

MIL-P-60312C (PA)

5 June 1975

SUPERSEDING

MIL-P-60312B (MU)

30 November 1970

MILITARY SPECIFICATION

PARTS, MOLDED, PLASTIC FOAM, POLYSTYRENE
(FOR USE WITH AMMUNITION)

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 SCOPE. - This specification covers two types of parts molded from universally antistatic polystyrene foam plastic (expanded bead type) and used in packaging and shipping containers for ammunition items (see 6.1 and 6.13).

1.2 CLASSIFICATION

1.2.1 The molded parts shall be of the following types and classes as specified.

Type I - Colored

Class 1 - Non-modified

Type II - Natural Unpigmented

Class 1 - Non-modified

Class 2 - Modified (see 6.15)

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-A-48078 - Ammunition, Standard Quality Assurance Provisions, General Specification for.

STANDARDS

FEDERAL

FED-STD-595 - Colors.

FSC: 8140

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STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-1169 - Packaging, Packing and Marking for Shipment of Inert Ammunition Components.

(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).

2.2 Other publications. - The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS

- ASTM-D1692-74 - Flammability of Plastic Sheeting and Cellular Plastics.
- ASTM-D2044 - Moisture Content in Paper and Paperboard by Toluene Distillation.

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

3. REQUIREMENTS

3.1 Material. - The foamed plastic parts shall be molded from expandable polystyrene bead material by the application of heat in a closed mold.

3.2 Dimensions and tolerances. - The dimensions and tolerances of the molded parts shall be in accordance with the applicable drawing, specification, contract or purchase order. Draft angles, not exceeding 2 degrees, will be permitted if required to facilitate removal of the parts from the mold. No grease or oil shall be used for mold release purposes. Teflon is suggested.

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3.3 Color (Type I only) - The color of the molded parts shall be green, unless otherwise specified by the procuring activity (see 6.2). The green color shall be that of color number 34373, of FED-STD-595, or a darker green than that number when examined by visual means in accordance with 4.5.2. (Color variation or mottling of the color is acceptable provided the lightest portion meets the stated color requirements).

3.4 Density. - The molded plastic parts shall have the densities (as applicable) as stated in Table I, when tested in accordance with 4.5.3.

TABLE I

<u>Density (Nominal)</u>	<u>Minimum (1)</u>
1	0.8
2	1.7
3	2.6
4	3.5
5	4.3
6	5.3

(1) Unless otherwise specified on component drawing.

3.5 Moisture content. - Moisture content of the molded part, at time of packing, shall not exceed 0.4 percent when tested in accordance with 4.5.4 (see 6.3).

3.6 Anti-static surface coating. - Unless otherwise specified in the applicable drawings, contract or purchase order, all surfaces of the molded components, prior to drying, shall be coated by dipping only, with an approved anti-static agent (see 6.4).

3.7 Static potential. - The static potential of the components shall be 600 volts maximum, when tested in accordance with 4.5.5. The test shall be performed after drying the component to the specified moisture control (see 6.5).

3.8 Resistance to surface blocking. - Anti-static coated parts shall be tested for resistance to surface blocking in accordance with 4.5.6. The tested assemblies shall separate immediately, under their own weight, when the uppermost part in each is lifted. In addition, such separation shall not result in rupture or transfer of such surface coating as determined by visual or other means specified.

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3.9 Integrity of structure. - The fusion of the beads, within the part, shall be demonstrated by the separation of a maximum of twelve (12) beads per 100 square inches, when tested in accordance with 4.5.7. This requirement shall apply except where the part drawing calls for a change to either the number of beads or the surface area.

3.10 Self-extinguishing property (Type II, Class 2 only) - Molded parts, known to comply with the moisture content specified shall be tested for a self-extinguishing property. A molded part shall be considered to have a self-extinguishing property if it burns upon exposure to flame but does not burn past the gage mark as described in paragraph 7.5 of ASTM-D1692-74. Additionally, no drop emitted by burning shall cause ignition, for more than 10 seconds of the specimen (positioned 12 inches below the test sample) when tested as specified in 4.5.8.

3.11 Molded marking on parts. - Each molded part shall have molded thereon, the molder's trademark and Government part or drawing number, and other markings that are required by the applicable contract, specification or drawing.

