

[METRIC]
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SUPERSEDING
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COMMERCIAL ITEM DESCRIPTION

CARBON BLACK, POWDERED, DRY

The General Services Administration has authorized the use of this commercial item description, for all federal agencies.

1. SCOPE. This CID covers several grades of carbon black used in the manufacture of explosives, propellants, stabilization of Cyclotol explosives, liners, and propellant for base bleed projectiles. The carbon black covered by this CID contains a higher percentage of carbon than is normally available as a commercial off-the-shelf product.

2. CLASSIFICATION. The carbon black procured under this CID shall be classified by grades based on the intended use of the product. The grade and quantity of carbon black shall be specified in the contract or order (see 7.2). The following grades are available:

Grade A - Rocket propellants.

Grade B - Stabilization of Cyclotol explosives.

Grade C - Small arms ammunition propellants.

Grade D - For use in ABL 917, 1362, 1481, and 2434 casting powders.

Grade E - Liner material for torpedo warheads; MK 103 and MK 107.

Grade F - Propellants for 2.2 KS, Tartar, Standard Arm, Polaris, and PBX (AF) - 108 liner material.

Grade G - For use in M864 propellant composition.

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 TACOM-ARDEC, Attn.: AMSTA-AR-QAW-E, Bldg 12, Picatinny Arsenal, NJ 07806-5000 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 6810

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A-A-59317

3. SALIENT CHARACTERISTICS

3.1 Properties. The properties of carbon black shall conform to the requirements and test methods specified in Table I. For Grade A carbon black, the contract or order (see 7.2) shall specify whether the diphenyl guanidine requirement shall replace the oil absorption requirement.

3.1.1 Settling. (Applicable to Grade B and C only). The difference in the percentage of RDX content of the slurry prepared with carbon black and Type I, Class 2 Cyclotol in accordance with MIL-E-82668 shall not be greater than two percent from top to bottom of the test sample.

3.1.2 Yield. (Applicable to Grade B and C only). The yield value (dynes/cm²) shall be derived from a mixture of 1800g of Type I, Class 2 Cyclotol with carbon black at a mix temperature of 95 ± 1°C.

3.1.3 Reactivity with explosives. (Applicable to Grade B and C only). The carbon black reaction with the explosive or propellant shall produce no more than 2.0 cm³/g of gas.

3.2 Workmanship. The carbon black shall be free of foreign matter such as wood, paper, metal, and dirt.

4. REGULATORY REQUIREMENTS. The offeror/contractor is encouraged to use recovered materials to the maximum extent practicable, in accordance with paragraph 23.403 of the Federal Acquisition Regulation (FAR).

4.1 Test methods and procedures. The carbon black shall be tested in accordance with the methods and procedures specified herein (see 7.6). Inspection shall be performed using prescribed analytical procedures for replicate determinations given in standard analytical textbooks.

PRECAUTIONS - This specification addresses chemically toxic or explosive materials which are potentially hazardous to personnel. Accordingly, it is emphasized that all applicable safety rules, regulations and procedures must be followed in handling and processing these materials.

4.1.1 Yield value.

4.1.1.1 Preparation of slurry. Prepared a batch of Type I, Class 2 Cyclotol (see 3.1.1) with carbon black, in a gallon wide mouth, steam heated kettle. The kettle shall be equipped with an impeller type agitator driven by an air motor. Place aluminum foil around the top of the kettle to prevent drafts from cooling the surface of the explosive.

4.1.1.2 Mix procedure. The temperature of the mix shall be 95 + 1°C. All the components shall be accurately weighed to 0.1g. First, add 1800g of Cyclotol to the kettle and melt. Then add the remaining components to the kettle in the following order: 16.7g Composition D-2 in accordance with MIL-C-18164. Next, add 1.8g of lecithin in accordance with MIL-L-3061, (except the requirement for 93 + 10 penetration shall not apply) and 54g of carbon black. After the addition of carbon black, mix the batch for exactly 15 minutes at 800 RPM.

