

METRIC

MIL-D-3718C  
11 July 1986  
 SUPERSEDING  
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## MILITARY SPECIFICATION

## DYE MIX, DISPERSE RED 9-DEXTRIN (METRIC)

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 mixture of Disperse Red 9 dye and dextrin.

## 2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation.

## SPECIFICATIONS

## FEDERAL

L-P-378 - Plastic Sheet and Strip, Thin Gauge, Polyolefin

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: Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, U.S. Army Chemical Research, Development and Engineering Center, ATTN: SMCCR-SPD-TS, Aberdeen Proving Ground, MD 21010-5423 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

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AMSC N/A

FSC 6820

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MILITARY

- MIL-D-3284 - Dye, Disperse Red 9 (Metric)
- MIL-D-3464 - Desiccants, Activated, Bagged, Packaging Use and Static Dehumidification
- MIL-D-3994 - Dextrin, Technical

STANDARDS

MILITARY

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes
- MIL-STD-129 - Marking for Shipment and Storage
- MIL-STD-147 - Palletized Unit Loads

(Copies of specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted shall be those listed in the issue of the DODISS specified in the solicitation. Unless otherwise specified, the issues of the documents not listed in the DODISS shall be the issue of non-government documents which is current on the date of the solicitation.

UNIFORM FREIGHT CLASSIFICATION RULES

(Application for copies should be addressed to the Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.)

ASTM STANDARDS

- D 1193 - Reagent Water (DOD Adopted)
- D 1895 - Apparent Density, Bulk Factor, and Pourability of Plastic Materials (DOD Adopted)
- D 3951 - Commercial Packaging (DOD Adopted)
- E 11 - Wire-Cloth Sieves for Testing Purposes (DOD Adopted)

(Application for copies should be addressed to ASTM, 1916 Race Street, Philadelphia, PA 19103.)

(Nongovernment standards and other publications are normally available from the organizations which prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specification, specification sheets or MS standards), the text of this

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specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

## 3. REQUIREMENTS

3.1 Composition. Dye Mix, Disperse Red 9-Dextrin shall be a thoroughly blended mixture of Dye, Disperse Red 9 conforming to MIL-D-3284 and Dextrin, Technical conforming to MIL-D-3994. No other materials shall be used in the preparation of the dye mix.

3.2 Chemical and physical characteristics. Dye Mix, Disperse Red 9-Dextrin shall conform to the chemical and physical characteristics of table I when tested as specified therein.

TABLE I. Chemical and physical characteristics

Characteristic	Requirement	Test paragraph
1-Methylaminoanthraquinone, percent by weight (dry basis)	85 $\pm$ 2	4.2.4.1
Dextrin, percent by weight, minimum	3.2	4.2.4.2
Volatile matter, percent by weight, maximum	2.5	4.2.4.3
Particle size, percent by weight passing:		4.2.4.4
250-micrometer sieve, minimum	97	
150-micrometer sieve, minimum	90	
75-micrometer sieve, minimum	70	
Apparent density, grams per milliliter, minimum (dry basis)	0.35	4.2.4.5

## 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not

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relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

#### 4.2 Quality conformance inspection.

4.2.1 Lotting. A lot shall consist of the Dye Mix, Disperse Red 9-Dextrin produced by one manufacturer, at one plant, from the same materials, and under essentially the same manufacturing conditions provided the operation is continuous. The minimum lot size shall be 2,270 kilograms. In the event the process is a batch operation (see 6.3), several batches may be mixed together to form a lot provided the batches are subjected to some physical mixing operation intended to make the final product substantially uniform and homogeneous; otherwise, each batch shall constitute a lot. No more than one lot of Disperse Red 9 dye shall be used to prepare a lot of dye mix.

#### 4.2.2 Sampling.

4.2.2.1 For examination of packaging. Sampling shall be conducted in accordance with MIL-STD-105.

4.2.2.2 For test. See 6.6 for sampling and testing precautions. Three representative specimens of approximately 200 grams (g) each shall be randomly removed from the lot of dye mix offered for acceptance and shall be placed in separate clean, dry containers labeled to identify the lot represented.

