NOTICE OF CHANGE

MIL-STD-331B
NOTICE 4
1 May 1994

MILITARY STANDARD
FUZE AND FUZE COMPONENTS, ENVIRONMENTAL AND PERFORMANCE TESTS FOR

TO ALL HOLDERS OF MIL-STD-331B:

1. THE FOLLOWING PAGES OF MIL-STD-331B HAVE BEEN REVISED AND SUPERSEDE THE PAGES LISTED:

NEW PAGE	DATE	SUPERSEDED PAGE	DATE
v	1 May 1994	v	1 December 1992 (Notice 3)
vi	1 May 1994	vi	1 December 1989 (Revision B)
vii	1 May 1991	vii	Reprinted without change (Notice 3)
viii	1 May 1994	viii	1 December 1992 (Notice 3)
A2-1 thru A2-4	1 May 1994	A2-1 thru A2-4	1 December 1989 (Revision B)
A2-5	1 May 1994	None	NEW PAGE

2. RETAIN THIS NOTICE AND INSERT BEFORE TABLE OF CONTENTS.

3. Holders of MIL-STD-331B will verify that page changes and additions indicated above have been entered. This notice page will be retained as a check sheet. This issuance, together with appended pages, is a separate publication. Each notice is to be retained by stocking points until the military standard is completely revised or canceled.

Custodians:
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Navy - OS
Air Force - 99

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A2.4 EQUIPMENT

A2.4.1 Test equipment design. The test equipment shall conform to Naval Surface Warfare Center, Crane Division drawings QEL 1386-1 through -45. It consists of three sizes of wood-lined metal boxes and the necessary structure and drive mechanism to support and rotate one or more of the boxes on the axis indicated in the drawings. Refer to Figure A2-1.

A2.4.2 Box sizes. The size of box required for a test will depend on the size of the fuze being tested. Three test box sizes have been standardized to test fuzes having a maximum dimension of 381 mm (15 in). The requirements to test fuzes having a maximum dimension greater than 381 mm (15 in) was not considered to occur often enough to economically warrant requiring an additional box as part of the standard equipment. However, when such fuzes are to be tested, it is necessary that the proper size and type of test box is used. For fuzes having a maximum dimension greater than 381 mm (15 in) and up to and including 508 mm (20 in), the test box shall be identical to the other three boxes in materials, construction, axis of revolution, and mounting position. For fuzes with a maximum dimension exceeding 508 mm (20 in), it is recommended that other methods of testing to this type of environment, such as the loose cargo transport test of MIL-STD-810, be devised.

A2.4.3 Material substitution. Polyethylene sheet having the properties shown in Table A2-1 may be substituted for the maple wood box liner specified in Drawing QEL 1386.

TABLE A2-1. Physical Properties of Polyethylene Sheet High Molecular Weight

Properties	ASTM Test Method	Value
1. Hardness: Rockwell	D785	R64
Shore	D2240	R67
2. Specific gravity	D792	0.940
3. Shear strength, psi	D732	3,500
4. *Bend creep modulus, psi*	NA	110,000
5. Impact strength, ft-lb/in of notch (Bar Izod Test) @ +23°C and @ -140°C	D256A	No break

Note: Allowable tolerances are ±10 percent of the listed value.

A2.5 PROCEDURE

A2.5.1 Select test box. Determine the maximum dimension of the fuze being tested (usually a diagonal measurement) and using this dimension, select the applicable box for use from Table A2-2.

TEST A2.1

JUMBLE

A2.1 PURPOSE. This is a laboratory safety test simulating repeated impacts that may occur in the transportation environment. The fuze must withstand random impacts imparted by free-fall inside a rotating, closed, lined box.

A2.2 DESCRIPTION

A2.2.1 General. The test box containing a loose fuze is rotated at a speed of 30 ± 2 revolutions per minute for a total of 3600 ± 10 revolutions. The inside dimensions of the box are sufficiently larger than the external fuze dimensions so that the fuze can tumble freely. During box rotation, the fuze impacts the interior surfaces at random. Three different size boxes are required to accommodate testing of the size range of fuzes not to exceed 381 mm (15 in) maximum dimension.

