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INCH POUND

MIL-DTL-32221B
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SUPERSEDING
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DETAIL SPECIFICATION

FILLED BAKERY ITEM, SHELF STABLE, FOR OPERATIONAL RATIONS

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 shelf stable filled bakery item in a flexible pouch intended for use by the Department of Defense as a component of operational rations.

1.2 Classification. The product will be of the following types as specified (see 6.1).

1.2.1 Types. The types are as follows:

Type I - Filled French toast
Type II - Cinnamon bun
Type III - Apple turnover
Type IV - Blueberry turnover
Type V - Cherry turnover

Comments, suggestions, or questions on this document should be addressed to: US Army Research, Development & Engineering Command, Natick Soldier Research, Development and Engineering Center, RDNS-SEC-F, 15 Kansas Street, Natick, MA 01760-5056 or emailed to elizabeth.r.painter2.civ@mail.mil. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at https://assist.dla.mil.

AMSC N/A FSC 8920

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2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are specified in sections 3, 4, or 5 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 documents cited in sections 3, 4, or 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. None.

2.2.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications 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.

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

Federal Food, Drug, and Cosmetic Act and regulations promulgated thereunder (21 CFR Parts 1-199)

(Copies of this document are available online at www.gpoaccess.gov/nara or from the Superintendent of Documents, ATTN: New Orders, P.O. Box 371954, Pittsburgh, PA 15250-7954.)

U.S. ENVIRONMENTAL PROTECTION ACENCY (EPA)

National Primary Drinking Water Regulations

(Copies of this document are available online at www.epa.gov or from the Office of Drinking Water, Environmental Protection Agency, WH550D, 401 M Street, SW, Washington, DC 20460.)

2.3 Non-Government publications. The following documents 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.

AOAC INTERNATIONAL

Official Methods of Analysis (OMA) of AOAC International

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(Copies of this document are available from www.aoac.org or AOAC International, 2275 Research Boulevard, Suite 300, Rockville, MD 20850-3250.)

AMERICAN ASSOCIATION OF CEREAL CHEMISTS (AACC)

Approved Methods of the American Association of Cereal Chemists

(Copies of this document are available from www.aaccnet.org or American Association of Cereal Chemists, 3340 Pilot Knob Road, St. Paul, MN 55121.)

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

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

(Copies of this document are available from www.asq.org or ASQ, 600 North Plankinton Ave., Milwaukee, WI 53203.)

NATIONAL ACADEMY OF SCIENCES

Food Chemicals Codex

(Copies of this document are available from www.nap.edu or National Academy Press, 2101 Constitution Avenue, N.W. Washington, DC 20418.)

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 Product standard. When specified (see 6.1), a sample shall be subjected to first article (FA) or product demonstration model (PDM) inspection as applicable, in accordance with 4.2. 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.

3.2 Ingredients. All ingredients shall be clean, sound, wholesome, and free from foreign material, evidence of rodent or insect infestation, extraneous material, off-flavors, off-odors, and

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off-colors. All ingredients shall meet and be in accordance with good commercial manufacturing practices.

3.2.1 Ingredients for bread.

3.2.1.1 Flour. The flour shall be matured, bleached, enriched, hard wheat flour, which will produce a product in compliance with 3.5. Alternatively, unenriched flour may be used provided the equivalent enrichments required in the Code of Federal Regulations (CFR) for Standard of Identity for Enriched Flour (21 CFR Part 137.165) are added at the time of production of the finished product. The flour used for preparation of the dough shall have a protein content of not less than 12.5 percent. Amylolytic enzyme activity, as determined by the "falling number" method shall not be less than 225. Flour not meeting protein requirements but otherwise in compliance may be supplemented with vital wheat gluten to the required protein level.

3.2.1.2 Water. Water used for formulation and washing shall conform to the National Primary Drinking Water Regulations.

3.2.1.3 Shortening. Solid non-hydrogenated shortening shall be made from refined, bleached, deodorized palm oil commonly used by the baking industry and shall have a free fatty acid content of less than or equal to 0.1 percent, a Peroxide Value of less than or equal to 1 meq/kg, and a Mettler Dropping Point between 106-114°F. The shortening shall be a creamy, opaque white oil that possesses a bland clean odor and flavor. The shortening may contain regulated additives/ingredients. Shortening used for greasing dough trough, dough pieces, or baking molds shall conform to the above requirements.

3.2.1.4 Maple flakes. For Type I, the maple flakes shall have a flake size of 10.0 by 4.0 by 1.9 mm. Flakes shall have a medium brown color and a maple odor and flavor (see 6.2.1).

