

SECTION C

This document covers shelf stable macaroni and cheese, cooked, dehydrated, packaged in a boil-in-bag (BIB) then overpacked in a barrier pouch for use by the Department of Defense as a component of operational rations.

C-1 ITEM DESCRIPTION

PCR-M-019, MACARONI AND CHEESE, COOKED, DEHYDRATED, PACKAGED IN A BOIL-IN-BAG (BIB)

Class and type.

Class.

Class 2 - Large opening fitment and cap
For use in Unitized Group Ration-Heat & Serve (UGR-H&S)

Type.

Type II - BIB without center seal

C-2 PERFORMANCE REQUIREMENTS

A. Product standard. A sample shall be subjected to first article (FA) or product demonstration model (PDM) inspection as applicable, in accordance with the tests and inspections of Section E of this Performance-based Contract Requirements (PCR) document. The approved sample shall serve as the product standard. Should the contractor at any time plan to or actually produce the product using different raw material or process methodologies from the approved product standard, which result in a product noncomparable to the product standard, the contractor shall submit a replacement FA or PDM for approval. In any event, all product produced must meet all requirements of this document including product standard comparability.

B. Shelf life. The packaged product, overpacked in a barrier pouch, shall meet the minimum shelf life requirement of 36 months at 80°F.

C. Dehydrated product.

(1) Appearance.

a. General. The finished product shall be cooked, dehydrated elbow macaroni covered in a cheddar cheese sauce powder. The product shall be fully dehydrated. The finished product shall be free from foreign materials.

b. Macaroni. The cooked, dehydrated macaroni shall be enriched, elbow shaped and shall be not less than 1/2 inch in length. The cooked, dehydrated macaroni shall be an off-white to light tan color. The macaroni may have a yellow-orange color from the sauce powder.

c. Sauce. The cooked, dehydrated cheddar cheese sauce shall be a light to medium yellow-orange color, free-flowing powder. The sauce powder may contain some clumps.

(2) Odor. The dehydrated packaged food shall have a cooked macaroni and cooked dairy odor. The dehydrated packaged food shall be free from foreign odors.

(3) Texture. The product shall not have wet or soft spots indicating incomplete dehydration.

D. Net weight. The average net weight shall be not less than 42.3 ounces (1200 grams). The net weight of an individual BIB shall be not less than 41.3 ounces (1170 grams).

E. Rehydrated product.

(1) Appearance.

a. General. The finished product shall be rehydrated elbow macaroni in a cheddar cheese sauce. The finished product shall be free from foreign materials.

b. Macaroni. The rehydrated elbow macaroni shall be discernible and shall be an off-white to light tan color. The macaroni may have a yellow-orange color from the sauce.

c. Sauce. The rehydrated cheddar cheese sauce shall be a light to medium yellow-orange color. The sauce shall be slightly smooth and moderately thick.

(2) Odor and flavor. The rehydrated packaged food shall have a cooked macaroni and mild cheddar cheese odor and flavor. The rehydrated packaged food shall be free from foreign odors.

(3) Texture.

- a. Macaroni. The rehydrated elbow macaroni shall be slightly soft to slightly firm.
- b. Sauce. The rehydrated cheddar cheese sauce shall be creamy and moderately thick.

F. Palatability and overall appearance. The finished product shall be equal to or better than the approved product standard in palatability and overall appearance.

G. Analytical requirements.

- (1) Protein. The protein content shall be not less than 18.0 percent.
- (2) Fat. The fat content shall be not greater than 24.0 percent.
- (3) Sodium. The sodium content shall be not greater than 1550 mg per 100 grams.
- (4) Moisture. The moisture content of the dehydrated product shall be not greater than 3.0 percent.
- (5) Oxygen. The oxygen content of the headspace gas in the barrier pouch shall not exceed 2.0 percent.

H. Microbiological requirements.

- (1) Aerobic plate count. The aerobic plate count shall not be greater than 25,000 Colony Forming Units (CFU) per gram.
- (2) Escherichia coli (E. coli) count. *E. coli* shall have less than 10 CFU per gram or less than 3 Most Probable Number (MPN) per gram, where findings indicate zero colonies CFU per plate or zero tubes producing gas for MPN.
- (3) Salmonella. The *Salmonella* test shall be negative for each of five BIBs tested per production lot.

I. BIB filling and sealing. The product shall be packaged into the BIB and then into the barrier pouch within 96 hours from drying. If the product cannot be packaged within 96 hours, then the remaining product shall be adequately protected from moisture by either holding under a nitrogen atmosphere with 2.0 percent or less oxygen, or under a vacuum of at least 27 inches of mercury (27 Hg). If a vacuum is used, it shall be broken with nitrogen. Product may be held for a period not to exceed 30 days prior to packaging into BIBs.

