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MILITARY SPECIFICATION

DESIGN AND EVALUATION OF CARTRIDGES FOR STORES SUSPENSION EQUIPMENT

This specification has been approved by the Naval Air Systems Command, Department of the Navy.

1. SCOPE

1.1 This specification furnished general requirements for design and establishes uniform methods for evaluation testing of cartridges used in stores suspension equipment. The purpose of the testing program is to determine soundness of design and verify resistance to deleterious service environments. For purposes of this specification, the term cartridge includes any assembled unit containing propellant, or pyrotechnic material, either singly or in any combination, designed as the energy source for stores suspension equipment. Cartridges must be safe for handling, transportation, storage and use and must not deteriorate to a degree which would render their performance or safety doubtful under normal service handling, adverse storage, or transportation. Additionally, they shall meet the safety and structural design requirements of MIL-D-21625(Wep).

1.2 Classification of the types of cartridge release.

Type I

Safety of handling and installation. Certification as to safety of handling and installation is required prior to the use of cartridges in military stores suspension equipment. For requirements, see 3.8.1

FSC 1377

MIL-D-81303A(AS)

Type II

Interim service release. This release is required prior to any flights or use of cartridges in stores suspension equipment when military personnel are involved, and will be granted in accordance with the provisions of 3.8.2. The cognizant branch of service has the prerogative of authorizing procurement of cartridges for service use, subsequent to a Type II release.

Type III A

Final release to service (fully documented). This type of release is required for admission of cartridges for stores suspension equipment into the military supply system as a fully documented cartridge (see 6.3.1 through 6.3.1.4). For requirements, see 3.8.3.

Type III B

Special release to service (documented by Specification Control or Source Control drawing). If the data required for a Type III A release is not available (i.e., proprietary rights, patents, etc.), then a Type III B release to service for military use is permissible. For requirements for a Type III B release, see 3.8.4. Documentation data requirements of 6.3.1.4 are required for a Type III B release; however, the documentation data requirements of 6.3.1 through 6.3.1.4 are excluded for a Type III B release.

Type IV

Use of approved cartridge in a new application. If a cartridge which has previously been granted a Type II, Type III A or Type III B release is to be used in a new application with similar ballistic requirements, Type I release is automatic. A Type IV release to service for the new application will be granted in accordance with 3.8.6.

2. APPLICABLE DOCUMENTS

2.1 The following specifications, standards and documents of the issue in effect on the date of submission of the design, form a part of this document to the extent specified herein.

SPECIFICATIONS

Military

MIL-E-5272

Environmental Testing,
Aeronautical and Associated
Equipment, General Specifi-
cation for

MIL-D-81303A(AS)

MIL-D-1000

Drawings, Engineering and
Associated Lists

MIL-T-7743

Testing, Store Suspension
Equipment, General Specifications
for

MIL-I-23659

General Specification for
Initiators, Electric, Design
and Evaluation of

MIL-P-24014

Preclusion of Hazards from
Electromagnetic Radiation to
Ordnance, General Requirements
for

MIL-D-21625

Design and Evaluation of
Cartridges for Cartridge
Actuated Devices

STANDARDS

Military

MIL-STD-10

Surface Roughness, Waviness and
Lay

MIL-STD 302

Forty-Foot Drop Test for Use in
Development of Fuzes

MIL-STD-100

Engineering Drawing Practices

Navy Department

WR-43

Preparation of Quality Assurance
Provisions

PUBLICATIONS

Department of Defense

M200

Standardization Policies,
Procedures and Instructions

MIL-D-81303A(AS)

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

3. REQUIREMENTS

3.1 General. The requirements given in this specification for electric, environmental and functional testing are considered to be the minimum requirements to which impulse cartridges for stores suspension equipment should be subjected. Stores suspension equipment is hereinafter referred to as device.

3.2 Cartridges. The number of cartridges required for evaluation will depend upon the number of different devices in which their use is intended. A minimum of 192 cartridges will be required for evaluation in accordance with Table 3 in the primary device plus 30 cartridges in accordance with Table 4 for each additional device in which the cartridge is intended to be used. The cartridges shall be acceptance tested in the device of intended application.

3.2.1 All cartridges submitted for testing shall be from one lot, identical in design, and manufactured by the same processes..