3.2.1.5 Cinnamon flakes. For Type I, II, and III cinnamon flakes shall have a flake size of 10.0 by 4.0 by 1.9 mm. Flakes shall have a medium brown to dark brown color and a cinnamon odor and flavor (see 6.2.2).

3.2.1.6 Glycerol. The glycerol shall comply with the Food Chemicals Codex.

3.2.1.7 Yeast, instant dry. Yeast shall be active dry baker's yeast instant dry. Compressed yeast shall not be used.

3.2.1.8 Salt. Salt shall be iodized, white, refined sodium chloride with or without anti-caking agents.

3.2.1.9 Emulsifier. The emulsifier shall be sucrose fatty acid esters complying with the 21 CFR Part 172.859 and shall be limited to sucrose ester stearate having a Hydrophilic-Lipophilic

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Balance (HLB) number of approximately sixteen.

3.2.1.10 French toast flavor. For Type I, the appearance shall be an off-white colored powder with a sweet maple and French toast odor and flavor (see 6.2.3).

3.2.1.11 Gum arabic. Gum arabic shall comply with the Food Chemicals Codex and shall have been produced from a solution of gum arabic which has been spray dried.

3.2.1.12 Calcium sulfate. Calcium sulfate shall comply with the Food Chemicals Codex.

3.2.1.13 Xanthan gum. Xanthan gum shall comply with the Food Chemicals Codex.

3.2.1.14 Sorbic acid, encapsulated. Encapsulated sorbic acid shall comply with the Food Chemicals Codex. The encapsulated sorbic acid shall consist of 70 ± 2 percent sorbic acid and 30 ± 2 percent vegetable oil. The vegetable oil shall have a melting point of 141°F to 147°F (61ºC to 64ºC) (see 6.2.4).

3.2.1.15 FD&C Yellow #5 Alum Lake. The lake shall be a yellow, water insoluble pigment made by absorbing FD&C Yellow #5 dye on a substrate of Alumina. The pure dye range shall be 35 to 42 percent (see 6.2.5).

3.2.1.16 Vital wheat gluten. Vital wheat gluten shall have a protein content (N x 5.7) of not less than 71.0 percent and a moisture content of not more than 6.5 percent.

3.2.1.17 Oxidizer/conditioner/mix reducer. For Type II, the oxidizer/conditioner/mix reducer shall be Im-Prove 200 or equal complying with the Food Chemicals Codex (see 6.2.6).

3.2.1.18 Sugar, white, granulated. For Type II, sugar shall be white, refined, granulated cane or beet sugar, or a combination thereof.

3.2.1.19 Butter flavor. For Type II, the butter flavor shall be a yellow powder with a creamy artificial butter odor and flavor (see 6.2.7).

3.2.1.20 Blueberry flavor. For Type IV, the appearance shall be a white colored powder with a blueberry odor and flavor (see 6.2.8).

3.2.1.21 Blueberry flakes. For Type IV, the blueberry flakes shall have a flake size of 10.0 by 4.0 by 1.9 mm. Flakes shall have a white to an off-white color with a blueberry odor and flavor (see 6.2.9).

3.2.1.22 Strawberry mini flakes. For Type V, the strawberry mini flakes shall have a flake size of 10.0 by 4.0 by1.9 mm. Flakes shall have a medium red color and shall have a strawberry

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odor and flavor (see 6.2.10).

3.3 Preparation and processing.

3.3.1 Preparation of bread.

3.3.1.1 Preparation of type I, filled French toast dough. The bread shall be formulated from the following ingredients in the proportions specified:

Ingredient	Percent by weight
Flour 1/	46.6
Water 1/	25.2
Shortening	7.8
Maple flakes	6.0
Cinnamon flakes	4.7
Glycerol	4.6
Yeast (instant dry only) 1/	1.8
Salt	1.1
Emulsifier	0.7
French toast flavor	0.5
Gum arabic	0.5
Calcium sulfate	0.2
Xanthan gum	0.2
Sorbic acid, encapsulated	0.09
FD&C Yellow #5 Alum Lake	0.01

1/ The percent by weight of flour, water and yeast may be adjusted, if necessary, to compensate for in-plant processing equipment, humidity and temperature conditions.