SECTION D

D-1 PACKAGING

A. Packaging. The product shall be filled and sealed in a preformed BIB in accordance with PACKAGING REQUIREMENTS AND QUALITY ASSURANCE PROVISIONS FOR PRODUCT PACKAGED IN A BOIL-IN-BAG (BIB).

(1) Barrier pouch. One Class 2, Type II BIB and oxygen scavenger(s) (in accordance with the applicable assembly document) shall be placed in a barrier pouch having maximum outside dimensions of 18 by 18 inches. The pouch shall be made from a heat sealable barrier material. Note that material conforming to MIL-PRF-131 has been used. All four edges of the pouch shall be heat-sealed with seals not less than 1/8 inch wide. The BIB and oxygen scavenger(s) shall not be entrapped in the heat seals. The side, bottom and closure seals shall have an average seal strength of not less than 6 pounds per inch of width and no individual specimen shall have a seal strength of less than 5 pounds per inch of width. Alternatively, the filled and sealed pouch shall exhibit no rupture or seal separation greater than 1/16 inch or seal separation that reduces the effective closure seal width to less than 1/16 inch when tested for internal pressure resistance. A tear nick, notch or serrations shall be provided to facilitate opening of the filled and sealed pouch.

(2) Oxygen scavenger. The oxygen scavenger shall be constructed of materials that are safe for direct food contact. The oxygen scavenger shall be in compliance with all applicable Food and Drug Administration (FDA) regulations.

(3) Box. One barrier pouch with one Class 2, Type II BIB and oxygen scavenger(s) shall be packed in a box in accordance with the applicable assembly document. The box shall be style RSC, or telescoping design. If paperboard is used, it shall be minimum 0.028 inch thick and shall have a minimum basis weight of 100 pounds per square feet. The material may be coated. The material may be bleached. Corrugated materials of E, B, or C flute may also be used. The use of materials composed of the highest percentage of recovered materials practicable is encouraged. The outside dimensions of the carton shall not exceed 12-1/2 by 11-1/2 by 4-1/2 inches.

D-2 LABELING

A. Labeling. Each BIB shall be correctly and legibly labeled. Printing ink shall be permanent black ink or other dark contrasting color, which is free of carcinogenic elements. A carcinogenic-free pre-printed self-adhering clear polyester label printed with indelible contrasting ink may also be used. The label shall contain the following information:

- (1) Name of product (letters not less than 1/4 inch high)
- (2) Ingredients
- (3) Date 1/
- (4) Net weight
- (5) Contractor's name and address
- (6) Company code
- (7) "Nutrition Facts" label in accordance with the Nutrition Labeling and Education Act (NLEA) and all applicable FDA regulations

NOTE: There shall be a black line, minimum 1/16 inch thick, indicating the fill level.

1/ Each BIB shall have the date of pack noted by using either a four-digit code or five-digit code. When using the four-digit code, begin with the final digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 0045. When using the five-digit code, begin with the decade digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 50045. The Julian code shall represent the day the product was packaged into the BIB.

The following instructions shall be printed on the BIB:

YIELD: Serves 25 portions of approximately 3/4 cup each.

PREPARATION:

1. Shake BIB to settle contents. Open cap.
2. Support BIB on flat surface.
3. Add about 112 ounces (14 cups) of potable water to fill line. Replace cap.
4. Shake BIB until contents are rehydrated. Knead if necessary.
5. Remove cap and remove excess air from BIB. Replace cap.

WARNING: Do not heat BIB in oven.

Rehydrated food should be used within one hour unless refrigerated for use within 24 hours.

COOKING:

IN WATER: Place rehydrated closed BIB in boiling water. Simmer gently 25 minutes. At 15 minutes, remove from boiling water and thoroughly knead the pouch to mix the contents. Return the pouch to the boiling water. Avoid overcooking (BIB may show evidence of bulging).

TO TRANSPORT AFTER HEATING: Insert BIB into an insulated food container or empty cooked product into an insulated food container to protect during transport.

CAUTION: Use care when opening as pressure may have been generated within the BIB.

TO OPEN: Cut bottom of BIB with clean knife.

Note: The font tested by DEVCOM Soldier Center was Microsoft Helvetica. The font used shall be similarly clear/easy to read as Helvetica. The recommended font sizes are as follows: 22 for the product name, 14 for “yield” and “cooking/heating.” If an additional note is required on the label it should also be in font size 14. All other information should be in font size 9.

