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MIL-STD-1337B (SHIPS)  
8 APRIL 1971

SUPERSEDING  
MIL-STD-1337A (SHIPS)  
16 June 1969

## MILITARY STANDARD

# GENERAL SUPPRESSION SYSTEM DESIGN REQUIREMENTS FOR PORTABLE ELECTRIC HAND TOOLS



FSC 5130

MIL-STD-1337B(SHIPS)  
8 April 1971

DEPARTMENT OF THE NAVY  
NAVAL SHIP SYSTEMS COMMAND  
WASHINGTON, D. C. 20360

General Suppression System Design Requirements For  
Portable Electric Hand Tools

1. This Military Standard was approved 8 April 1971 and is mandatory for use by the Naval Ship Systems Command.

2. Recommended corrections, additions, or deletions should be addressed to Commander, Naval Ship Engineering Center, Department of the Navy, Center Building, Prince George's Center, Hyattsville, Maryland 20782.

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#### FOREWORD

The purpose of this standard is to establish suppression design requirements for portable electric hand tools that must conform to the electromagnetic interference control requirements of MIL-STD-461.

This standard also takes exception to MIL-STD-461 and MIL-STD-462, in order to establish more realistic techniques for electromagnetic interference suppression in electric hand tools previously established in MIL-I-43121 and MIL-I-16910, which are now superseded by MIL-STD-461.

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## 1. SCOPE

1.1 Scope. This standard covers electromagnetic interference design requirements for portable electric hand tools (metal or insulated encasements or a combination thereof) having functional or double-insulation.

1.2 Classification. Electric hand tools (see 3.1) shall be equipped with suppression systems of one of the following classes:

- Class 1 - Suppression system with nominal leakage current not exceeding 5 milliamperes.
- Class 2 - Suppression system with nominal leakage current not exceeding 1 milliampere.

## 2. REFERENCED DOCUMENTS

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

### SPECIFICATIONS

#### MILITARY

- MIL-C-25 - Capacitors, Fixed, Paper-Dielectric, Direct Current (Hermetically sealed in Metal cases), General Specification for.
- MIL-C-11693 - Capacitors, Feed-Through, Radio-Interference Reduction, AC and DC (Hermetically Sealed in Metallic Cases), General Specification for.
- MIL-C-12889 - Capacitors, By-Pass, Radio-Interference Reduction, Paper Dielectric, AC and DC (Hermetically Sealed in Metallic Cases), General Specification for.
- MIL-F-15733 - Filters, Radio Interference, General Specification for.

### STANDARDS

#### MILITARY

- MIL-STD-461 - Electromagnetic Interference Characteristics Requirements for Equipment.
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement of.

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

## 3. DEFINITIONS

3.1 Portable electric hand tools. For the purpose of this standard a portable electric hand tool is defined as any electrically-driven tool which may be hand held while operating, and includes among others such items as saws, grinders, sanders, drills, hammers, wrenches, polishers, and nut runners.

## 4. GENERAL REQUIREMENTS

### 4.1 Suppression system design

4.1.1 Interference-free design. Whenever practical, inherently interference-free motors shall be used. In all instances the design shall insure that the intensity of electromagnetic interference inherently generated and propagated is the minimum achievable compatible with the state of the art, prior to the application of suppression measures. The need for the application of suppression components to provide further interference reduction does not preclude this requirement. Suppression components shall be installed inside the tool housing. Wherever practical, the armature winding shall be connected between the two halves of the field winding, thus taking advantage of the inductance of the field windings in reducing the level of electromagnetic-frequency energy entering the power leads. A typical suppression system is shown in figure 1; however, suppression in accordance with this figure is not mandatory.

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4.1.2 Label. Tools with Class 1 suppression system shall bear a permanent label warning of the necessity for using the grounding connection to avoid shock.

4.1.3 Performance. The tool and the suppression system shall be capable of meeting all use and environmental requirements prescribed in the tool specification with the complete suppression system applied. However, short-time dielectric strength, over-voltage or over-current tests on the tool in which the applied voltage or current exceeds the short-time test ratings of suppression components approved for the application may be performed with the pertinent suppression components removed or otherwise protected.

## 5. DETAILED REQUIREMENTS

5.1 Suppression components. Suppression components shall conform to the requirements of MIL-C-25, MIL-C-11693, MIL-C-12889, or MIL-F-15733, as applicable, except as noted in 5.1.1 and 5.1.2.

5.1.1 Semi-coaxial capacitors. Capacitors of this type may be used in the suppression system if they are certified by the capacitor manufacturer to meet all of the requirements and tests of MIL-C-11693 which would be applicable to feed-thru capacitors of the same electrical and environmental ratings qualified under that specification except that: (1) case, terminal and mounting bracket provisions shall be acceptable to the contracting officer for the particular application; (2) the insertion-loss requirement is changed to require only that the frequency of maximum insertion loss shall not be lower than 50 MHz.