4.1.1.3 Viscosity measurements. Viscosity measurements, of the mix, are then made at $95 \pm 0.5^\circ\text{C}$ with a Brookfield Viscometer, Model RVT or equivalent, using a preheated (95°C) spindle #1. The measurements are made at increasing RPM's of 0.5, 1.0, 2.5, 5.0, 10.0, 20.0, 50.0, and 100.0 respectively. Then, the measurements shall be retraced. The last two measurements at 1.0 and 0.5 RPM, at a decreasing rate of shear, are used to calculate the yield value. Use the following equation to calculate the yield value (see 7.4):

$$Y = \frac{2 r_1 (V_1^1 - V_2^1)}{100}$$

where:

y = Yield value (dynes/cm²)
 r_1 = 0.5 RPM
 $(r_2$ = 1.0 RPM)
 V_1^1 = apparent viscosity at r_1 (centipoise)
 V_2^1 = apparent viscosity at r_2 (centipoise)
 2 = proportionality factor between r_1 and r_2

Retain the Cyclotol mix for the settling test (see 4.1.2).

4.1.2 Settling test. Immediately after the completion of the yield value test, pour the Cyclotol mix into two preheated (95°C) aluminum molds. The molds, equipped with aluminum foil risers, shall be four inches in height and have a one inch inside diameter. Pour the explosive into the riser to a depth of one inch. Place the molds, containing the explosive, into an explosion-proof oven at $95 \pm 1^\circ\text{C}$ for five hours. Remove the molds and contents from the oven and allow the samples to solidify at ambient laboratory temperature. Saw off the riser section. Analyze the top one inch (under the riser) and the bottom one inch of each stick, for RDX as follows.

4.1.2.1 Procedure for determining TNT, content. Reduce the sample, using a wooden mortar and pestle, through a No. 20 mesh sieve (U.S. Standard). Accurately weigh an approximately 2g sample to the nearest 0.1 mg into a tared, sintered glass, medium porosity, filtering crucible fitted with a filter paper disc. Cut the filter paper disc from Fisher 9-795 (see 7.7) or equivalent semi-crimped, rapid filter paper. The filter paper shall be of the same diameter and make a tight seal with the bottom of the crucible. Quantitatively transfer the sample to a 150 mL beaker (see 7.5). Add 20 mL of reagent grade benzene saturated with RDX. (The benzene should become saturated with RDX at room temperature within a minimum of 12 hours and filtered just prior to use). Heat the beaker on an oscillating hot plate for 30 minutes at a temperature of 70° to 75°C . Disintegrate the sample by oscillating or if necessary by use of a stirring rod. Upon removal from the hot plate, wash down the sides of the beaker with approximately 10 mL RDX saturated benzene. Cool the sample to room temperature. Quantitatively transfer the sample to the original tared filtering crucible. Transfer the sample, with the aid of a wash bottle containing benzene saturated with RDX. Filter the sample. Rinse the beaker three additional times with 15 mL portions of benzene - RDX solution from the wash bottle. The rinsings shall be added to the crucible. The contact time with the crucible residue shall be five to ten seconds. Do not disturb the filter paper when stirring the crucible and contents during washings. Wash down the sides of the crucible with a fourth rinsing. Aspirate for 30 seconds after the last washing. Dry the crucible and its contents in an oven, at $95 \pm 5^\circ\text{C}$, for 30 minutes. Cool in a desiccator for 30 minutes, weigh and calculate the percent TNT, including wax and lecithin present, according to the following formula.

A-A-59317

$$\text{Percent TNT} = \frac{(A-B) \times 100}{C}$$

where:

- A = weight of crucible plus sample, in grams
- B = weight of crucible plus first residue, in grams
- C = weight of sample, in grams

Retain the residue for determination of carbon black (4.1.2.2).