3.3 Design.

3.3.1 General. The cartridge shall be of the simplest and most efficient design consistent with the proposed use. Cartridges shall be designed in such a manner that they can be readily installed in the devices by military personnel without the use of special tools or equipment. All inert and explosive materials shall be referenced by approved government specifications where possible. Proprietary materials or processes shall not be used unless specifically approved in writing by the cognizant government contracting agency.

3.3.2 External configuration. The external configuration of the cartridge shall be conventional, with a cylindrical body headed by a cylindrical flange of greater diameter at the ignition end. The electrode contact surface shall be $.000 \pm .003$ inch below the surface

MIL-D-81303A(AS)

of the cartridge head. External dimensions of the cartridges shall be:

Flange (Rim) diameter	1.175 $\begin{smallmatrix} +.028 \\ -.028 \end{smallmatrix}$
Flange (Rim) thickness	.090 $\begin{smallmatrix} +.000 \\ -.010 \end{smallmatrix}$
Head length	.500 max.
Body diameter	1.060 $\begin{smallmatrix} +.000 \\ -.010 \end{smallmatrix}$
Electrode diameter	.150 min.
Taper	None
Overall length	As specified in contract
Wall thickness	As specified in contract

3.3.3 Assembly. The cartridge shall be as simple and safe to assemble as possible. The propellant, or pyrotechnic material shall be as tightly confined as practicable without hand stacking the charge. Spacers for this purpose are to be avoided. The cartridge closure shall provide a hermetic seal. Sealants used in close proximity to propellants or pyrotechnics shall be compatible with these materials.

3.3.4 Inert materials. Selection of inert materials shall satisfy the environmental, strength, compatibility and weight requirements set forth in the detail specification for the device of intended application. Neither pyrocellulose nor paper materials should be included as wads, spacers or closure discs. Materials which are nutrients for fungi shall not be used.

3.3.5 Cartridge case. The cartridge case must be as light as practicable but strong enough to withstand rough handling and environmental treatment as specified in the contract. The case shall be capable of reliable sympathetic ignition in the prescribed manner in the device of primary application.

3.3.6 Propellant, pyrotechnic, and other explosive materials. The propellant, pyrotechnic and other explosive materials shall not cause corrosion, erosion or have any detrimental effects after five firings without cleaning the primary device of intended use.

MIL-D-81303A(AS)

3.3.7 Weight. The weight of all cartridges shall be minimized.

3.3.8 Surface finishes and treatment. Surface finishes on all components shall be specified in accordance with MIL-STD-10. All external surfaces shall be suitably treated to resist corrosion and abrasion (without decreasing conductivity of electrically initiated cartridges).

3.3.9 Dissimilar metals. The use of dissimilar metals shall be minimized. Where two components made of dissimilar metals are in contact, the area of contact shall be suitably sealed from air and moisture or treated to prevent galvanic action.

3.3.10 Stability of components. All materials or components shall function satisfactorily after a minimum of five years total life of which not more than two years shall be after removal from their hermetically sealed container.

3.3.11 Marking. Marking shall be nondefaceable through normal service handling and use and shall include: designation, lot number, manufacturer's identification and month and year of manufacture in accordance with the applicable drawings.

3.3.12 Initiators.

3.3.12.1 Electric initiators. Electric initiators used in cartridges shall be centered, single poled, case grounded and shall meet the applicable requirements of MIL-I-23659, except for the following: high temperature shall be +200°F in lieu of that specified in MIL-I-23659.

3.3.13 Special requirements. Those special requirements which are in conflict with the requirements of this specification shall be resolved in favor of the special requirements only if necessary for satisfactory operation of the cartridge in the device of proposed use and subject to approval by the cognizant government contracting agency.

3.4 Environmental requirements.

3.4.1 Leakage. Each cartridge of the evaluation sample shall be subjected to a dry leak test. In addition, those cartridges selected for the environmental tests of 3.4.3 through 3.4.10, omitting 3.4.9, shall be leak tested subsequent to this environmental treatment.

MIL-D-81303A(A)

Cartridges which exhibit a leak rate in excess of 10^{-5} cc/sec of air at a pressure differential of 1 ± 0.1 atmosphere shall be considered defective, discarded, and replaced with a cartridge which does pass the leak test. The leak test shall be conducted as specified in 4.2.1.

3.4.2 Forty-foot drop test. Each cartridge shall be capable of passing the 40-foot drop test unprotected. The cartridge need not be usable after the test but no cartridge shall fire as a result of the test. See 4.2.2.

