

MIL-R-22449(Wep)  
15 April 1960  
SUPERSEDING  
OS 8745A  
10 March 1960

## MILITARY SPECIFICATION

### REQUIREMENTS (CERTIFICATION) FOR PYROTECHNIC ITEMS

This specification has been approved by the Bureau of Naval Weapons, Department of the Navy.

#### 1. SCOPE

1.1 This specification establishes the minimum requirements for pyrotechnics which must be met prior to Bureau of Naval Weapons certification for manufacture, stocking and issue by the Naval Ordnance establishment. This specification shall be used in conjunction with the applicable contract documents.

#### 2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on the date of submission of the design, form a part of this specification:

#### SPECIFICATIONS

##### Military

MIL-E-5272

Environmental Testing, Aeronautical and Associated Equipment, General Specification for

MIL-W-21927

Weapons; Handling and Preparation for Delivery: General Requirements for

MIL-D-70327

Engineering Drawings and Associated Lists

FSC 1370

MIL-R-22449(Wep)

**STANDARDS**

**Military**

MIL-STD-129	Marking for Shipment and Storage
MIL-STD-300	Jolt Test for use in Development of Fuzes
MIL-STD-301	Jumble Test for use in Development of Fuzes
MIL-STD-302	Forty Foot Drop Test for use in Development of Fuzes
MIL-STD-303	Transportation Vibration Test for use in Development of Fuzes
MIL-STD-304	Temperature and Humidity Test for use in Development of Fuzes

**Bureau of Ordnance**

NAVORD OSTD 78	Instructions for Preparation of Ordnance Classification of Defects
NAVORD OSTD 599	Preparation of Drawings and Lists of Drawings

**PUBLICATIONS**

**Department of Defense**

Manual M-205	Military Outline of Form and Instructions for the Preparation of Specifications
--------------	---

**Bureau of Ordnance**

OP 1	Preparation of Ordnance Publications
------	--------------------------------------

(Copies of specifications, standards and publications required by contractors should be obtained from the procuring activity or as directed by the Contracting Officer.)

MIL-R-22449(Wep)

2.2 Other publications. The following document forms a part of this specification. Unless otherwise indicated the issue in effect on date of submission of design shall apply:

#### CODE OF FEDERAL REGULATIONS

49 CFR 71-78

Interstate Commission Rules and Regulations for the Transportation of Explosives and Other Dangerous Articles

(Application for copies should be addressed to the Superintendent of Documents, Government Printing Office, Washington 25, D.C. Orders for the above publication should cite the latest edition and supplements thereto.)

### 3. REQUIREMENTS

3.1 The Bureau of Naval Weapons evaluation is designed to demonstrate the safety, reliability and reproducibility of pyrotechnic items. In order to effect Bureau of Naval Weapons certification, the item shall (1) conform to all requirements of this specification, (2) be identical in design as shown on the applicable documents, and (3) be manufactured and assembled, utilizing the same materials, production methods, tooling, gages and test equipment as would be used for quantity production.

3.2 Documentation. Documentation shall be prepared in accordance with the latest issue of the following instructions:

- (a) Bureau of Naval Weapons production LM's and drawings in accordance with Military Specifications MIL-D-70327, Class 1 or 2 and MIL-W-21927 as applicable.
- (b) Military Specifications in accordance with Standardization Manual M-205.
- (c) Ordnance Classification of Defects in accordance with NAVORD OSTD 78.
- (d) Fleet handling and operation instructions. (OP format). In accordance with Bureau of Ordnance OP 1.

3.3 Packaging and packing. Items shall be packaged and packed in accordance with the applicable requirements of Military Specification MIL-W-21927.

3.4 Testing. The items shall withstand the tests and meet the acceptance criteria of 4.

MIL-R-22449(Wep)

3.5 Evaluation samples. Unless otherwise specified, two hundred items shall be furnished to the Bureau of Naval Weapons for evaluation.

#### 4. TESTS

4.1 Prior approval must be obtained from the Bureau of Naval Weapons when it is not practical to use any test schedule specified herein or a modified test schedule is desired. This request for approval shall include the following information:

- a. Proposed test schedule.
- b. Basis of proposed test schedule (i.e., test reports and calculations).
- c. Reason for using an alternate method.

4.1.1 The jolt test shall be conducted in accordance with Standard MIL-STD-300.

4.1.1.1 Acceptance criteria shall be (1) no explosive nor pyrotechnic elements shall explode or burn, and (2) no parts shall be broken, displaced, come apart, or arm in such a manner as to make the assembly unsafe to handle or dispose of. Samples shall be destroyed after testing.

4.1.2 The jumble test shall be conducted in accordance with Standard MIL-STD-301.

4.1.2.1 Acceptance criteria shall be (1) no explosive nor pyrotechnic elements shall explode or burn, and (2) no parts shall be broken, displaced, come apart, or arm in such a manner as to make the assembly unsafe to handle or dispose of. Samples shall be destroyed after testing.

