MIL-G-155A
20 SEPTEMBER 1962
SUPERSEDING
JAN-G-155
13 DECEMBER 1944

MILITARY SPECIFICATION

GRAPHITE, DRY

(FOR USE IN AMMUNITION)

This specification has been approved by the Department of Defense and is mandatory for use by the Department of the Army, the Navy, and the Air Force.

1. SCOPE

1.1 **Scope.** This specification covers four grades of graphite for use in ammunition.

1.2 **Classification.** Graphite shall be of the following grades (see 6.2 and 6.3).

Grade I–Manufactured.
Grade II–Natural.
Grade III–Manufactured.
Grade IV–Natural.

2. APPLICABLE DOCUMENTS

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

SPECIFICATIONS

FEDERAL

RR-S-366 —Sieves, Standard, Testing.
UU-S-48 —Sacks, Shipping Paper.
PPP-D-723 —Drums, Fiber.
PPP-D-729 —Drums, Metal, 55 gallons (for Shipment of Noncorrosive Material).

MILITARY

JAN-P-112 —Packaging and Packing for Overseas Shipment. Drums, Plywood (for Drums, Whose Weight of Contents Does Not Exceed 200 Pounds).
JAN-T-339 —Tetryl (Trinitrophenylmethylnitramine).

STANDARDS

MILITARY

MIL-STD-105 —Sampling Procedures and Tables for Inspection by Attributes.
MIL-STD-109 —Inspection Terms and Definitions.
MIL-STD-129 —Marking for Shipment and Storage.

PUBLICATIONS

ORDNANCE CORPS

ORD-M608-11 —Procedures and Tables for Continuous Sampling by Attributes.

(Copies of specifications, standards, drawings 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.)

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.

CONSOLIDATED CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules.

(Application for copies of these freight classification rules should be addressed to the CONSOLIDATED CLASSIFICATION COMMITTEE, 202 Chicago Union Station, Chicago 6, Illinois.)

FSC 9620

AMERICAN TRUCKING ASSOCIATION PUBLICATION

National Motor Freight Classification Rules and Container Specifications.

(Application for copies should be addressed to the AMERICAN TRUCKING ASSOCIATION, 1421 16th Street, N. W., Washington, D. C.)

3. REQUIREMENTS

3.1 Appearance (applicable to Grade II and IV only). Graphite of grades II and IV shall appear steel gray or silver gray in color and shall have a metallic luster.

3.2 Properties. Graphite shall conform to the limits for the properties specified in Table I, when determined as specified in the applicable sub-paragraphs of 4.3.

TABLE I

Properties	Grade I percent	Grade II percent	Grade III percent	Grade IV percent	Paragraph
Moisture, Maximum	0.20	0.50	0.50	0.50	4.3.1
Ash, maximum (max.)	0.60	6.0	0.60	6.0	4.3.2
Silica, max	.....	1.0	.....	2.75	4.3.3
Other grit	None	None	None	None	4.3.4
Acidity	None	None	None	None	4.3.5
Free sulfur, max	0.02	.....	0.05	0.05	4.3.6
Total sulfur, max	0.20	.....	0.50	0.50	4.3.7
Granulation:					4.3.8
through United States (U. S.) standard sieve number (No.) 100 (149 micron) minimum (min.).	.....	65.0	.....	.....	
Through U. S. standard sieve No. 200 (74 micron) min.	98.0	.....	98.0	.....	
Through U. S. standard sieve No. 325 (44 micron) min.	.....	.....	.....	98.0	

3.3 Lubricating quality (applicable to Grade I and II only). When specified, Grade I and II graphite shall be tested for use as a pellitizing lubricant as described in paragraph 4.2.2.1.

3.4 Glazing quality (applicable to Grade III and IV only). When specified Grade III and IV graphite shall withstand the glazing test specified in paragraph 4.2.2.2.

4. QUALITY ASSURANCE PROVISIONS

4.1 General quality assurance provisions. The supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own or any other inspection facilities and services acceptable to the Government. Inspection records of the examinations and tests shall be kept complete and available to the Government as specified in the contract or order. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements. Reference shall be made to Standard *MIL–STD–109* in order to define the terms used herein. Inspection shall be performed in accordance with this specification and other specifications referenced in any of the contractual documents.

