METRIC

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SUPERSEDING
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DETAIL SPECIFICATION

UREA, TECHNICAL (METRIC)

Inactive for new design after 23 February 1998.

This specification is approved for use by all departments and agencies of the Department of Defense.

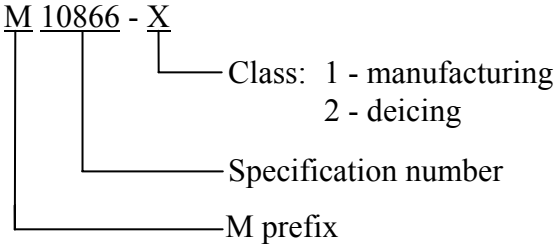
1. SCOPE

1.1 Scope. This specification covers two classes of technical grade urea.

1.2 Classification. The urea covered by this specification should be of the following classes, as specified (see 6.2).

Class 1 - for manufacturing
Class 2 - for deicing

1.3 Part or identifying number (PIN). The PIN to be used for urea acquired to this specification is created as follows:



Comments, suggestions, or questions on this document should be addressed to Defense Supply Center Richmond, ATTN: DSCR-VEB, 8000 Jefferson Davis Highway, Richmond, VA 23297-5616 or e-mailed to STDZNMGT@dla.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST database at http://assist.daps.dla.mil.

AMSC N/A FSC 6810

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3 and 4 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 the documents cited in sections 3 and 4 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 (see 6.2).

DEPARTMENT OF DEFENSE STANDARDS

MIL-STD-1916 - DoD Preferred Methods for Acceptance of Product.

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

2.3 Non-government publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents are those cited in the solicitation or contract (see 6.2).

ASTM INTERNATIONAL

ASTM E 1	- Standard Specification for ASTM Liquid-in-Glass Thermometers.
ASTM E 11	- Standard Specification for Wire Cloth and Sieves for Testing Purposes.
ASTM E 203	- Standard Test Method for Water Using Volumetric Karl Fischer Titration.
ASTM E 258	- Standard Test Method for Total Nitrogen in Organic Materials by Modified Kjeldahl Method.

(Copies of these documents are available online at http://www.astm.org/ or from ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959.)

ASSOCIATION OF ANALYTICAL COMMUNITIES (AOAC) INTERNATIONAL

- Official Methods of Analysis.

(Copies of this document are available from the Association of Official Analytical Communities, 481 North Frederick Avenue, Suite 500, Gaithersburg, MD 20877-2417.)

2.4 Order of precedence. 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 Appearance.

3.1.1 Class 1. Class 1 urea shall be white crystalline material free from visible impurities and foreign matter when tested as specified in 4.2.4.1.

3.1.2 Class 2. Class 2 urea shall be in "shotted" or "prilled" form and shall be free flowing when tested as specified in 4.2.4.1.

3.2 Chemical and physical characteristics. Urea shall conform to the applicable chemical and physical characteristics of table I when tested as specified therein.

TABLE I. Chemical and physical characteristics.

Characteristic	Class 1		Class 2		Test paragraph
	Minimum	Maximum	Minimum	Maximum	
Nitrogen, percent by weight	46.0	46.7	46.0	46.7	4.2.4.2
Water, percent by weight				0.50	4.2.4.3
Biuret content, percent by weight				2.5	4.2.4.4
Ash, percent by weight		0.003		0.1	4.2.4.5
Initial melting point, °C	132.0	133.0	129.0	133.0	4.2.4.6

3.3 Class 2 labeling. Containers of class 2 urea shall be marked in bold characters to show the following information:

NOTICE

UREA FOR USE IN DEICING AIRCRAFT RUNWAY AND RAMP AREAS ONLY. NOT AUTHORIZED FOR USE IN DEICING OF OTHER PAVEMENTS. USE ONLY AT TEMPERATURES ABOVE -9 ºC (15 ºF). SPREAD AT RATE NO GREATER THAN 1.22 KILOGRAMS PER SQUARE METER (1/4 POUND PER SQUARE FOOT).

4. VERIFICATION

4.1 Classification of inspection. The inspection requirements specified herein are classified as a conformance inspection (see 4.2).

