

SS-G-659a

March 1, 1967

SUPERSEDING

Fed. Spec. SS-G-659

October 29, 1943

**FEDERAL SPECIFICATION**  
**GRAPHITE, DRY (LUBRICATING)**

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

**1. SCOPE**

1.1 Scope. This specification covers a powdered lubricating graphite supplied in bulk quantities.

**2. APPLICABLE DOCUMENTS**

2.1 Specifications and standards. The following specifications and standards, of the issues in effect on date of invitation for bids, form a part of this specification to the extent specified herein.

Federal Specifications:

RR-S-368 - Sieve, Test.  
PPP-C-96 - Cans, Metal, 28 Gage and Lighter.

Federal Standard:

Fed. Std. No. 124 - Marking for Domestic Shipment (Civilian Agencies).

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402

(Single copies of this specification and other product specifications required by activities outside the Federal Government for bidding purposes are available without charge at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, Mo., Dallas, Denver, San Francisco, Los Angeles, and Seattle, Wash.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Standard:

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

(Copies of Military Specifications and Standards 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 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 shall apply.

American Society for Testing and Materials (ASTM) Publication:

D1553 - Methods for Analysis of Graphite Used as Lubricants.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race St., Philadelphia, Pa., 19103.)

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### 3. REQUIREMENTS

3.1 Material. Graphite shall be a dry powder, free from any indications of caking or lumping, packed in can sizes, as specified (see 6.2).

3.2 Condition. Unless otherwise specified (see 6.2), either natural or manufactured graphite, prepared to conform to the requirements specified herein, may be furnished.

3.3 Ash content. The ash content of the graphite, when determined in accordance with 4.4.1, shall be not more than 2.5 percent.

3.4 Volatile matter. The volatile matter of the graphite, when determined in accordance with 4.4.2, shall not exceed 2.5 percent.

3.5 Graphite-carbon content. The graphite-carbon content of the graphite, when determined in accordance with 4.4.2, shall be not less than 95 percent.

3.6 Particle size. No residue shall be retained on a 100 mesh screen; not less than 88 percent shall pass through a 200 mesh screen; not less than 60 percent shall pass through a 325 mesh screen, when the graphite is tested in accordance with 4.4.3.

3.7 Acidity. The pH value of the water soluble constituents in the graphite shall be not less than 5 nor more than 7, when tested in accordance with 4.4.4.

3.8 Moisture content. The loss in weight of the graphite shall be not more than 0.5 percent when tested in accordance with 4.4.5.

3.9 Workmanship. Graphite shall be free from abrasives or other undesirable impurities as defined in this specification.

### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Sampling. The acceptance sample shall consist of a sample for tests (4.2.2) and a sample for examination of end item (4.2.3). Samples shall be labeled completely with information identifying the purpose of the sample, name of product, lot number, date of sampling, and contract number.

4.2.1 Lot. All graphite manufactured as one batch shall be considered a lot and shall be numbered as such for purposes of inspection.

4.2.2 Sampling for tests. The sample for tests shall consist of two one pound samples of graphite taken at random from each lot of graphite. The lots are unacceptable if a sample fails to meet any of the test requirements.

4.2.3 Sampling for examination of end item. A random sample of filled containers and a sample of shipping containers fully prepared for delivery shall be selected from each lot of lubricant in accordance with MIL-STD-105 at inspection level I.

#### 4.3 Examination.

4.3.1 End item. Graphite shall be examined for dampness and any indication of caking or lumping. The acceptable quality level (AQL) shall be 2.5 percent defective, in accordance with MIL-STD-105.

4.3.2 Inspection of preparation for delivery. An inspection shall be made to determine that the packaging, packing, and marking comply with the requirements in section 5. Defects shall be scored in accordance with table I. For examination of interior packaging, the sample unit shall be one shipping container fully prepared for delivery, selected at random just prior to the closing operations. Sampling shall be in accordance with MIL-STD-105. Defects of closure listed shall be examined on shipping containers fully prepared for delivery. The lot size shall be the number of shipping containers in the end item inspection lot. The inspection level shall be S-2 with an AQL of 4.0 defects per hundred units.

Table I. Classification of preparation for delivery defects

Examine	Defects
Markings (exterior and interior)	Omitted; incorrect; illegible; improper size, location, sequence, or method of application.
Materials	Any component missing or damaged.
Workmanship	Inadequate application of components such as incomplete closure of container flaps, loose strapping, inadequate stapling. Distortion of container.
Contents (exterior and interior container)	Number per container if more or less than required. Net weight exceeds requirements.

