

MIL-H-48358 (AR)
30 September 1977

MILITARY SPECIFICATION
HMX/RESIN EXPLOSIVE COMPOSITION
LX-14-0
(FOR USE IN AMMUNITION)

This specification is approved for use by the US Army Armament Research and Development Command, and is available for use by all Departments and Agencies of the Department of Defense.

1. SCOPE.

1.1 This specification covers a high energy solid explosive composed of HMX, uniformly coated with a Polyurethane elastomer. (see 6.3 and 6.5).

2. APPLICABLE DOCUMENTS.

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

SPECIFICATIONS

MILITARY

- MIL-P-63196 - Polyurethane Elastomer
- MIL-H-45444 - HMX
- MIL-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification for.

STANDARDS

MILITARY

- MIL-STD-650 - Explosive: Sampling Inspection and Testing.
- MIL-STD-1235 - Single and Multilevel Continuous Inspection by Attributes.

FSC: 1376

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, US Army Armament Research and Development Command, Attn. DRDAR-QA, Dover, New Jersey 07801 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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US ARMY

- 7548644 - Box, Packing for High Explosives Assembly Details, Packing and Marking.
- 7548645 - Carton, Packing, Reusable, Collapsible for High Explosives Assembly, Details, Packing and Marking.

2.2 Other publications. The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

ASTM Designation: E300 - 70 Recommended Practice
for Sampling Industrial
Chemicals.

(Application for copies of ASTM Standards should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103).

3. REQUIREMENTS.

3.1 Material. - The explosive composition shall be HMX particles coated with the polyurethane elastomer binder. The mixture shall contain a small amount of pigment coloration for identification (see 6.6 and 6.8).

3.1.1 Constituent Material. The constituent material shall conform to the following specifications.

TABLE I

<u>Constituent Material</u>	<u>Specification</u>
HMX	MIL-H-45444 Grade B (See 3.1.2)
Polyurethane Elastomer	MIL-P-63196
Heliogen Violet Toner 49-6001	(See 6.6, 6.8)

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3.1.2 Classes of HMX. The granulation of classes of the HMX used in the composition shall conform to Table II.

TABLE II

<u>Granulation Classes of HMX of MIL-H-45444</u>	<u>Percent by Weight</u>
1	65 + 1.0
Special (see 6.7)	25 ± 1.0
2	10 (Max 90% thru 325 Mesh screen) + 0.05

3.2 Composition. - The analytical composition of a blended sample representative of a lot or a batch as defined in 4.4.1 shall be as specified in Table III when tested as specified in 4.6.3.

TABLE III

<u>Class</u>	<u>Percent by Weight</u>	
	<u>Batch</u>	<u>Lot</u>
HMX	95.5 + 0.6	95.5 ± 0.5
Polyurethane Elastomer	4.5 ± 0.6	4.5 ± 0.5

3.2.1 Volatiles. The volatile content of the composition shall be 0.10% maximum when tested as specified in 4.6.2.

3.2.2 Bulk Density. The bulk density of the composition shall be 0.85 g/cc minimum when tested as specified in 4.6.1.

3.2.3 Granulation. The composition shall be supplied in the form of free-flowing particles, which shall comply with the following granulation requirements when tested as specified in 4.6.5.

<u>U.S.S. Sieve Size Designation or Number</u>	<u>Cumulative Percent Retained</u>
5/16 in	none
4	1 maximum
50	95 minimum
80	98 minimum

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3.2.4 Insoluble particles. The composition shall have no insoluble particle retained on a USS Sieve No. 40, and not more than 5 insoluble particles retained on a USS Sieve No. 60 when tested as specified in 4.6.4.

3.3 First article inspection. This specification contains provisions for first article inspection. Requirements for the submission of first article samples by the contractor shall be as specified in the contract.

3.4 Foreign matter. - The composition shall be free of metal inclusions, woods and other foreign matter when tested as specified in 4.4.2.1.

4. QUALITY ASSURANCE PROVISIONS.

4.1 Responsibility for inspection and standard quality assurance provisions. Unless otherwise specified herein or in the contract, the provisions of MIL-A-48078 shall apply and are hereby made a part of this detail specification.

4.2 Classification of inspections. The following types of inspections shall be conducted on this item:

- a) First article inspection (see 4.3)
- b) Quality conformance inspection (see 4.4)

4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. The first article sample shall consist of ten (10) pounds of LX-14-0.

4.3.2 Inspection to be performed. The sample will be subjected by the Government to any or all of the examinations or tests specified in 4.5 and 4.6 of this specification.

4.3.3 Rejection.

4.4 Quality conformance inspection.

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4.4.1 Inspection lot formation. Inspection lots shall comply with lot formation provisions of MIL-A-48078. (see 6.8) In addition, a lot shall consist of one or more batches of LX-14-0 of one composition designation only, produced by one manufacturer, in accordance with the same specification, or same specification revision, under one continuous set of operating conditions. Each batch shall consist of that quantity of LX-14-0 that has been subjected to the same unit chemical or physical mixing process intended to make the final product homogeneous. In addition, each lot shall contain:

a. HMX of one type only, from one interfix lot number from one manufacturer only.

b. Binder from one interfix lot number from one manufacturer only.