3.4.3 Six-foot drop test. Each cartridge shall be capable of passing the 6-foot drop test, unprotected, without impairing its ability to perform its intended function. See 4.2.3.

3.4.4 Fifteen "g" shock. Each cartridge shall be capable of withstanding ten shocks of 15 "g" maximum acceleration when mounted in the device of intended use or a suitable test vehicle affording the same degree of support. The 15 "g" maximum acceleration shall be reached within 8 milliseconds and the acceleration shall not exceed 8 "g" for a minimum of 11 milliseconds. See 4.2.4.

3.4.5 Temperature and humidity cycling. Each cartridge shall be capable of passing the temperature and humidity cycling test. At the conclusion of the test, cartridges must meet functional requirements, be free from visible damage and free from leaks as determined by leak test. See 4.2.5.

3.4.6 Vibration. Each cartridge shall be capable of passing the vibration test of 4.2.6, and meet the functional requirements thereafter.

3.4.7 Salt spray. Each cartridge shall be capable of passing the salt spray test of 4.2.7 and meet the functional requirements thereafter.

3.4.8 High temperature storage. Each cartridge shall be capable of passing the high temperature storage test of 4.2.8, and meet the functional requirements thereafter.

3.4.9 Cook-off test. Twelve cartridges shall be subjected to the cook-off test of 4.2.9.

3.4.10 Twelve-hour high temperature exposure. Twelve cartridges shall pass the high temperature exposure test of 4.2.10.

MIL-D-81303A(AS)**3.5 Functional tests.**

3.5.1 Operation at -65°F and atmospheric pressure. See 4.3.2.

3.5.2 Operation at +200°F and atmospheric pressure. See 4.3.3.

3.5.3 Operation at 80,000 feet altitude and +200°F. See 4.3.4.

3.5.4 Operation at 80,000 feet altitude and -65°F. See 4.3.5.

3.5.5 Operation at +70°F and atmospheric pressure. See 4.3.6.

3.5.6 Iced rack. Operate stores suspension equipment and eject store when device is conditioned in accordance with applicable section of paragraph 4.6 of MIL-T-7743. See 4.3.7.

3.6 Damage and deterioration. Damage to or deterioration of any internal or external part of the cartridge which could in any manner prevent it from meeting operational requirements during service life shall provide reason to consider the cartridge as having failed to meet the test to which it was subjected.

3.7 Functional results. Results of functional tests of the cartridges shall fall within the maximum and minimum performance limits for specified condition of temperature, altitude, and load as may be appropriate for the stores suspension equipment.

3.8 Criteria for acceptance.

3.8.1 Minimum requirements for Type I certification shall be satisfactory performance in the tests listed in Table 1 as performed by the government, contractor or independent testing laboratory. If the tests are performed by the contractor or an independent testing laboratory, the test facility must be approved by the cognizant government contracting agency and a certified copy of the test data shall be submitted to the cognizant government contracting agency for approval prior to the granting of a Type I release.

MIL-D-81303A(AS)

TABLE 1

<u>Test</u>	<u>Number of Cartridges Required</u>	<u>Applicable Section for Test Procedures</u>	<u>Discard</u>	<u>*Functional Test at Indicated Temperature</u>
Leak	30 (Expend to tests listed below)	4.2.1		
40-foot drop	6	4.2.2	6	6 at +70°F
6-foot drop	6	4.2.3		6 at +70°F
15 "g" shock	6	4.2.4		6 at +70°F
Vibration	6	4.2.6		6 at +70°F
Normal temperature, non-treated	6	4.3.6		6 at +70°F

*Firing program shall be continuous as workday permits. Rounds shall be fired in random sequence.

3.8.2 Minimum requirements for Type II release are, in addition to satisfactory performance in the tests listed in Table 1, satisfactory results from the tests of Table 2, performed under the same conditions as above.

TABLE 2

<u>Test</u>	<u>Number of Cartridges Required</u>	<u>Applicable Section for Test Procedures</u>	<u>*Functional Test at Indicated Temperature</u>
Leak	54 (Expend to tests listed below)	4.2.1	
Temperature and humidity cycling	18	4.2.5	18 at +70°F
Low temperature	12	4.3.2	12 at -65°F
High temperature	12	4.3.3	12 at +200°F
Normal temperature, non-treated	12	4.3.6	12 at +70°F

*Firing program shall be continuous as workday permits. Rounds shall be fired in random sequence.

