

**INCH-POUND****MIL-DTL-3301D**

08 October 2008

SUPERSEDING

MIL-C-3301C

15 September 1970

And Amendment 2

26 April 1995

DETAIL SPECIFICATION  
COMPOUND, ASPHALTIC, HOT-MELT (CAVITY LINING)

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

## 1. SCOPE

**1.1. Scope.** This specification covers a hot-melt asphaltic compound for coating the inner walls of metal cases prior to filling with explosives.

**2.1 General.** The documents listed in this section are specified in sections 3, 4, or 5 of this specification. This section does not include documents cited in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all specified requirements of documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

## 2.2 Government documents.

**2.2.1 Specifications, standards, and handbooks.** The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract.

### DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-129	Military Marking for Shipment and Storage
MIL-STD-147	Palletized Unit
MIL-STD-286	Propellants, Solid: Sampling, Examination and Testing

### DEPARTMENT OF DEFENSE SPECIFICATIONS

MIL-DTL-248	Trinitrotoluene (TNT)
MIL-DTL-512	Aluminum Powder, Flaked, Grained, and Atomized

Comments, suggestions, or questions on this document should be addressed to DEPARTMENT OF THE NAVY, Indian Head Division, NSWC, Code E11G3, Document Control, 4072 North Jackson Road, Suite 106, Indian Head, MD 20640-5115 OFFICIAL BUSINESS, or emailed to [amanda.penn@navy.mil](mailto:amanda.penn@navy.mil). Since contact information can change, you may want to verify the currency of this information using the ASSIST Online database at <http://assist.daps.dla.mil>.

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MIL-M-14745            Minol-2 Composition

MIL-E-22267           Explosive Compositions, HBX Type

(Copies of these documents are available online at <http://assist.daps.dla.mil/> or from the Standardization Documents Order Desk, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

**2.2.2 Other Government documents, drawings, and publications.** This section is not applicable to this document.

**2.3 Non-Government publications.** The following documents form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents are those cited in the solicitation or contract.

AMERICAN SOCIETY FOR QUALITY (ASQ)

ANSI/ASQ Z1.4           Sampling Procedures and Tables for Inspection by Attributes

(Copies of ANSI/ASQ Z1.4 are available online at [www.asq.org](http://www.asq.org) or ASQ Distribution Center, 5131 S. Third Street, Milwaukee, Wisconsin 53207-6028.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM D5            Test Method for Penetration of Bituminous Materials

ASTM D36           Standard Test Method for Softening Point of Bitumen (Ring-and-Ball Apparatus)

ASTM D92           Test Method for Flash and Fire Points by Cleveland Open Cup

ASTM D140          Standard practice for sampling Bituminous Materials

(Copies of these documents are available online at <http://www.astm.org> or from the American Society for Testing and Materials Customer Service, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.)

**2.3 Order of precedence.** Unless otherwise noted herein or in the contract, in the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained

### 3. REQUIREMENTS

**3.1 First article.** When specified (see 6.2), a sample (see 6.3) shall be subjected to first article inspection in accordance with 4.2. A first article inspection shall be required if :

- a. There has been more than 12 months since production of the latest accepted lot,
- b. There has been a relocation of the production facility,
- c. There has been a major change in personnel or procedures, or

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- d. There has been a change in the source of supplies for the materials used in the manufacture of the asphaltic compound.

**3.2 Materials.** The materials used in the manufacture of the asphaltic compound shall be of acceptable quality, suitable for the purpose intended, and shall be such as to produce a compound which shall be easily heat liquefiable but which does not flow at temperatures below the softening point. The compound shall contain no volatile solvents.

**3.3 Heat resistance.** When tested as specified in 4.4.2, a dried film of the compound on a metal panel shall not sag or flow when heated by immersion in a glycerin bath maintained at  $109 \pm 1$  °C ( $228 \pm 2$  °F) for 1 hour.

**3.4 Acid resistance.** When tested as specified in 4.4.3, a dried film of the compound on a metal panel shall withstand the action of picric, sulfuric, nitric, and hydrochloric acids for 6 hours without disintegration, browning, or dulling. There shall be no etching of the metal underneath the compound.