The bread shall be manufactured by the straight dough method. The following procedure has been shown to produce product meeting the end item requirements:

a. Begin with lowest mixing speed.
b. Mix all dry ingredients except flavor flakes.
c. Add shortening and mix to crumble consistency.
d. Add water and mix until incorporated.
e. Add glycerol and mix until dough forms ball.
f. Increase speed and continue mixing until dough develops.
g. Add the maple and cinnamon flakes at the last stage of dough development.
h. Chill dough sufficiently such that it will sheet into pieces that will meet end item requirements.

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3.3.1.2 Preparation of type II, cinnamon bun dough. The bread shall be formulated from the following ingredients in the proportions specified:

Ingredient	Percent by weight
Flour 1/	47.5
Water 1/	25.8
Shortening	8.2
Glycerol	6.0
Cinnamon flakes	4.7
Yeast (instant dry only) 1/	1.9
Sugar	1.9
Salt	1.2
Emulsifier	0.9
Oxidizer/conditioner/mix reducer	0.5
Gum arabic	0.5
Vital wheat gluten	0.3
Calcium sulfate	0.24
Xanthan gum	0.23
Sorbic acid, encapsulated	0.09
Butter flavor	0.03
FD&C Yellow #5 Alum Lake	0.01

1/ The percent by weight of flour, water and yeast may be adjusted, if necessary, to compensate for in-plant processing equipment, humidity and temperature conditions.

The bread shall be manufactured by the straight dough method. The following procedure has been shown to produce product meeting the end item requirements:

a. Begin with lowest mixing speed.
b. Mix all dry ingredients except flavor flakes.
c. Add shortening and mix to crumble consistency.
d. Add water and mix until incorporated.
e. Add glycerol and mix until dough forms ball.
f. Increase speed and continue mixing until dough develops.
g. Add the cinnamon flakes at the last stage of dough development.
h. Chill dough sufficiently such that it will sheet into pieces that will meet end item requirements.

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3.3.1.3 Preparation for Type III, apple turnover dough. The bread shall be formulated from the following ingredients in the proportions specified:

Ingredients	Percent by weight
Flour, bread 1/	46.9
Water 1/	29.1
Shortening	7.9
Cinnamon flakes	6.6
Glycerol	4.7
Yeast (instant dry only) 1/	1.9
Salt	1.2
Emulsifier	0.7
Gum arabic	0.5
Calcium sulfate	0.2
Xanthan gum	0.2
Sorbic acid, encapsulated	0.09
FD&C Yellow #5 Alum Lake	0.01

1/ The percent by weight of flour, water and yeast may be adjusted, if necessary, to compensate for in-plant processing equipment, humidity and temperature conditions.

The bread shall be manufactured by the straight dough method. The following procedure has been shown to produce product meeting the end item requirements:

a. Begin with lowest mixing speed.
b. Mix all dry ingredients except flavor flakes.
c. Add shortening and mix to crumble consistency.
d. Add water and mix until incorporated.
e. Add glycerol and mix until dough forms ball.
f. Increase speed and continue mixing until dough develops.
g. Add cinnamon flakes at last stage of dough development. Time to develop varies on batch size and mixer.
h. Chill dough sufficiently such that it will sheet into pieces that will meet end item requirements.

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3.3.1.4 Preparation for Type IV, blueberry turnover dough. The bread shall be formulated from the following ingredients in the proportions specified:

Ingredients	Percent by weight
Flour, bread 1/	47.6
Water 1/	29.6
Shortening	8.0
Blueberry flakes	5.0
Glycerol	4.7
Yeast (instant dry only) 1/	1.9
Salt	1.2
Emulsifier	0.8
Gum arabic	0.5
Blueberry flavor	0.2
Calcium sulfate	0.2
Xanthan gum	0.2
Sorbic acid, encapsulated	0.09
FD&C Yellow #5 Alum Lake	0.01

1/ The percent by weight of flour, water and yeast may be adjusted, if necessary, to compensate for in-plant processing equipment, humidity and temperature conditions.

The bread shall be manufactured by the straight dough method. The following procedure has been shown to produce product meeting the end item requirements:

a. Begin with lowest mixing speed.
b. Mix all dry ingredients except flavor flakes.
c. Add shortening and mix to crumble consistency.
d. Add water and mix until incorporated.
e. Add glycerol and mix until dough forms ball.
f. Increase speed and continue mixing until dough develops.
g. Add blueberry flakes at last stage of dough development. Time to develop varies on batch size and mixer.
h. Chill dough sufficiently such that it will sheet into pieces that will meet end item requirements.