#### 4.2.3 Inspection procedure.

4.2.3.1 For examination of packaging. The sample unit shall be one filled and closed shipping container, ready for shipment. Sample containers and the packaging thereof shall be examined for the following defects using an AQL of 2.5 percent defective:

- (a) Contents per container not as specified
- (b) Container not as specified
- (c) Polyethylene liner or closure thereof not as specified (level B only)
- (d) Container closure not as specified
- (e) Container damaged or leaking
- (f) Desiccant not as specified or missing (level B only)
- (g) Unitization not as specified
- (h) Marking incorrect, missing, or illegible

4.2.3.2 For test. Each specimen taken in 4.2.2.2 shall be tested as specified in 4.2.4. Failure of any test by any specimen shall be cause for rejection of the lot represented.

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4.2.4 Tests. See 6.6 for sampling and testing precautions. Water in accordance with ASTM D 1193 and reagent grade chemicals shall be used throughout the tests. Where applicable, blank determinations shall be run and corrections applied where significant. Tests shall be conducted as follows:

4.2.4.1 1-Methylaminoanthraquinone. Prepare and measure the absorbance of standard Disperse Red 9 dye solution (see 6.4) and a solution of the specimen as follows: Weigh to the nearest milligram (mg)  $415 \pm 5$  mg of the standard dye or specimen which has been previously dried to a constant weight in an oven at  $70^\circ$  to  $80^\circ\text{C}$  and quantitatively transfer to a 500-milliliter (mL) beaker, using small quantities of methanol for washing. Stir to break up all lumps in order to insure complete wetting and to facilitate solution, heating if necessary. Transfer quantitatively to a 500-mL volumetric flask, dilute to the volume mark with methanol, and mix thoroughly. Filter through a 15-centimeter fluted filter paper and discard the first 300 mL of filtrate. Remove a 20-mL aliquot from the remaining 200 mL of filtrate, transfer to a second 500-mL volumetric flask, dilute to the volume mark with methanol, and mix thoroughly. Using a suitable spectrophotometer, measure the absorbance value of the more dilute solution at  $500 \pm 2$  nanometers. Use the methanol used in preparing the solution as the reference liquid in the spectrophotometer. Cell spacers or variable path length cells may be used in lieu of the prescribed dilution procedures. Calculate the percent by weight 1-methylaminoanthraquinone as follows:

$$\text{Percent 1-methylaminoanthraquinone} = \frac{ABC}{DE}$$

where: A = Percent purity of standard dye,  
 B = Absorbance value of specimen,  
 C = Weight of standard dye in grams,  
 D = Absorbance value of standard dye, and  
 E = Weight of specimen in grams.

4.2.4.2 Dextrin.

(a) Solution I. Dissolve 40 g of cupric sulfate ( $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ ) in 1 liter of water.

(b) Solution II. Dissolve 200 g of potassium-sodium tartrate ( $\text{KNaC}_4\text{H}_4\text{O}_6 \cdot 4\text{H}_2\text{O}$ ) and 150 g of sodium hydroxide in water and dilute to 1 liter.

(c) Procedure. Weigh 0.500 g of specimen into a 250-mL Erlenmeyer flask. Add 100 mL of water and 5 mL of concentrated hydrochloric acid and heat until just before boiling begins. Remove the flask from heat and filter the solution through a filter crucible, rinsing with a small amount of hot water. Heat the solution to boiling and simmer for 3 hours adding water as necessary to maintain a volume of 100 mL. After this 3-hour period, continue boiling but allow the solution to evaporate to 20 mL. Remove from heat and allow to cool to room temperature. Add 20 mL of solution I and 40 mL of solution II and filter through a filter crucible to remove the material which precipitates from

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the basic solution. Heat the filtrate over a Bunsen burner which is regulated so that the solution begins to boil in about 4 minutes and continue to boil for exactly 3 minutes. (It is important that these directions be strictly observed.) Allow the red precipitate ( $\text{Cu}_2\text{O}$ ) to settle and then filter through a filter crucible. Rinse the precipitate with ethanol and then dry for 1/2 hour at  $105^\circ \pm 5^\circ\text{C}$ . Weigh the precipitate and calculate the percent by weight dextrin as follows:

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

where: A = Grams of dextrin equivalent to the grams of the precipitate ( $\text{Cu}_2\text{O}$ ) as obtained from table II, and  
B = Weight of specimen in grams

4.2.4.3 Volatile matter. Weigh to the nearest milligram approximately 5 g of the specimen in a tared, glass-stoppered weighing bottle. Remove the stopper and dry to constant weight at  $70^\circ$  to  $75^\circ\text{C}$ . Cool to room temperature in a desiccator and weigh. Calculate the percent by weight volatile matter as follows:

$$\text{Percent volatile matter} = \frac{100 (A - B)}{W}$$

where: A = Weight of specimen and stoppered bottle before heating in grams,  
B = Weight of specimen and stoppered bottle after heating in grams, and  
W = Weight of specimen in grams.