**3.5 Water resistance.** When tested as specified in 4.4.4, a dried film of the compound on a metal panel shall withstand immersion in distilled water for 18 hours without blistering, whitening, and not more than a slight dulling.

**3.6 Flexibility.** A dried film of the compound on a metal panel shall show no chipping, scaling, or cracking when tested as specified in 4.4.5.

**3.7 Chemical requirements.** The asphaltic compound shall conform to the chemical requirements of Table I when tested as specified therein.

TABLE I. Chemical requirements.

Requirement	Percent maximum	Test paragraph
Acidity, as H <sub>2</sub> SO <sub>4</sub>	0.01	4.4.6
Alkalinity, as NaOH	0.01	4.4.6
Insoluble matter in toluene	1.00	4.4.7
Ash	1.00*	4.4.8
Manganese	0.10*	4.4.9
Lead	0.04*	4.4.10

\*Quality conformance tests for manganese and lead shall not be required when the ash content is less than 0.04 percent.

**3.8 Softening point.** The softening point of the asphaltic compound shall be not less than 113 °C (235 °F) when tested as specified in 4.4.11.

**3.9 Penetration.** The asphaltic compound shall conform to the following penetration values when tested as specified in 4.4.12:

200gm/60 sec. /0 °C (32 °F)	15 min.
100gm/ 5 sec. /25 °C (77 °F)	25 min.
50gm/ 5 sec. /46 °C (115 °F)	80 max..

**3.10 Viscosity.** The viscosity of the asphaltic compound shall be not more than 700 centipoises at 149 °C (300 °F) when tested as specified in 4.4.13.

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**3.11 Flash point.** The flash point of the asphaltic compound shall be not less than 260 °C (500 °F) when tested as specified in 4.4.14.

**3.12 Reactivity.** When subjected to the vacuum stability test-as specified in 4.4.15, the reactivity of the asphaltic compound with TNT , HBX-1, HBX-3, H-6, and tritonal explosives shall not exceed 3.0 milliliters of gas over and above that generated by the controls when the test is conducted at  $100 \pm 0.5$  °C for 40 hours. The reactivity of the asphaltic compound with Minol-2 explosive shall not exceed 3.5 milliliters of gas over and above that generated by the controls when the test is conducted at  $90 \pm 0.5$  °C for 40 hours. The explosives tested with the asphaltic compound in the vacuum stability test shall be in accordance with the following: TNT shall conform to MIL-DTL-248, Type I; HBX-1, HBX-3, and H-6 shall conform to MIL-E-22267; Minol-2 shall conform to MIL-M-14745; Tritonal shall consist of  $80 \pm 3$  percent by weight TNT, MIL-T-248, Type I and  $20 \pm 3$  percent by weight aluminum powder, MIL-DTL-512, Type 3, Class 7.

**3.13 Workmanship.** The asphaltic compound ingredients shall be processed in a manner that will produce the high quality material necessary to meet the requirements of this specification. The finished product shall be homogeneous, free from a foam like texture on its surface, or other defects that could adversely affect its intended use.

## 4. VERIFICATION

**4.1 Classification of inspections.** The inspection requirements specified herein are classified as follows:

- a. First article inspection (see 4.2)
- b. Quality conformance inspection (see 4.3)

**4.2 First article inspection.** The first article inspection shall consist of a review for approval of the submitted manufacturer's reports and subjecting the first article sample (4.2.1) to examination and testing to determine conformance to the requirements of this specification.

**4.2.1 First article samples.** Unless otherwise specified in the contract or purchase order (see 6.2), the following applies to the first article. A test report from the manufacturer or a commercial laboratory showing the formula number of the compound, formulation and composition of the asphaltic compound including the identification of ingredient samples by specific chemical name in addition to trade name, and laboratory data showing complete test results required by this specification except reactivity shall be forwarded to the procuring activity before first article samples are supplied (see 6.3). The first article samples shall consist of 10 pounds of compound and 1 pound of each ingredient used. The samples shall be forwarded to the agency responsible for first article testing as designated in the solicitation or contract (see 6.3). The samples shall be plainly identified by securely attached durable tags or labels marked with the following information:

- (a) Sample for first article inspection
- (b) COMPOUND, ASPHALTIC, HOT-MELT ('CAVITY LINING)
- (c) Name and address of manufacturer
- (d) Location and identity of the plant which produced the samples
- (e) Manufacturer's identification

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(f) Date of manufacture

(g) Submitted by (name) (date) for first article inspection in accordance with the requirements of Specification MIL-C-3301 under authorization of (reference authorizing letter) (see 6.3).