(1) The product shall be formulated and labeled in accordance with all FDA labeling regulations and policies. The BIBs shall be labeled with the following product name:

MACARONI AND CHEESE, COOKED, DEHYDRATED

B. Barrier pouch. Each barrier pouch shall be correctly and legibly labeled. Printing ink shall be permanent black ink or other dark contrasting color, which is free of carcinogenic elements. The label shall contain the following information:

- (1) Name of product (letters not less than 1/4 inch high)
- (2) Contents
- (3) Date 1/
- (4) Contractor's name and address

In addition, the label shall contain the following warnings:

DO NOT OPEN WITH KNIFE
USE IMMEDIATELY

DO NOT STORE REHYDRATED PRODUCT IN BOIL-IN-BAG POUCHES

1/ Each barrier pouch shall have the date of pack noted by using either a four-digit code or five-digit code. When using the four-digit code, begin with the final digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 0045. When using the five-digit code, begin with the decade digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 50045. The Julian code shall represent the day the product was packaged into the BIB.

C. Box. Each box shall be correctly and legibly labeled. Printing ink shall be permanent black ink or other, dark, contrasting color. The label shall contain the following information:

- (1) Name of product (letters not less than 1/4 inch high)
- (2) Contents
- (3) Date 1/
- (4) Contractor's name and address

1/ Each box shall have the date of pack noted by using either a four-digit code or five-digit code. When using the four-digit code, begin with the final digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 0045. When using the five-digit code, begin with the decade digit of the current year followed by the three-digit Julian code. For example, 14 February 2050 would be coded as 50045. The Julian code shall represent the day the product was packaged into the BIB.

D-3 PACKING

A. Packing. Not more than 40 pounds of product shall be packed in a fiberboard shipping box constructed in accordance with style RSC of ASTM D5118/D5118M, Standard Practice for Fabrication of Fiberboard Shipping Boxes. The fiberboard shall conform to type CF, class D, variety SW, minimum burst grade 200 or ECT 32 of ASTM D4727/D4727M, Standard Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes. Each box shall be closed in accordance with ASTM D1974/D1974M, Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes.

D-4 UNITIZATION

A. Unit loads. Unit loads shall be as specified in accordance with DLA Troop Support Form 3507, Loads, Unit: Preparation of Semiperishable Subsistence Items.

D-5 MARKING

A. Shipping containers and unit loads. Shipping containers and unit loads shall be marked in accordance with DLA Troop Support Form 3556, Marking Instructions for Boxes, Sacks, and Unit Loads of Perishable and Semiperishable Subsistence.

SECTION E INSPECTION AND ACCEPTANCE

The following quality assurance criteria, utilizing ANSI/ASQ Z1.4, Sampling Procedures and Tables for Inspection by Attributes, are required. Unless otherwise specified, single sampling plans indicated in ANSI/ASQ Z1.4 will be utilized. When required, the manufacturer shall provide the Certificate(s) of Conformance to the appropriate inspection activity. Certificate(s) of Conformance not provided shall be cause for rejection of the lot.

A. Definitions.

(1) Critical defect. A critical defect is a defect that judgment and experience indicate would result in hazardous or unsafe conditions for individuals using, maintaining, or depending on the item; or a defect that judgment and experience indicate is likely to prevent the performance of the major end item, i.e., the consumption of the ration.

(2) Major defect. A major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose.

(3) Minor defect. A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit.

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

(1) Product standard inspection. The first article or product demonstration model shall be inspected in accordance with the provisions of this document and evaluated for appearance, odor, flavor, and texture. Any failure to conform to the performance requirements or any appearance or palatability failure shall be cause for rejection of the lot.

(2) Periodic review evaluation. The approved first article or product demonstration model shall be used as the product standard for periodic review evaluations. All food components that are inspected by the USDA shall be subject to periodic review sampling and evaluation. The USDA shall select sample units during production of contracts and submit them to the following address for evaluation:

COMBAT CAPABILITIES DEVELOPMENT COMMAND (DEVCOM) SOLDIER CENTER
FCDD-SCD-SCR
10 GENERAL GREENE AVENUE
NATICK, MA 01760-5000

One lot shall be randomly selected during each calendar month of production or as otherwise specified in the contract. Two (2) sample units shall be randomly selected from that one production lot. The two (2) sample units shall be shipped to DEVCOM Soldier Center within five (5) working days from the end of the production month from which they are randomly selected and upon completion of all USDA inspection requirements. The sample units will be evaluated for overall quality against the current first article or product demonstration model.

