MIL-C-25107B(USAF)
16 March 1972

SUPERSEDING
MIL-C-25107A(USAF)
24 July 1961

MILITARY SPECIFICATION

CARBON REMOVING COMPOUND, ORTHODICHLOROBENZENE, FOR ENGINE PARTS

1. SCOPE

1.1 This specification covers one type and grade of carbon remover for use in conveyorized and engine overhaul cleaning systems at Air Force depots.

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

Federal

QQ-A-250/4	Aluminum Alloy 2024, Plate and Sheet
QQ-C-576	Copper Flat Products With Slit, Slit and Edge-rolled, Sawed or Machined Edges, (Plate, Bar, Sheet, and Strip)
QQ-L-201	Lead Sheet
QQ-M-44	Magnesuim Alloy Plate and Sheet (AZ31B)
TT-T-548	Toluene, Technical
PPP-D-729	Drums, Metal, 55-Gallon (For Shipment of Noncorrosive Material)

Military

MIL-S-7952	Steel, Sheet and Strip, Uncoated, Carbon (1020 and 1025) (Aircraft Quality)

STANDARDS

Federal

Fed. Test Method Std. No. 141	Paint, Varnish, Lacquer, and Related Materials; Methods of Inspection, Sampling, and Testing

FSC 6850

Fed. Test Method Std. No. 791	Lubricants, Liquid Fuels, and Related Products; Methods of Testing

Military

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

(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 or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) STANDARDS,

D 86	Distillation of Petroleum Products, Test for
D 92	Flash and Fire Points by Cleveland Open Cup, Test for
D 95	Water in Petroleum and Other Bituminous Materials, Test for
D 96	Water and Sediment in Crude Oils, Tests for
D 270	Petroleum and Petroleum Products, Sampling
D 453	Tar Acids in Creosote-Coal Tar Solutions, Test for

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

CONSOLIDATED CLASSIFICATION COMMITTEE

Uniform Freight Classification Rules

(Application for copies should be addressed to the Consolidated Classification Committee, 202 Chicago Union Station, Chicago, Illinois 60606.)

(Technical Society and Technical Association specification and standards are generally available for reference from libraries. They are distributed among technical groups and using Federal Agencies.)

3. REQUIREMENTS

3.1 Materials. The ingredient materials used in the manufacture of the carbon removing compound shall be of high quality and shall conform to the requirements specified herein.

3.1.1 Certification. The manufacturer shall certify that the ingredient materials have been included in the proportions specified in 3.2.

3.2 Chemical composition. The chemical composition of the carbon removing compound shall conform to the limits of table I.

Table I, Chemical composition.

Ingredient Material	Percent by volume	Percent by weight
Orthodichlorobenzene (min)		53
Cresylic acid (100% acid basis)(min)		23
Potassium oleate (anhydrous basis)(max)		12
Potassium oleate (anhydrous basis)(min)		10
Water (max)	5	
Inhibitors and other materials (max)	5	

3.3 Ingredient and compound properties.

3.3.1 Ingredient properties.

3.3.1.1 The orthodichlorobenzene ingredient shall have the properties shown in table II.

Table II. Properties of orthodichlorobenzene.

Property	Requirement
Distillation range (5% to 95% point)	175° to 184°C (347° to 363.2°F)
Specific gravity (25°/25°C) (min)	1.29
Free acid (HCL) (max)	0.01% by wt.
Flash point (closed cup) (min)	68°C (154.4°F)

3.3.1.2 Cresylic acid. The cresylic acid ingredient shall be an isomeric mixture of cresols.

3.3.1.2.1 Appearance. The material shall be free of suspended matter when examined by transmitted light.

3.3.1.2.2 Color. The cresylic acid shall be colorless to brown-yellow or pink.

3.3.1.2.3 Odor. The cresylic acid shall have the characteristic spicy phenolic odor. The product shall contain no mercaptans or other odoriferous compounds in such quantity as to produce obnoxious odors under service conditions.

3.3.1.2.4 Distillation range. The distillation range of the cresol ingredients shall be as follows:

Initial point - 180°C (350°F) (min)
50% point - 200°C to 220°C (392°F to 428°F)
90% point - 230°C (446°F) (max)

3.3.1.2.5 Assay. The tar acids shall be 95 percent minimum (percent by weight).

3.3.1.3 Oleic acid. The oleic acid (distilled red oil) ingredient shall have the properties shown in table III.

Table III. Properties of oleic acid (distilled red oil)

Property	Requirement
Acid number (min)	182
Saponification number	197 - 203
Iodine number	80 - 93
Titer	6° to 10°C (43° to 50°F)
Rosin or rosin soap	NONE

3.3.1.4 The potassium hydroxide shall be in accordance with table IV.

Table IV. Potassium hydroxide.

