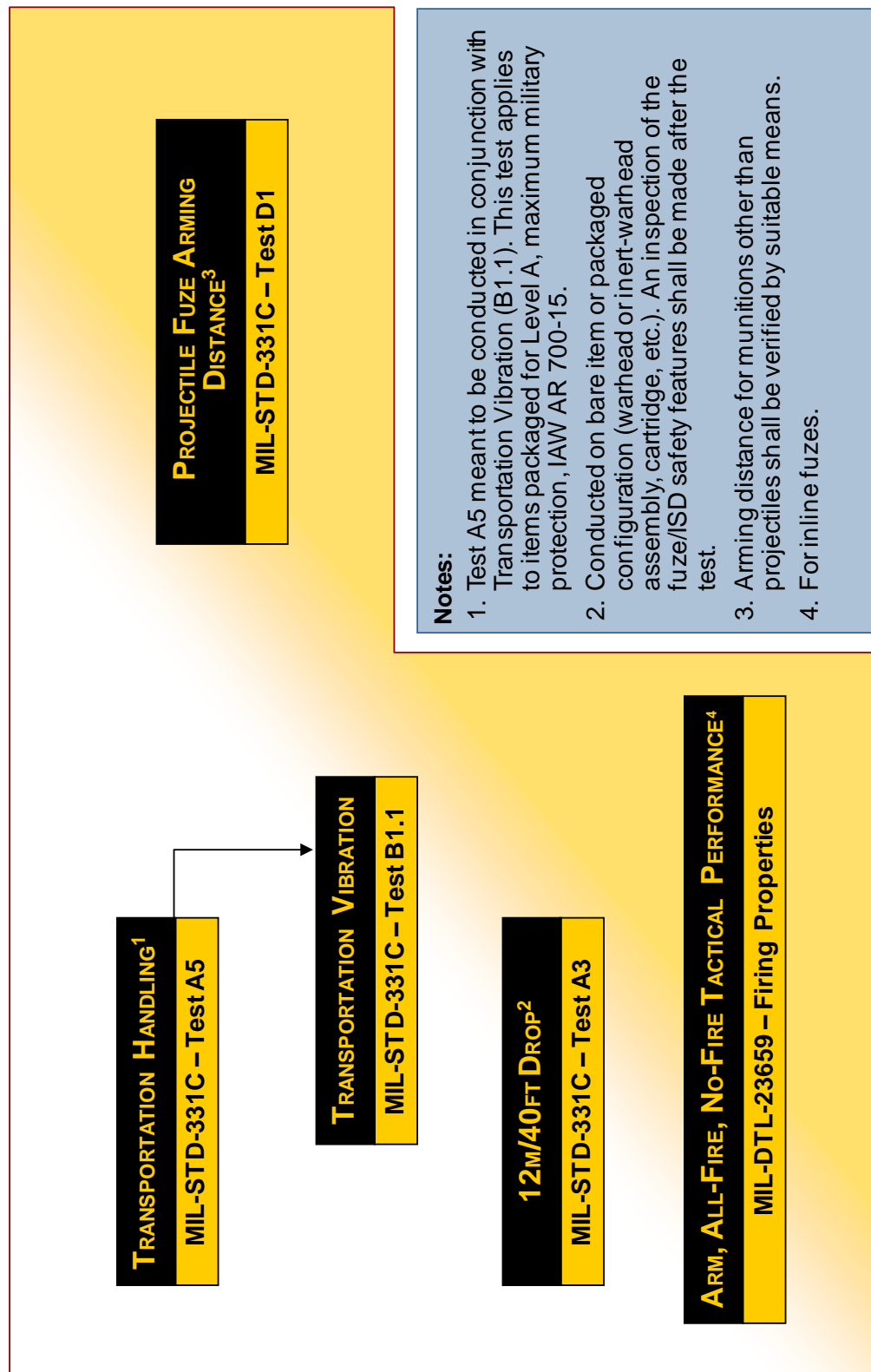


Figure 4. Additional Miscellaneous Tests

3.5 Performance Tests

3.5.1 As part of the qualification program for fuzes, S&As and ISDs, the following performance tests shall be conducted: Progressive Arm, Subverted Jolt (two configurations), Subverted Jumble (two configurations), Subverted 1.5m (5 ft) Drop (two configurations) and Arm, All-fire, No-fire Tactical Performance.

3.5.2 The subverted Jolt, Jumble and 1.5m Drop tests require two configurations to be tested. One configuration has the first safety feature intact, with the second safety feature subverted. The other configuration has the second safety feature intact with the first safety feature subverted. Each of these tests will be conducted with the required quantities of each configuration.

