

**SECTION C**

This document covers shelf stable energy gel packaged in a flexible pouch for use by the Department of Defense as a component of operational rations. The gel is designed to deliver high caloric content and low volume/weight.

**C-1 ITEM DESCRIPTION**

**PCR-E-018, ENERGY GEL, PACKAGED IN A FLEXIBLE POUCH, SHELF STABLE**

Flavors.

Flavor I -	Mixed Berry
Flavor II -	Lemon Lime
Flavor III -	Orange

Packages.

Package A -	Meal, Cold Weather (MCW)
Package B -	Food Packet, Long Range Patrol (LRP)
Package C -	Meal, Ready-to-Eat™ (MRE™)
Package J -	First Strike Ration® (FSR®)
Package L-	Food Packet, Modular Operational Ration Enhancement (MORE)

**C-2 PRODUCT 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 Product 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 non comparable 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. Commercial sterility. The packaged food shall be processed until commercially sterile.

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

C. Shelf life. The packaged product shall meet the minimum shelf life requirement of 36 months at 80°F.

D. Appearance.

(1) General. The finished product shall have a cohesive and soft, jelly-like appearance. The finished product shall have a gel matrix with a very slight tendency to flow and no separation or syneresis shall be apparent. The finished product shall be free from foreign materials.

a. Flavor I. The mixed berry gel shall have a translucent medium to bright red color.

b. Flavor II. The lemon lime gel shall have a translucent bright greenish – yellow color.

c. Flavor III. The orange gel shall have a translucent medium to bright orange color.

E. Odor and flavor. The packaged food shall be free from foreign odors and flavors.

(1) Flavor I. The mixed berry gel shall have a distinct berry odor and flavor characteristic of raspberry and strawberries with moderate sweet and tart flavor attributes.

(2) Flavor II. The lemon lime gel shall have a distinct lemon and lime odor and flavor with moderate sweet and tart flavor attributes.

(3) Flavor III. The orange gel shall have a distinct orange odor and flavor with moderate sweet and tart flavor attributes.

F. Texture. The gel shall have a tender and soft, jelly-like texture with a smooth mouth feel.

G. Net weight. The net weight shall be not less than 2.1 ounces (60 grams).

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

I. Analytical requirements.

(1) pH. The pH shall be not greater than 4.00.

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

(2) Brix. The brix measurement shall be not less than 50° brix.

J. Product formulation and ingredients. The following formulas shall be used. Ingredient suppliers and available specific ingredients may change (companies bought out, part numbers change, ingredients no longer supplied, and etc.). Any changes in ingredients or formula will need to be approved by U.S. Army Natick Soldier Research, Development and Engineering Center (NSRDEC).

(1) Flavor I, Mixed Berry.

<u>Ingredients</u>	<u>Percent by weight</u>
Water, distilled, deionized	43.639
Maltodextrin <u>1/</u>	42.0
Sucrose (fine grind table sugar)	8.0
High oleic canola oil <u>2/</u>	5.0
Citric acid	0.3
Konjac flour <u>3/</u>	0.28
Modified food starch <u>4/</u>	0.2
Potassium citrate	0.15
Gellan gum <u>5/</u>	0.14
Xanthan gum	0.14
Mixed berry flavor burst <u>6/</u>	0.13
Antioxidant <u>7/</u>	0.016
Wild cherry red <u>8/</u>	0.005

1/ Maltodextrin shall have a dextrose equivalent of 16.5 to 19.9 and moisture content not greater than 6.0. The bulk density shall be 33.0 to 43.0 pounds/cubic feet. “Maltrin 180” from Grain Processing Corporation, 1600 Oregon St. Muscatine, IA 52761-1494 meets this requirement.

2/ High oleic canola oil shall have a free fatty acid content as oleic not greater than 0.05 percent and an Oxygen Stability Index of not less than or equal to 11 hours at 110°C. The “Clear Valley 65 High Oleic Canola Oil” from Cargill Corporation, PO Box 9300 Minneapolis, MN 55440-9300 meets this requirement.