**4.2.2 Retention of data.** The supplier shall retain test data accumulated from performance of quality conformance inspections. Data collected during a 12-month interval shall be forwarded to the procuring activity at the end of such 12-month interval. The purpose of the collection and submittal of test data is to show continuing conformance of the product with the requirements of this specification. Failure to submit this periodic feedback of test data shall result in loss of first article approval for that product. In addition, the supplier shall immediately notify the procuring activity at any time during the 12-month period when his product no longer meets the first article requirements or when production of the suppliers product has been terminated.

**4.3 Quality conformance inspection.** For each inspection lot of material submitted for acceptance, quality conformance inspection shall consist of all the examinations and tests except reactivity (4.4.15); and except 4.4.9 and 4.4.10 when the ash content (4.4.6) is less than 0.04 percent (see Table I).

**4.3.1 Inspection lot.** An inspection lot shall consist of the asphaltic compound produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions provided the operation is continuous. In the event the process is a batch operation, each batch shall constitute a lot (see 6.4).

#### **4.3.2 Sampling.**

**4.3.2.1 For examination of preparation for delivery.** Sampling for examination of preparation for delivery shall be conducted in accordance with ANSI/ASQ Z1.4.

**4.3.2.2 For tests.** A 10 pound sample shall be taken at random from each lot in accordance with ASTM D140.

#### **4.3.3 Inspection procedure.**

**4.3.3.1 For tests.** The method of withdrawal and preparation of test samples shall be in accordance with ASTM D140. Failure of any test sample to meet any test requirement shall be cause for rejection of the lot represented. Containers which have samples removed shall be shipped as part of the lot if the lot is accepted.

**4.3.3.2 For examination of preparation for delivery.** Using the sample of filled containers selected in 4.3.2.2, adjust the sample to conform to ANSI/ASQ Z1.4, Inspection Level I (see 6.2.1). The sample unit shall be one filled and closed shipping container. Sample containers shall be examined for compliance with all requirements of this specification in regard to contents, closure, damaged or leaking container, improper container, and marking.

**4.3.3.3 Examination of product.** The asphaltic compound shall be examined for conformance with the requirements of this specification with respect to material and workmanship.

#### **4.4 Test methods.**

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**4.4.1 Values.** Unless otherwise specified, the values specified in Section 3 apply to the average of the results obtained from duplicate determinations for each particular test.

**4.4.2 Heat resistance.**

**4.4.2.1 Preparation of test panels.** Solvent-cleaned, mechanically-polished plain carbon steel panels, 6 by 4 inches, by approximately 1/8 inch thick shall be used. Coat the panels by dipping them into the molten compound which shall be maintained at 150 to 160 °C (302 to 320 °F). Leave the top 1 inch of the panel uncoated. The film thickness should be approximately 1/16 inch on each side of the panel. Suspend the panel with the uncoated portion up and allow to cool to room temperature. Trim the excess compound from the bottom edge of the panel with a hot sharp knife.

**4.4.2.2 Procedure.** Suspend a panel, prepared as described in 4.4.2.1, in a bath of reagent-grade glycerin at  $109 \pm 1$  °C ( $228 \pm 2$  °F) for 1 hour so that the uncoated end of the panel is uppermost and one half of coated portion is submerged. Remove the panel and cool by immersion in cold water. Examine the film for sag or flow. A slight surface displacement at the glycerin line is permissible.