3.12 Workmanship. - Molded parts shall be free of grease, dirt or other foreign matter. They shall be essentially smooth, free of ridges, grooves and other defects. Occasional minor marks from knockout pins, steam ports, finishing operations, or sink marks are acceptable provided that serviceability is not affected. The surfaces shall be uniform in composition and free of holes or voids that might affect their performance or intended use.

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

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 inspection shall be conducted on this item:

- a. First Article Inspection (see 4.3).
- b. Quality Conformance Inspection (see 4.4).
- c. Packaging Inspection (see 5).

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4.3 First article inspection.

4.3.1 Submission. - The contractor shall submit a first article sample (see 6.2e) as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. All materials shall be obtained from the same sources of supply as will be used in regular production. The first article sample, which has been produced by the contractor using the same production processes, procedures and equipment as will be used in fulfilling the contract shall consist of:

- a. Ten consecutively produced parts from each cavity (1).
- b. Five representative samples selected for moisture determination and prepared for shipment in accordance with the provisions of paragraph 4.4.3.1 (2).
- c. Twelve test specimens (containing skin and anti-static coating, each measuring 6 x 12 x 1/2 inch (+) 1/8 inch (3).

4.3.2 Inspections to be performed. - See MIL-A-48078.

4.3.3 Rejection. - See MIL-A-48078.

4.4 Quality conformance inspection.

4.4.1 Inspection lot formation. - Inspection lots shall comply with the lot formation provisions of MIL-A-48078.

4.4.2 Examination.

4.4.2.1 Sampling for examination. - Sampling for examination shall be in accordance with the following when examining for the defects specified in Table II.

4.4.2.1.1 A sample of 10 molded parts shall be selected at random from each lot. If three or more parts fail to comply with the applicable requirements, the lot shall be rejected.

- (1) When the first article sample is fabricated in molds containing more than ten cavities, a quantity of five representative samples of each cavity will suffice.
- (2) Individual sample units selected for testing shall be placed in separate polyethylene bags immediately after selection and so wrapped and sealed that included air, is kept to a minimum.
- (3) From the twelve specimens submitted, ten samples shall be selected and subjected to static potential charge. Additionally, all twelve samples shall be prepared therefrom for self-extinguishing property testing.

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4.4.2.1.1.1 In the event that one or two molded parts fail the examination requirements, retest may be performed using an additional 10 samples. Failure of one unit of the retest quantity shall reject the lot.

TABLE II

<u>Category</u>	<u>Defect</u>	<u>Method of Inspection</u>
Critical:	None defined.	
Major B:		
101.	Cavity dimension not as specified (see 3.2, 6.11 and 6.12)	Gage (CD)
Minor:		
201.	Defective workmanship (see 3.12)	Visual
202.	Marking incorrect, missing or illegible	Visual
203.	Suppliers identification missing	Visual

4.4.3 Testing.

4.4.3.1 Sampling. - A sample of six (6) units representing the product of each shift shall be selected for tests specified in Table III, unless otherwise specified herein. Failure of one or more units to meet the applicable requirements shall be cause for rejection of the production for that particular shift. Non-destructive tests and the structural integrity test shall be performed on each unit of a sample.

TABLE III

<u>Inspection/Requirement</u>	<u>Defect Classification</u>
Color (see 3.3)	Minor
Density (see 3.4)	Major B
Static potential (see 3.7)	Major B
Resistance to surface blocking (see 3.8)	Major B
Integrity of structure (see 3.9)	Major B

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4.4.3.1.1 Moisture determination (see 3.5). - Major B defect - The moisture determination shall be performed on a sample of two units selected from the production of each shift (4). Selection of the samples shall be made near the center portion of the drying stack or container. Failure of any unit of the sample to meet the applicable requirement of 3.5, when tested in accordance with 4.5.4, shall reject the represented production for that particular shift.

4.4.3.1.2 Self extinguishing property (see 3.10). - Major B defect - Twelve samples shall be prepared for this test. Failure of any sample to meet the applicable requirement of 3.10, when tested in accordance with 4.5.8, shall be cause for rejection of the lot.

All testing shall be completed prior to packing any component for shipment.