3/ Konjac flour shall be derived from the tubers of Amorphophallus and contain 95% soluble fiber. “Konjac Flour Propol RS” from SunOpta Inc. 5850 Opus Parkway Suite 150 Minnetonka, MN 55343 meets this requirement.

4/ Modified food starch shall be derived from waxy maize. The modified food starch shall have a moisture content of 10 to 12 percent and a pH of 5 to 7 percent. The modified food

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

starch shall be resistant to high temperature, low pH, and shear. “Thermtex” from National Starch and Chemical Co. 10 FINDERNE Ave. Bridgewater, NJ 08807 meets this requirement.  
5/ Gellan Gum shall be a fine mesh multifunctional gelling agent. Not less than 97 percent shall fall through a 100 mesh (150µm). Food Chemicals Codex, 21 CFR § 172.665. “KELCOGEL F” from CP Kelco, 1000 Parkwood Circle Suite 1000 Atlanta, GA 30339 meets this requirement.

6/ “Mixed Berry Flavor Burst number 528175” from Givaudan Flavors Corporation, 1199 Edison Dr. Cincinnati, OH 45216.

7/ Antioxidant shall contain 31-33% emulsifier, 29-31% corn oil, 19-21 percent TBHQ and 2.7-3.3 percent citric acid, “Tenox 20A Food Grade Antioxidant” from Eastman Chemicals, Box 431 Kingsport, TN 37660 meets this requirement.

8/ “Wild Cherry Red Shade number 7598” from Sensient Technologies, 777 East Wisconsin Ave. Milwaukee, WI 53202-5304.

(2) Flavor II, Lemon Lime.

<u>Ingredients</u>	<u>Percent by weight</u>
Water, distilled, deionized	43.484
Maltodextrin <u>1/</u>	42.0
Sucrose (fine grind table sugar)	8.0
High oleic canola oil <u>2/</u>	5.0
Citric acid	0.3
Konjac flour <u>3/</u>	0.28
Modified food starch <u>4/</u>	0.2
Lemon lime flavor, oil based <u>5/</u>	0.2
Potassium citrate	0.15
Gellan gum <u>6/</u>	0.14
Xanthan gum	0.14
Antioxidant <u>7/</u>	0.016
Lemon yellow natural color <u>8/</u>	0.09

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2/ High oleic canola oil shall have a free fatty acid content as oleic not greater than 0.05 percent and an Oxygen Stability Index of not less than or equal to 11 hours at 110°C. The

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

“Clear Valley 65 High Oleic Canola Oil” from Cargill Corporation, PO Box 9300 Minneapolis, MN 55440-9300 meets this requirement.

3/ Konjac flour shall be derived from the tubers of Amorphophallus and contain 95% soluble fiber. “Konjac Flour Propol RS” from SunOpta Inc. 5850 Opus Parkway Suite 150 Minnetonka, MN 55343 meets this requirement.

4/ Modified food starch shall be derived from waxy maize. The modified food starch shall have a moisture content of 10 to 12 percent and a pH of 5 to 7 percent. The modified food starch shall be resistant to high temperature, low pH, and shear. “Thermtex” from National Starch and Chemical Co. 10 Finderne Ave. Bridgewater, NJ 08807 meets this requirement.

5/ “Natural Lemon Lime Conc Extract oil based GM-1414” from Fleurochem Inc., 33 Sprague Ave, Middletown, NY 10940-5128.

6/ Gellan Gum shall be a fine mesh multifunctional gelling agent. Not less than 97 percent shall fall through a 100 mesh (150µm). Food Chemicals Codex, 21 CFR § 172.665. “KELCOGEL F” from CP Kelco, 1000 Parkwood Circle Suite 1000, Atlanta, GA 30339 meets this requirement.

