QQ-F-838B
January 25, 1972
SUPERSEDING
Fed. Spec. QQ-F-838a
July 17, 1964

FEDERAL SPECIFICATION

FUSIBLE ALLOYS; INGOTS AND BARS

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

1. SCOPE

1.1 This specification covers two compositions of fusible alloys (see 3.1 and 6.1).

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 Standards:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies).
Fed. Test Method Std. No. 151 - Metals; Test Methods.

(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, D. C. 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.)

FSC 9630

Military Standards:

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

(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.)

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 shall be addressed to the American Trucking Association, Inc., Tariff Order Section, 1616 P. Street, Washington, DC 20036.)

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies shall be addressed to the Uniform Classification Committee, Room 202, Union Station, 516 W. Jackson Boulevard, Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Chemical composition. The chemical composition of fusible alloys shall be as shown in table I.

TABLE I. Chemical composition and melting ranges

Composition	Chemical composition, percent				Melting ranges	
	Lead	Tin	Bismuth	Cadmium	Solidus 1/	Liquidus 1/
A	26-28	12-14	48-51	9-12	158°F. (70°C.)	170°F. (77°C.)
B	39-41	-	51-52	8-9	195°F. (91°C.)	220°F. (104°C.

1/ It should be noted that the alloys are completely solid below the solidus and completely liquid above the liquidus temperature.

3.2 Melting range. Ingots and bars of fusible alloys shall have melting ranges within the limits shown in table I.

3.3 Tube bending ability (composition A). The characteristics of composition A alloys shall be such as to permit tube bending, as described in 4.5.3, without cracks, kinks, or other evidence of unequal bending in the tube. There shall also be no dross or particles of adhering alloy remaining in the tube when the alloy is remelted and poured out.

3.4 Shapes and sizes.

3.4.1 Composition A. Fusible alloys shall be furnished in ingots of commercial standard forms or shapes, each weighing 5 pounds or under.

3.4.2 Composition B. Fusible alloys shall be furnished in ingots of commercial standard forms or shapes, or in 1/4-inch or 3/8-inch bars, 24 inches long or over.

3.5 Identification marking. Unless otherwise specified by the procuring activity each ingot or bar shall be legibly and indelibly marked or stamped with the Federal specification number and the manufacturer's name or trademark (see 6.2).

3.6 Workmanship. Ingots and bars shall be of uniform quality, composition and appearance, smooth and free from excessive dross, scum, dirt, or foreign material.

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, the supplier may utilize his own facilities or any commercial laboratory acceptable to 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 Lot. A lot shall consist of all the material from one melt, submitted for inspection as a unit with a total weight of 2,000 pounds, or under.

4.3 Sampling.

4.3.1 Sampling for chemical analysis. A sample for chemical analysis shall be taken from each lot. The selected sample shall be cut in half. One half shall be marked and held in reserve until after acceptance of the lot. The remaining half shall be saw cut, without using lubricants at approximately equal intervals of 1 inch or less throughout its entire length. The sawings shall be thoroughly mixed and samples weighing 5 ounces, or more, shall be taken from the sawings.

4.3.2 Sampling for other tests. One sample from each lot shall be selected for each of the other tests described in 3.2 and 3.3.

4.3.3 Sampling for visual examination. From each lot of material, samples for visual examination shall be selected in accordance with inspection level I of MIL-STD-105. The acceptable quality level (AQL) shall be 1.5 percent defective.

4.4 Visual examination. Each sample selected in accordance with 4.3.3 shall be examined for compliance with shape and size requirements (see 3.4), marking requirements (see 3.5) and workmanship requirements (see 3.6).

4.4.1 Examination of preparation for delivery. Prior to shipment, examination shall be made for compliance with the requirements of section 5.

4.5 Test procedures.

4.5.1 Chemical analysis. The samples obtained in accordance with 4.3.1 shall be analyzed in accordance with method 111 or 112 of Fed. Test Method Std. No. 151. A single analysis of a composite sample may be made. In case of dispute, analysis by method 111 shall be the basis for acceptance or rejection.