4.4.4 Inspection equipment. - The inspection equipment required to perform the inspection prescribed in this specification is identified in the examination (4.4.2) and Test Methods (4.5) paragraphs herein. The contractor shall submit for approval inspection equipment designs in accordance with the terms of the contract. See Section 6 of MIL-A-48078 and 6.7 herein.

4.5 Test methods and procedures. (see 6.8).

4.5.1 Specimens. - The specimen shall be one or more complete molded items unless limitation imposed by specified equipment makes necessary the use of a smaller specimen. In such case, the item may be sectioned.

4.5.2 Color. - Examine the specimen, on all sides, using daylight illumination to determine compliance with 3.3.

4.5.3 Density. - Accurately weigh the unit. Determine the volume of the unit by measuring the volume of water displaced by the unit when completely submerged. Determine the density of the material by dividing the weight of the unit by its volume. Determinations shall be made on three units. Any unit failing to meet the applicable requirement shall be classed defective.

(4) Individual sample units selected for testing shall be placed in separate polyethylene bags immediately after selection and so wrapped and sealed that included air kept to a minimum.

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4.5.4 Moisture content.

4.5.4.1 Preparation of specimen. - Accurately weigh a specimen of approximately 100 grams to the nearest 0.1 gram. Its cross sectional area shall fit into a two liter flask and may be composed of more than one piece, if necessary. The dimensions shall be established prior to acceptance testing and shall then become part of this test procedure until the size or shape of the test flask is changed. The cutting of the unit to obtain the specimen shall not be accomplished by use of heat, such as hot wires, heated knives, etc. A knife with a serrated edge has been found to be adequate for this purpose. The piece removed as the specimen shall be removed from that section of the unit where maximum weight will be obtained. In the event one unit does not completely fill the flask, sufficient material must be added to do so.

4.5.4.2 Apparatus. - The test apparatus for performing the moisture determination shall be a typical distillation process as shown in Figure I (see 6.6).

Test flask. - A two liter cylindrical reaction flask with cover and clamp to hold the cover. The cover shall contain one opening with a standard 24/40 tapered joint (see 6.9).

Heating element. - Any heating element that will fit the test flask and apply heat as required.

Distillation trap. - A Dean-Stark or Bidwell-Sterling type distillation trap with 0.1 milliliter divisions and 24/40 joints.

Reflux condenser. - Water jacketed, 400 millimeters minimum length with 24/40 joint.

Drying tube. - A drying tube containing a moisture-indicating dessicant, equipped with a rubber stopper to fit the end of the reflux condenser.

4.5.4.3 Test procedure. - In general, the precautions, calibration and techniques prescribed in ASTM D2044 (5) shall be observed. Place an established quantity of dry (suitably distilled) toluene into the test flask. This quantity of dry toluene shall be determined prior to performing any acceptance testing, and shall quantitatively be a minimum of 25 percent in excess of that required to completely dissolve a typical specimen of the size and shape determined above. Add the specimen to the flask and assemble the cover as soon as the specimen is in place. A maximum of

(5) Boiling chips may be obtained from the Fisher Scientific Co., 711 Forbes St., Pittsburgh, PA., 15219. Their catalogue, item B-365 - Boileezers or 9-191-21 - Boiling Chips or substantial equal.

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five minutes is allowed from the time when the unit is removed from the polyethylene bag to the time when the cover is assembled to the test flask. If this time period is exceeded, discard the contents of the test flask, the test shall not be completed, and a replacement unit and a specimen shall be selected and prepared, adhering to all of the requirements for selecting the original specimen. The toluene solution containing water from the specimen shall be refluxed by the application of heat to the test flask until the water level in the distillation trap maintains a constant level for 15 minutes minimum. The system shall then be allowed to cool to ambient temperature. Then, 40 to 50 milliliters of toluene, in 10 milliliter increments, shall be poured down the condenser to rinse any water droplets from the surface. The distillation trap shall then be removed from the system, its contents stirred to assure complete separation of the toluene and water. The volume of the water shall be observed and recorded as V, estimated to the nearest 0.05 milliliter. The total percent of moisture content shall be calculated as follows:

$$\text{Percentage of moisture content} = \frac{100 V}{W}$$

Where:

V = Volume of water, measured in milliliters.