7/ Antioxidant shall contain 31-33% emulsifier, 29-31% corn oil, 19-21percent TBHQ and 2.7-3.3 percent citric acid, “Tenox 20A Food Grade Antioxidant” from Eastman Chemicals, Box 431 Kingsport, TN 37660 meets this requirement.

8/ “Lemon Yellow Natural Color number 0321” from Colormaker Inc. 3309 E. Miraloma Ave. Suite 105 Anaheim, CA 92806.

(3) Flavor III, Orange.

<u>Ingredients</u>	<u>Percent by weight</u>
Water, distilled, deionized	43.634
Maltodextrin <u>1/</u>	42.00
Sucrose (fine grind table sugar)	8.0
High oleic canola oil <u>2/</u>	5.0
Citric acid	0.3
Konjac flour <u>3/</u>	0.28
Modified food starch <u>4/</u>	0.2
Potassium citrate	0.15
Gellan gum <u>5/</u>	0.14
Xanthan gum	0.14
Orange flavor <u>6/</u>	0.13
Antioxidant <u>7/</u>	0.016
FD&C Yellow number 6 Lake Concentrate	0.01

**PCR-E-018**

**3 March 2010**

**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

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2/ High oleic canola oil shall have a free fatty acid content as oleic not greater than 0.05 percent and an Oxygen Stability Index of not less than or equal to 11 hours at 110°C. The “Clear Valley 65 High Oleic Canola Oil” from Cargill Corporation, PO Box 9300 Minneapolis, MN 55440-9300 meets this requirement.

3/ Konjac flour shall be derived from the tubers of Amorphophallus and contain 95% soluble fiber. “Konjac Flour Propol RS” from SunOpta Inc. 5850 Opus Parkway Suite 150 Minnetonka, MN 55343 meets this requirement.

4/ Modified food starch shall be derived from waxy maize. The modified food starch shall have a moisture content of 10 to 12 percent and a pH of 5 to 7 percent. The modified food starch shall be resistant to high temperature, low pH, and shear. “Thermtex” from National Starch and Chemical Co. 10 FINDERNE AVE. BRIDGEWATER, NJ 08807 meets this requirement.

5/ Gellan Gum shall be a fine mesh multifunctional gelling agent. Not less than 97 percent shall fall through a 100 mesh (150µm). Food Chemicals Codex, 21 CFR § 172.665. “KELCOGEL F” from CP Kelco, 1000 Parkwood Circle Suite 1000 Atlanta, GA 30339 meets this requirement.

6/ “Juicy Orange flavor GM-4600” from Fleurochem Inc., 33 Sprague Ave. Middletown, NY 10940-5128.

7/ Antioxidant shall contain 31-33% emulsifier, 29-31% corn oil, 19-21percent TBHQ and 2.7-3.3 percent citric acid, “Tenox 20A Food Grade Antioxidant” from Eastman Chemicals, Box 431 Kingsport, TN 37660 meets this requirement.

K. Preparation and processing (General for all flavors). The following preparation and processes were used at U.S. Army Natick Soldier Research, Development, and Engineering Center for processing the energy gels. Industrial preparation, processing and equipment may be used to produce product of same quality as produced at U.S. Army Natick Soldier Research, Development, and Engineering Center.

(1) Equipment. High shear mixer (Robo Coupe 6X Blixer), fitted with serrated “S” blades or equivalent that achieves appropriate dispersion of gums and ensures proper gel matrix development.

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

(2) Preparation. Group ingredients as follows and mix each individual group so the ingredients are well blended and uniformly distributed.

- a. Gums mixture includes Konjac flour, xanthan gum, Gellan gum, and potassium citrate.
- b. Sugar mixture includes maltodextrin, sucrose and starch.
- c. Oil mixture includes high oleic canola oil and antioxidants
- d. Acid, color and dry flavor mixture includes citric acid, artificial colors, and dry flavors as applicable.
- e. Liquid mixture includes room temperature distilled, de-ionized water and liquid flavors as applicable.