4.4.2 Examination. Unless otherwise specified in the Classification of Defects and test tables, sampling plans for major and minor defects shall be in accordance with MIL-STD-105, Inspection Level II (See MIL-A-48078). (see 4.5.1)

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CLASSIFICATION OF DEFECTS & TESTS

PARAGRAPH	TITLE	SHEET 1 OF 1		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	DRAWING NUMBER 7548644 and 7548645 NEXT HIGHER ASSEMBLY	PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.1	Box or Box Fiberboard prior to closing								
<u>Critical:</u>	None defined								
<u>Major</u>									
131.	Foreign matter	0.40%	3.4					Visual	
132.	Liner pierced or torn	0.40%	5.1					Visual	
133.	Liner improperly closed	0.40%	5.1					Visual	
104	Color	0.40%	3.1					Visual	
<u>Minor</u>									
201.	Type of liner incorrect	0.65%	5.1					Visual	
202.	Bag liner pulled too tight not allowing slack	0.65%	5.1					Visual/Manual	
<u>NOTES:</u>									

DRDAR-QA Form 160 Jul 77 Replaces SAPPA-QA Form 2567 Feb 74 Which is Obsolete

CLASSIFICATION OF DEFECTS & TESTS

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PARAGRAPH	TITLE	EXAMINATION OR TEST	NO. OF SAMPLE UNITS	SHEET 1 OF 1		PARAGRAPH REFERENCE /INSPECTION METHOD
				AQL OR 100%	REQUIREMENT PARAGRAPH	
4.4.2.2	Sealed Boxes					DRAWING NUMBER 7548644 NEXT HIGHER ASSEMBLY
<u>Critical:</u>	None defined					
<u>Major</u>	Top improperly assembled			0.40%	5.1	Visual/Manual
131.	Box damaged			0.40%	5.1	Visual
132.	Lot number misleading or unidentifiable			0.40%	5.1	Visual
133.	Strapping missing, broken, or loose			0.40%	5.1	Visual/Manual
134.						
<u>Minor</u>	Strapping improperly assembled			0.65%	5.1	Visual/Manual
201.	Marking misleading or unidentifiable			0.65%	5.1	Visual
202.						
NOTES:						

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PARAGRAPH	TITLE	SHEET 1 OF 1		NO. OF SAMPLE UNITS	EXAMINATION OR TEST	AQL OR 100%	REQUIREMENT PARAGRAPH	PARAGRAPH REFERENCE / INSPECTION METHOD
4.4.2.3	Sealed Box fiberboard							
<u>Critical:</u>								
<u>Major</u>								
131.	Assembly torn or pierced	0.40%	5.1					Visual
132.	Lot number misleading or unidentifiable	0.40%	5.1					Visual
<u>Minor</u>								
201.	Glued Boxes	0.65%	5.1					Visual
202.	Marking misleading or unidentifiable	0.65%	5.1					Visual
203.	Banding strips missing, broken or improperly applied	0.65%	5.1					Visual/Manual
NOTES:								

DRD:R-QA Form 160 Jul 77 Replaces SARPA-QA Form 2567 Feb 74 Which is Obsolete

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4.5 Testing.

4.5.1 Sampling for test 4.6.1 through 4.6.5. Approximately 500 grams of explosive composition shall be selected from each batch to be sampled using ASTM Procedures E300-70 for solids. Samples shall be selected for inspection in accordance with MIL-STD-1235, CSP-1 Plan, Inspection Level II, AQL 6.5%. If any sample fails to meet any test requirement the batch represented by the sample shall be rejected. All batches produced between the time that the last batch was tested and accepted and the batch which failed shall be tested in accordance with the applicable methods given in paragraph 4.6. If any of these batches fail to meet any of the test requirements, that batch shall also be rejected. In addition, after any failure of a batch the contractor will return to 100% inspection until "1" successive batches are accepted as required by MIL-STD-1235. The classification of defects shall be as given in Table 4.

TABLE IV

<u>Inspection/Requirement</u>	<u>Defect Classification</u>
Composition (see 3.2)	Major
Volatiles (see 3.2.1)	Major
Bulk Density (see 3.2.2)	Major
Granulation (see 3.2.3)	Major
Insoluble Particles (see 3.2.4)	Major

4.5.2 Inspection equipment. The government reserves the right to inspect the contractor's equipment and determine that he has available and utilizes correctly, measuring and test equipment of the required accuracy and precision and that the instruments are of the proper type and range to make measurements of the required accuracy. Commercial inspection equipment shall be employed, where applicable for all tests and examinations specified. The contractor is responsible for assuring proper calibration procedures are followed. Government approval of all inspection equipment is required prior to its use for acceptance purposes.