A2.2.2 Fuze configuration. The fuzes shall be completely assembled, including all explosive elements which are a part of the fuze design.

A2.2.3 Applicable publications. All standards, specifications, drawings, procedures and manuals which form a part of this test are listed in Section 2 of the introduction to this standard. Special attention is directed to Army drawing 81-3-35 and Navy drawings QEL 1386-1 through -45 and QEL 1387-1 which provide details of the jumble machine.

A2.2.4 Test documentation. Test plans, performance records, equipment, conditions, results and analysis shall be documented in accordance with Section 4.8 of the general requirements to this standard.

A2.3 CRITERIA FOR PASSING TEST

A2.3.1 Fuze condition. At the completion of this test, the fuze shall be safe for transportation, storage, handling and use in accordance with Paragraph 4.6.2.1a of the general requirements to this standard. The fuze does not have to be operable.

A2.3.2 Decision basis. Breakdown, inspection, other appropriate tests and engineering judgment shall form the basis for the decision that fuzes have passed or failed the test.

TABLE A2-2. Selection of Test Boxes

Maximum Fuze Dimension, mm (in)	Box Designation	Test Box Inside Reference Dimension without Liner, mm (in)			Drawing
		Height	Width	Length	
Less than 127 (5)	A	165 (6.5)	318 (12.5)	445 (17.5)	QEL 1386-4
127 to 254 (5 to 10)	B	292 (11.5)	394 (15.5)	546 (21.5)	QEL 1386-5
254 to 381 (10 to 15)	C	445 (17.5)	495 (19.5)	648 (25.5)	QEL 1386-6
Greater than 381 (15)	See A2.4.2				

A2.5.2 Inspect Equipment. Verify that the equipment is in good operating condition:

a. All working parts are structurally sound and all screw and bolt connections are tight.

b. The liner of the test box is in good condition, having a required thickness of 6.35 mm (1/4 in) minimum in the impact areas.

c. The machine, including the test box, is electrically grounded.

A2.5.3 Place fuze in box. Place one bare fuze in the box and secure the cover. No more than one fuze per box is permitted even if more than one fuze is to be tested.

A2.5.4 Operate machine. Rotate the box through 3600 ± 10 revolutions at a speed of 30 ± 2 rpm, 2 hours nominal run time.

A2.5.5 Compliance. At the completion of the required revolutions, remove fuze from test box. Analyze the test results and determine whether or not the test article meets the pass/fail criteria in Section A2.3. Continue testing the specified number of items.

A2.6 ALTERNATE AND OPTIONAL TESTS

None.

A2.7 RELATED INFORMATION

A2.7.1 Jumble test background. The jumble test has been used for many years to establish the safety and ruggedness of fuze designs under severe conditions of transportation. Although transport vehicles have changed in nature since the test was first devised, the occurrence of a "rough environment" of transportation is considered to have remained essentially of the same severity. This test therefore continues to be used as a ruggedness test of fuze designs.

A2.7.2 Protective fixtures. Historically, certain types of fuzes have been tested in protective fixtures. This practice was a deviation from the test intent and should not have been applied to fuzes which entered development phase testing after 15 April 1974. Accordingly, on 30 June 1976, a revision to Jumble Test 102.1 deleted the reference to the "Fixture for Jumbling Fuzes", which is drawing 81-3-37.

A2.7.3 Jumble box dimensions. Table A2-2 has been revised to make the dimensions consistent with those of Drawings QEL 1386-4, -5 and -6. The revised dimensions do not include the liner.

A2.7.4 Liner material substitution. Substitution of polyethylene sheet for maple wood as the jumble box liner material provides a similar test environment and offers significant advantages. It wears about six times more slowly. Consequently, the use of polyethylene will be more uniform and consistent with time, from piece to piece, and among different test facilities. Experience has shown that the procurement cycle for polyethylene is significantly shorter than that for wood. Refer to Frankford Arsenal Technical Report 75077 (Paragraph A2.7.5, b.) for more information.

A2.7.5 Bibliography.

a. JANAF Fuze Committee Journal Article No. 28, Jumble Test History, September 1963.

b. Frankford Arsenal Technical Report 75077, Improvements to Fuze Test Methods and Development of New Monitoring Techniques, National Technical Information Service (NTIS) No. AD-A024032, 5285 Port Royal Road, Springfield, VA 22161.