MIL-D-81303A(AS)

3.8.3 Full service release, Type III A can be given only subsequent to the cartridge satisfying the requirements of Section 3 and after successful performance in the complete testing program as set forth in Section 4 at the government, contractor or independent testing laboratory together with full documentation as specified in 6.3.1 through 6.3.1.4. If the tests are to be performed by the contractor or an independent testing laboratory, the test facility must be approved by the cognizant government contracting agency and a certified copy of the test data shall be submitted to the cognizant agency for approval prior to the granting of a Type III A release. Documentation in accordance with the requirements of 6.3.1 through 6.3.1.4 shall be prepared by either a government activity or by a contractor as determined by contractual agreement. Distribution of cartridges shall be in accordance with Table 3.

TABLE 3

<u>Test</u>	<u>Number of Cartridges Required</u>	<u>Applicable Section for Test Procedures</u>	<u>Discard</u>	<u>*Functional Test at Indicated Temperature</u>
Leak	180 (Expend to tests listed below)	4.2.1		
40-foot drop	6	4.2.2	6	
6-foot drop	6	4.2.3		6 at +70°F
15 "g" shock	12	4.2.4		12 at +70°F
Temperature and humidity cycling	18	4.2.5		18 at +70°F
Vibration	12	4.2.6		12 at +70°F
Salt spray	12	4.2.7		12 at +70°F
High temperature storage	18	4.2.8		18 at +70°F
Cook-off	12	4.2.9	12	
High temperature exposure	12	4.2.10		12 at +70°F
Low temperature	12	4.3.2		12 at -65°F
High temperature	12	4.3.3		12 at +200°F
High altitude	12	4.3.4		12 at +200°F
High altitude	12	4.3.5		12 at -65°F
Normal temperature, non-treated	12	4.3.6		12 at +70°F
Iced rack	12	4.3.7		12 at -65°F

*Firing program shall be continuous as workday permits. Rounds shall be fired in random sequence.

MIL-D-81303A(AS)

3.8.4 Minimum test requirements for a Type III B release are satisfactory cartridge performance in accordance with the test requirements of 3.8.3. These tests may be performed by the contractor or an independent or government testing laboratory. If the tests are performed by the contractor or an independent testing laboratory, the test facility must be approved by the cognizant government contracting agency and a certified copy of the test data must be submitted to the cognizant government agency for approval prior to granting a Type III B release. If a Type III B release is granted, either a Source Control or Specification Control drawing, whichever is applicable, shall be prepared by a government activity or contractor as determined by contractual agreement. For definitions of Source Control and Specification Control drawings, refer to applicable paragraphs of MIL-STD-100. Additionally, the documentation data of 6.3.1.4 are required for a Type III B release.

3.8.5 Each variable (i.e., velocity, pressure, acceleration and time) output data generated by each cartridge from the environmental tests of 3.4.3 through 3.4.10, excluding 3.4.9, shall be tested for homogeneity of statistical parameters (mean and variance) when compared to the cartridges from the +70°F functional test. Parameters which show no significant difference at the .05 level of significance shall be pooled and utilized to estimate the probability of exceeding the predetermined critical limits. Statistical parameters which show significant differences at the .05 level of significance shall be utilized independently to determine the probability of exceeding predetermined critical limits. Output data generated by the high temperature (+200°F) functioning tests of 3.5.2 shall be evaluated by the same procedure as prescribed for the units fired at +70°F. Statistical parameter values (mean and variance) representing low temperature (-65°F) functioning tests of 3.5.1 shall be used separately to estimate the probability of exceeding predetermined critical values. The criteria for evaluating the results shall be as follows: The probability of exceeding the predetermined critical performance limits shall be less than .01 for each probability determination and no cartridge shall fail to fire.

3.8.6 Acceptance of standard cartridge for use in an additional device. When it is desired to use a previously approved cartridge (cartridge which has had a Type III A or Type III B release) in a different application with similar ballistic requirements, certification of 3.8.1 is automatic. A Type IV release for service use in the new application will be granted upon satisfactory performance in the tests of Table 4 performed under the conditions of 3.8.1.