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3.3.1.5 Preparation for Type V, cherry turnover dough. The bread shall be formulated from the following ingredients in the proportions specified:

Ingredients	Percent by weight
Flour, bread 1/	47.71
Water 1/	29.62
Shortening	8.02
Strawberry flakes	5.01
Glycerol	4.75
Yeast (instant dry only) 1/	1.89
Salt	1.19
Emulsifier	0.76
Gum arabic	0.47
Calcium sulfate	0.23
Xanthan gum	0.23
Sorbic acid, encapsulated	0.11
FD&C Yellow #5 Alum Lake	0.01

1/ The percent by weight of flour, water and yeast may be adjusted, if necessary, to compensate for in-plant processing equipment, humidity and temperature conditions.

The bread shall be manufactured by the straight dough method. The following procedure has been shown to produce product meeting the end item requirements:

a. Begin with lowest mixing speed.
b. Mix all dry ingredients except flavor flakes.
c. Add shortening and mix to crumble consistency.
d. Add water and mix until incorporated.
e. Add glycerol and mix until dough forms ball.
f. Increase speed and continue mixing until dough develops.
g. Add strawberry flakes at last stage of dough development. Time to develop varies on batch size and mixer.
h. Chill dough sufficiently such that it will sheet into pieces that will meet end item requirements.

3.3.2 Inspection of fillings.

3.3.2.1 All filling mixtures shall be cooled at room temperature and not refrigerated. The fillings shall be used in the final product or frozen within 60 days. See Section 6 NOTES for suggested filling formulations.

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3.3.2.2 The filling mixture water activity (a_w) shall not be greater than 0.84. A Certificate of Analysis (CoA) will be required.

3.3.2.3 If frozen, the fillings shall be held at 0°F (-18°C) or below for not more than 180 days. A Certificate of Conformance (CoC) will be required.

3.3.3 Preparation of filled bakery item.

3.3.3.1 Sheeting and filling. The chilled dough shall be sheeted into pieces of sufficient weight and filled to ensure compliance with finished product net weight requirements.

3.3.3.2 Forming.

3.3.3.2.1 Type I. For type I, the filling weight shall be a minimum 1.1 ounces (31.2 grams). The formed product made with a dough weight of 3.0 ounces (85.0 grams) and filling weight of 1.1 ounces (31.2 grams) and a final product weight of 4.1 ounces (116.2 grams) prior to proofing and baking have been shown to meet end item requirement weights.

3.3.3.2.2 Type II. For type II, the filling weight shall be a minimum 0.8 ounces (22.7.grams). The formed product made with a dough weight of 3.3 ounces (93.6 grams) and filling weight of 0.8 ounces (22.7 grams) and a final product weight of 4.1 ounces (116.2 grams) prior to proofing and baking have been shown to meet end item requirement weights.

3.3.3.2.3 Types III, IV and V. For type III, IV and V, the filling weight shall be a minimum 1.3 ounces (38 grams). The formed product made with a dough weight of 2.3 ounces (63 grams) and filling weight of 1.3 ounces (38 grams) and a final product weight of 3.6 ounces (101 grams) prior to proofing and baking have been shown to meet end item requirement weights.

3.3.3.3 Proofing. The formed product shall be proofed at 90ºF to 100ºF (32ºC to 38ºC) and 75 to 100 percent relative humidity (RH) for 40 to 70 minutes. Fluctuations due to opening and closing of proof box doors are acceptable as long as end item requirements are met.

3.3.3.4 Baking. The proofed product shall be fully baked to a minimum internal temperature of 180°F (82°C) and until the exterior is a uniform medium golden brown.

3.4 Packaging methods. A continuous method shall be used. One unit of a filled bakery item and one oxygen scavenger shall be placed into the pouch. The internal temperature of the product shall be not less than 80ºF (27ºC) or greater than 120ºF (49ºC).

3.4.1 Oxygen scavenger. The oxygen scavenger shall be constructed of materials that are safe for direct and indirect food contact, and shall be suitable for use with edible products. The oxygen scavenger shall be in compliance with all applicable FDA regulations.