4.2.4.4 Particle size. Use sieves conforming to ASTM E 11. Nest the sieves in order of decreasing mesh size (with the sieve of largest mesh on top) on a receiving pan. Weigh to the nearest 0.1 g approximately 10 g of the specimen and then use one of the following procedures:

(a) Dry method. Place the weighed specimen on the top sieve and brush the material with a camel's-hair brush until no more specimen passes through the sieve. Remove the sieve and weigh the material retained. Repeat this procedure with each of the other sieves. Calculate the percent material passing through each sieve.

(b) Wet method. Mix the weighed specimen with sufficient water in a beaker by stirring with a glass rod to produce a smooth paste. Carefully wash the thoroughly wetted specimen through the sieves. (The use of a wetting agent is permitted.) Dry the sieves in an oven at  $70^\circ$  to  $75^\circ\text{C}$  and weigh the material remaining on each sieve. Calculate the percent material passing through each sieve.

4.2.4.5 Apparent density. Determine the apparent density in accordance with ASTM D 1895, method A except that the specimen shall be dried as specified in 4.2.4.3 prior to testing.

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TABLE II. Dextrin equivalent to cuprous oxide

Cu <sub>2</sub> O, mg	Dextrin mg	Cu <sub>2</sub> O, mg	Dextrin mg	Cu <sub>2</sub> O, mg	Dextrin mg	Cu <sub>2</sub> O, mg	Dextrin mg
10	4.0	57	24.3	104	45.1	151	66.3
11	4.5	58	24.8	105	45.5	152	66.8
12	4.9	59	25.2	106	46.0	153	67.2
13	5.3	60	25.6	107	46.4	154	67.7
14	5.7	61	26.1	108	46.9	155	68.2
15	6.2	62	26.5	109	47.3	156	68.6
16	6.6	63	27.0	110	47.8	157	69.1
17	7.0	64	27.4	111	48.2	158	69.5
18	7.5	65	27.8	112	48.7	159	70.0
19	7.9	66	28.3	113	49.1	160	70.4
20	8.3	67	28.7	114	49.6	161	70.9
21	8.7	68	29.2	115	50.0	162	71.4
22	9.2	69	29.6	116	50.5	163	71.8
23	9.6	70	30.0	117	50.9	164	72.3
24	10.0	71	30.5	118	51.4	165	72.8
25	10.5	72	30.9	119	51.8	166	73.2
26	10.9	73	31.4	120	52.3	167	73.7
27	11.3	74	31.8	121	52.7	168	74.1
28	11.8	75	32.2	122	53.2	169	74.6
29	12.2	76	32.7	123	53.6	170	75.1
30	12.6	77	33.1	124	54.1	171	75.5
31	13.1	78	33.6	125	54.5	172	76.0
32	13.5	79	34.0	126	55.0	173	76.4
33	13.9	80	34.4	127	55.4	174	76.9
34	14.3	81	34.9	128	55.9	175	77.4
35	14.8	82	35.3	129	56.3	176	77.8
36	15.2	83	35.8	130	56.8	177	78.3
37	15.6	84	36.2	131	57.2	178	78.8
38	16.1	85	36.7	132	57.7	179	79.2
39	16.5	86	37.1	133	58.1	180	79.7
40	16.9	87	37.5	134	58.6	181	80.1
41	17.4	88	38.0	135	59.0	182	80.6
42	17.8	89	38.4	136	59.5	183	81.1
43	18.2	90	38.9	137	60.0	184	81.5
44	18.7	91	39.3	138	60.4	185	82.0
45	19.1	92	39.8	139	60.9	186	82.5
46	19.6	93	40.2	140	61.3	187	82.9
47	20.0	94	40.6	141	61.8	188	83.4
48	20.4	95	41.1	142	62.2	189	83.9
49	20.9	96	41.5	143	62.7	190	84.3
50	21.3	97	42.0	144	63.1	191	84.8
51	21.7	98	42.4	145	63.6	192	85.3
52	22.2	99	42.9	146	64.0	193	85.7
53	22.6	100	43.3	147	64.5	194	86.2
54	23.0	101	43.8	148	65.0	195	86.7
55	23.5	102	44.2	149	65.4	196	87.1
56	23.9	103	44.7	150	65.9	197	87.6