5.1.2 Standard feed-through. The standard feed-through (also called coaxial) capacitor, in order to meet the stringent insertion loss requirements of MIL-C-11693, has fully extended-foil construction and axially symmetrical (coaxial) connections to both foils. The semicoaxial capacitor, as permitted here for suppression on electric hand tools, has extended-foil construction with coaxial connection to the feed-through conductor for only one coil; the other foil is not extended, and only its outer end is connected to the case. Thus the r-f current path is not axially symmetrical, and the resulting self-inductance causes the insertion loss of the unit to drop somewhat at frequencies above its broad self-resonant frequency.

5.1.2.1 Capacitors versus filters. Filters shall not be used where the requirements of this standard can be met by reasonable and proper application of capacitors, unless it can be shown that use of filters will reduce the cost of suppression. Multiple capacitors in one case are not considered as filters, regardless of commercial nomenclature. Suppression components shall be installed in such a manner, wherever practical, as to provide shielding or separation between r-f input (unfiltered) and output (filtered) circuits.

5.1.3 Shock hazard. The total nominal capacitance of suppression components (including that in filters) applied from either side of the power line to case or frame of the tool shall not exceed the values shown in Figure 2. A plus tolerance not exceeding 20 percent is permitted above the nominal values. Capacitance from line to line and brush to brush are not limited, but capacitance from brush to case or frame shall be considered as line to frame. Tools incorporating a ground conductor and appropriate grounding device in their power cords may employ capacitance values within the limits shown by the (5-milliampere) curve in Figure 2. Tools that are not required to be grounded may employ capacitance values within the limits shown by the (1-milliamperere) curve in Figure 2.

5.2 Electromagnetic interference characteristics requirements and measurement of. Electromagnetic interference requirements and measurement procedures shall be in accordance with MIL-STD-461 and MIL-STD-462. The following changes to these documents shall be applicable for portable electric hand tools.

### 5.2.1 Changes applicable to MIL-STD-461.

#### 5.2.1.1 Method A-CE1. Change the test procedures for electric tools as follows:

- (a) The tool case shall be nonconductively separated from the metal ground plane by 1 meter.

#### 5.2.1.2 Figure A-CE1. The EMI Meter may be on a separate ground plane.

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5.2.1.3 Emission limits. Radiated emission limits for portable electric hand tools shall be as indicated on Figure 3 in lieu of the limit for RE02 and RE05 broadband emissions in MIL-STD-461.

5.2.2 Changes applicable to MIL-STD-462. Requirements for loads shall be changed as follows:

5.2.2.1 Loads. The equipment under test, except electric hand tools, shall be loaded with the full mechanical and electrical loads, or equivalent for which it is designed. This requirement specifically includes electrical loading of the contacts of mechanisms which are designed to control electrical loads even though such loads are physically separate from the equipment under test. Operation of voltage regulators and other circuits that function intermittently is required during testing. The loads used shall simulate the resistance, inductance, and capacitance of the actual load. Mechanical devices shall also be operated under load. The device under test shall be actuated by the same means as in the installation. Example: If a solenoid is actuated by a silicon-controlled rectifier, do not use a toggle switch to operate the solenoid for the test. Electric hand tools shall be tested at no load.

5.2.2.2 Figure RE02-2. Make the following changes to figure RE02-2:

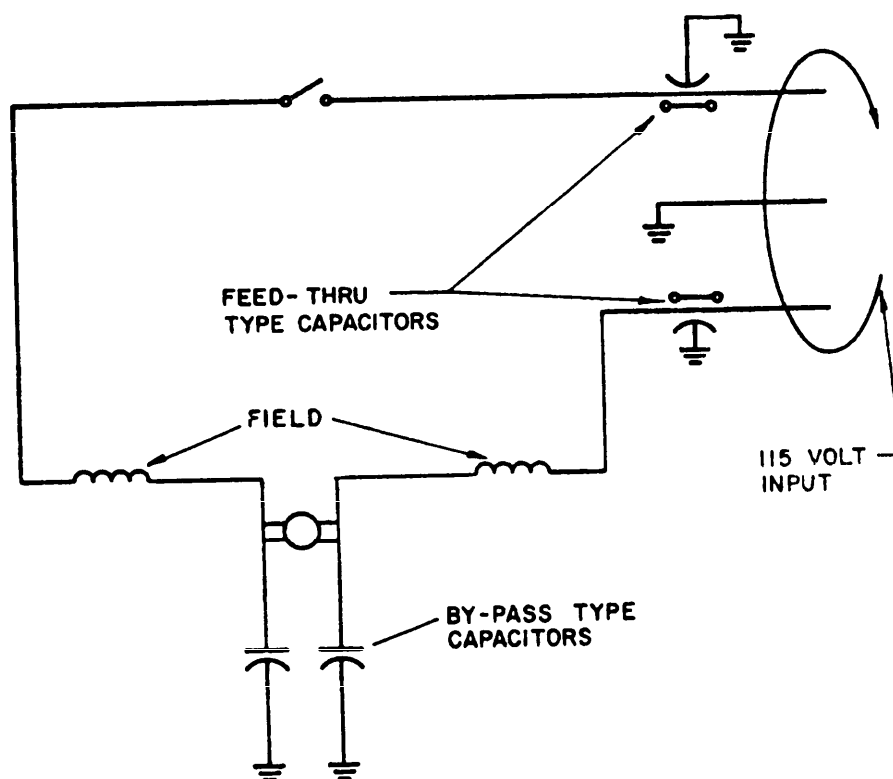
- (a) Substitute line impedance stabilization networks for the 10 microfarad capacitors shown.
- (b) Add a flexible nonferrous metal bond strap from the antenna ground plane to the test ground plane.