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3.5 Finished product requirements. The finished product shall comply with the following requirements:

a. There shall be no foreign materials such as, but not limited to dirt, insect parts, hair, glass, wood, or metal.

b. There shall be no foreign odors or flavors such as, but not limited to burnt, scorched, rancid, sour, stale, musty or moldy.

c. There shall be no foreign color to the product.

d. For type I and II, no individual pouch shall contain less than 3.5 ounces (99 grams). For type III, IV, and V no individual pouch shall contain less than 3.1 ounces (88 grams).

e. Each pouch shall contain one intact unit of filled bakery item and one intact oxygen scavenger.

f. The water activity (a_w) for any individual pouch shall not be greater than 0.86 when measured at 77ºF (25ºC).

g. The oxygen content of the filled and sealed pouch shall not exceed 0.30 percent after 48 hours from time of sealing.

h. The texture of the bread shall not be excessively dry and crumbly or excessively moist and gummy.

i. The bread shall be slightly dense and have a uniform cell structure.

j. The bread shall show no evidence of compression streaks.

k. The crust color shall be a uniform medium golden-brown.

l. The crust shall show no evidence of excessive flour dusting.

m. The filling shall not be excessively thin or runny.

n. The filled bakery items shall not have filling leakage through the bread portion of the product.

o. The type I product shall have a sweet maple and French toast odor and flavor and shall have a light to medium golden-brown colored gel matrix.

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p. For type I, the crust shall have visible dark brown maple flakes.

q. The type II, product shall have a sweet cinnamon odor and flavor and shall have a medium to dark brown colored gel matrix.

r. For type II and III, the crust shall have visible dark brown cinnamon flakes.

s. For type III, the product shall have a sweet, cooked apple pie odor and flavor and shall have visible apple pieces throughout the tan to pale yellow colored gel matrix.

t. For type IV, the product shall have a sweet, cooked blueberry odor and flavor and shall have visible blueberry pieces throughout the dark blue to purple colored gel matrix.

u. For type V, the product shall have a sweet, slightly tart, cooked cherry odor and flavor and shall have visible cherry pieces throughout the cherry-red colored gel matrix.

v. For type V, the crust shall have visible medium red to dark red fruit flakes.

w. For types I and II, the product shall be a square or rectangular shape.

x. For types III, IV, and V, the product shall be a half circle shape.

3.5.1 Palatability and overall appearance. The finished product shall be equal to or better than the approved product standard (see 6.1) in palatability and overall appearance.

3.6 Plant qualifications. The product shall be prepared, processed and packaged in establishments meeting the requirements of 21 CFR Part 110 “Current Good Manufacturing Practice in Manufacturing, Processing, Packaging, or Holding of Human Food”, and the plant sanitation requirements of the appropriate Government inspection agency.

3.7 Federal Food, Drug, and Cosmetic Act. All deliveries shall conform in every respect to the provisions of the Federal Food, Drug, and Cosmetic Act and regulations promulgated thereunder.

4. VERIFICATION

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

a. Product standard inspection (see 4.2).

b. Conformance inspection (see 4.3).

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4.2 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.

4.2.1 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:

US Army Research, Development and Engineering Command
Natick Soldier Research, Development and Engineering Center
RDNS-SEC-F
15 Kansas Street
Natick, MA 01760-5056

One lot shall be randomly selected during each calendar month of production or as otherwise specified in the contract. Three (3) sample units of each item produced shall be randomly selected from that one production lot. The three (3) sample units shall be shipped to Natick 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.

4.2.2 Product examination. The filled and sealed pouches shall be conditioned to 70ºF to 80ºF (21ºC to 27ºC) and examined for the defects listed in table I. The lot size shall be expressed in pouches. The sample unit shall be the contents of one pouch. Utilizing the double sampling plans indicated in ANSI/ASQ Z1.4, the inspection level shall be S-3 and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 1.5 for major defects and 4.0 for minor defects.

4.3 Conformance inspection. Conformance inspection shall include the examinations of 4.2.1, 4.3.1, 4.3.2, and the tests of 4.4.1 and 4.4.2.

4.3.1 Component and material inspection. Components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.3.2 Ingredient and component examination. Conformance of ingredients and components to identity, condition, and other requirements specified in 3.2 shall be certified by the ingredient supplier or ingredient manufacturer, and compliance shall be verified by examination of

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pertinent labels, markings, US Grade Certificates, Certificates of Analyses (CoA), or other such valid documents acceptable to the inspection agency. If necessary, each ingredient shall be examined organoleptically or inspected according to generally recognized test methods such as the standard methods described in the Official Methods of Analysis (OMA) of AOAC International and in the Approved Methods of the American Association of Cereal Chemists, to determine conformance to the requirements. Any nonconformance to an identity, condition, or other requirement shall be cause for rejection of the ingredient or component lot or of any involved product.