4.1.3 The drop test shall be conducted in accordance with Standard MIL-STD-302.

4.1.3.1 Acceptance criteria shall be (1) assembly shall be safe to handle and dispose of, and (2) no explosive nor pyrotechnic element shall ignite or burn. Samples shall be destroyed after testing.

4.1.4 The transportation vibration test shall be conducted in accordance with provisions of Standard MIL-STD-303.

4.1.4.1 Acceptance criteria shall be (1) no assembly shall show signs of breakdown or loosening which would make the assembly unsafe to handle, (2) no explosive nor pyrotechnic element shall explode or burn, and (3) assembly shall function as intended.

4.1.5 The temperature and humidity test shall be conducted in accordance with Standard MIL-STD-304.

4.1.5.1 Acceptance criteria shall be (1) assembly shall be safe to handle, and (2) assembly shall function as intended.

4.1.6 The aircraft vibration test shall be conducted in accordance with Specification MIL-E-5272 (applicable procedure).

4.1.6.1 Acceptance criteria shall be (1) no assembly shall show signs of breakdown or loosening which would make the assembly unsafe to handle, (2) no explosive nor pyrotechnic element shall explode or burn, and (3) assembly shall function as intended.

4.1.7 The pack shall be tested in accordance with the applicable procedures of Specification MIL-W-21927.

4.1.7.1 Acceptance shall be in accordance with Specification MIL-W-21927.

## 5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with the applicable documents and the Code of Federal Regulations '49 CFR 71'78'.

### 5.2 Marking

5.2.1 Special marking. Marking of exterior containers shall be in accordance with the Code of Federal Regulations '49 CFR 71-78'.

5.2.2 Normal marking. In addition to the markings required by the contract, unit packages and shipping containers shall be marked in accordance with the requirements of Standard MIL-STD-129 and MIL-STD-130.

## 6. NOTES

6.1 Intended use. This specification is intended for use, in conjunction with contract documents applicable to pyrotechnic items.

MIL-R-22449(Wep)

6.2 Design. The relationship of the item with respect to the overall ordnance systems involved should be known.

6.2.1 The item, when practical, should be initiated by external forces after leaving occupied areas (i.e., hydrostatic pressure, set back, water impact, sea battery ignition, delay trains, etc.).

6.2.2 The item, under normal handling and storage, should contain out-of-line or interrupted initiating "trains", whenever the pyrotechnics involved are considered hazardous.

6.2.3 Electrically initiated items should be designed so as to eliminate or minimize hazards of induced energy by electromagnetic radiation, by use of (1) radio frequency (RF) shielding, and RF attenuating devices, and (2) squib and primer bridges requiring the largest firing-energy levels compatible with the use for which the item is intended.

6.2.4 The presence of chemicals or compounds that are toxic in nature, or produce toxic by-products of combustion or reaction should be made known so that special precautions may be specified.

6.2.5 The design should permit handling, shipping, storage and use with high reliability under all applicable climatic and environmental conditions, considering safety, function, life, interchangeability and coordination.

6.2.6 Adverse effects due to stresses, motions, possible interference and incompatibility should be investigated.

6.2.7 Parts and material covered by Government specifications or standards should be used wherever feasible.

6.2.8 Critical and strategic materials should not be used unless other materials are not considered adequate substitutes.

6.2.9 When applicable safety wires, pins, etc., should be secured in place and safety instructions, tag, etc., attached.

6.2.10 When applicable seals and enclosures should be provided to prevent entry of moisture.

6.2.11 Parts should be secured in place to prevent loosening or opening in handling, shipment, or use due to shock or vibration.

6.2.12 Items should be capable of being mass produced and should be capable of being inspected.

6.3 General safety precautions. The loading, assembly and handling of items covered by this specification, and the sub-assemblies thereof, involve hazardous operations and therefore require suitable explosives safety precautions. Use of this specification will not be construed as to relieve the contractor or manufacturer of responsibility for the safety of his operations. Listed below are certain minimum provisions which a contractor or manufacturer (which explosively loads the item covered) should observe in order to fulfill his responsibility for safety. At Bureau of Naval Weapons, Navy Department, and other Government plants, these provisions are mandatory. Such other warnings and precautions pertinent to the operational effectiveness or safety during use or loading of the specified item should be included in the detail technical requirements of the specification.

6.3.1 All loading operations should be conducted in a neat and orderly manner.

6.3.2 Safe equipment and methods should be utilized for transporting and handling explosives and loaded parts. Where required, remote control barricaded handling equipment shall be used for explosives operations such as mixing, pouring, weighing, charging, sifting, drying, pressing, coating, crimping, etc.

6.3.3 Personnel handling detonators, primers, delay elements, lead-ins, boosters and related parts which affect functioning should, insofar as practicable, avoid using bare fingers or improper equipment in order to prevent damage, corrosion or deterioration from perspiration or other contaminating deposits.