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## 5. PACKAGING

5.1 Unit packing. Dye Mix, Disperse Red 9-Dextrin shall be unit packed level B or commercial as specified (see 6.2).

5.1.1 Level B. Uniform quantities of no less than 65 and no more than 130 kilograms  $\pm 1/4$  percent of the marked net weight of dye mix shall be packed in a fiber drum conforming to rule 51, section 2 of the Uniform Freight Classification for a weight limit of over 225 but not over 300 pounds, with an aluminum barrier of 7.62 micrometers minimum thickness incorporated into one of the inner plies of the sidewall. Each drum shall be provided with a close-fitting bag liner formed from polyethylene of 101.6 micrometers minimum thickness conforming to type I, class 1, grade and finish optional of L-P-378. Seams shall be completely heat sealed and shall meet the heat-seal strength requirements of L-P-378. The filled bag shall be closed by heat sealing, tying, or knotting. A minimum of eight units of desiccant conforming to MIL-D-3464 shall be placed on top of the closed liner. Drum closure shall be fully gasketed and shall form a tight seal between the rim and the top of the drum.

5.1.2 Commercial. Uniform quantities of no less than 65 and no more than 130 kilograms  $\pm 1/4$  percent of the marked net weight of dye mix shall be unit packed in accordance with ASTM D 3951.

5.2 Packing. Dye mix, unit packed as specified in 5.1, shall require no further protection for shipment other than unitization.

5.3 Unitization. Shipping containers shall be unitized in accordance with the applicable requirements of MIL-STD-147.

5.4 Marking. Marking for level B shipments shall be in accordance with MIL-STD-129. Marking for commercial shipments shall be in accordance with ASTM D 3951. All shipments shall be marked to show lot number and date of manufacture. In addition, each container shall be durably and legibly marked with contrasting letters and background to show the name and address of the manufacturer, the net weight of contents, and the following information:

## CAUTION

This dye contains 1-methyaminanthraquinone.  
Avoid contact with skin or clothing.  
In case of contact, flush with water.  
Avoid breathing dye or combustion products.  
Mask during manufacture or use where potential for exposure exists.  
If this chemical gets into the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical.

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## 6. NOTES

6.1 Intended use. Dye Mix, Disperse Red 9-Dextrin is intended for use in the manufacture of red signaling smoke mixtures.

6.2 Ordering data. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification
- (b) Level of unit packing required (see 5.1)

6.3 Batch. A batch is defined as that quantity of material which has been manufactured by some unit chemical process.

6.4 Dye of known purity. 1-Methylaminoanthraquinone dye of known purity for use in 4.2.4.1 may be obtained by authority of the Procuring Contracting Officer (PCO). Alternately, the contractor may prepare his own standard dye and obtain verification of its purity by authority of the PCO from Commander, U.S. Army Armament, Munitions and Chemical Command, Product Assurance Directorate, Aberdeen Proving Ground, MD 21010-5423.

6.5 Significant places. For the purpose of determining conformance with this specification, an observed or calculated value should be rounded off "to the nearest unit" in the last right-hand place of figures used in expressing the limiting value, in accordance with the rounding-off method of ASTM E 29.

6.6 Sampling and testing precautions. This specification requires inspection and use of chemical materials which are potentially hazardous to personnel. All applicable safety rules, regulations and procedures must be followed in the handling and processing of these materials.

## Custodians:

Army - EA  
Navy - AS

## Review activities:

Army - MD  
DLA - GS

## Preparing activity:

Army - EA  
Project No. 6820-0087

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**NOTE:** This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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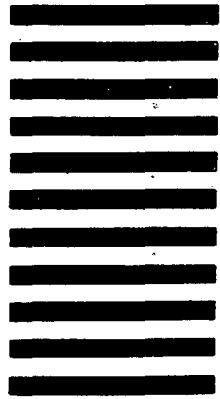
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## STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER MIL-D-3718C		2. DOCUMENT TITLE DYE MIX, DISPERSE RED 9-DEXTRIN (METRIC)	
3a. NAME OF SUBMITTING ORGANIZATION		4. TYPE OF ORGANIZATION (Mark one)	
b. ADDRESS (Street, City, State, ZIP Code)		<input type="checkbox"/> VENDOR	
		<input type="checkbox"/> USER	
		<input type="checkbox"/> MANUFACTURER	
		<input type="checkbox"/> OTHER (Specify): _____	
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	
c. MAILING ADDRESS (Street, City, State, ZIP Code) - Optional		8. DATE OF SUBMISSION (YYMMDD)	

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