(3) Conformance inspection. Conformance inspection shall include the examinations/tests and methods of inspection cited in this section and in PACKAGING

REQUIREMENTS AND QUALITY ASSURANCE PROVISIONS FOR PRODUCT
PACKAGED IN A BOIL-IN-BAG (BIB).

E-5 QUALITY ASSURANCE PROVISIONS (PRODUCT)

A. Product examination. The finished product shall be examined for compliance with the performance requirements specified in Section C of this Product Contract Requirements document utilizing the double sampling plans indicated in ANSI/ASQ Z1.4. The lot size shall be expressed in BIBs. The sample unit shall be the contents of one BIB. The inspection level shall be S-2 and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 1.5 for major defects and 6.5 for minor defects. Defects and defect classifications are listed in table I.

TABLE I. <u>Product defects 1/ 2/</u>		
Category		Defect
<u>Major</u>	<u>Minor</u>	
<u>Dehydrated product</u>		
<u>Appearance</u>		
101		Product not cooked or not dehydrated elbow macaroni or not covered in a cheddar cheese sauce powder.
102		Product not fully dehydrated. <u>3/</u>
	201	Cooked, dehydrated macaroni not enriched elbow shaped or is less than 1/2 inch in length. <u>4/</u>
	202	Cooked, dehydrated macaroni not an off-white to light tan color.
	203	Cooked, dehydrated cheddar cheese sauce not a light to medium yellow-orange color or not a free-flowing powder.
<u>Odor</u>		
103		Dehydrated packaged food does not have a cooked macaroni or not a cooked dairy odor.
<u>Texture</u>		
104		Product has wet or soft spots indicating incomplete dehydration.

TABLE I. Product defects 1/ 2/ - Continued

Category		Defect
<u>Major</u>	<u>Minor</u>	
		<u>Net weight</u>
	204	Net weight of an individual BIB less than 41.3 ounces (1170 grams). <u>5/</u>
		<u>Rehydrated Product 6/</u>
		<u>Appearance</u>
105		Product not rehydrated elbow macaroni or not in a cheddar cheese sauce.
	205	Rehydrated elbow macaroni not discernible or not an off-white to light tan color.
	206	Rehydrated cheddar cheese sauce not a light to medium yellow-orange color.
	207	Rehydrated cheddar cheese sauce not slightly smooth or not moderately thick.
		<u>Odor and flavor</u>
106		Rehydrated packaged food does not have a cooked macaroni or not mild cheddar cheese odor or flavor.
		<u>Texture</u>
	208	Rehydrated elbow macaroni not slightly soft to slightly firm.
	209	Rehydrated cheddar cheese sauce not creamy or not moderately thick.

1/ Presence of any foreign materials such as, but not limited to dirt, insect parts, hair, glass, wood, or metal, or any foreign odors or flavors such as, but not limited to burnt, scorched, rancid, sour, stale, musty or moldy or foreign color shall be cause for rejection of the lot. Foreign flavor is not applicable to dehydrated product.

2/ Finished product not equal to or better than the approved product standard in palatability and overall appearance shall be cause for rejection of the lot. Palatability not applicable to dehydrated product.

3/ Presence of dark colored cores or a glazed surface area more than 0.25 inch in any dimension.

4/ Verification of macaroni as enriched elbow shaped macaroni product shall be with the statement of ingredients on the label or verified by Certificate of Conformance (CoC). Length of elbow macaroni shall be verified by CoC.

5/ Sample average net weight less than 42.3 ounces (1200 grams) shall be cause for rejection of the lot.

6/ Prior to conducting the rehydrated product examination, the product shall be rehydrated and cooked per BIB instructions.

B. Methods of inspection.

(1) Shelf life. The contractor shall provide a Certificate of Conformance (CoC) that the product has a 36 month shelf life when stored at 80°F. Government verification may include storage for 6 months at 100°F or 36 months at 80°F. Upon completion of either storage period, the product will be subjected to a sensory evaluation panel for appearance and palatability and must receive an overall score of 5 or higher based on a 9 point quality scale to be considered acceptable.

(2) Net weight. The net weight of the filled and sealed BIBs shall be determined by weighing each sample unit on a suitable scale tared with a representative empty BIB and cap. Results shall be reported to the nearest 0.1 ounce or to the nearest 1 gram.