MIL-D-81303A(AS)

TABLE 4

<u>Functional Tests</u>	<u>Applicable Section for Test Procedure</u>	<u>Number of Cartridges Required</u>
Normal temperature (+70°F)	4.3.6	12
Low temperature (-65°F)	4.3.2	6
High temperature (+200°F)	4.3.3	6
High altitude (80,000 ft. and -65°F)	4.3.5	6

4. QUALITY ASSURANCE PROVISIONS

4.1 Measurements and records. All functional tests of cartridge actuated devices are to be performed with the equipment mounted and loaded in a manner to simulate as closely as possible service conditions.

4.2 Environmental tests.

4.2.1 Leakage tests. The leak test shall be conducted with a dry gas leak tester of sufficient sensitivity to ascertain if cartridges meet the leak rate requirement of 3.4.1. Any cartridge which has a leak rate in excess of 10^{-5} cc/sec of air shall be rejected. The test method shall be as specified by the manufacturer of the type leak tester used.

4.2.2 Forty-foot drop test. This test is to be conducted using the impact surface prescribed in MIL-STD-302. Six cartridges shall be dropped bare and shall be allowed to strike the plate in any impact position the cartridges may acquire in the 40-foot fall. The impact plate shall be cleaned of any foreign matter prior to conducting the test. It is not required that the cartridges be usable after the drop test, but no cartridges are to fire during the test. Cartridges must be safe to handle and to dispose of after the test.

4.2.3 Six-foot drop test. A sample of six cartridges shall be selected at random from the qualification lot. Two cartridges shall be dropped in each of the following positions:

Nose Up
Nose Down
Horizontal

MIL-D-81303A(AS)

A new cartridge shall be used for each drop and no cartridge shall fire during this test. It is required that cartridges perform in functional tests after this test. They shall be functionally tested as specified and meet the specified requirements after the test.

4.2.4 Fifteen "g" shock test. Cartridges are to be mounted in the devices for which they are designed, or in a suitable test vehicle affording the same degree of support, and subjected to ten shocks of 15 "g" maximum acceleration. The maximum acceleration of 15 "g" shall be reached in a maximum of 8 milliseconds, and the acceleration shall exceed 8 "g" for a minimum of 11 milliseconds. Four cartridges each are to be tested in the position corresponding to normal landing and launching attitude and four in a position perpendicular to normal landing attitude. Cartridges shall be free from visible damage or leaks and shall meet all functional requirements after this test.

4.2.5 Temperature and humidity cycling. This test provides for cycling between temperatures of -65°F (or -80°F), +70°F, and +200°F (90 percent relative humidity) with additional storage at -80°F and +200°F for two periods of two weeks each. Provision has been made for withdrawal of cartridges at two times during the cycling, see schedule below. This is to provide opportunity to observe the extent of progressive deterioration, if such exists. The schedule has been arranged in such a manner that operations are not required outside regular working hours except for such supervision as may be necessary to insure proper operation of the controlled temperature cabinets. Cartridges shall be supported on screen trays so that all areas are exposed to the prescribed atmospheric conditions at all times throughout the test. At the conclusion of the test, cartridges must be operable, free from visible damage, and free from leaks as determined by the leakage test. Cartridges will be conditioned at +70°F for functional tests. The schedule to be followed is:

Monday	1300	Place in cabinet or room maintained at -65°F;
	1600	Remove from -65°F room and place in room maintained at +200°F, 90 percent relative humidity and allow to remain overnight;
Tuesday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);

MIL-D-81303A(AS)

Wednesday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Thursday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Friday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Saturday and Sunday		Maintain in +200°F (90 percent relative humidity);
Monday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Tuesday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Wednesday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);

MIL-D-81303A(AS)

Thursday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -65°F;
	1600	Remove from -65°F and place in +200°F (90 percent relative humidity);
Friday	0800	Remove from +200°F and place in +70°F;
	1300	Remove from +70°F and place in -80°F;
Saturday and Sunday		Maintain at -80°F;
Monday	0800	Remove from -80°F and place in +70°F. Remove six cartridges. Condition three at +70°F and fire in device or test set. Store remaining three cartridges (at +70°F) which are to be fired at end of cycling program.