Property	Requirement
Actual KOH (min)	83%
KCl as Cl (max)	0.04%
Iron as Fe (max)	0.01%

3.3.1.5 Inhibitors. The compositions of the inhibitors and coupling agents are not restricted, except that they shall be suitable for the purpose intended and shall not have a boiling point at atomspheric pressure of less than 150°C (300°F).

3.3.2 Compound properties.

3.3.2.1 Gravity. The specific gravity of the compound shall be reported at 25°C. There is no specification requirement for specific gravity except that production samples shall not vary more than ±0.03 between successive batches.

3.3.2.2 Corrosion. The change in weight per specimen shall not exceed the following values:

	Milligrams
Steel	+1.0 to -1.0
Aluminum alloy	+5.0 to -1.0
Copper	+1.0 to -1.0
Lead	+20.0 to -20.0
Magnesium alloy	+5.0 to -5.0

3.3.2.3 Undissolved matter. Undissolved matter shall not exceed 0.1 percent by volume.

3.3.2.4 Flash point. The flash point of the compound shall not be lower than 71.1°C (160°F).

3.3.2.5 Seal. The compound shall form a distinct emulsion when 150 milliliters of the compound is shaken with 50 milliliters of water. Not less than 20 milliliters nor more than 50 milliliters of a top layer (aqueous OR emulsion) shall separate after standing for 1 hour. The pH of the top layer shall be greater than 9.8.

3.4 Workmanship. The ingredient materials shall be carefully formulated to produce a compound which is stable. The product shall be free from abrasive materials, rosin, soap containing rosins or inert fillers. The product shall be homogeneous and contain no undissolved matter which cannot be readily dispersed on mild agitation.

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 in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 supplies and services conform to prescribed requirements.

*4.1.1 Inspection records. Inspection records of the examinations (4.5) and tests (4.6) shall be kept complete and available to the Government as specified in the contract or order.

4.2 General inspection provisions. Except where otherwise indicated, the provisions of this section are applicable to the cleaning compound. The quality assurance of ingredient materials covered by applicable specifications shall be in accordance with such specifications. Sampling and inspection of ingredient materials not covered by separate specification shall be as specified herein.

4.3 Samplings.

* 4.3.1 Ingredient materials. Sampling of carbon removing ingredient materials shall be sampled in accordance with ASTM-D270-65. The samples shall be subjected to the tests for properties of ingredient materials as specified in 4.6.1. Sampling and testing of the ingredient materials shall be conducted prior to compounding.

4.3.2 Product. Sampling of the compounded carbon remover product shall be sampled in accordance with Federal Test Method Standard No. 141, method 1021. The samples shall be subjected to the examination of product and all tests described under 4.6 with the exception of tests for properties of ingredient materials (4.6.1).

4.3.3 Sampling for inspection of filled containers. A random filled sample of filled containers shall be selected from each lot in accordance with the provisions of MIL-STD-105 at inspection level I and an AQL of 2.5 percent defective. The sample containers shall be subjected to the examination of filled containers as specified in 4.5.2.

4.4 Report of tests. The manufacturer shall submit test reports in accordance with the provisions of Federal Test Method Standard No. 141, method 1031, showing the results of all tests. The report shall be accompanied by the certification of ingredients as required in 3.1.1.

4.5 Examinations.

4.5.1 Product. Examination of product samples selected in accordance with 4.3.2 shall be visually examined for compliance with 3.4.

4.5.2 Examination of filled containers. Each sample selected in accordance with 4.3.3 shall be visually examined for defects of construction of the container and the closure, for evidence of leakage, for unsatisfactory markings, and all other preparation for delivery requirements of section 5. Each sample filled container in the sample having one or more defects, or under the required fill, shall be rejected and if the number of defective containers in any sample exceeds the acceptance number for the specified sampling plan of MIL-STD-105, the lot represented by the sample shall be rejected. Rejected lots may be resubmitted for acceptance, provided the contractor has removed or reworked all nonconforming products.

4.6 Test methods.

4.6.1 Properties of ingredient materials. Testing for property

requirements applicable to the ingredients specified herein may be conducted in accordance with any standard laboratory method acceptable to the procuring activity.

