

O-M-575A
September 12, 1975
SUPERSEDING
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August 12, 1964

FEDERAL SPECIFICATION
MORPHOLINE, TECHNICAL

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

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers three classes of morpholine (see 6.1).

1.2 Classification. Morpholine shall be of the following classes, as specified (see 6.2):

- Class 1 - Morpholine 99.0 percent.
- Class 2 - Morpholine 91.0 percent.
- Class 3 - Morpholine 40.0 percent.

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issues in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

Federal Specifications:

- PPP-D-729 - Drums, Shipping, and Storage, Steel, 55-Gallon.
- PPF-P-704 - Pails, Metal: (Shipping, Steel, 1 Through 12 Gallon).

Federal Standards

- Fed. Std. No. 123 - Marking for Shipment (Civil Agencies).
- Fed. Std. No. 313 - Symbols for Packages and Containers for Hazardous Industrial Chemicals and Materials.

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

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

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

Military Standards:

- MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes.
- MIL-STD-129 - Marking for Shipment and Storage.
- MIL-STD-147 - Palletized and Containerized Unit Loads, 40" x 48" Pallets, Skids, Runners, or Pallet-Type Base.

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(Copies of Military Specifications and Standards required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

Federal Regulation:

49 CFR 173 Subpart H: Marking and Labeling of Hazardous Materials.

(The Code of Federal Regulations (CFR) and the Federal Register (FR) are for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402. When indicated, reprints of certain regulations may be obtained from the Federal agency responsible for issuance thereof).

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

National Motor Freight Traffic Association, Inc., Agent:

National Motor Freight Classification.

(Application for copies should be addressed to the American Trucking Associations, Inc., Tariff Order Section, 1616 P Street, N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

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

3. REQUIREMENTS

3.1 Material. Morpholine shall be a liquid.

3.2 Purity. Morpholine shall conform to the purity of table I when tested as specified in 4.3.1.

TABLE I. Purity requirements for morpholine

| Requirement | Class 1 | Class 2 | Class 3 |
|---------------------------|---------|---------|---------|
| Purity, weight %, minimum | 99.0 | 91.0 | 40.0 |

3.3 Workmanship. Morpholine shall be clear, visibly free from foreign matter, and suitable for the intended use.

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 that supplies and services conform to prescribed requirements.

4.2 Quality conformance inspection.

4.2.1 Examination of preparation for delivery.

4.2.1.1 Lot. For this examination, a lot shall be morpholine, fully packed, marked, and offered for examination at one time. Lot size shall be expressed in number of filled shipping containers.

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4.2.1.2 Sampling plan. Sampling shall be conducted in accordance with MIL-STD-105. Sample unit for this examination shall be one shipping container. Sample size, acceptance and rejection numbers shall be determined by special inspection level S-2 and acceptable quality level (AQL) 4.0 percent defective, respectively. Defects shall be scored in accordance with table II.

TABLE II. Examination of preparation for delivery

| Examine | Defect |
|-------------|---|
| Marking | Omitted; incorrect; illegible; not as specified. |
| Packing | Not as specified. |
| Contents | Net contents less than specified. |
| Workmanship | Hole in container; closure incomplete or inadequate; leakage or seepage from any part of the container. |

4.2.2 Examination of material and workmanship.

4.2.2.1 Lot. For this examination, a lot shall be morpholine, produced by one manufacturer, at one plant, within a 24-hour period, from the same raw materials, by the same manufacturing process, and offered for examination at one time.

4.2.2.2 Sampling plan. Sample size for this examination shall be two pounds (approximately one liter) selected at random from the lot. Defects shall be determined in accordance with table III. Lot shall be rejected if sample contains one defect.

TABLE III. Examination of material and workmanship

| Examine | Defect |
|-------------|--|
| Material | Not a liquid. |
| Workmanship | Not clear; foreign matter visibly present. |

4.2.3 Testing.

4.2.3.1 Lot. A lot shall be as specified in 4.2.2.1.

4.2.3.2 Sampling plan. Sample size for testing shall be two pounds, selected as specified in 4.2.2.2. Sample portions shall be sealed in a clean, dry, glass container with identifying lot number and date. All testing shall be performed on the sample. Lot shall be rejected if the sample fails to meet any specified requirement.

4.3 Test method.

4.3.1 Purity. Into a one-liter volumetric flask, place approximately 14 g of morpholine, weighed to the nearest 0.01 g. Dilute with distilled water and mix thoroughly until homogeneous. Transfer a 25-ml aliquot to a 250-ml wide-mouth erlenmeyer flask and titrate with standardized 0.1 N-hydrochloric acid against methyl red indicator. Calculate purity of morpholine by:

$$\% \text{ morpholine} = \frac{N \times V \times 348}{W}, \text{ where}$$

N = normality of hydrochloric acid,
 V = volume, ml, of hydrochloric acid,
 W = weight, g, of sample.

5. PREPARATION FOR DELIVERY

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

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5.1.1 Level A. Not less than four hundred sixty (460) pounds of morpholine shall be furnished in a 55-gallon steel drum conforming to PPP-D-729, type II.

5.1.1.1 When specified (see 6.2), not less than forty (40) pounds of morpholine shall be furnished in a 5-gallon steel pail conforming to PPP-P-704, type I. Pails shall be palletized in accordance with MIL-STD-147 and labeled in accordance with Fed. Std. No. 313.

5.1.2 Level B. Morpholine shall be furnished as specified in 5.1.1.

5.1.3 Level C. In quantities as specified (see 6.2), morpholine shall be packed in containers to assure carrier acceptance and safe arrival at destination. Containers shall be in compliance with Uniform Freight Classification, or National Motor Freight Classification, as applicable.

5.2 Marking. Marking shall be in accordance with Fed. Std. No. 123 for civil agencies, or MIL-STD-129 for military activities, as specified (see 6.2).

5.3 Labeling. Except where otherwise specified (see 5.1.1.1), containers shall be labeled in accordance with 49 CFR 173 Subpart H.

6. NOTES

6.1 Intended use. Morpholine is intended for use as a corrosion inhibitor in heating plants where boiler feedwater is deaerated. It volatilizes with steam, circulates through the lines, and returns with the condensate to the boiler. Morpholine neutralizes acidity resulting from dissolved carbon dioxide and maintains alkalinity to inhibit corrosion in the boiler, pipes, and radiators.

6.1.1 Classes. Selection of class may depend upon environmental conditions of storage and handling. To aid selection of class, physical properties are provided in table IV below.

TABLE IV. Physical properties of morpholine

| Property | Class 1 | Class 2 | Class 3 |
|-------------------------------|---------|---------|---------|
| Specific gravity @ 20°/20° C. | 1.002 | 1.022 | 1.032 |
| Freezing point, C° | -3 | -18 | -27 |
| Flash point (TOC), C° | 38 | 46 | 88 |

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

- (a) Title, number, and date of this specification.
- (b) Class of morpholine required (see 1.2).
- (c) Size and level of packing required (see 5.1).
- (d) Marking required (see 5.2).
- (e) Labeling required (see 5.1.1.1 and 5.3).

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Orders for this publication are to be placed with General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein. Price 25 cents each.