4.1.2.2 Procedure for determining carbon black. Extract the residue remaining on the filtering crucible with hot acetone at 50° to 55°C using the filtrator connector to a water aspirator. Run approximately 20 mL of hot acetone through the crucible without stirring until the crucible is warm. Wash the residue on the filter with five washings of hot acetone using approximately 20 mL per washing. The contact time of the washings to the residue in the crucible shall be five to ten seconds. Stir gently, during the washings, so as not to disturb the filter paper. Dry the crucible and its residue in an oven, at 95 ± 5°C, for 30 minutes. Cool in a desiccator for 30 minutes, weigh and calculate the percent carbon black according to the following formula:

$$\text{Percent carbon black} = \frac{(D-E) 100}{C}$$

where:

- D = weight of crucible plus second residue, in grams
- C = weight of sample, in grams
- E = weight of crucible, in grams

4.1.2.3 RDX determination. Calculate the percent RDX including nitrocellulose, as follows:

$$\text{Percent RDX} = 100 - (\text{percent TNT} + \text{percent carbon black})$$

4.1.3 Reactivity. Reactivity shall be determined in accordance with MIL-STD-650, Method 504.1.1, at a temperature of 100 ± -0.5°C, except as follows:

- a. The first sample shall contain one gram of Cyclotol explosive, Type I, Class 2 as specified in MIL-E-82668.
- b. The second sample shall contain one gram of carbon black.
- c. The third sample shall contain an intimate mixture of one gram of Cyclotol and one gram of carbon black.

$$\text{Gas due to reactivity, cm}^3/\text{g} = \frac{C - (A+B)}{2}$$

where:

- C = amount of gas evolved by the 50/50 mixture of Cyclotol and carbon black.
- A = amount of gas evolved by the Cyclotol sample.
- B = amount of gas evolved by the carbon black sample.

5. QUALITY ASSURANCE PROVISIONS.

5.1 Product Conformance. The products provided shall meet the salient characteristics of this commercial item description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial market. The government reserves the right to require proof of such conformance.

6. PACKAGING. Preservation, packing, and marking shall be as specified in the contract or order.

7. NOTES.

7.1 Source of documents.

7.1.1 The Code of Federal Regulations (CFR) is available by mail order from the Superintendent of Documents, ATTN: New Order, PO Box 371954, Pittsburgh, PA 15250-7954.

7.1.2 ASTM standards are available from the American Society for Testing of Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

7.1.3 Military specifications and standards are available from the Standardization Documents Order Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

7.2 Ordering data. Procurement documents should specify the following:

- a. Title, number, and date of this CID.
- b. Issue of Department of Defense Index of Standards and Specifications (DODISS) to be cited in the solicitation, and if required, the specific issue of individual documents referenced.
- c. Grade and quantity of product (2.1).
- d. Whether diphenyl guanidine requirement is applicable vs. Oil absorption (3.1).
- e. Packaging and marking requirements (see 6).
- f. Applicability of alternative test methods (see 7.6).

7.3 Material Safety Data Sheets. Products meeting the requirements of this CID may be subject to the requirements of 29 CFR 1910.1200 and FED-STD-313 for Material Safety Data Sheets (MSDS).