4.2 Conformance inspection.

4.2.1 Lotting. A lot shall consist of one class of urea 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 6.3).

4.2.2 Sampling.

4.2.2.1 Sampling for examination of preparation for delivery. Sampling shall be conducted in accordance with MIL-STD-1916 verification level I.

4.2.2.2 Sampling for test. Sampling shall be conducted in accordance with table II. A representative specimen of approximately 200 grams shall be removed from each sample container and placed in a suitable clean dry container labeled to identify the lot and container from which it was taken.

TABLE II. Sampling for test.

Number of containers in batch or lot	Number of sample containers
2 to 25	2
26 to 150	3
151 to 1,200	5
1,201 to 7,000	8
7,001 to 20,000	10
Over 20,000	20

4.2.3 Inspection procedure.

4.2.3.1 Inspection for examination of preparation for delivery. The sample unit shall be one filled container ready for shipment. Sample containers and the preparation for delivery thereof shall be examined for the following defects in accordance with MIL-STD-1916 verification level I:

a. Contents per container not as specified.
b. Container not as specified.
c. Container closure not as specified.
d. Container damaged or leaking.
e. Marking incorrect, missing, or illegible.

4.2.3.2 Inspection for test. Each sample 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.

4.2.4 Tests. Tests shall be conducted as follows:

4.2.4.1 Appearance. Visually examine the class 1 urea specimen for color, form, and the presence of impurities and foreign matter. Visually examine the class 2 urea specimen for form and flowing characteristics.

4.2.4.2 Nitrogen. Determine percent by weight nitrogen in the specimen in accordance with ASTM E 258 using the 0.5 normal (N) acid procedure and a specimen weight of 0.50 to 0.60 gram.

4.2.4.3 Water. Determine the percent by weight water in the specimen in accordance with ASTM E 203.

4.2.4.4 Biuret. Determine the percent by weight biuret in the specimen in accordance with the procedure in the AOAC International document, "Official Methods of Analysis".

4.2.4.5 Ash. Weigh to the nearest 0.01 gram approximately 50 grams of the specimen into an ignited tared (to the nearest 0.1 milligram (mg)) platinum dish. Heat until a gray solid ash remains. Ignite at approximately 800 °C to a constant weight. Cool to room temperature in a desiccator and weigh to the nearest 0.1 mg. Calculate the percent by weight ash as follows:

$$\text{Percent ash} = \frac{100\,(A-B)}{W}$$

where: A = Weight of dish and ash in grams
B = Tare weight of dish in grams
W = Weight of specimen in grams

4.2.4.6 Initial melting point. Determine the initial melting point of the specimen as specified in 4.2.4.6.1 through 4.2.4.6.5.

4.2.4.6.1 Apparatus.

4.2.4.6.1.1 Capillary melting point apparatus. The apparatus shall consist of a silicone fluid bath, stirrer, immersion heater coil, transformer control, and adjustable magnifier constructed and be operated in such a way that the temperature around the samples and thermometer is uniform and can be easily controlled within the limits required by this test method. A means shall be provided so that the capillary tubes can be introduced into the bath and properly positioned without removing the thermometer from the heating bath.

4.2.4.6.1.2 Melting point capillary tubes. The capillary tube to contain the sample shall be a glass tube approximately 90 to 120 millimeters (mm) and 0.9 to 1.1 mm in internal diameter with walls 0.2 to 0.3 mm thick and closed at one end.

4.2.4.6.1.3 Thermometer. The thermometer shall be of the partial immersion type and be capable of detecting the proper range in accordance with ASTM E 1.

4.2.4.6.1.4 Sieve. A 125-micron (µm) sieve used in preparation of the standard sample and of samples of material to be tested shall meet the requirements of ASTM E 11.

4.2.4.6.2 Standard sample.

4.2.4.6.2.1 Chemical composition. The standard sample shall be homogeneous and of the same basic chemical composition as the unknown to be analyzed. This condition is satisfied when both materials are quite pure, or when both the standard and the unknown have been made by the same industrial process. Significant deviations from identity in chemical composition lead to some loss of precision.

4.2.4.6.2.2 Particle size. The standard sample must be uniformly blended, and particle size must be fine enough so that a test specimen of approximately 0.1 gram will yield reproducible melting point data. In preparing a standard sample from coarse crystalline material the sample should be ground fine, passed through a 125-µm sieve, and blended thoroughly before subdividing and storing for use in the test.