**4.4.3 Acid resistance.** Place a panel, prepared as described in 4.4.2.1, on a flat horizontal surface. Place on the coating at different places drops of the following solutions:

Saturated picric acid  
Sulfuric acid, sp. gr. 1.30  
Nitric acid, sp. gr. 1.22  
Hydrochloric acid, sp. gr. 1.09

Allow the acids to remain in contact with the coating for 6 hours while the temperature is maintained at approximately 21 °C (70 °F), covering the drops with small watch glasses in order to prevent evaporation. Remove the acids by washing with cold water and dry the film at room temperature for 1 hour. Examine the areas previously in contact with the acids and note if the compound is resistant to each of these acids as indicated by absence of disintegration, browning, or dulling of the coating. Do not consider a slight bloom around the area of a spot exposed to acid as an indication of failure to resist the acid. Remove the coating with benzene and examine the metal. Note if the coating has resisted the action of each acid as indicated by the absence of any corrosion of the metal.

**4.4.4 Water resistance.** Suspend a panel, prepared as described in 4.4.2.1 in a beaker of cold distilled water for 18 hours so that the uncoated end of the panel is uppermost and one half of the coated portion is submerged. Examine the panel for blistering, whitening, softening, or other visible defects.

**4.4.5 Flexibility.** A strip of No. 30 gage cold rolled steel sheet, 2 by 8 inches, shall be cleaned by washing with benzene and thoroughly dried. It shall be coated on one side to a thickness of 1/16 inch by flowing on the molten compound and then cooled at room temperature for a period of 48 hours. With the coating on the outside, bend the test panel rapidly 180 degrees over a mandrel 1 inch in diameter. No cracking of any kind shall be visible after the bending test.

**4.4.6 Acidity or alkalinity.** Dissolve 5 gm sample of the compound in 10 ml. of toluene which is neutral to phenolphthalein. Shake the solution with 100 ml. of distilled water in a 250 ml. separator funnel for at least 5 minutes. Filter and titrate with N/100 H<sub>2</sub>SO<sub>4</sub> or N/100 NaOH as necessary using phenolphthalein as indicator. A blank shall be run on an equal volume of the water used. Calculate the acidity or alkalinity of the sample as follows:

Acidity as sulfuric acid, percent by weight =  $\frac{4.9(C-B)N}{100}$

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$$\text{Alkalinity as sodium hydroxide, percent by weight} = \frac{W}{4.0 (A-B) N} W$$

Where: A = milliliters of H<sub>2</sub>SO<sub>4</sub> solution required for the titration of sample

B = milliliters of standard solution required for the blank

C = milliliters of NaOH solution required for the titration of sample

N = normality of the standard H<sub>2</sub>SO<sub>4</sub> or NaOH

W = weight of sample in grams

#### 4.4.7 Insoluble matter in toluene.

**4.4.7.1 Apparatus.** The extraction apparatus shall consist of a heat resistant glass assay flask, a block tin condensing coil with a nickel, copper or tin-plated metal cap, which fits securely around the rim of the flask, and a glass siphon cup which is suspended under the condenser. This apparatus shall be suitable for use with an electric hot plate or steam bath.

**4.4.7.2 Procedure.** An ordinary Whatman, or equal, paper filter thimble shall be dried and weighed. Transfer a weighed portion of approximately 6 gm of the sample to the paper thimble. The paper thimble and its contents are placed into the glass siphon cup which is then suspended under the condenser by a fine wire bail. Add approximately 60 ml. of toluene to the paper thimble, allowing the excess solvent to flow over into the flask. The flask shall be cautiously heated on a steam bath or electric hot plate just enough to vaporize the solvent. Cold water shall be circulated through the condenser. The extraction shall be discontinued when the toluene drops colorless from the siphon cup. The extraction may be complete in 1 to 5 hours. When the solvent comes through clear, the paper filter shall be removed and washed with a fine jet of toluene from a washing bottle to wash out any bitumen that may be retained at the top of the paper and to break up any channels that may have been formed by the toluene passing through. If the washings show any color, the thimble shall be put back into the siphon cup and the extraction continued until the solvent again becomes colorless. The paper thimble shall then be removed, dried carefully to constant weight at approximately 100 °C (212 °F) cooled and weighed. The solution in the flask shall be rinsed into a weighed porcelain or silica evaporating dish and the solvent evaporated under a hood. The residue shall be ignited over a flame or a muffle, the ash weighed, and the weight added to that of insoluble matter in the filter thimbles. Calculate the corrected loss in weight of the original sample to percent insoluble in toluene.