The second two-week period follows the same schedule of temperature and humidity cycling. Withdrawals of cartridges during the second two-week period are to be as follows:

Fourth Monday	Withdraw six cartridges, condition three at +70°F and fire. Store remaining three cartridges (at +70°F) which are to be fired at end of cycling program.
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The completion of the two periods occurs at 0800 on the fifth Monday after starting. At this time the remaining six cartridges are to be removed, conditioned at +70°F, together with remainder of cartridges from two and three weeks cycling, and fired. Firing results shall be within the performance limits specified by the cognizant government contracting agency.

4.2.6 Vibration test. Cartridges shall be mounted in a test vehicle affording the same degree of support as the device for which they are designed.

4.2.6.1 Procedure. The vibration test shall be conducted with the frequency cycling between 10 and 2,000 cps in 15-minute cycles with an amplitude of 0.018 inch (total excursion 0.036 inch) or an

MIL-D-81303A(AS)

applied acceleration of ± 10 "g", whichever is the limiting value. Six cartridges shall be vibrated in each of the following orientations: parallel to the longitudinal axis of the cartridge and perpendicular to this axis. Vibration times shall be according to Table 5.

TABLE 5VIBRATION TEST SCHEDULE

(Times refer to one position)

<u>Type</u>	<u>Vibration at Room Temperature</u>	<u>Vibration at +200°F</u>	<u>Vibration at -65°F</u>
Cycling	60 minutes	15 minutes	15 minutes
Resonance	60 minutes	15 minutes	15 minutes

4.2.6.2 Resonance. Resonant frequencies shall be determined by varying the frequency of applied vibration through the specified range at amplitudes or accelerations not exceeding those shown in Figure 1 for each position. The test specimen shall then be vibrated at the most severe resonant frequency with the applied amplitude shown in Figure 1. If no resonant frequencies are found, the specimen shall be vibrated for twice the times shown in Table 5 for resonance at a frequency of 55 cps and an applied amplitude of 0.030 inch (total excursion of 0.060 inch).

4.2.7 Salt spray test. This test shall be conducted according to procedure I of MIL-E-5272, except that in lieu of operation the cartridges shall perform satisfactorily in functional tests.

4.2.8 High temperature storage test. Cartridges are to be placed in the temperature conditioning chamber in such a manner that the air can circulate freely about the cartridge. Temperature is to be maintained at +160°F. The following schedule provides for a total storage time of 24 days, with periodic withdrawals for functional test.

Tuesday	0800	Place in +160°F storage;
Second Wednesday	0800	Remove six cartridges;
Third Thursday	0800	Remove six cartridges;
Fourth Friday	0800	Remove six cartridges.

MIL-D-81303A(AS)

No attention is required outside normal working hours except that necessary to insure that proper temperature is maintained. Cartridges shall be free from visible damage or leaks and shall perform satisfactorily in functional tests after this test.

4.2.9 Cook-off test. This test is intended to establish (within 25°F) the maximum temperature to which a cartridge can be exposed for a period of one hour without cook off.

4.2.9.1 Procedure. Place three cartridges in an oven preheated to the highest temperature which it is estimated the cartridges will withstand for one hour. If no cartridge cooks off, increase the temperature in 25°F increments and repeat with three new cartridges until cook off of at least one cartridge occurs within the one-hour period. If any cartridge cooks off in the first group tested, repeat the test using temperatures decreased in 25°F increments until cook off does not occur within the one-hour period.

4.2.10 High temperature exposure (12 hours). This test is intended to determine (within 25°F) the maximum temperature to which cartridges may be exposed for 12 hours and function satisfactorily when fired after cooling to +70°F.

4.2.10.1 Procedure. Place six cartridges in an oven preheated to a temperature 25°F less than the maximum for one hour as determined in 4.2.9.1. Maintain temperature for 12 hours. If no cartridge cooks off, allow to cool to +70°F and functionally test as specified in 4.3.5. If any cartridge cooks off, or fails to function satisfactorily after cooling, repeat the test with additional groups of cartridges, decreasing the temperature in increments of 25°F, until satisfactory performance is obtained.

4.3 Functional test.

4.3.1 General. All cartridges (except for high altitude tests) shall be fired in the appropriate store suspension device. Operations at extreme temperatures and under high altitude conditions will be performed when possible in the temperature control cabinet. Physical size of the equipment and the amount of travel required will generally be the limiting factors. If it is not possible to fire in the temperature conditioning cabinet, the cartridge shall be fired as quickly as possible after removal from the cabinet and in no case shall the elapsed time exceed three minutes. All temperatures specified in 4.3.2 through 4.3.5 shall have a tolerance of $\pm 5^\circ\text{F}$.