4.5.2 Determination of melting ranges. A sample of the fusible alloy shall be heated in a suitable refractory container until the alloy is completely molten. A temperature indicator (thermometer or thermocouple) shall be inserted into the molten metal. The source of heat shall then be removed and the molten alloy allowed to cool slowly at a rate not less than 10°F. (5.5°C.) nor greater than 18°F. (10°C.) per minute while constantly being stirred. Temperature readings shall be made every 10 seconds and recorded until the alloy is completely solid. From the readings obtained, a cooling curve of temperature versus time shall be plotted on coordinate paper. The breaks in the cooling curve represent the transformation from liquid to solid state and shall be used to determine the liquidus and solidus temperatures. If any of the specimens have a higher liquidus or lower solidus than required in table I, the entire lot represented by the specimen shall be rejected.

4.5.3 Bend test (composition A). A soft aluminum tube approximately 3/4-inch in diameter shall be coated on the inner surface with a light engine oil and then filled with liquid fusible alloy. The tube shall then be immersed in cold water until the alloy has solidified and thoroughly cooled. The tube shall be bent through an angle of 180 degrees over a diameter equal to four times the diameter of the tube, on a suitable tube-bending apparatus. The bend surface of the tube shall be inspected for cracks, kinks, and other evidence of unequal bending. The tube shall then be immersed in boiling water and the liquid fusible alloy poured out, after which the tube shall be washed in gasoline or any other suitable oil solvent and blown out with compressed air. The inside of the tube shall be inspected for dross or adherent

particles of fusible alloy. A fusible alloy which does not allow satisfactory bending or which shows a tendency to stick to the inside of the tube shall be rejected.

4.6 Rejection.

4.6.1 Examination. Any sample unit containing one or more visual or dimensional defects shall be rejected. If the number of defective units in any sample exceeds the acceptance number specified in 4.3.3 for that sample size, the entire lot represented by the sample shall be rejected.

4.6.2 Tests. A lot shall be rejected for failure to meet any of the test requirements when tested in accordance with 4.5, subject to the rejection and retest provisions of Fed. Test Method Std. No. 151.

5. PREPARATION FOR DELIVERY

5.1 Preservation and packaging. Unless otherwise specified preservation and packaging shall be level C (see 6.2).

5.1.1 Level C. Cleaning, drying, preservation, and packaging shall be in accordance with manufacturer's commercial practice.

5.2 Packing. Unless otherwise specified packing shall be level C (see 6.2)

5.2.1 Level C. Packing shall be in accordance with commercial practice adequate to insure acceptance and safe delivery by the carrier for the mode of transportation employed. Containers shall comply with the requirements of the Uniform Freight Classification or National Motor Freight Classification, as applicable to the mode of transportation.

5.3 Marking.

5.3.1 Civil agencies. In addition to any special marking required in the contract or order, marking of the shipping containers shall be in accordance with Fed. Std. No. 123.

5.3.2 Military activities. In addition to any special marking required in the contract or order, marking of shipping containers shall be in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The fusible alloys specified herein are intended to be used as follows:

Composition A - For use in bending aluminum, aluminum alloy copper, and other types of tubing. Used for the manufacture of temporary tooling, forming dies, etc.

Composition B - For use in safety plugs of valves on cylinders for ground use.

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. Identification marking, if other than in 3.5.
c. Preparation for shipment if other than in 5.1 and 5.2.
d. Special marking, when required (see 5.3).

6.3 For accurate determination of melting ranges (see 3.2 and 4.5.2), the thermometer or thermocouple should be calibrated against known temperatures such as a water-ice mixture (32°F., 0°C.) and melting point of indium metal (313.5°F., 156.4°C.).

6.4 In performing the tube bending test (see 3.3 and 4.5.3), it should be noted that too much oil or improper filling (excessive splashing) may cause failure. Care should be taken in performing this test.

6.5 The packaging, packing, and marking requirements specified herein apply to direct shipment to the Government, and are not intended to apply to contracts or orders between the manufacturer and the prime contractor.

MILITARY CUSTODIANS:

Army - MR
Navy - SH
Air Force - 11

Preparing activity:
Army - MR

Review activities:

Air Force - 84

User activities:

Army - GL

Orders for this publication are to be placed with the 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 10 cents each.

SPECIFICATION ANALYSIS SHEET

Form Approved Budget Bureau No. 119-R004

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.

SPECIFICATION

QQ-F-838B, Fusible Alloys; Ingots and Bars

ORGANIZATION	CITY AND STATE

CONTRACT NO	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
		$

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)*	DATE

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE

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