TABLE I. Product defects 1/ 2/

Category		Defect
Major	Minor	
		General
101		Product not type as specified.
	201	Product shape not as specified.
102		Pouch does not contain one intact unit of filled bakery item or does not contain one intact oxygen scavenger. 3/
103		Tear or hole or open seal in oxygen scavenger.
		Bread
104		Bread texture excessively dry or crumbly or excessively moist or gummy.
	202	Bread not slightly dense or not a uniform cell structure.
	203	Bread shows evidence of compression streaks.
		Crust
	204	Crust color not a uniform medium golden-brown.
	205	Crust shows evidence of excessive flour dusting.
		Filling
	206	Filling excessively thin or runny.
105		Leakage of filling from the bread portion of the product. 4/

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TABLE I. Product defects 1/ 2/ - Continued

Category		Defect
Major	Minor	
		Type I
106		Product does not have a sweet maple or French toast odor or flavor.
	207	Product does not have a light to medium golden-brown colored gel matrix.
	208	Crust contains no visible dark brown maple flakes.
		Type II
107		Product does not have a sweet cinnamon odor or flavor.
	209	Product does not have a medium to dark brown colored gel matrix.
	210	Crust contains no visible dark brown cinnamon flakes.
		Type III
108		Product does not have a sweet, cooked apple pie odor or flavor.
	211	Crust contains no visible dark brown cinnamon flakes.
	212	Product does not have visible apple pieces throughout the tan to pale yellow colored gel matrix.
		Type IV
109		Product does not have a sweet, cooked blueberry odor or flavor.
	213	Product does not have visible blueberry pieces throughout the dark blue to purple colored gel matrix.
		Type V
110		Product does not have a sweet, slightly tart, cooked cherry odor or flavor.
	214	Crust contains no visible medium red to dark red fruit flakes.

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TABLE I. Product defects 1/ 2/ - Continued

Category		Defect
Major	Minor	
	215	Product does not have visible cherry pieces throughout the cherry-red colored gel matrix.
		Net weight
	216	For Types I and II, net weight of an individual pouch less than 3.5 ounces (99 grams). 5/
	217	For Types III, IV, and V, net weight of an individual pouch less than 3.1 ounces (88 grams). 5/

1/ Presence of any foreign materials for example, dirt, insect parts, hair, glass, metal 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.

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 (see 3.5.1).

3/ Construction of the oxygen scavenger and compliance with FDA regulations will be verified by CoC.

4/ Filling leaking from an opening less than 1/2 inch is acceptable.

5/ The net weight of the filled and sealed pouches shall be determined by weighing each sample on a suitable scale tared with a representative empty pouch and one oxygen scavenger. Results shall be reported to the nearest 0.1 ounce or to the nearest 1 gram.

4.4 Tests. A CoA for the filling mixture a_w is required (see 3.3.2). A CoC for filling storage time and temperature is required (see 3.3.2).

4.4.1 Water activity (a_w) testing. Eight filled and sealed pouches shall be randomly selected from one production lot and tested for a_w in accordance with the latest edition of the Official Methods of Analysis (OMA) of AOAC International, method 978.18, using an electric hygrometer system self temperature controlled at 77ºF (25°C) or an equivalent instrument. Water activity shall be determined not less than 4 days but not more than 14 days after baking to allow moisture equilibration in the product. The sample unit shall be a specimen from the center of the product. Test results shall be reported to the nearest 0.01 a_w. Government verification will be conducted through actual testing by a Government laboratory. Any nonconforming a_w result shall be cause for rejection of the lot (see 3.5).

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4.4.2 Oxygen content testing. Eight filled and sealed pouches shall be randomly selected from one production lot and individually tested for oxygen content. Testing shall be accomplished after the filled and sealed pouches have been allowed to equilibrate at room temperature for not less than 48 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 in 3.5 shall be classified as a major defect and shall be cause for rejection of the lot.

5. PACKAGING

5.1 Packaging. For acquisition purposes, the packaging requirements shall be as specified in the contract or order (see 6.1). When actual packaging of material is to be performed by DoD personnel, these personnel need to contact the responsible packaging activity to ascertain requisite packaging requirements. Packaging requirements are maintained by the Inventory Control Point's packaging activity within the Military Department or Defense Agency, or within the Military Department'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.

6. NOTES

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

6.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number, and date of this specification.
b. Type of product required (see 1.2).
c. When other than first article or product demonstration model is required (see 3.1).
d. Provisions for approved product standard samples (see 3.5.1).
e. Packaging requirements (see 5.1).

6.2 Source information for bread ingredients.

6.2.1 Maple flakes. SensoryEffects Maple NT - 2471 mini flakes manufactured by Loders Croklaan, 24708 West Durkee Rd, Channahon, IL 60410 meets the requirements of 3.2.1.4 and performs satisfactorily in this product.