4.2 Preproduction *inspection.* When specified by the procuring activity the preproduction inspection shall be performed.

4.2.1 *Submission.* The contractor shall submit that quantity of material, specified by procuring activity, which has been produced by the production process which the contractor will use in fulfilling the contract, to a Government-approved facility designated by the contracting officer. All materials shall be obtained from the same source of supply as will be used in regular production.

4.2.2 *Inspection to be performed.* The material shall be inspected for all the inspections

specified in 4.3 of this specification. In addition, the following special examinations and test shall be performed:

4.2.2.1 *Pelletizing Quality (Applicable to Grade I and II).* Mix two parts by weight of the sample and 100 parts by weight of tetryl, complying with the requirements of Specification JAN–T–339. Make at least 25 pellets of the mixture by subjecting portions of the mixture to pressure in a pelletizing machine.

Note. The graphite shall be considered satisfactory if the machine works smoothly and easily, if the powder does not stick to any parts of the machine, and if the resulting pellets do not fall apart.

4.2.2.2 *Glazing quality (applicable to Grade III and IV).* The graphite shall be subjected to an actual factory glazing operation and to such additional tests as shall be considered necessary by the contracting officer.

4.2.3 *Lot formation.*

4.2.3.1 A lot shall consist of graphite of one grade only, produced by one manufacturer in accordance with the same specification, or same specification revision, from the same batch or blending operation that has been subjected to the same processing operation or condition. A batch shall be that quantity of graphite that has been subjected to the same unit chemical or physical process intended to make the final product substantially uniform.

4.2.4 *Examination.* Sampling plans and procedures for the following classification of defects shall be in accordance with Standard MIL–STD–105. Continuous sampling plans, in accordance with Handbook ORD–M608–11 may be used if approved by the procuring activity. Also, at the option of the procuring activity, AQL's and sampling plans may be applied to the individual characteristics listed using an AQL of 0.25 percent for each major defect and an AQL of 0.40 percent for each minor defect.

4.2.4.1 *Drums, prior to filling (polyethylene liner).*

Categories	*Defects*	*Method of inspection*
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Liner cut, torn or punctured	Visual
Minor: None defined.		

4.2.4.2 *Container, prior to filling (alternative method).*

Categories	*Defects*	*Method of inspection*
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Laminations or coatings, incomplete	Visual
Minor: None defined.		

4.2.4.3 *Drums, prior to closing (polyethylene liner).*

Categories	*Defects*	*Method of inspection*
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Liner not complete sealed	Visual
Minor: None defined.		

4.2.4.4 *Drums, sealed (steel)*

Categories	*Defects*	*Method of inspection*
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Weight of contents	Scale
102.	Closing ring damaged or not properly positioned (drum not properly closed)	Visual
Minor:	AQL 0.40 percent	
201.	Marking misleading or unidentifiable	Visual

4.2.4.5 *Drums, sealed (fiber) or sacks (paper).*

Categories	Defects	Method of inspection
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Weight of contents	Scale
102.	Closure incomplete or damaged to the extent that contents sift out	Visual
Minor:	AQL 0.40 percent	
201.	Marking misleading or unidentifiable	Visual

4.2.4.6 *Drums, sealed (plywood)*

Categories	Defects	Method of inspection
Critical: None defined.		
Major:	AQL 0.25 percent	
101.	Weight of contents	Scale
102.	Strapping missing or broken	Visual
Minor:	AQL 1.00 percent	
201.	Strapping mislocated	Visual
202.	Markings misleading or unidentifiable	Visual

4.2.5 *Testing.* The lot shall be sampled and specimens selected for testing by the following procedure.

4.2.5.1 *Sampling.* Select 10 percent of the containers in the lot. If there are less than 100 containers in the lot, select 10 containers. If there are less than 10 containers in the lot, all containers shall be selected. Remove a portion of approximately 2 ounces of material from each container. Mix thoroughly each of the primary samples so obtained and remove sufficient material to form a composite sample of approximately 20 ounces. Mix the composite sample thoroughly, place this in an air-tight container, and label so as to show the name of the material, manufacturer, plant, contract or order number, lot number, and number of pounds in the lot. All acceptance tests shall be made on the composite sample prepresentative of the lot. If the composite sample fails to comply with any of the requirements specified, the lot shall be rejected.