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4.6 Test methods and procedures.(see 6.4) The tests in paragraphs 4.6.1 thru 4.6.5 shall be performed, using prescribed analytical procedures for replicate determinations given in standard analytical textbooks.

4.6.1 Bulk Density. The bulk density of the explosive composition shall be determined in accordance with Method 201.3 of MIL-STD-650.

4.6.2 Volatiles. The volatiles shall be determined in accordance with method 101.6 of MIL-STD-650.

4.6.3 Composition.

4.6.3.1 HMX Content

4.6.3.1.1 Reagent. Prepare HMX-saturated chloroform, by adding excess HMX to reagent grade chloroform, stirring the resultant slurry at least two hours at room temperature. The chloroform is stored over the excess HMX and filtered before use.

4.6.3.1.2 Procedure. Place approximately 5 grams of dried sample, weighed to the nearest 0.1 mg, into a 250 ml beaker and add 150 ml of saturated chloroform. Stir for thirty minutes. Rinse down the wall of the beaker and stir for fifteen additional minutes. Remove stirrer, washing off any residue with 10 ml of saturated chloroform. Transfer the slurry into a tared medium porosity Gooch crucible which has been connected to a vacuum filtering flask. Carefully rinse any residue remaining in the beaker into the crucible, using three 5 ml portions of the saturated solvent. Wash the residue on crucible with three 20 ml portions of saturated chloroform. Remove the crucible from the filtering flask and wash all discernable residue from beneath the frit with saturated chloroform. Dry for one hour in a vacuum oven at $60 \pm 2^\circ\text{C}$, then cool in a desiccator. Weigh the crucible and its contents and calculate the percentage of HMX as follows:

$$\% \text{ HMX} = \frac{100 (A - B)}{W}$$

Where:

A = Weight of crucible and residue, in grams

B = Tare weight of crucible, in grams

W = Weight of sample, in grams

This analysis will be run in triplicate. The average of the three determinations will be reported as percent HMX.

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4.6.3.2 Binder Content. - Subtract the value reported as percent HMX from 100 to obtain the percent binder.

4.6.4 Insoluble Particles. The insoluble particles shall be determined in accordance with method 106.1 of MIL-STD-650, using Acetone as the solvent.

4.6.5 Granulation. - The granulation of the molding powder shall be determined in accordance with Method 204.1 of the latest revision of MIL-STD-650.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 Level A. - Packing shall be in accordance with Drawing 7548644 as specified for explosive composition.

5.1.2 Level B. - Packing shall be in accordance with Drawing 7548645 as specified for explosive composition.

5.2 Marking. - Marking shall be in accordance with Drawings 7548644 and 7548645 as applicable.

6. NOTES

6.1 Ordering data. See MIL-A-48078

6.2 Submission of inspection equipment designs for approval. See MIL-A-48078. Submit equipment designs, as required, to Commander, US Army Armament Research and Development Command, ATTN: DRDAR-QA, Dover, New Jersey and VIPER Project Office, US Army Missile Research and Development Command, Redstone Arsenal, Alabama 35809.

6.3 Polyurethane Elastomer. - A material that has been found satisfactory for use in this explosive composition as a binder is Estane 5703 F1, manufactured by B. F. Goodrich Chemical Co. Use of a binder from another source shall be evaluated in accordance with MIL-P-63196 by the US Army Armament Research and Development Command, DRDAR-QAR-R before being approved as an equivalent. (see 6.2)

6.4 Prior approval of the Contracting Officer is required for use of equivalent test methods. A description of the proposed method should be submitted through the Contracting

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Officer to: Commander, US Army Armament Research and Development Command, ATTN: DRDAR-QA, Dover, New Jersey 07801. This description should include but not be limited to the procedures used, the accuracy and precision of the method, test data to demonstrate the accuracy and precision and drawings of any special equipment required.

6.5 Intended use. The material covered in this specification is intended to be used for application as an explosive where high energy and good thermal stability are needed in ammunition items.

6.6 Colorizer. Heliogen Violet Toner 49-6001 manufactured by General Aniline and Film Corp has been found satisfactory. Use of a colorizer from another source should be evaluated by the US Army Armament Research and Development Command, DRDAR-QAR-R before being approved as an equivalent.

6.7 HMX - Special Class.- The HMX shall have the following size distribution.

<u>US Standard Sieve Number</u>	<u>Nominal Opening Microns</u>	<u>Weight, % Passing</u>
50	297	100
120	125	90 + 5.0
325	44	50 + 0.-15.0

In addition, the particle size distribution of this HMX should conform to the following:

<u>Size Interval, Microns</u>	<u>Weight % in Interval</u>
0-10	30 maximum
40-70	17 minimum
Over 100	10 minimum

6.8 Color. - Approximately one-fifth (1/5) the number of batches comprising a lot should be a uniform violet. The lot should be a uniform speckled violet with a white background.

Custodian:
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