(3) Mixing.

- a. Add liquid mixture to mixer and begin agitation.
- b. Slowly add gum mixture to mixer while agitating. This must be done carefully to prevent clumping of the gums. Pulse agitation or other techniques of adding the gums to the water may be used.
- c. Mix until gums and water form a semi-solid, uniform gel matrix. No clumps of aggregated starch and/or gums shall be present.
- d. Reduce the mixer speed and slowly add half of the sugar mixture.
- e. While mixer is operating add in the oil mixture in and mix until product is completely uniform.
- f. Add remainder of the sugar mixture and blend until uniformly dispersed.
- g. Add the acid, color, flavor mixture and mix until the gel is completely uniform. There shall be no apparent clumps of gums, starch or maltodextrin present. The gel texture will be a soft gel and able to flow.

(4) Thermal processing. The gel shall be thermally processed in accordance with Title 21 of the Code of Federal Regulations, Parts 114 & 108 (21CFR114 & 21CFR108.25), for Acidified Foods.

**PCR-E-018**

**3 March 2010**

**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

a. Records of processing temperatures. Recording charts of all heating and cooling times and temperatures, regardless of type of system used, shall be maintained. The charts shall be taken from recorders, which have been accurately calibrated in the applicable temperature range and time recording function. The recording clock time and actual time shall be synchronized during all processing operations. The charts shall also include the date, plant identification, operator, contract number, lot number, and product being run (for example, startup water, product, and post rinses). The charts shall be maintained for three years and shall be made available for review by the government inspector.

b. Continuity of preparation, processing, and packaging. The gel shall be prepared, processed, and filled into a pouch in a continuous manner with minimum delay between the various stages.

(5) Pouch filling and sealing. ~~The gel shall be aseptically filled (hot filled) at 170° to 180°F into a pouch, fabricated and constructed as specified in D-1,A(1), and sealed immediately after filling.~~ The gel shall be hot-filled into a pouch, fabricated and constructed as specified in D-1,A(1), and sealed immediately after filling.

(6) Filled pouch cooling temperature requirements. The filled and sealed pouch of gel shall be water cooled, air cooled or a combination of both, sufficiently to ensure that the product temperature in the center of the pouch shall be below 100°F prior to packing for shipment to ration assembler. If water cooling is utilized, the pouches shall be thoroughly dry before packing.

## **SECTION D**

### **D-1 PACKAGING**

A. Packaging. The 2.1 ounces (60 grams) of product shall be filled into a pouch as described below.

(1) Pouches.

a. Pouch material. The pouches shall be fabricated from 0.002 inch thick polyolefin film laminated or extrusion coated to 0.00035 inch thick aluminum foil which is then laminated to 0.0005 inch thick polyester. The three plies shall be laminated with the polyester on the exterior of the pouch. Tolerances for the thickness of plastic films shall be plus or minus 20 percent and tolerance for the foil layer shall be plus or minus 10 percent. The polyolefin layer of bag material shall be suitably formulated for hot fill or post-fill processing. The material shall show no evidence of delamination, degradation, or foreign



**PCR-E-018**

**3 March 2010**

**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

odor when heat-sealed or fabricated into pouches. The material shall be suitably formulated for food packaging and shall not impart an odor or flavor to the product. For package A (MCW), the exterior surface of the pouch shall be colored white with a color in the range of 37778 through 37886 of FED-STD-595, Colors Used in Government Procurement. For package B (LRP), package C (MRE™), package J (FSR®), and package L (MORE) the exterior surface of the pouch shall be uniformly colored in the range of 20219, 30219, 30227, 30279, 30313, 30324, or 30450 of FED-STD-595.