**4.4.8 Ash.** Transfer a weighed portion of approximately 1 gm. of the sample to a tared porcelain or platinum crucible and place in a cold muffle furnace having a good air circulation and capable of having its temperature regulated between 700 and 750 °C (1292-1382 °F). Gradually raise the temperature of the furnace to a red heat. Finish the ignition to constant weight at a temperature between 700 and 750 °C (1292-1382 °F). Cool in a desiccator and weigh. Calculate the weight of residue as percent ash in the sample.

**4.4.9 Manganese.** Transfer approximately 10 grams of the compound to a tared crucible, weigh accurately to 1 mg. and ignite at dull red heat until residue is free from carbon. Cool and dissolve in 10 ml. of concentrated nitric acid, and filter if necessary. Dilute to 100 ml. with distilled water and transfer a 20 ml. aliquot of the solution to a 250 ml. beaker. Add 1 gm. of lead peroxide and boil. Note if manganese is present as indicated by the development of a red coloration in the solution. If the presence of manganese is indicated, filter through asbestos and titrate the clean filtrate with N /10 oxalic acid until the red coloration disappears. Calculate the percent manganese in the sample as follows:

$$\text{percent manganese} = \frac{5.495 V N}{W}$$

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Where: V = ml. of N/10 oxalic acid used  
 N = normality of oxalic acid  
 W = weight of original sample, gm.

Note: See 4.4.10.1 for alternate procedure for the analysis of Manganese.

**4.4.10 Lead.** Transfer the remaining 80 ml. portion of the solution obtained as described in paragraph 4.4.9 to a beaker and evaporate to 5 ml. Make the solution slightly alkaline with ammonium hydroxide. Acidify with acetic acid and add an excess. Bring to the boiling point and add 10 to 15 ml. of a 10 percent solution of sodium or potassium dichromate. Boil the solution and allow to stand for 16 hours. Note if lead is present as indicated by a yellow precipitate. If lead is present, filter the solution through a tared Gooch crucible (or equivalent) and wash the precipitate with water and alcohol. Dry the crucible and contents at approximately 110 °C (230 °F) for 1 hour, cool and weigh. Calculate the increase in weight of the crucible as lead in the sample as follows:

$$\text{percent lead} = \frac{80.1 A}{W}$$

Where: A = weight of residue, gm.  
 W = weight of original sample, gm.

**4.4.10.1 Alternate procedure for the determination of lead and manganese by the atomic absorption spectrophotometric method.**

**4.4.10.1.1 Specimen.** The specimen shall consist of approximately 0.5 gm of the asphaltic compound weighed to within 0.2 mg. in a 125 ml. flat bottom flask. Two specimens shall be prepared and determined in duplicate.

**4.4.10.1.2 Apparatus.**

- (a) Atomic absorption spectrophotometer
- (b) Volumetric flasks, 50, 100 and 500 ml.
- (c) Flat bottom flask, 125 ml with ground glass neck
- (d) Condensers with ground glass fitting (suitable with 125 ml. flat bottom flasks)
- (e) Ventilated steam bath
- (f) . Hot plate in ventilated hood
- (g) Pipettes, 1, 3, 5 and 8 ml.

**4.4.10.1.3 Materials.**

- (a) Nitric acid, 70 percent
- (b) Perchloric acid, 70 percent



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(c) Hydrochloric acid, 37 percent

(d) A stock solution of lead perchlorate is prepared by dissolving (with heating as needed) 50 mgs of lead in 5 ml. 70 percent perchloric acid in a 500 ml volumetric flask. Cool the resulting solution thoroughly and dilute, to the mark with distilled water.

(e) A stock solution of manganese is prepared by dissolving 100 mgs of lead metal in 5 ml. 37 percent hydrochloric acid in a 500 ml. volumetric flask. Boil the solution for a few minutes and then cool the solution thoroughly. Add 5 ml 70 percent perchloric acid and dilute to volume with distilled water.