3.5.3 Performance Tests shall be conducted as described in Figure 5.

3.6 Electromagnetic Environmental Effects (E3) Tests

3.6.1 The following E3 tests shall be conducted as part of the qualification program for fuzes, S&As and ISDs: Personnel-Borne Electrostatic Discharge (ESD), Helicopter-Borne ESD, Power Supply Transients, Lightning Effects, Electromagnetic Radiation (EMR), Electromagnetic Pulse (EMP) and Electromagnetic Interference (EMI).

3.6.2 E3 Tests shall be conducted as described in Figure 6.

Performance Tests

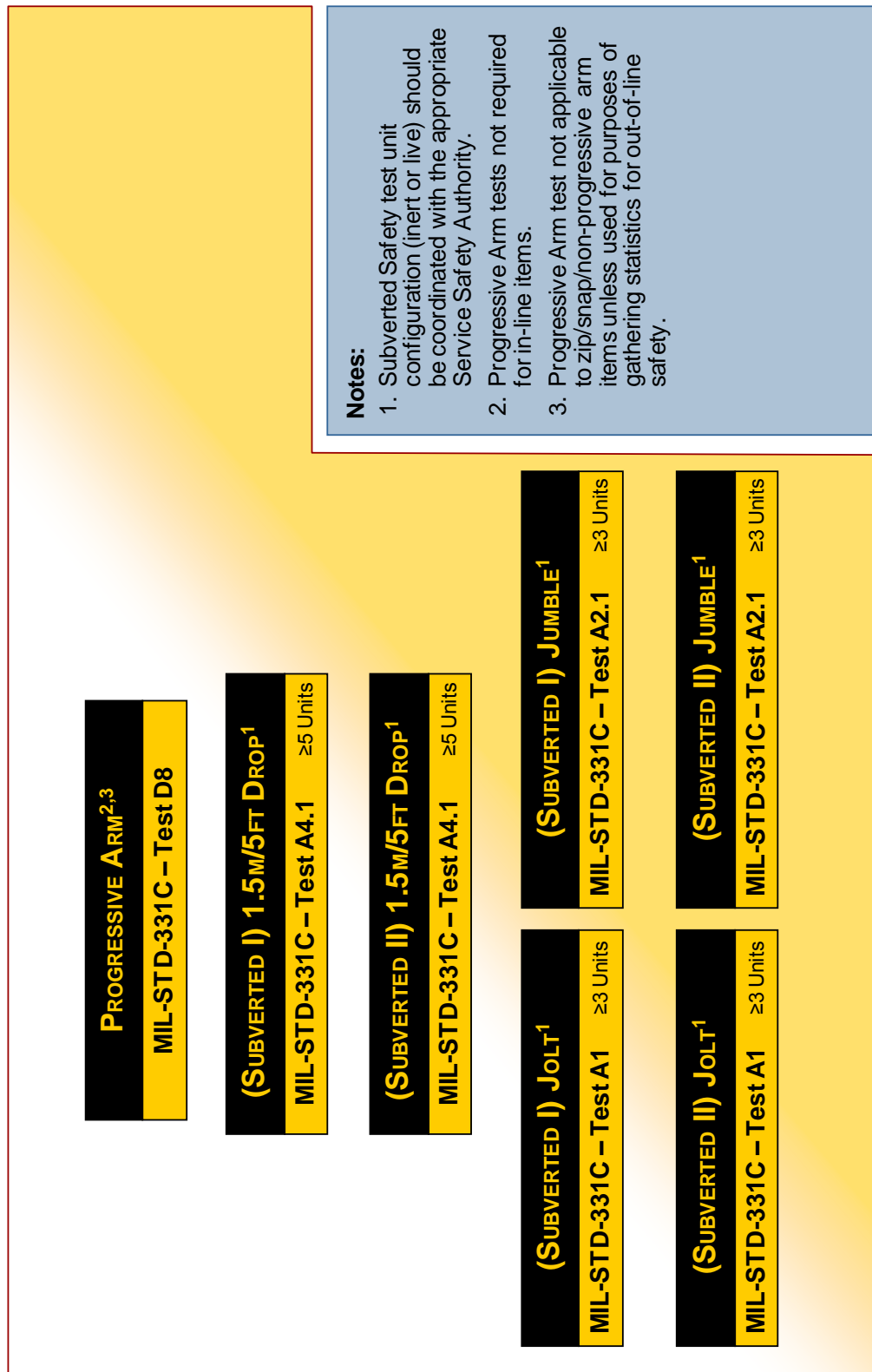


Figure 5. Performance Tests

Electromagnetic Environmental Effects (E3) Tests⁴

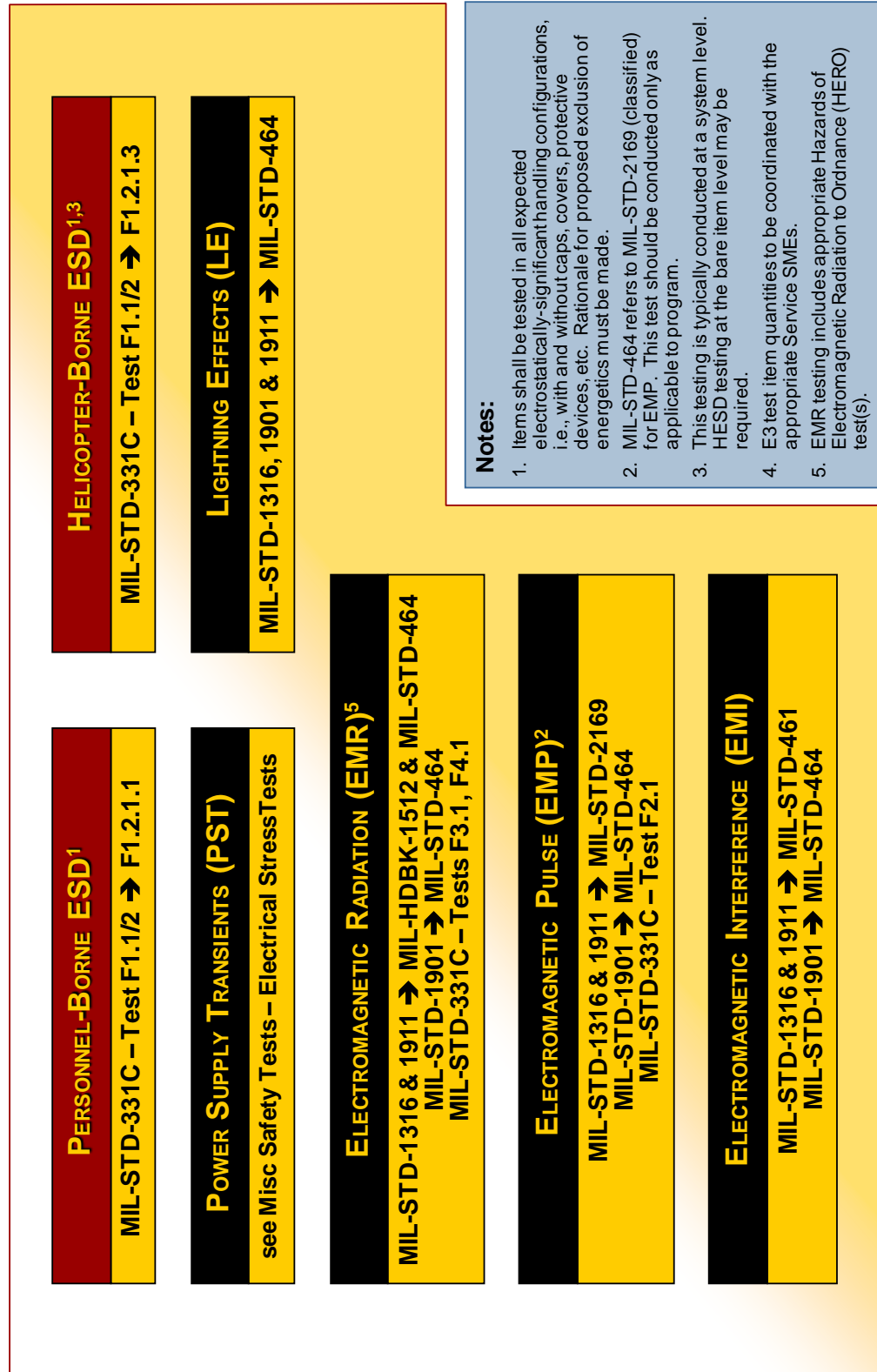


Figure 6. Electromagnetic Environmental Effects Tests

4. ACRONYMS

AFSRB	U.S. Army Fuze Safety Review Board
DoD	Department of Defense
E3	electromagnetic environmental effects
EMI	electromagnetic interference
EMP	electromagnetic pulse
EMR	electromagnetic radiation
ESD	electrostatic discharge
ET	extreme temperature
FESWG	DoD Fuze Engineering Standardization Working Group
FISTRP	U.S. Navy Fuze and Initiation System Technical Review Panel
HEMP	high altitude electromagnetic pulse
HERO	hazards of electromagnetic radiation to ordnance
HESD	helicopter-borne electrostatic discharge
ISD	ignition safety device
ISSRB	U.S. Army Ignition System Safety Review Board
JOTP	Joint Ordnance Test Publication
LE	lightning effects
NNMSB	U.S. Air Force Nonnuclear Munitions Safety Board
PESD	personnel-borne electrostatic discharge
PST	power supply transients
S&A	safe and arm
SME	subject matter expert
STS	stockpile to target sequence
T&H	temperature & humidity
Tac Vib	tactical vibration
TOP	test operation procedure
Trans Vib	transportation vibration
TS	thermal shock