b. Pouch construction. The pouch shall be a flat style pouch having maximum inside dimensions of 2-7/8 inches wide by 6 inches long. The pouch shall be made by heat sealing three edges with 3/8 inch (-1/8 inch, +3/16 inch) wide seals. The side and bottom 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 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. Excess pouch material at the edges of the pouch shall not exceed 3/16 inch. A 1/8 inch wide lip may be incorporated at the open end of the pouch.

c. Pouch filling and sealing. The 2.1 ounces (60 grams) of product shall be filled into the pouch and the pouch sealed. The closure seal shall be free of foldover wrinkles or entrapped matter that reduces the effective closure seal width to less than 1/16 inch. Seals shall be free of impression or design on the seal surface that would conceal or impair visual detection of seal defects. The average seal strength shall be 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 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. The pouch shall show no aberration in the pouch material or heat seals. Filled and sealed pouches showing aberrations shall withstand a minimum internal pressure of 17 pounds per square inch gauge (psig) for 30 seconds to verify package integrity. Not less than 24 hours after hot-filling, the pouches shall withstand an internal pressure of 17 psig for 30 seconds without 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.

**D-2 LABELING**

A. Pouches. Each 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:

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

- (1) Name and flavor of product (letters not less than 1/8 inch high)
- (2) Ingredients
- (3) Date 1/
- (4) Net weight
- (5) Name and address of packer
- (6) "Nutrition Facts" label in accordance with the Nutrition Labeling and Education Act (NLEA) and all applicable FDA regulations.
- (7) KNEAD PACKAGE BEFORE OPENING

1/ Each pouch shall have the date of pack noted by using a four digit code beginning with the final digit of the current year followed by the three digit Julian day code. For example, 14 February 2011 would be coded as 1045. The Julian day code shall represent the day the product was packaged into the pouch.

### **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-L, of ASTM D 5118/D 5118M, Standard Practice for Fabrication of Fiberboard Shipping Boxes. The fiberboard shall conform to type CF, class D, variety SW, grade 200 of ASTM D 4727/D 4727M, Standard Specification for Corrugated and Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes. Each box shall be closed in accordance with ASTM D 1974, Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes.

### **D-5 MARKING**

A. Shipping containers. Shipping containers shall be marked in accordance with DSCP 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.

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

(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 overall appearance and palatability. Any failure to conform to the product requirements or any appearance or palatability failure shall be cause for rejection of the lot. 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-CFF  
15 Kansas Street  
Natick, MA 01760-5056

One lot shall be randomly selected during each calendar month of production. Six (6) sample units of each item produced shall be randomly selected from that one production lot. The six (6) sample units shall be shipped to Natick within five working days from the end of the production month and upon completion of all USDA inspection requirements. The sample units will be evaluated for the characteristics of appearance, odor, flavor, texture and overall quality.

(2) Conformance inspection. Conformance inspection shall include the product examination and the methods of inspection cited in this section.

**E-5 QUALITY ASSURANCE PROVISIONS (PRODUCT)**

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

A. Product examination. The finished product shall be examined for compliance with the product 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 pouches. The sample unit shall be the contents of one pouch. 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. Defects and defect classifications are listed in table I. The pouches shall be kneaded prior to conducting any portion of the product examination.

TABLE I. Product defects 1/ 2/

Category		Defect
<u>Major</u>	<u>Minor</u>	
		<u>General</u>
101		Product not flavor as specified.
		<u>Appearance</u>
	201	Gel not cohesive or not soft or not jelly-like.
	202	Gel does not have a slight tendency to flow.
	203	Gels show syneresis or separation 3/.
	204	Flavor I mixed berry gel not a translucent medium to bright red color.
	205	Flavor II lemon lime gel not a translucent bright greenish to yellow color.
	206	Flavor III orange gel not a translucent medium to bright orange color.
		<u>Odor and flavor</u>
102		Flavor I mixed berry gel not a distinct berry odor or flavor characteristic of raspberry and strawberries with moderate sweet or tart flavors.
103		Flavor II lemon lime not a distinct lemon or lime odor or flavor with moderate sweet or tart flavors.