**4.4.10.1.4 Procedure.**

(a) Add 20 ml. of 70 percent nitric acid to the sample contained in the 125 ml flat bottom flask.

(b) Heat the sample on a steam bath under a reflux condenser for about 4-6 hours.

(c) Remove the sample solution to a hot plate and again under a reflux condenser heat until the solution boils gently. Reflux over night. Note : Do not heat too vigorously in the beginning or sample solution may foam into the condenser.

(d) After sample solution has refluxed over night, remove the condenser and boil the solution so that vapors escape. Continue to boil until the sample solution begins to foam.

(e) Remove the sample from the heat and cool slightly. Add 5 ml. of 70 percent perchloric acid.

(f) Return the flask to the heat. Heat slowly and carefully never allowing the reaction to proceed rapidly enough to remove all the liquid from the bottom of the flask. Note: Do not allow samples being heated with perchloric acid to go to dryness.

(g) When the reaction has subsided continue heating until white fumes of perchloric acid are seen.

(h) Remove from the hot plate and cool thoroughly. Transfer the solution to a 50 ml volumetric flask, dilute to the mark with distilled water and mix well.

(i) Prepare working standards by pipetting successively 1, 3, 5 and 8 ml. of the stock lead perchlorate into a series of four 100 ml. volumetric flasks. In the same order, pipette 1, 3, 5 and 8 ml aliquots of the stock manganese perchlorate solution into the flasks. Add to each flask 8 ml of 70 percent perchloric acid. Dilute to mark with distilled water and mix. These standards give lead concentrations of 1, 3, 5 and 8 ppm and manganese concentrations of 2, 6, 10, and 16 ppm. Note: Procedure can also be shortened using "pass or no pass" criteria in the specification. Only one standard solution then need be prepared.

(j) Prepare a blank solution in 100 ml. volumetric flask. Add 8 ml. 70 percent perchloric acid and dilute to the mark with distilled water.

(k) The sample (in duplicate), standards and blank are then analyzed by atomic absorption (following instrument instruction manual and standard safety procedures). For lead use 2833A analytical wavelength and for manganese the 2795 A wavelength. Use air as the oxidizer and hydrogen as the fuel. Note: It is recommended that an inert platinum or glass aspiration capillary be used. If the concentrations of either lead or manganese should prove to be outside the range of

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concentrations covered by the standards, other standards of different concentrations can be prepared.

(1) Obtain the absorbance of the sample and standard solutions as follows:

- (1) Convert absorption to absorbance
- (2) Subtract any absorbance due to the blank from each of the standards and sample solution absorbances.

(m) On linear graph paper, plot absorbance versus concentration (ppm) for the lead standards. From the resulting curve, determine the concentration of lead in the sample solution. Similarly, plot absorbance versus concentration for the manganese standards and determine the concentration of manganese.

(n) Calculate the percent lead and percent manganese using the following formulas:

$$\text{Percent Lead} = \frac{A \times 5.0}{1000 \times W}$$

Where: A = Lead content of the sample solution in parts per million  
W = Weight of the sample in grams

$$\text{Percent Manganese} = \frac{B \times 5.0}{1000 \times W}$$

Where: B = Manganese content of the sample solution in parts per million  
W = Weight of the sample in grams

**4.4.11 Softening point.** The softening point shall be determined in accordance with ASTM D36, except that a shouldered ring shall be employed. The shouldered ring shall be heated to at least 177 °C (350 °F) before the molten compound is poured.

**4.4.12 Penetration.** The penetration values shall be determined in accordance with ASTM D-5.

**4.4.13 Viscosity.**

**4.4.13.1 Apparatus.**

Brookfield Viscometer - Model No. LVF, Spindle No. 2, Speed - 12 rpm.

Sample container - Stainless steel beaker - 10 cm diameter by 11 cm high, straight sides, no pouring lip.

Bath - Silicone oil bath - 11 inch diameter by 10 inches high.