A-A-59317

TABLE I. Chemical and physical properties and tests

Properties	Test Method	Grade A		Grade B		Grade C		Grade D		Grade E		Grade F		Grade G	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Fixed carbon (%)	ASTM D-1506 / ASTM D1509	96.8	-	93	-	93	-	93	N/A	94	-	N/A	N/A	N/A	N/A
Moisture (%)	ASTM D1509 / ASTM E-203	-	3.0	N/A	N/A	N/A	N/A	N/A	6.0	N/A	N/A	N/A	N/A	-	1.0
Sulfur (%)	ASTM D-1619	-	0.5	N/A	N/A	N/A	N/A	N/A	0.5	N/A	N/A	N/A	N/A	N/A	N/A
Acetone extract (%)	ASTM D-305	-	0.5	-	0.5	-	0.5	-	0.5	N/A	N/A	N/A	N/A	N/A	N/A
Ash (%)	ASTM D-1506	-	0.4	N/A	N/A	N/A	N/A	N/A	0.1	-	2.0	-	.75	-	.75
Water soluble material (%)	ASTM D-305	-	0.2	-	0.02	-	0.4	-	0.02	-	N/A	-	N/A	-	N/A
Coarse particles	ASTM E-11-95	-	0.2	-	0.2	-	0.2	-	0.1	-	N/A	-	N/A	-	N/A
Grit (%)	ASTM E-11-95	-	0.1	-	0.1	-	0.1	-	None	-	N/A	-	N/A	-	N/A
Volatile material (%)	ASTM E-11-95	N/A	N/A	-	7.0	-	7.0	-	N/A	-	6.0	-	6.0	-	N/A
Organic dyes	ASTM D-305	None	None	None	None	None	None	None	None	None	N/A	None	N/A	None	N/A
Oil absorption g oil absp 100g sample	ASTM D-1483	35	45	70	120	60	100	60	100	60	N/A	60	N/A	60	N/A
Diphenyl guanidine absorption (%)	ASTM D-5054	-	15	N/A	N/A	N/A	N/A	N/A	98	-	5.4	-	N/A	-	N/A
Bulk density (g/cm ³)	ASTM D-1513	0.14	0.30	0.14	0.22	0.45	0.55	0.45	0.55	0.45	N/A	0.45	N/A	0.45	N/A
Reactivity (cm ³ /g)	MIL-STD-650 Meth. 504.1.1	N/A	N/A	-	2.0	-	2.0	-	N/A	-	N/A	-	N/A	-	N/A
Iodine absorption $\frac{\text{mgI}_2}{\text{g sample}}$	ASTM D-1510	N/A	N/A	25	35	25	35	25	35	25	N/A	25	N/A	25	N/A
Dibutyl Phthalate absorption No.	ASTM D-2414	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	60	70	N/A	N/A	N/A	N/A
Acidity (pH)	ASTM 1512	N/A	N/A	N/A	N/A	N/A	N/A	N/A	5.0	4.0	7.0	7.0	9.5	5.5	8.5
Yield $\frac{\text{dyne}}{\text{cm}^2}$	Para 4.1.1	N/A	N/A	8	25	8	25	8	25	8	N/A	8	N/A	8	N/A
Settling	Para 4.2.2	N/A	N/A	see 3.1.1	see 3.1.1	see 3.1.1	see 3.1.1	see 3.1.1	see 3.1.1	see 3.1.1	N/A	see 3.1.1	N/A	see 3.1.1	N/A
Surface area $\frac{\text{m}^2}{\text{g}}$	ASTM D-3037	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	87	126.0	N/A	N/A	87	N/A

7.4 Conversion data. In order to calculate the Yield Value using units of the International Metric System, the following conversions are given:

$$\begin{aligned} 1 \text{ dyne} &= 1 \times 10^{-5} \text{ newtons (N)} \\ 1 \text{ centipoise} &= 1 \times 10^{-3} \text{ Pascal seconds (Pa.s)} \end{aligned}$$

7.5 Use of benzene. Benzene is considered carcinogenic. Therefore, adequate ventilation must be provided when working with this solvent. A fume hood should be employed.

7.6 Equivalent test methods. The contractor may propose to the Government alternate (equivalent) test methods for any test in section 4 and table I. This test shall have, as a minimum, the same accuracy and precision as the present test method.

7.7 Fisher products. Information regarding Fisher products may be obtained from Fisher Scientific, 600 Business Center Drive, Pittsburgh, PA 15205-9913.

7.8 Key Words.

Benzene
Chemicals
Lamp Black

MILITARY INTERESTS:

Custodians
Army-AR

Review Activities
Army-EA, MI
DLA-GS

CIVIL AGENCY COORDINATING ACTIVITY:
GSA-FSS

Preparing Activity:
Army-AR

Project 6810-1598

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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I RECOMMEND A CHANGE:

1. DOCUMENT NUMBER
A-A-59317

2. DOCUMENT DATE (YYMMDD)
980828

3. DOCUMENT TITLE **CARBON BLACK, POWERED, DRY**

4. NATURE OF CHANGE *(Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)*

5. REASON FOR RECOMMENDATION

6. SUBMITTER

a. NAME *(Last, First, Middle Initial)*

b. ORGANIZATION

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d. TELEPHONE *(Include Area Code)*
(1) Commercial
(2) AUTOVON
(if applicable)

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8. PREPARING ACTIVITY

NAME COMMANDER

US ARMY TACOM-ARDEC Mr. Gary Vander Sande

b. TELEPHONE *Include Area Code)*

(1) Commercial 973 724-2163
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ATTN: AMSTA-AR-QAW-E BLDG 12
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