## 6. NOTES

6.1 Not applicable.

Preparing activity:  
Navy - SH  
(Project 5130-N201)

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THE REQUIRED CAPACITANCE VALUES & THE NECESSITY FOR  
ADDITIONAL SUPPRESSION CAN BE DETERMINED ONLY BY ELECTROMAGNETIC  
INTERFERENCE MEASURING TESTS

Figure 1 - Typical interference reduction system for electric hand tools.



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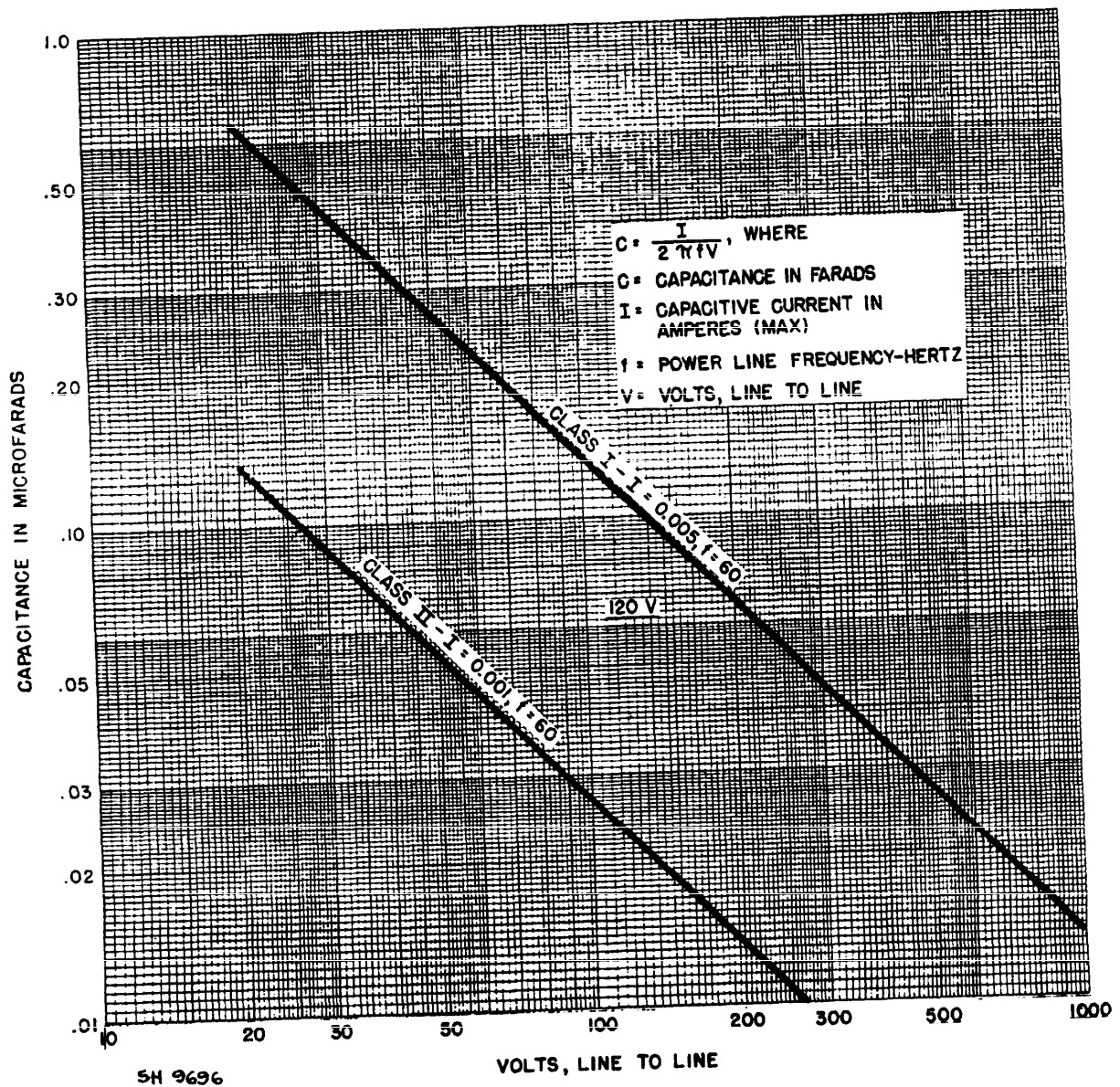


Figure 2 - Maximum nominal capacitance from each line to frame as limited by shock hazard.

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