**4.4.13.2 Procedure.** The sample (800 ± 50 ml) shall be contained in the stainless steel sample beaker and heated with occasional stirring in an oil bath (approximately 2 hours) until the temperature of the sample shall be stabilized at 149 ± 0.6 °C (300 ± 1 °F). A bath temperature of approximately 155 °C (311 °F) is needed to maintain this sample temperature. The spindle shall be lowered into the sample until the immersion mark on the spindle shaft is at the surface of the liquid. The spindle shall be allowed 15 minutes to reach equilibrium temperature and then the drive motor shall be activated. Readings shall be

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taken as described in the Brookfield Model LVF instruction manual. Five readings shall be taken and the viscosity calculated from the average of the five runs.

**4.4.14 Flash point.** The flash point shall be determined in accordance with ASTM D-92.

**4.4.15 Reactivity.** Determine the reactivity of the compound in contact with TNT, HBX-1, HBX-3, H-6, Minol-2, and Tritonal explosives using the vacuum stability test. Prepare the samples as specified in 4.4.15.1.

**4.4.15.1 Preparation of samples.** Heat the compound until pourable, then deposit on glass plates a sufficient amount of the compound to provide 2.5 (N+2) grams of dried film (where N equals the number of explosives involved). Air dry the films under ambient conditions for 48 hours, then peel off with a sharp edged tool in strips approximately 1/2 inch wide. Suspend the strips on glass rods in an oven or cabinet with circulating air at approximately 30 °C (86 °F) for another 48 hours. The strips are then removed and cut into approximately 1/4 inch squares. (If an air circulating oven is not available, it will be satisfactory to place the suspended strips before a fan in a warm room for 48 hours.) It is important that the room in which this operation is conducted is free from acid, alkaline or other contaminating fumes. Reduce the explosive materials to 12 mesh or finer by remote grinding or rasping and dry for at least 24 hours in a desiccator over a desiccating agent. Keep both the compound film and the ground explosives dry in stoppered containers until ready for testing.

**4.4.15.2 Calibration of apparatus.** Calibrate the necessary number of vacuum stability test assemblies, in accordance with Figure 1, Method 401.1.2 of MIL-STD-286

**4.4.15.3 Testing procedure** Use  $2N + 2$  (where N equals the number of explosives used) tubes similar to the heating tube portion of the apparatus shown in Figure 1, Method 403.1.2 of MIL-STD-286. For controls add 2.5 grams of the dried compound to each of two tubes and 2.5 grams of each explosive to additional individual tubes. Place uniform mixtures of 2.5/2.5 grams of the asphaltic compound and each of the explosives specified in the test in single separate tubes. Uniform distribution or mixing is obtained by carefully layering alternate portions of the dried compound with the explosive. After the addition of each portion lightly tamp the mixture with a glass or metal rod to insure intimate contact of the materials. After all the samples have been prepared connect the respective heating tubes with the capillary tubes as prescribed and conduct the vacuum stability test according to Method 403.1.2 of MIL-STD-286 at  $100 \pm 0.5$  °C ( $212 \pm 1$ °F) for 40 hours for TNT, HBX-1, HBX-3, H-6, and Tritonal. For Minol-2 explosive, the test shall be conducted at  $90 \pm 0.5$  °C ( $194 \pm 1$  °F) for 40 hours. Make all readings at room temperature with the samples removed from the bath. Correct the readings of both the controls and the test samples to standard conditions of temperature and pressure.

**4.4.15.4 Calculation of reactivity.** Calculate the reactivity of each of the explosive materials with the coating compound for compliance with 3.12 as follows:

$$\text{Reactivity in ml. gas} = X - (Y + Z)$$

Where: X = ml. of gas produced by the mixture of explosive material and asphaltic compound

Y = ml. of gas produced by the explosive material alone.

Z = ml. of gas produced by the asphaltic compound alone.

## 5. PACKAGING

**5.1 Packaging.** For acquisition purposes, the packaging requirements shall be as specified in the

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contract or order (see 6.2). When packaging of materiel is to be performed by DOD personnel or in-house contractor personnel, these personnel need to contact the responsible packaging activity to ascertain packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activities within the Military Service or Defense Agency, or within the military service's system commands. Packaging data retrieval is available from the managing Military Department's or Defense Agency's automated packaging files, CD-ROM products, or by contacting the responsible packaging activity.