4.3 Test methods and procedures. The following test methods and procedures shall be performed.

4.3.1 *Determination of moisture.* Transfer to a tared glass weighing dish a portion of approximately 2 grams (gm.) of the sample and weigh accurately. Dry the dish and contents at 100 degrees Centigrade (° C.) to 105° C. for 1 hour, cool in a desiccator and weigh. Calculate the loss in weight and percent of moisture.

$$\text{Percent moisture} = \frac{100A}{B}$$

where:

A = loss in weight of dish and specimen

B = weight of specimen

4.3.2 *Determination of ash.* Transfer (to a tared, porcelain crucible for Grade I and III, and platinum crucible for Grade II and IV) a portion of approximately one gm. of the sample and weigh accurately. Using a gas flame or muffle furnace, ignite the crucible and contents until all combustible matter has been removed, cool in a desiccator and weigh. Retain the residue for the silica and other grit determinations as specified in 4.3.3 and 4.3.4. Calculate the weight of residue as percent ash as follows:

$$\text{Percent ash} = \frac{100\ (A)}{B}$$

where:

A = weight of residue, gm.

B = weight of specimen, gm.

4.3.3 *Determination of silica (Applicable to Grade II and IV only).* To the ash in the platinum crucible, add five milliliters (ml.) of hydrofluoric acid and a few drops of sulfuric acid. Evaporate and ignite. Cool in a desiccator and weigh. Calculate the loss in

weight as percent silica as follows, and retain the residue for grit determination:

$$\text{Percent silica} = \frac{100\ A}{B}$$

where:

A = weight of residue, gm.

B = weight of specimen, gm.

4.3.4 *Determination of other grit.*

4.3.4.1 *Applicable to Grade I and III only.* Transfer at least three portions of approximately 0.1 gm. each of the sample, to smooth glass slides. Rub the material between glass slides determining the presence of grit by scratching noise and scratches on the glass slide.

4.3.4.2 *Applicable to Grades II and IV only.* Transfer the residue from silica determination to a smooth glass slide. Rub the material between glass slides and determine the presence of grit by scratching noise, and scratches on the glass slide.

4.3.5 *Determination of acidity.* Transfer a portion of approximately 10 gm. of the sample of a 250 ml. beaker, add 100 ml. of neutral distilled water and heat quickly to boiling while stirring. Filter immediately and cool to room temperature. Test the filtrate by adding two drops of phenophthalein and then two drops of methyl red. If colorless to phenophthalein and yellow to methyl red, acidity may be reported as none.

4.3.6 *Determination of free sulfur.* Extract an accurately weighted portion of approximately 25 gm. of sample with 50 ml. of the boiling ethyl ether for approximately 15 minutes. Filter, wash the residue with ether, and evaporate the combined filtrate and washings to dryness. To the ether soluble residue add 10 ml. of concentrated nitric acid, 5 ml. of concentrated hydrochloric acid and again evaporate the mixture to dryness. Moisten the residue with 2 to 4 ml. of concentrated hydrochloric acid and then add 30 to 40 ml. of hot distilled water. Filter, wash the residue with distilled water, keeping the final volume of filtrate and washings within 100 ml. Heat the filtrate to boiling and rapidly add 10 ml. of 5 percent barium chloride solution with vigorous agitation, and allow the barium sulfate precipitate to settle for at least 24 hours. Filter through a tared fine porosity crucible, wash the residue with hot distilled water and test the last few washings of the precipitate with 2 drops of silver nitrate to see that all chloride is removed. Ignite at dull red heat, cool in a desiccator and weigh. Calculate the increase in weight, corrected the barium sulfate obtained in a blank determination on all reagents, to percentage of free sulfur in the specimen as follows:

$$\text{Sulfur percent} = \frac{13.73\ (A-B)}{W}$$

where:

A = weight of precipitate in sample.

B = weight of precipitate in blank.

W = weight of specimen.