W = Weight of the specimen, measured in grams.

4.5.5 Static potential charge. - Place the specimen on an ungrounded surface, in an environment of not more than 55 percent relative humidity, and briskly rub with a rayon or silk cloth, not less than 25 strokes for a distance of 8 inches minimum, each stroke superimposed upon the preceding stroke. The cloth used in this test shall be of a size and so arranged that there is no possibility of the operator's hand touching the specimen during the test. After the specimen has been rubbed as required, the specimen shall not be touched in any manner. Measure the static potential by holding the detecting head of a Keithley Static Meter No. 600B, with detecting head No. 2503 (see 6.10) or sensor element of Enviro/Tech Sciences Inc., Model W100, Calibrated Electrostatic Charge Detector (or substantial equal) not more than 3/8 inch from the approximate center of the unit surface where the rubbing was accomplished. This determination shall be accomplished immediately after the last stroke of the rubbing cloth.

NOTE: Static potential charge measurements require stringent adherence to manufacturers recommended procedures, including calibration and head standoff distances. Special attention should be given to preventing disturbance of the coaxial cable between the detector head and the electrometer during test when using the Keithley equipment.

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4.5.6 Resistance to surface blocking. - Resistance to surface blocking shall be determined as follows: The specimens shall be two halves comprising one set of mating molded components, or in the case of one part items, two similar components shall be the test specimens. The major surfaces of the two components, or two halves, shall be placed in intimate contact so that the greatest possible surface contact is made. Three such assemblies shall then be placed in an air circulating oven maintained at 150, plus or minus 2 degrees F for a period of 30 minutes with each such assembly under an evenly distributed weight comprising 20, plus or minus one pound per square foot of contacted area. When the 30 minutes have elapsed, the assemblies shall be removed from the oven and placed on a table or any flat surface sufficient in size to accommodate the sample. The weights shall then be removed and the contacted surfaces in each assembly separated by lifting the uppermost part or half from the lowermost part or half of each two-piece assembly (6). Failure to immediately separate or any visual evidence of rupture or transfer of surface coating in either part in any of the three assemblies shall be an indication of failure to comply with the requirement.

4.5.7 Integrity of structure. - This evaluation shall be performed as follows: Over a clean smooth surface, the test unit shall be broken into approximately two equal parts. Those two parts shall, in turn be broken in a similar manner. When possible, do not break across or through cavities. (The unit, prior to breaking, should be scored circumferentially close to the center of its length and width to the minimum depth necessary to be readily broken by hand pressure). Shake out any loose pellets onto the prepared surface. Then over the same surface using a stencil brush (with bristles measuring approximately (approx) 1-1/4 inch in length) hold the brush in an upright position and subject each fracture surface to reciprocating strokes of the brush until no further material is retained. Under no circumstances shall the brush bristles be suppressed more than 1/4 inch (approx). Discard all released material except discrete pellets. Count retained pellets. Any sample unit exceeding the requirement shall be classed defective.

(6) *Under no circumstances shall the lowermost part or half of each two piece assembly be held in position to prevent movement during this phase of the test.*

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4.5.8 Self-extinguishing property. - This determination shall be performed prior to start of production on a contract and at the latest, when beads of a different shipment than those previously used are introduced into the process. Twelve units of the product of the second container through the pre-expander shall be selected immediately after molding for test. One specimen measuring 2 x 6 inches (when possible) x 1/2 inch shall be taken from each unit and dried until the weight of each is stabilized. (7) The samples to be tested must have molded skin with anti-static surface coating on at least one twelve square inch sample surface. In instances where the sample thickness is less than one-half inch, the specimen must contain molded skin on both sides with anti-static coating applied. Testing, for compliance with the provisions of paragraph 3.10 will be performed in accordance with ASTM-D1692-74. Prior to testing, care should be exercised to assure compliance with the following procedures:

(a) Skin side of specimen positioned for burning faces the hardware-cloth specimen support.

(b) Two specimens, of the twelve specimens prepared are positioned skin face up (twelve inches below specimen to be burned) to receive all drops (as possible) emitted by the upper specimen. In the event the two aforementioned specimens show pronounced evidence of burning, shrinking, curling or melting from previous testings, new foam samples shall be prepared and substituted as necessary.