4.2.4.6.2.3 Storage. The standard sample shall be stored under such conditions that its quality will not deteriorate. This is vital to the success of the method, since deterioration of the standard sample may cause lowered initial melting temperature, which will result in falsely high indications of the purity of the materials under test. Many chemicals are somewhat hygroscopic, and it may be agreed that the standard or both the standard and the sample are to be conditioned by appropriate means before the initial melting point is determined.

4.2.4.6.3 Sampling. A bulk sample shall be withdrawn by means appropriate to the processing, shipment, or storage conditions. This bulk sample shall be blended and subdivided, with grinding steps where appropriate, until a blended sample of 1 to 10 grams with a particle size passing 125-µm sieve is obtained.

4.2.4.6.4 Procedure.

a. Grind approximately 0.1-gram test specimens of the standard sample and of the unknown sample as finely as possible in mortars or on pieces of flat glass with spatulas. Charge the melting point capillary tubes with the finely ground test specimens to form packed columns in the bottom of the tubes from 3 to 4 mm in height. The capillary tubes are packed tightly by adding the powdered test specimen in three or four increments, ensuring each increment is well packed.

b. Preheat the oil bath to approximately 15 °C below the expected melting range. Then adjust the temperature rise rate to 1 ± 0.2 °C per minute during the actual melting of the sample.

c. Without removing the thermometer from the heating bath, place the packed capillary tubes containing the standard and unknown sample in the heating bath when the temperature is about 5 °C below the expected initial melting point. Hold the packed capillary tubes adjacent to the thermometer bulb in such a way that they and the thermometer bulb are at a uniform temperature.

d. Observe the samples closely through the magnifier and record the initial melting point.

e. The initial melting point is defined as the temperature at which positive evidence of liquefaction is observed. Just before this temperature is reached, samples show varying degrees of shrinkage away from the walls of the capillary tube. Then, the main column of sample collapses against the side or the bottom of the capillary, or both. After a further rise in temperature, which may vary from 0.2 °C to more than 1 °C, the portion of the sample in contact with the tube is observed to form a distinct liquid film that wets the surface. The liquefaction or wetting may occur at the bottom, sides, front, or rear of the capillary tube. When wetting occurs at the back, the point may be missed unless care is taken to watch the rear of the tube. The capillary tube may be rotated to view the rear side. The area of the wetted surface should represent 25 to 50 percent of the area of the tube in contact with the sample and visible to the operator. The temperature at this point is taken as the initial melting point. The minute droplets resulting from the small particles that adhere to the wall of the capillary tube after the shrinkage of the sample should not be considered in arriving at the initial melting point. Neither should a darkening or color change of the sample be considered, but such changes should be noted along with any additional evidence of decomposition.

4.2.4.6.5 Calculation. Calculate the corrected initial melting point in degrees Celsius as follows:

$$A_i = B_i + D_i - C_i$$

where: A_i = Corrected initial melting point of unknown sample
B_i = Observed initial melting point of unknown sample
D_i = Assigned initial melting point of standard sample
C_i = Observed initial melting point of standard sample

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.2). When packaging of materiel is to be performed by DoD 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 command. 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.

5.2 Unit quantity. The urea shall be packed in 22.7 kilograms (kg), 45.4-kg, or 907.2-kg unit quantities as specified (see 6.2).

6. NOTES

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

6.1 Intended use. Class 1 urea is intended for use in the manufacture of other chemicals. Class 2 urea is intended for use in the melting of thin layers of ice at temperatures above -9 °C (15 °F) and for the prevention of ice accumulation on runways during freezing rain (urea is less corrosive to aircraft structural materials than rock salt (sodium chloride) and calcium chloride).

6.2 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Class of urea required (see 1.2).
c. The specific issue of individual documents referenced (see 2.2 and 2.3).
d. Packaging requirements (see 5.1).
e. Unit quantity (see 5.2).

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

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

6.5 Subject term (key word) listing.

aircraft
crystalline
deicing
prilled
runways
shotted

6.6 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:
Army - MD1
Navy - OS
Air Force - 11

Preparing Activity:
DLA - GS3

(Project 6810-1719)

Review Activity:
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 database at http://assist.daps.dla.mil.