TABLE I. Product defects 1/ 2/ - Continued

Category		Defect
<u>Major</u>	<u>Minor</u>	
104		Flavor III orange gel not a distinct orange odor or flavor with moderate sweet or tart flavors.
		<u>Texture</u>
	207	Gel not soft or not tender or not jelly-like.
	208	Gel does not have a smooth mouth feel.
		<u>Net weight</u>
	209	Net weight less than 2.1 ounces (60 grams).

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 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.

3/ Visually examine product after it has been placed on a smooth flat surface and not disturbed for at least one minute.

**B. Methods of inspection.**

(1) Commercial sterility. Commercial sterility shall be verified in accordance with FDA regulations.

(2) Shelf life. The contractor shall provide a Certificate of Conformance 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 hedonic scale to be considered acceptable.

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

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

(4) Analytical. The sample to be analyzed shall be a composite of eight filled and sealed pouches which have been selected at random from the lot. The composite sample shall be prepared and analyzed in accordance with the following methods of the Official Methods of Analysis (OMA) of AOAC International:

<u>Test</u>	<u>Method Number</u>
pH	981.12
Brix	932.14

Test results for pH shall be reported to the nearest 0.01. Test results for Brix shall be reported to the nearest whole number. Government verification will be conducted through actual testing by a Government laboratory. Any nonconforming results shall be cause for rejection of the lot.

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

A. Packaging.

(1) Pouch material certification. The pouch material shall be tested for these characteristics. A Certificate of Conformance (CoC) may be accepted as evidence that the characteristics conform to the specified requirements.

<u>Characteristic</u>	<u>Requirement paragraph</u>	<u>Test procedure</u>
Thickness of films for laminated material	D-1,A(1)a	ASTM D 2103 <u>1/</u>
Aluminum foil thickness	D-1,A(1)a	ASTM B 479 <u>2/</u>
Laminated material identification and construction	D-1,A(1)a	Laboratory evaluation
Color of laminated material	D-1,A(1)a	FED-STD-595 <u>3/</u>

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1/ ASTM D 2103 Standard Specification for Polyethylene Film and Sheeting

2/ ASTM B 479 Standard Specification for Annealed Aluminum and Aluminum-Alloy Foil for Flexible Barrier, Food Contact, and Other Applications

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

3/ FED-STD-595 Colors Used in Government Procurement

(2) Unfilled preformed pouch certification. A CoC may be accepted as evidence that unfilled pouches conform to the requirements specified in D-1,A(1)a and b. When deemed necessary by the USDA, testing of the unfilled preformed pouches for seal strength shall be as specified in E-6,B(1)a.

(3) Filled and sealed pouch examination. The filled and sealed pouches shall be examined for the defects listed in table II. The lot size shall be expressed in pouches. The sample unit shall be one pouch. The inspection level shall be I and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 0.65 for major defects and 2.5 for minor defects.

TABLE II. Filled and sealed pouch defects 1/

Category		Defect
<u>Major</u>	<u>Minor</u>	
101		Tear or hole or open seal.
102		Seal width less than 1/16 inch. <u>2/</u>
103		Presence of delamination. <u>3/</u>
104		Unclean pouch. <u>4/</u>
105		Pouch has foreign odor.
106		Any impression or design on the heat seal surfaces which conceals or impairs visual detection of seal defects. <u>5/</u>
107		Not packaged as specified.
108		Presence of stress cracks in the aluminum foil. <u>6/ 7/</u>
	201	Label missing or incorrect or illegible.
	202	Tear nick or notch or serrations missing or does not facilitate opening.

TABLE II. Filled and sealed pouch defects 1/ - Continued

Category		Defect
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**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

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<u>Major</u>	<u>Minor</u>	
	203	Seal width less than 1/8 inch but greater than or equal to 1/16 inch.
	204	Presence of delamination. <u>3/</u>

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1/ Any evidence of rodent or insect infestation shall be cause for rejection of the lot.