## 4.4 Test methods.

4.4.1 Ash content. Weight 1 gram (g.) of the graphite in a porcelain or platinum crucible. Heat in a muffle furnace, gradually raising the temperature to 1800°F. (982°C.) until all combustible matter has been burned off. Cool in a desiccator, weigh, and again ignite at the same temperature as a check for constant weight. Calculate the percentage of ash from the weight of the residue (see 3.3).

4.4.2 Volatile matter and graphite-carbon content. Weight 2 g of the graphite in a 100 ml. pyrex beaker, covered with a nickel sheet. Place the beaker containing the sample in a furnace at a temperature of  $825^{\circ} \pm 20^{\circ}\text{F}$ . ( $441^{\circ} \pm 11^{\circ}\text{C}$ .), and allow to remain at this temperature for 16 hours. The 16 hours need not necessarily be consecutive. Cool in a desiccator and weigh. Calculate the percentage of volatile matter from the loss in weight. The graphite-carbon content is obtained by adding the percentages of ash and volatile matter and subtracting from 100. (see 3.4 and 3.5).

4.4.3 Particle size (see 3.6).

4.4.3.1 Sieves. The following standard testing sieves with woven wire cloth having frames 8 inches in diameter and complying with RR-S-366 shall be used (see table II).

Table II. Standard testing sieves

U. S. Series No.	Inch	Sieve opening micron
100	0.0059	149
200	.0029	74
325	.0017	44

4.4.3.2 Apparatus. A mechanical shaker, capable of vibrating the sieves 900 to 1000 times a minute and giving them 2 impacts each motor revolution, shall be used. For ease of operation and reproducibility of results, an automatic electric time switch shall be connected to the shaker.

4.4.3.3 Method. The three sieves shall be assembled in the proper order along with a bottom pan and a cover for the top sieve. A 50 g. sample shall be approximated and transferred to the top sieve. Adhesive tape shall be run around the outside connecting edges of the sieves and the bottom pan, and the assembly placed on the mechanical sieve shaker to be shaken for 45 minutes. The residue on each sieve and in the bottom pan shall be removed and weighed; the amounts that passed through each sieve shall be calculated. The sum of all individually retained weights shall be used as the total weight of the original sample.

4.4.4 Acidity. Place 10 g. of the graphite in a Soxhlet extractor. Add 100 ml. of distilled water to the flask and carry out the extraction for 2 hours. Dilute the extract with recently boiled distilled water to a volume of 250 ml. and determine pH value with a glass electrode (see 3.7).

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4.4.5 Moisture. Moisture shall be determined in accordance with ASTM D 1553 (see 3.8).

### 5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A, B, or C, as specified (see 6.2).

5.1.1 Level A. Graphite in quantities, as specified (see 6.2), shall be packaged in cans conforming to PPP-C-96, type V.

5.1.2 Level B (civil agencies). Bulk graphite shall be packaged in cans conforming to PPP-C-96, type V, class 1, 2, or 4.

5.1.3 Level C. Graphite shall be packaged in accordance with industry practice.

5.2 Packing. Packing shall be level A, B, or C, as specified (see 6.2).

5.2.1 Level A, B, or C (cans). The graphite, packaged as specified in 5.1.1 and 5.1.2.1, shall be packed in accordance with the appendix to PPP-C-96.

5.3 Standard pack, civil agencies. The standard pack for civil agency procurement shall be as specified in paragraphs 5.1.2 and 5.2.1.

5.4 Marking.

5.4.1 Civil agencies. In addition to markings required by the contract or order, the interior packages and shipping containers shall be marked in accordance with Fed. Std. No. 123.

5.4.2 Military agencies. Marking of interior packages and shipping containers shall be in accordance with the appendix to PPP-C-96.

### 6. NOTES

6.1 Intended use. Graphite covered by this specification is intended for use as a dry lubricant or to be compounded with oils and greases.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- (a) Title, number, and date of this specification.
- (b) Container sizes desired (see 3.1).
- (c) If natural or manufactured graphite is preferred (see 3.2).
- (d) Selection of applicable levels of packaging and packing desired (see 5.1 and 5.2).
- (e) Quantity of graphite desired in pounds (see 5.1.1).

6.3 The sieves specified are a standard type, procurable by U. S. Sieves numbers from laboratory supply houses. The shaker specified is a Cenco Meinzer (Catalog No. 18480), manufactured by the Central Scientific Company, Chicago, Ill.

### MILITARY CUSTODIANS:

Army - CE  
Navy - WEP  
Air Force - MOAMA

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See section 2 of this specification to obtain extra copies and other documents referenced herein.