4.3.7 *Determination of total sulfur.* Transfer an accurately weighed portion of approximately one gm. of the sample to a beaker. Add 30 ml. of concentrated nitric acid and 0.1 gm. of sulfate-free sodium carbonate. Heat the mixture to boiling and then add 60 ml. of concentrated hydrochloric acid, slowly at first, until violent reaction has subsided. Evaporate the solution to dryness. Moisten the residue with 2 to 4 ml. of concentrated hydrochloric acid, add 30 to 40 ml. of hot distilled water and digest for a few minutes on a steam bath. Filter the mixture and wash the residue with distilled water, keeping the final volume of filtrate washing within 100 ml. Heat the filtrate to boiling and rapidly add 10 ml. of 5 percent barium chloride solution, with vigorous agitation. Allow the precipitate of barium sulfate to settle for at least 24 hours. Filter the mixture through a tared fine porosity crucible, wash the residue with hot distilled water and test the last few washings of the precipitate with 2 drops of silver nitrate to see that all chloride is removed. Ignite at dull red heat, cool in the desiccator and weigh. Calculate the increase in weight, corrected for the barium sulfate obtained in a blank determination of all reagents, to percentage of total sulfur in the specimen as follows:

$$\text{Sulfur percent} = \frac{18.73\ (A-B)}{W}$$

where:

A = weight of precipitate in sample.
B = weight of precipitate in blank.
W = weight of specimen.

4.3.8 *Determination of granulation.* Place an accurately weighted portion of 25 gm. of the sample and two metallic washers on the appropriate U.S. standard sieve, in accordance with Specification RR-S-366, assembled to a bottom pan. Place a cover on the sieve and shake the assembly for 10 minutes by hand or 5 minutes by means of a mechanical shaker geared to produce 300 + 15 gyrations per minute and 150 + 10 taps of the striker per minute. When no more material passes through, weigh the portion retained on the sieve and calculate the percentage of specimen passing through the sieve as follows:

$$\text{Percent through} = W - \frac{(A \pm B)\ 100}{W}$$

where:

A = weight retained on designated sieve.
B = weight retained on sieves nested above designated sieve.
W = weight of specimen.

5. PREPARATION FOR DELIVERY

5.1 Packing.

5.1.1 *Level A.* Unless otherwise specified in the contract or purchase order, graphite shall be packed in a fiber, plywood or metal drum in accordance with Specifications PPP-D-723 (Type III, Grade A), JAN-P-112, and PPP-D-729 (Type III, Full Removable Head Type), respectively. Fiber and plywood drums shall be furnished with a nominal 0.004 inch thick polyethylene liner properly heat sealed or otherwise closed to afford protection to the contents equivalent to that given by a heat seal closure. (Alternatively, an equivalent degree of protection may be furnished by suitable laminations or coatings of the inner surface of the drum).

5.1.2 *Level C.* Graphite shall be packed to afford protection against damage during direct shipment from the supply source to the first receiving activity for immediate use. Containers shall comply with Uniform Freight Classification Rules and Container Specifications for rail shipments for National Motor Freight Rules and Container Specifications for truck shipments, as applicable. (Alternatively, graphite may be packed in a paper shipping sack in accordance with Specification UU-S-48. Closure of drums or sacks shall be in accordance with the applicable specifications.)

5.2 **Marking.** In addition to any special marking required by the contract or purchase order, containers shall be marked in accordance with Standard MIL-STD-129.

6. NOTES

6.1 **Ordering data.** Procurement documents should specify the following:

a. Title, number and date of this specification.
b. Grade of material required.
c. Test for lubricating quality, if required, for Grade I and II only.
d. Test for glazing quality, if required, for Grade III and IV only.
e. Level of packing required.

6.2 **Intended uses.** Graphite is intended for the following uses:

a. Grade I and II as lubricants in pelleting explosives.
b. Grade III and IV as glazing agents.

6.3 **Material.**

a. Grade I and III graphites are manufactured graphites.
b. Grade II and IV graphites are natural graphites.

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 United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied 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.

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1. DOCUMENT NUMBER	2. DOCUMENT TITLE

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5. PROBLEM AREAS

a. Paragraph Number and Wording:

b. Recommended Wording:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
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