2/ The effective closure seal is defined as any uncontaminated, fusion bonded, continuous path, minimum 1/16 inch wide, from side seal to side seal that produces a hermetically sealed pouch.

3/ Delamination defect classification:

Major - Delamination of the outer ply in the pouch seal area that can be propagated to expose aluminum foil at the food product edge of the pouch after manual flexing of the delaminated area. To flex, the delaminated area shall be held between the thumb and forefinger of each hand with both thumbs and forefingers touching each other. The delaminated area shall then be rapidly flexed 10 times by rotating both hands in alternating clockwise- counterclockwise directions. Care shall be exercised when flexing delaminated areas near the tear notches to avoid tearing the pouch material. After flexing, the separated outer ply shall be grasped between thumb and forefinger and gently lifted toward the food product edge of the seal or if the separated area is too small to be held between thumb and forefinger, a number two stylus shall be inserted into the delaminated area and a gentle lifting force applied against the outer ply. If separation of the outer ply can be made to extend to the product edge of the seal with no discernible resistance to the gentle lifting, the delamination shall be classified as a major defect. Additionally, spot delamination of the outer ply in the body of the pouch that is able to be propagated beyond its initial borders is also a major defect. To determine if the laminated area is a defect, use the following procedure: Mark the outside edges of the delaminated area using a bold permanent marking pen. Open the pouch and remove the contents. Cut the pouch transversely not closer than 1/4 inch ( $\pm 1/16$  inch) from the delaminated area. The pouch shall be flexed in the area in question using the procedure described above. Any propagation of the delaminated area, as evidenced by the delaminated area exceeding the limits of the outlined borders, shall be classified as a major defect.

Minor - Minor delamination of the outer ply in the pouch seal area is acceptable and shall not be classified as a minor defect unless it extends to within 1/16 inch of the food product edge of the seal. All other minor outer ply delamination in the pouch seal area or isolated spots of delamination in the body of the pouch that do not propagate when flexed as described above shall be classified as minor defects.



**PCR-E-018**

**3 March 2010**

**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

4/ Outer packaging shall be free from foreign matter which is unwholesome, has the potential to cause pouch damage (for example, glass, metal filings) or generally detracts from the clean appearance of the pouch. The following examples shall not be classified as defects for unclean:

a. Foreign matter which presents no health hazard or potential pouch damage and which can be readily removed by gently shaking the package or by gently brushing the pouch with a clean dry cloth.

b. Dried product which affects less than 1/8 of the total surface area of one pouch face (localized and aggregate).

5/ If doubt exists as to whether or not the sealing equipment leaves an impression or design on the closure seal surface that could conceal or impair visual detection of seal defects, samples shall be furnished to the contracting officer for a determination as to acceptability.

6/ Applicable to form-fill-seal pouches only.

7/ The initial examination shall be a visual examination of the closed package. Any suspected visual evidence of stress cracks in the aluminum foil (streaks, breaks, or other disruptions in the laminated film) shall be verified by the following physical examination. To examine for stress cracks, the inside surface of both tray-shaped bodies shall be placed over a light source and the outside surface observed for the passage of light. Observation of light through the pouch material in the form of a curved or straight line greater than 2 mm in length shall be evidence of the presence of stress cracks. Observation of light through the pouch material in the form of a curved or straight line 2 mm in length or smaller or of a single pinpoint shall be considered a pinhole. Observation of ten or more pinholes per pouch shall be evidence of material degradation.