## 6. NOTES

(This section contains information of a general or explanatory nature which may be helpful, but is not mandatory.)

**6.1 Intended use.** Hot melt asphaltic compound covered by this specification is intended for use as a protective lining for fabricated metal cases in applications where charges of high explosives are poured into the cases, particularly where crevices exist in the case walls. Since this compound was developed for use with military grade high explosives, no commercial application exists.

**6.2 Acquisition requirements.** Acquisition documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Quantity in pounds (Avoirdupois)
- (c) Whether first article inspection is required and, if so, specify the test activity (see 3.1 and 4.2)
- (d) Items of data required for each first article and production lot (see 6.3)
- (e) Packing and marking if other than specified in 6.5

**6.2.1 Quality conformance sampling.** An AQL of 2.5% defective has been used successfully for quality conformance sampling. The contracting activity is cautioned that any deviation for this ANSI/ASQC Z1.4 selection should be warranted and verified statistically.

**6.3 First Article.** When a first article inspection is required, the contracting officer should provide specific guidance to offeror(s) whether the item(s) should be a preproduction sample, a first article sample, a first production item, a sample selected from the first production items, or a standard production item from the contractor's current inventory. The contracting officer should also include specific instructions in acquisition documents of the first articles. Invitation(s) for bid(s) should provide that the U.S. Government reserves the right to waive the requirements for samples for first article inspection to those bidders offering a product which has been previously acquired or tested by the U. S. Government, and that bidders offering such products, who wish to rely on such production or test, must furnish evidence with the bid that prior U.S. Government approval is presently appropriate for the pending contract. Bidders should not submit alternate bids unless specifically requested to do so in the solicitation.

**6.4 Batch.** A batch is defined as that quantity of material that has been manufactured by some unit chemical or physical mixing process intended to make the final product substantially uniform.

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**6.5. Packing and marking.** The following Packing and marking requirements should be specified in the contract.

**6.5.1 Packing.**

**6.5.2.1 Level A.** Not applicable.

**6.5.2.2 Level B.** The material should be packed in Type I, Grade C fiber drums conforming to PPP-D-723. The inside of the container should be treated with a suitable release agent which will not contaminate the contents and which will promote ready removal of content. Each drum should be furnished with a top heading. Drums should be palletized in conformance with MIL-STD-147.

**6.5.2.3 Level C.** The material should be packed in fiber drums conforming to Rule 51 or in Package No. 1060 of the Uniform Freight Classification. The inside of the container should be treated with a suitable release agent which will not contaminate the contents and which will promote ready removal of content. A uniform quantity of drums should be securely fastened to a disposable pallet of sufficient strength to assure safe loading, delivery to and unloading by first consignee.

**6.5.3 Marking.** Unless otherwise specified in the contract or order, marking should be in accordance with MIL-STD-129

**6.6 Previous Sources of Supply.** The manufacturer's listed below were previously approved sources. The procuring activity is cautioned that these manufacturer's listed below may no longer produce a product that meets the requirements of this specification.

GOVERNMENT DESIGNATION	MANUFACTURER'S DESIGNATION	MANUFACTURER'S NAME AND ADDRESS
MIL-C-3301	Code No. 568-L	Chemtura 4240 White Oak Avenue Hammond, IN 46320 Plant: Lawrenceville, IL
MIL-C-3301	SL-508-83	Lion Oil Company Lion Oil Building El Dorado, Arkansas 71730 Plant: Same Address
MIL-C-3301	6H70	Lion Oil Company Lion Oil Building El Dorado, Arkansas 71730 Plant: Same Address

**6.7 Subject term (key word) listing.**

TNT  
HBX-1  
HBX-3  
H-6

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Tritonal  
Minol-2

**6.8 Changes from previous issue.** Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extent of the changes.

Custodians :

Navy – OS

Army –AR

Air Force – 99

Preparing Activity:

Navy - OS

(Project 8030-2009-002)

Review Activities:

Army – MR

Air Force - 84

Navy - AS

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <http://assist.daps.dla.mil/>.