5. PREPARATION FOR DELIVERY

5.1 Packaging, packing and marking, Level A or Level C. - Packaging, packing and marking of the molded components for shipment and storage shall be in accordance with the requirements of MIL-STD-1169 or as otherwise specified by the procuring activity.

(7) *When units are of insufficient size to prepare samples meeting the specified requirements, sample units containing skin and anti-static coating as specified, will be prepared and intimately combined to form specimens which closely approximate the desired requirements. Marking of the test specimen will be performed as per instructions contained in paragraph 5.2.1 of ASTM-D1692-74. In addition, sufficient specimens will be selected to justify the requirement of subparagraph (b).*

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6. NOTES

6.1 Intended use. - The molded components covered by this specification are intended for use in packaging fuzes and other ammunition items.

6.2 Ordering data. - Procurement documents shall specify the following:

- a. Title, number and date of this specification.
- b. Level of packaging and packing required (see 5.1).
- c. Type and class required.
- d. Color (if other than green is required).
- e. Provisions for submission of first article samples.
- f. Deletion of anti-static properties (if applicable).
- g. Provisions of MIL-A-48078.

6.3 For drying to meet the requirement, it is recommended, but not guaranteed, that the parts to be dried in an oven having an exhaust system for removal of moisture laden air for 8 hrs, minimum at 150 degrees plus or minus 5 degrees Fahrenheit or to be air dried in circulating air at 72 degrees, minimum for 5 days, minimum or a mixture of both (see 6.5).

6.4 Materials which have been found to be satisfactory anti-static agents are:

- a. Catanac SN - may be obtained from the American Cyanamid Co., Bound Brook, N.J.
- b. Zelec NK - may be obtained from E.I. duPont de Nemours, Wilmington, Delaware.

6.5 Receiving agencies. - Each receiving agency shall perform, as a minimum, the testing for moisture content and static potential (see 3.5 and 3.7).

6.6 Moisture content. - In the event an item is so large that the size and mold cycle time will reduce production per shifts to the point that destroying 2 units would be uneconomical, and unrealistic, the cognizant procuring agency shall obtain a special sampling plan from Picatinny Arsenal, ATTN: SARPA-QA-A-P, Dover, New Jersey prior to submission of Invitation for Bid or Request for Proposal.

6.7 Submission of inspection equipment designs for approval. - See MIL-A-48078. Submit equipment designs, as required, to Commander, Picatinny Arsenal, ATTN: SARPA-QA-T, Dover, New Jersey 07801.

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6.8 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 Officer to: Commander, Picatinny Arsenal, ATTN: SARPA-QA-A-P, Dover, New Jersey 07801. This description should include but not be limited to the accuracy and precision of the method, test data to demonstrate the accuracy and precision and drawings of any special equipment required.

6.9 Moisture determination equipment. - One source for the flask and cover depicted in Figure 1-ECK & KREBS Scientific Laboratory Glass Apparatus, Inc., 27-09 40th Avenue, Long Island City, New York 11101.

6.10 No. 600B Keithley Static Meter, with a No. 2503 static detector head, for use in determining static potential, may be obtained from Keithley Instruments, Cleveland, Ohio. The Electro-Static Locator, Type E, may be obtained from the Simco Company, 920 Walnut Street, Lansdale, Pennsylvania. Model W100 Calibrated Electrostatic Charge Detector may be procured from Enviro/Tech Sciences, Inc., 1238 Chestnut Street, Newton Upper Falls, Massachusetts 02164. Other instruments substantially equal in accuracy may be used.

6.11 It is recommended that models made to the minimum drawing requirements be utilized for checking cavity dimensions of the molded parts.

6.12 Delay time in dimensioning examinations. - No attempt shall be made to determine compliance with dimension and tolerance requirements of the supports for minimum period of 8 hours after molding or removal from heated drying chamber.

6.13 This specification may be utilized to purchase molded, plastic foam, polystyrene parts which do not possess the anti-static properties outlined in the scope of this specification. This deletion must be specified in accordance with paragraph 6.2.