(3) Analytical. The sample to be analyzed shall be a one-pound composite from three filled and sealed BIBs that have been selected at random from one lot. The composite sample shall be blended to uniformity using a blender or food processor. The blending must be rapid and conducted in such a way that minimum heat is transferred to the product and that the product has minimum exposure to atmospheric moisture. The composite sample shall be analyzed in accordance with the following Official Methods of Analysis (OMA) of AOAC International:

<u>Test</u>	<u>Method Number</u>
Protein	988.05 or 992.15
Fat	925.12 or 933.05
Sodium	984.27, 985.35, 2011.14, or 2011.19

Moisture 1/ 927.05 2/, 950.46A 2/, 985.14 3/, or 2008.06

1/ Moisture determination may be performed on a calibrated Brookfield Ametek Computrac Moisture Analyzer using the manufacturer's recommended instructions for test method and sample preparation. Moisture analysis on this device shall be performed at 100°C.

2/ The temperature-time cycle for moisture analysis shall be modified by using a temperature of 70°C for 16 hours at a pressure of not more than 100 mm of mercury.

3/ AOAC method 985.14 may also be performed after the method has been validated against method 950.46A 2/.

Test results for the protein, fat and moisture shall be reported to the nearest 0.1 percent. Test results for sodium shall be reported to the nearest 1 milligram per 100 grams. Government verification will be conducted through actual testing by a Government laboratory. Any result not conforming to the analytical requirements specified in Section C of this Performance-based Contract Requirements document shall be cause for rejection of the lot.

(4) Oxygen testing. Eight filled and sealed barrier pouches shall be randomly selected from one production lot and individually tested for oxygen content. Testing shall be accomplished after the filled and sealed barrier pouches have been allowed to equilibrate at room temperature for not less than 144 hours from the time of sealing. Test results shall be reported to the nearest 0.01 percent. Any individual result not conforming to the oxygen content requirement shall be classified as a major defect and shall be cause for rejection of the lot.

(5) Microbiological testing. The finished product shall be tested for microbiological activity. Five filled and sealed BIBs shall be selected at random from the lot regardless of lot size. The product shall be individually tested for microbiological levels in accordance with the OMA of AOAC International or the Food and Drug Administration (FDA) Bacteriological Analytical Manual (BAM). Government verification will be conducted through actual testing by a Government laboratory. Any result not conforming to the microbiological requirements specified in Section C of this Performance-based Contract Requirements document shall be cause for rejection of the lot.

<u>Test</u>	<u>Method Number</u>
Aerobic plate count	966.23, 990.12, or BAM Ch. 3
<i>E. coli</i>	991.14 or BAM Ch. 4
<i>Salmonella</i>	967.26, 967.28, 991.13, 2003.09, 2004.03, 2013.09, or BAM Ch. 5

NOTE: The following condition applies for *Salmonella* and microbiological testing:

USDA *Salmonella* and additional microbiological testing is required for each end item lot and shall be the basis for lot acceptance with respect to *Salmonella* and other microbiological testing requirements.

E-6 QUALITY ASSURANCE PROVISIONS (PACKAGING AND PACKING MATERIALS)

A. Inspection for packaging, labeling, packing, and marking shall be in accordance with the PACKAGING REQUIREMENTS AND QUALITY ASSURANCE PROVISIONS FOR PRODUCT PACKAGED IN A BOIL-IN-BAG (BIB).

SECTION J REFERENCE DOCUMENTS

Unless otherwise specified, the applicable version of these documents is that which is active on the date of the solicitation or contract.

DLA Troop Support Forms

Form 3507	Loads, Unit: Preparation of Semiperishable Subsistence Items
Form 3556	Marking Instructions for Boxes, Sacks, and Unit Loads of Perishable and Semiperishable Subsistence

SPECIFICATION

PACKAGING REQUIREMENTS AND QUALITY ASSURANCE PROVISIONS
FOR PRODUCT PACKAGED IN A BOIL-IN-BAG (BIB)

GOVERNMENT PUBLICATION

FDA Bacteriological Analytical Manual (BAM), 8th Edition
<http://www.fda.gov/food/foodscienceresearch/laboratorymethods/ucm2006949.htm>

DEPARTMENT OF DEFENSE SPECIFICATION

MIL-PRF-131 Barrier Materials, Watervaporproof, Greaseproof, Flexible,
Heat-Sealable

(Copies of these documents are available from <https://quicksearch.dla.mil>.)

NON-GOVERNMENTAL STANDARDS

AMERICAN SOCIETY FOR QUALITY (ASQ) www.asq.org

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

ASTM INTERNATIONAL www.astm.org

D1974/D1974M Standard Practice for Methods of Closing, Sealing, and
Reinforcing Fiberboard Boxes

D4727/D4727M Standard Specification for Corrugated and Solid Fiberboard
Sheet Stock (Container Grade) and Cut Shapes

D5118/D5118M Standard Practice for Fabrication of Fiberboard Shipping
Boxes

AOAC INTERNATIONAL www.aoac.org

Official Methods of Analysis (OMA) of AOAC International