6.2.2 Cinnamon flakes. SensoryEffects Cinnamon NT – 20259 mini flakes manufactured by Loders Croklaan, 24708 West Durkee Rd, Channahon, IL 60410 meets the requirements of 3.2.1.5 and performs satisfactorily in this product.

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6.2.3 French toast flavor. Michaelok Artificial French Toast Flavor # 1466 manufactured by David Michael & Co, 10801 Decatur Road, Philadelphia, PA 19154 meets the requirements of 3.2.1.10 and performs satisfactorily in this product.

6.2.4 Sorbic acid, encapsulated. Encapsulated sorbic acid manufactured by Balchem Corporation, Slate Hill, NY 10973 meets the requirements of 3.2.1.14 and performs satisfactorily in this product.

6.2.5 FD&C Yellow #5 Alum Lake. No. 09609 FD&C Yellow #5 Alum Lake 35 to 42 percent manufactured by Sensient Colors, 2526 Baldwin Street, St. Louis, MO 63106 meets the requirements of 3.2.1.15 and performs satisfactorily in this product.

6.2.6 Oxidizer/conditioner/mix reducer. Im-Prove 200 manufactured by CARAVAN, Totowa, NJ 07512, meets the requirements of 3.2.1.17 and performs satisfactorily in this product.

6.2.7 Butter flavor. Butter flavor 4425-28 manufactured by Edlong, Elk Grove Village, IL 60007 meets the requirements of 3.2.1.19 and performs satisfactorily in this product.

6.2.8 Blueberry flavor. Blueberry flavor number 3535 manufactured by David Michael & Co., Inc., 10801 Decatur Road, Philadelphia, PA 19154 meets the requirements of 3.2.1.20 and performs satisfactorily in this product.

6.2.9 Blueberry flakes. Mini No Color Blueberry Chips manufactured by SensoryEffects, 24 North Clinton Street, Defiance, OH 43512 meets the requirements of 3.2.1.21 and performs satisfactorily in this product.

6.2.10 Strawberry mini flakes. Strawberry mini flakes product number 01489 manufactured by SensoryEffects, 24 North Clinton Street, Defiance, OH 43512 meets the requirements of 3.2.1.22 and performs satisfactorily in this product.

6.3 Filling formulas and ingredients. The following filling formulas and ingredients have been successfully made at the Natick Soldier Research, Development and Engineering Center and a commercial manufacturer to produce end items meeting the requirements. Ingredient suppliers and available specific ingredients may change (companies bought out, part numbers change, ingredients no longer supplied, etc.). The following filling formulations are recommendations and have been proven successful.

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6.3.1 Preparation of type I filling. The maple filling may be formulated and prepared from the following ingredients in the proportions specified:

Ingredient	Percent by weight
High fructose corn syrup	32.7
Water	23.4
Crystalline dextrose	14.0
Imitation maple syrup	9.5
Corn syrup	9.3
Glycerol	4.7
Tapioca starch	2.8
Waxy maize starch	2.8
Imitation maple flavor	0.77
Moisture migration inhibitor	0.03

The following procedural steps have been shown to produce end items meeting the requirements:

a. Premix starches, gum and dextrose to eliminate clumping.
b. Mix syrups to blend completely.
c. Add dry ingredients to syrup mixture slowly, stirring constantly.
d. Mix in flavor and water.
e. Heat mixture, add glycerol after mixture reaches at least 100°F (38°C).
f. Cook filling mixture to a water activity (a_w) of 0.84.

6.3.2 Preparation of type II filling. The cinnamon filling may be formulated and prepared from the following ingredients in the proportions specified:

Ingredients	Percent by Weight
High fructose corn syrup	36.3
Water	23.4
Crystalline dextrose	14.0
Corn syrup	12.0
Glycerol	5.0
Ground cinnamon	3.3
Tapioca starch	2.5
Waxy maize starch	2.5
Imitation vanilla flavor	0.97
Moisture migration inhibitor	0.03

The following procedural steps have been shown to produce end items meeting the requirements:

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a. Premix starches, gum and dextrose to eliminate clumping.
b. Mix syrups to blend completely.
c. Add dry ingredients to syrup mixture slowly, stirring constantly.
d. Mix in flavor and water.
e. Heat mixture, add glycerol after the mixture reaches at least 100°F (38°C).
f. Cook filling mixture to a water activity (a_w) of 0.84.