MIL-D-81303A(AS)

4.3.2 Low temperature tests (-65°F). The cartridges are to be conditioned at a temperature of -65°F for a period one hour longer than that required to reach thermal equilibrium and are to be fired in the appropriate store suspension device within three minutes of removal from conditioning.

4.3.3 High temperature exposure tests (+200°F). The cartridges are to be fired at a temperature of +200°F. Conditioning time and method of firing shall be as specified for 4.3.2.

4.3.4 High altitude tests (80,000 ft. altitude and +200°F). The cartridges under test and the test vehicle, together with cartridges shall be conditioned at a temperature of +200°F, until temperature equilibrium is reached. The absolute pressure in the chamber shall then be reduced to 0.82 inch of mercury (corresponding to an altitude of 80,000 feet above sea level). These conditions shall be maintained for one hour. At the end of this time, equipment is to be fired. Twelve rounds shall be fired under these conditions.

4.3.5 High altitude tests (80,000 ft. altitude and -65°F). The cartridges under test and the test vehicle, together with cartridges shall be conditioned at a temperature of -65°F, until temperature equilibrium is reached. The absolute pressure in the chamber shall then be reduced to 0.82 inch of mercury (corresponding to an altitude of 80,000 feet above sea level). These conditions shall be maintained for one hour. At the end of this time, equipment is to be fired. Twelve rounds shall be fired under these conditions.

4.3.6 Normal temperature tests (+70°F). The cartridges shall be conditioned as in 4.3.2 to a temperature of +70°F and fired as specified in 4.3.2.

4.3.7 Iced rack. The cartridge shall function and meet all requirements of 3.5.5.

4.4 Measurements and records. The following records are to be made during functional tests when applicable:

- Pressure versus time at points of ballistic interest.
- Velocity (at end of stroke or at separation of parts).
- Travel versus time of load and range of maximum altitude.
- Acceleration versus time.
- Time interval between actuating firing mechanism and beginning of movement of load.
- Time interval between actuating firing mechanism and completion of operating cycle.

MIL-D-81303A(AS)

5. PREPARATION FOR DELIVERY

Not applicable.

6. NOTES

6.1 Intended use. This specification is intended to prescribe essential design requirements and establish adequate evaluation test procedures to be followed in designing and testing new cartridges for stores suspension equipment. The tests subject the cartridges to simulated and accelerated environmental conditions and to functional tests as necessary to insure satisfactory functional and ballistic performance reliability when cartridges and devices are operated or stored under the range of conditions encountered in service.

6.2 Test procedures may be adjusted, where possible within the requirements of this specification, to generate data useful in evaluation of functional and ballistic characteristics of the unit.

6.3 Data. For the information of Contractors and Contracting Officers, any of the data specified in (a) subparagraphs below, (b) applicable documents listed in Section 2 of this specification or (c) referenced lower-tier documents, need not be prepared for the Government and shall not be furnished to the Government unless specified in the contract or order. The data to be furnished shall be listed on DD Form 1423 (Contractor Data Requirements List) which shall be attached to and made a part of the contract or order. NAVWEPS Form 4200/15 (Drawings, Lists, and Specifications Required) shall be attached where applicable.

6.3.1 Contractors design requirements and specifications.

6.3.1.1 All inert and explosive materials used in cartridges shall be referenced by approved government specifications if such exist. Proprietary materials shall not be used unless specifically approved in writing by the cognizant government contracting agency. At the direction of the cognizant government contracting agency, the contractor shall submit cartridge drawings, in sufficient detail as to parts, special processes, and techniques to permit the preparation of documentation in accordance with 6.3.1.2 through 6.3.1.2.2. The contract shall specify whether the documentation is to be prepared by a government activity or by the contractor.

6.3.1.2 Drawings in accordance with MIL-D-1000, Category E, Form 1.

MIL-D-81303A(A8)

6.3.1.2.1 Production and acceptance specifications in accordance with M200, Notice 1.

6.3.1.2.2 Classification of characteristics in accordance with WR-43.

6.3.1.3 Complete manufacturing drawings of the devices and, where applicable, of test sets used in development and qualification of devices and cartridges. These shall be submitted no later than concurrently with test report for Type I release as specified in 3.7.1 except for those cartridges which are to be given a Type III B release.