4.6.2 Tar acid. The tar acid test shall be determined in accordance with ASTM D453.

4.6.3 Product. Testing of the compounded carbon remover shall be tested in accordance with the specified methods of Federal Test Method Standard No. 791 and other methods as described in 4.6.3.1 through 4.6.3.8.

* 4.6.3.1 Determination of orthodichlorobenzene and cresylic acid content. Distillation apparatus shall be in accordance with ASTM D86, except that a glass condenser shall be used. Determine the weight of a 100-cubic centimeter sample either by direct weighing or by calculation from the specific gravity. Place the sample in the distillation flask and distill at the rate of about two drops per second receiving the distillate in a Barrett Type 1 Tar Acid Separatory Funnel (ASTM D453). Continue distilling at the same rate until smoke from the residue can be seen in the neck of the distillation flask. The distillate will contain orthodichlorobenzene, water, and cresylic acid. Read the volume of the distillate to the nearest tenth of a milliliter. Extract the cresylic acid with 10 percent sodium hydroxide solution. Four extractions using 50 milliliters each of the 10 percent caustic should be sufficient to remove the cresylic acid as the sodium salt. Read the volume of orthodichlorobenzene remaining after cresylic extraction. The difference between this volume and the volume of the original distillate will be the volume of the cresylic acid and water. Substract the water content (calculated from the percentage of water determined in 4.6.3.3 to find the volume of cresylic acid). Separate the two layers and determine the specific gravity of the orthodichlorobenzene. From the specific gravity, volume, and weight of sample calculate the percentage of orthodichlorobenzene.

$$\frac{\text{Specific Gravity X Volume}}{\text{Weight of Sample}} \times 100 = \%\ \text{Orthodichlorobenzene}$$

Neutralize to methyl orange the caustic solution of cresylic acid with 1:1 sulphuric acid. Place in a separatory funnel, shake and allow to separate. Discard lower layer. Dry the separated cresylic acid with anhydrous copper sulfate and determine the specific gravity. Calculate the percentage of cresylic acid in the sample.

4.6.3.2 Determination of soap ingredient.

4.6.3.2.1 Free alkali. Dissolve 5.0 milliliters of sample in 50 to 100 milliliters of isopropyl alcohol which has been previously neutralized to phenolphthalein with 0.1N potassium hydroxide. Heat to boiling and titrate to phenolphthalein end point with 0.1N hydrochloric acid. Calculate the free alkali as follows:

$$\frac{\text{ml X 0.1 X 0.056}}{\text{Density X 5}} \text{ X 100 = \% Free Potassium Hydroxide}$$

4.6.3.2.2 Total alkali. Place 5.0-milliliter sample in a 400-milliliter beaker, add 150 milliliters of distilled water, bring to a boil and titrate to bromophenol blue end point with 0.1N hydrochloric acid. Calculate the total alkali.

$$\frac{\text{ml X 0.1 X 0.056}}{\text{Density X 5}} \text{ X 100 = \% Total Alkali as Potassium Hydroxide}$$

4.6.3.2.3 Combined alkali.

Total Alkali - Free Alkali = Alkali Combined as Potassium Oleate

4.6.3.2.4 Total soap.

$$\frac{\text{\% Combined Alkali}}{0.175} = \text{\% Potassium Oleate}$$

4.6.3.3 Water Content. The apparatus shall be as described in ASTM D95. The sample shall be thoroughly mixed and 100 milliliters of the solution shall be added to 100 milliliters of toluene in accordance with TT-T-548, in a 500-milliliter flask. Reflux gently until the water, bottom layer (in the trap), shows no further increase. Allow to cool and read the meniscus of the water layer. The volume of the water layer in milliliters shall be reported as percentage water.

4.6.3.4 Specific gravity. Specific gravity may be determined by any method accurate to within ±0.01 unit.

* 4.6.3.5 Corrosion test. Cut one inch square test plates of:
(a) steel in accordance with MIL-S-7952;
(b) copper in accordance with QQ-C-576;
(c) lead in accordance with QQ-L-201;
(d) aluminum alloy in accordance with QQ-A-250/4; and
(e) magnesium alloy in accordance with QQ-M-44.