6.3.3 Preparation of type III filling. The apple filling may be formulated and prepared from the following ingredients in the proportions specified:

Ingredient	Percent by weight
High fructose corn syrup	21.0
Water	20.9
Dried infused apple	20.9
Apple juice concentrate	11.0
Crystalline dextrose	10.7
Corn syrup	7.1
Glycerol	3.6
Tapioca starch	2.1
Waxy maize starch	2.1
Vanilla extract	0.56
Moisture migration inhibitor	0.02
Ground cinnamon	0.01
Apple flavor	0.01

The following procedural steps have been shown to produce end items meeting the requirements:

a. Premix starches, gum and dextrose to eliminate clumping.
b. Mix syrups and fruit concentrate to blend completely.
c. Add dry ingredients to syrup mixture slowly, stirring constantly.
d. Mix in flavor and water.
e. Heat mixture, add glycerol after the mixture reaches at least 100°F (38°C).
f. Cook filling mixture to a water activity (a_w) of 0.84.
g. Stir in dried apples and cinnamon.

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6.3.4 Preparation of type IV filling. The blueberry filling may be formulated and prepared from the following ingredients in the proportions specified:

Ingredient	Percent by weight
High fructose corn syrup	21.1
Water	20.9
Blueberry juice concentrate	11.1
Crystalline dextrose	10.7
Infused dried cultivated blueberries	10.5
Infused dried cranberries, blueberry flavored	10.5
Corn syrup	7.1
Glycerol	3.6
Tapioca starch	2.14
Waxy maize starch	2.14
Blueberry flavor	0.19
Moisture migration inhibitor	0.02
Natural blue coloring agent 1/	0.01

The following procedural steps have been shown to produce end items meeting the requirements:

a. Premix starches, gum and dextrose to eliminate clumping.
b. Mix syrups and fruit concentrate to blend completely.
c. Add dry ingredients to syrup mixture slowly, stirring constantly.
d. Mix in flavor and water.
e. Heat mixture, add glycerol after the mixture reaches at least 100°F (38°C).
f. Cook filling mixture to a water activity (a_w) of 0.84.
g. Stir in blueberry flavored infused dried cranberries and infused dried cultivated blueberries.

1/ Artificial blueberry color has been shown to change to a green color during extended storage time, therefore, it is not recommended to be used in this filling.

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6.3.5 Preparation of type V filling. The cherry filling may be formulated and prepared from the following ingredients in the proportions specified:

Ingredient	Percent by weight
High fructose corn syrup	20.1
Water	19.9
Infused dried red tart cherries	14.9
Crystalline dextrose	10.2
Infused dried cranberries, cherry flavored	10.0
Corn syrup	6.8
Apple juice concentrate	5.4
Cherry juice concentrate	5.1
Glycerol	3.4
Tapioca starch	2.03
Waxy maize starch	2.03
Cherry flavor	0.11
Moisture migration inhibitor	0.02
Artificial red coloring agent	0.01

The following procedural steps have been shown to produce end items meeting the requirements:

a. Premix starches, gum and dextrose to eliminate clumping.
b. Mix syrups and fruit concentrates to blend completely.
c. Add dry ingredients to syrup mixture slowly, stirring constantly.
d. Mix in flavor and water.
e. Heat mixture, add glycerol after the mixture reaches at least 100°F (38°C).
f. Cook filling mixture to a water activity (a_w) of 0.84.
g. Stir in cherry flavored infused dried cranberries and infused dried red tart cherries.

6.4 Oxygen scavenger. Oxygen scavenger suitable for the purpose may be obtained from the Multiform Desiccants, Inc., Buffalo, NY 14224. Other approved oxygen scavengers may be used.

6.5 Shelf life. This specification covers items where shelf life is a consideration. Specific shelf-life requirements should be specified in the contract or purchase order. The shelf-life codes are contained in the Federal Logistics Information System Total Item Record. Additive information for shelf-life management may be obtained from DoD 4140.27-M; Shelf-life Management Manual, or the designated shelf-life Points of Contact (POC). The POC should be contacted in the following order: (1) the Inventory Control Points (ICPs), and (2) the DoD Service and Agency administrators for the DoD Shelf-Life Program. Appropriate POCs for the

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DoD Shelf-Life Program can be contacted through the DoD Shelf-Life Management website: http://www.shelflife.hq.dla.mil/.

6.6 Subject term (key word) listing.

Combat field feeding

6.7 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 - GL
Navy - SA
Air Force – 35

Preparing activity:

Army - GL

(Project 8920-2015-001)

Review activities:

Army - MD, QM
Navy - MC
DLA - SS

Civil agency:

USDA - FV

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 Online database at https://assist.dla.mil.