6.3.4 The exposure of explosive materials and related parts shall be so controlled as to minimize the absorption of moisture from the atmosphere or other sources during loading and handling operations.

6.3.5 All explosives and completely or partially loaded items should be stored in suitable storage magazines located in accordance with the American Table of Distances (ATD) or other applicable safety standards, and, while in process, in safety lockers and chests if in loading rooms, or in adequate ready or service magazines located in accordance with intra-plant distances when outside of loading rooms. For Navy managed explosives loading plants, the provisions of the Armed Services Explosives Safety

MIL-R-22449(Wep)

Board covering quantity-distance relations for explosives will apply.

6.3.6 Proper care must be exercised at all times to protect personnel from accidents, fires or explosions, and to limit damage to equipment and loading areas. In this connection, the precautionary measures in the following paragraphs should be observed.

6.3.6.1 Employ properly proportioned and properly located protective barricades, screens or shields at all required points.

6.3.6.2 Keep only minimum limited quantities of explosives and completed or partially loaded parts present at each stage of operations.

6.3.6.3 Keep explosives and explosive parts in approved covered receptacles with covers in place when material is not being taken out of or put into the receptacles. Where necessary, receptacles should be conductive to ground electrostatic charges.

6.3.6.4 Protect operations from electrostatic charges by effectively grounding all machinery, equipment and fixtures; and where necessary, employ suitable grounded conductive coverings for floors, work benches and tables, and workers' conductive shoes. Workers' clothing of a type to minimize the accumulation of static charges should be employed. Fabrics such as silk and nylon, which promote static generation should be avoided. Additional grounding devices such as grounded bracelets for workers should be employed where operations are conducted with items which are unusually sensitive to initiation by static electricity. Such items include initiating explosives, tracer mixtures and low-energy type electric primers, detonators and squibs. The latter types of items should have the free ends of lead wires bared and twisted together, and be packed in relatively small groups wrapped in bare non-insulated aluminum foil or other uncoated metal foil. During assembly and processing operations such sensitive electric items should be short circuited by clips or other devices until installed with safety shunt in the final device. Additional precautions for these items should include mechanical shielding to contain or deflect fragments and blast, also electrical shielding of these items from induced electric currents generated by sources such as lightning, static, radiations from communications apparatus, radar, or high frequency heat apparatus, etc. Where necessary for safety, humidity of work rooms should be appropriately increased, as required to lessen electrostatic effects but without inducing excessive



moisture absorption by any of the components of the item being loaded.

6.3.6.5 Protect all explosive operations from effects of electric current originating from equipment such as soldering irons, heaters, switches, wiring, motors, lights, test instruments, etc., by suitable insulation, grounding separation or shielding. Such electric sources may initiate explosives by heat, sparks, arcs, or due to completing an electric circuit through an electric primer, detonator, or squib. Circuits may be inadvertently completed, for example, from a defective electric soldering iron through a grounded contact. All electric type primers, detonators or squibs provided with wire leads should have the free ends of the wires bared and twisted together to short circuit each unit, except when in process of assembly into a finished item. Where practicable, removable short circuiting clips or other devices should be employed during manufacturing operations involving electric primers, detonators or squibs.

6.3.6.6 Enforce, where necessary, the wearing of suitable safety footwear, gloves, goggles, respirators and impregnated garments to protect personnel against burns, poisoning and associated industrial hazards.

6.3.6.7 Allow no fires or exposed electrical or other sparking equipment, and little or no flammable material to be present in loading, handling and storage spaces. Enforce proper "Match" and "No Smoking" rules where necessary.

6.3.6.8 Enforce good housekeeping and maintain effective policing, inspection and supervisory methods throughout the loading area and surroundings. Employ effective cleaning methods periodically to minimize the accumulation of explosives or explosive dust and other contamination upon, and assure its removal from floors, walls, ceilings, ledges, tables, benches, piping and equipment or the items loaded; also, clean up any spilled material immediately.

Notice. When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the U.S. Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation or conveying any rights or permission to manufacture, use or sell any patented invention that may in any way be related thereto.

FOLD

---

DEPARTMENT OF THE NAVY

POSTAGE AND FEES PA  
NAVY DEPARTMENT

                      
OFFICIAL BUSINESS

CHIEF, BUREAU OF NAVAL WEAPONS  
ENGINEERING DIVISION  
ATTN: CODE RREN-5  
DEPARTMENT OF THE NAVY  
WASHINGTON, D. C. 20360

---

FOLD

## INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).

SPECIFICATION

ORGANIZATION (Of submitter)

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

MATERIAL PROCURED UNDER A



DIRECT GOVERNMENT CONTRACT



SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?



YES



NO IF "YES", IN WHAT WAY?

REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)

SUBMITTED BY (Printed or typed name and activity)

DATE