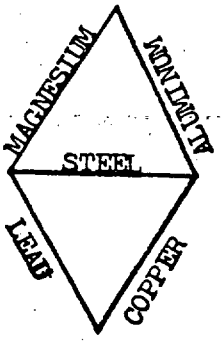
Drill two holes in each plate so that they may be fastened together as shown in figure 1. Clean both surfaces of each plate with wet pumice, rinse with alcohol, dry and weigh. Fasten the set together by means of thread or string as shown in figure 1. Care should be taken to insure good contact between the plates where they join except that there shall be no contact between the magnesium and lead plates or between the aluminum and copper plates. Place the set on an open end in a 250-milliliter low form beaker. Mix in a separate container, 150 milliliters of the compound to which has been added 50 milliliters of boiled distilled water. Pour mixture into test beaker and cover. Maintain at 65 ± 3°C (149 ± 5°F) for 24 hours. At the end of this test period, rinse with alcohol and remove the corrosive products by rubbing with cloth dampened with alcohol. Dry and weigh to determine weight change per specimen.

4.6.3.6 Undissolved matter. One hundred milliliters of a well mixed sample of the compound shall be placed in a graduated centifuge tube and centrifuged in accordance with ASTM D96.

4.6.3.7 Flash point. The flash point shall be determined by the method described in ASTM D92.

4.6.3.8 Seal. Place 150 milliliters of the compound in a 250-milliliter glass stoppered graduated cylinder. Adjust temperature to 25 ± 1°C (77 ± 2°F). Add 50 milliliters of boiled distilled water of the same temperature and shake vigorously for 30 seconds. Let stand for 1 hour and examine for creamy emulsion or water layer separating on top. Heat for 1 hour at 65 ± 3°C (149 ± 5°F). Remove water or emulsion seal and cool to 25°C (77° F) and determine the pH with suitable glass electrode.

4.7 Retest. Failure of any sample to meet the specified tests shall be cause for rejection of the lot represented.



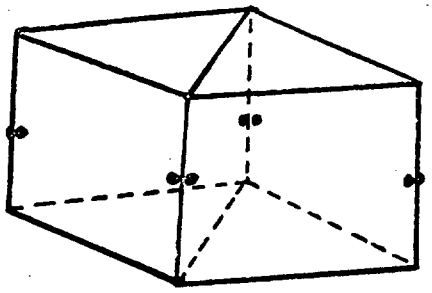


Figure 1 - Assembly Relationship of Corrosion Specimens.

5. PREPARATION FOR DELIVERY

5.1 Packaging. (see 6.2)

5.1.1 Level A. Unless otherwise specified, the carbon removing compound shall be packaged in 55-gallon drums conforming to PPP-D-729.

5.1.2 Level C. Unless otherwise specified, packaging shall be in accordance with the manufacturer's commerical practice.

5.2 Packing. (see 6.2)

5.2.1 Levels A and B. Carbon removing compound packaged in accordance with 5.1.1 will require no overpacking.

5.2.2 Level C. Carbon removing compound packaged in accordance with 5.1.2 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 Consolidated Freight Classification Rules or other common carrier regulations applicable to the mode of transportation.

* 5.3 Marking. Containers shall be marked in accordance with MIL-STD-129.

5.3.1 Additional marking. In addition, each container shall be durable and legibly marked with the following information in such a manner that the marking will not become damaged when the container is opened:

CAUTION: The ingredient materials used in the manufacture of this compound are toxic and caustic, and proper precautions should be taken to prevent contact with skin and clothing and to avoid inhalation of the vapors. If skin contact should occur, remove clothing and wash affected skin area with plentiful amounts of water. If eye contact should occur, or if the compound is accidentally swallowed, call a physician immediately.

6. NOTES

6.1 Intended use. The carbon removing compound covered by this specification is intended for use in softening and removing carbon

and fuel gum deposits from engine parts by immersion in the heated solution. Most paint coatings will also be removed by this compound.

6.2 Ordering data. Procurement documents should specify the following:

a. Title, number, and date of this specification.

b. Responsibility for inspection records (see 4.1).

c. Applicable levels of packaging and packing (see section 5).

6.2.1 Unit of purchase. Unit of purchase is the U. S. gallon of 231 cubic inches at 16.7° C (62° F).

6.3 Proper precautions should be taken to prevent contact with the skin and clothing and to avoid inhalation of the vapors.

* 6.4 The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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Project No. 6850-F430

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 22-R255

INSTRUCTIONS: This sheet is to be filled out by personnel, either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity. Comments and suggestions submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or serve to amend contractual requirements.

SPECIFICATION

ORGANIZATION

CITY AND STATE

CONTRACT NUMBER

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO *(If "yes", in what way?)*

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity - Optional)*

DATE

DD FORM 1 JAN 66 1426

REPLACES EDITION OF 1 OCT 64 WHICH MAY BE USED.

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