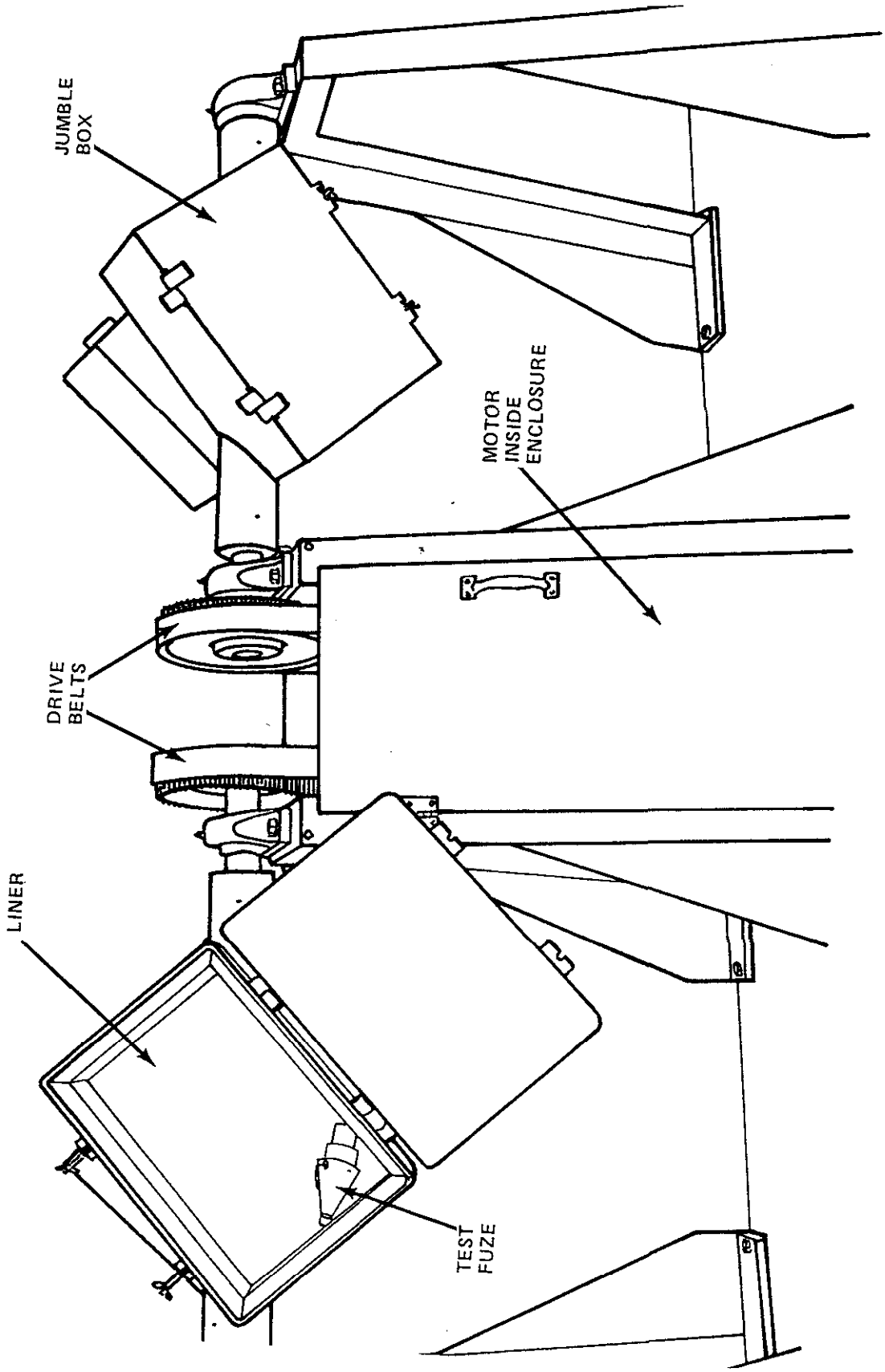

FIGURE A2-1. Jumble Machine