6.3.1.4 Copies of results of all tests performed by the prime or subcontractors during the development and evaluation of cartridges shall be furnished the cognizant government contracting agency. These results shall include all statistical calculations made during evaluation testing. Additionally, for a Type III B release, drawings of test sets and devices used during development and evaluation shall be furnished the cognizant government contracting agency.

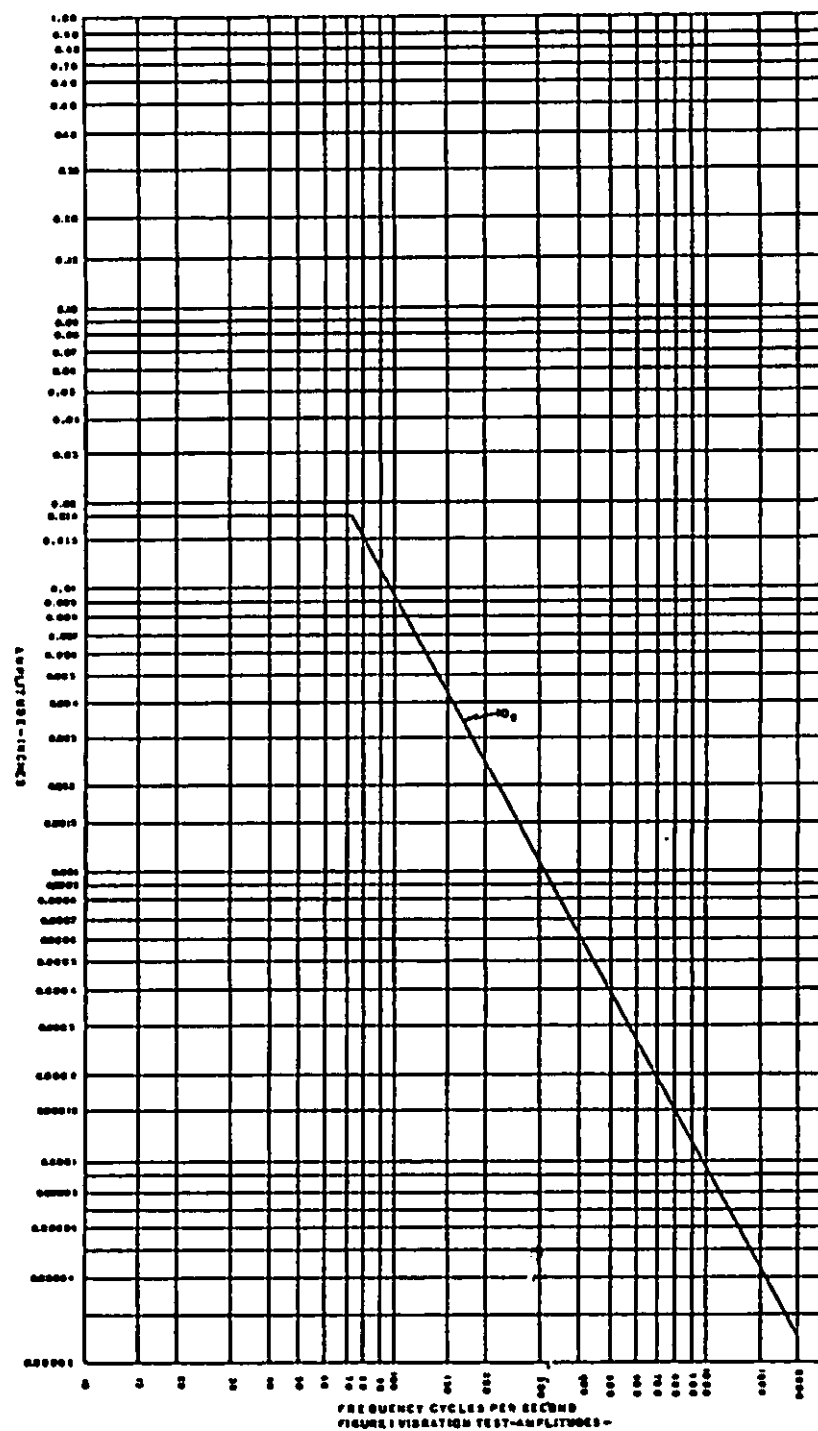


FIGURE 1