6.14 Temperatures for continuous use of storage of the molded components should not exceed 176 degrees F.

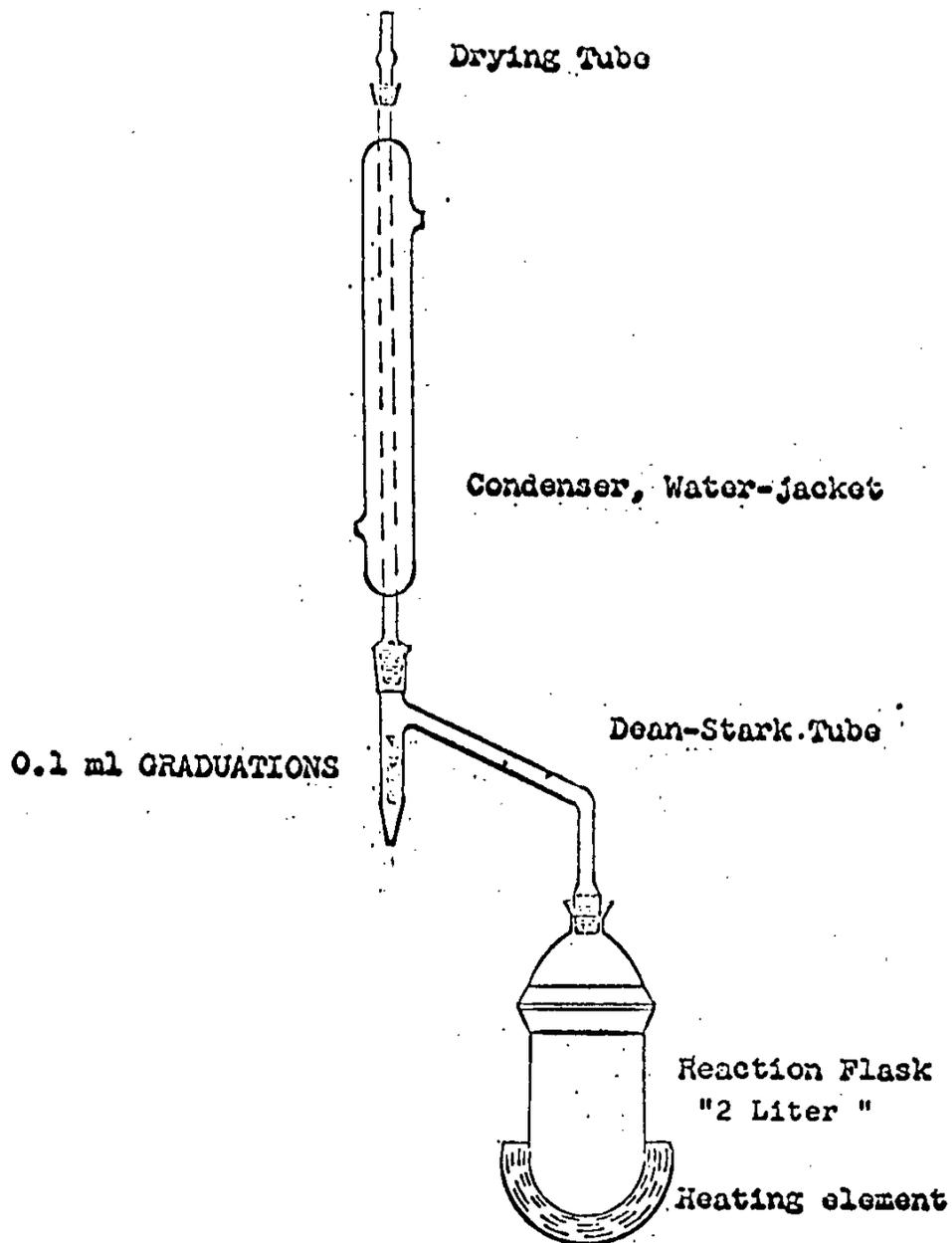
6.15 Type II, Class 2 modified material is fabricated to meet the self extinguishing property requirement, as well as the other requirements, of this specification.

Custodian:
Army - PA

Preparing Activity:
Army - PA

Project Number: 8140-A138

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MOISTURE DETERMINATION APPARATUS

Figure I