**B. Methods of inspection.**

(1) Seal testing. The pouch seals shall be tested for seal strength as required in a, b, or c, as applicable.

a. Unfilled preformed pouch seal testing. The seals of the unfilled preformed pouch shall be tested for seal strength in accordance with ASTM F 88, Standard Test Method for Seal Strength of Flexible Barrier Materials. The lot size shall be expressed in pouches. The sample unit shall be one pouch. The sample size shall be the number of pouches indicated by inspection level S-1. Three adjacent specimens shall be cut from each of the three sealed sides of each pouch in the sample. The average seal strength of any side shall be calculated by averaging the three specimens cut from that side. Any average seal strength of less than 6

**PCR-E-018**

**3 March 2010**

**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

pounds per inch of width or any test specimen with a seal strength of less than 5 pounds per inch of width shall be classified as a major defect and shall be cause for rejection of the lot.

b. Pouch closure seal testing. The closure seals of the pouches shall be tested for seal strength in accordance with ASTM F 88. The lot size shall be expressed in pouches. The sample unit shall be one pouch. The sample size shall be the number of pouches indicated by inspection level S-1. For the closure seal on preformed pouches, three adjacent specimens shall be cut from the closure seal of each pouch in the sample. For form-fill-seal pouches, three adjacent specimens shall be cut from each side and each end of each pouch in the sample. The average seal strength of any side, end or closure shall be calculated by averaging the three specimens cut from that side, end or closure. Any average seal strength of less than 6 pounds per inch of width or any test specimen with a seal strength of less than 5 pounds per inch of width shall be classified as a major defect and shall be cause for rejection of the lot.

c. Internal pressure test. The internal pressure resistance shall be determined by pressurizing the pouches while they are restrained between two rigid plates. The lot size shall be expressed in pouches. The sample unit shall be one pouch. The sample size shall be the number of pouches indicated by inspection level S-1. If a three seal tester (one that pressurizes the pouch through an open end) is used, the closure seal shall be cut off for testing the side and bottom seals of the pouch. For testing the closure seal, the bottom seal shall be cut off. The pouches shall be emptied prior to testing. If a four-seal tester (designed to pressurize filled pouches by use of a hypodermic needle through the pouch wall) is used, all four seals can be tested simultaneously. The distance between rigid restraining plates on the four-seal tester shall be equal to the thickness of the product +1/16 inch. Pressure shall be applied at the approximate uniform rate of 1 pound per square inch gage (psig) per second until 14 psig pressure is reached. The 14 psig pressure shall be held constant for 30 seconds and then released. The pouches shall then be examined for separation or yield of the heat seals. Any rupture of the pouch or evidence of seal separation greater than 1/16 inch in the pouch manufacturer's seal shall be considered a test failure. Any seal separation that reduces the effective closure seal width to less than 1/16 inch (see table II, footnote 2/) shall be considered a test failure and shall be classified as a major defect and shall be cause for rejection of the lot.

C. Packing.

(1) Shipping container and marking examination. The filled and sealed shipping containers shall be examined for the defects listed in table III. The lot size shall be expressed in shipping containers. The sample unit shall be one shipping container fully packed. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0 for major defects and 10.0 for total defects.

TABLE III. Shipping container and marking defects

Category		Defect
<u>Major</u>	<u>Minor</u>	
101		Marking missing or incorrect or illegible.
102		Inadequate workmanship. <u>1/</u>
	201	More than 40 pounds of product.

1/ Inadequate workmanship is defined as, but not limited to, incomplete closure of container flaps, loose strapping, inadequate stapling, improper taping, or bulged or distorted container.

**SECTION J REFERENCE DOCUMENTS**

Unless otherwise specified, the issues of these documents are those active on the date of the solicitation or contract.

DSCP FORMS

DSCP FORM 3556      Marking Instructions for Boxes, Sacks, and Unit Loads of Perishable and Semiperishable Subsistence

FEDERAL STANDARD

FED-STD-595      Colors Used in Government Procurement

GOVERNMENT PUBLICATIONS

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

NON-GOVERNMENTAL STANDARDS

AMERICAN SOCIETY FOR QUALITY (ASQ) [www.asq.org](http://www.asq.org)

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

ASTM INTERNATIONAL [www.astm.org](http://www.astm.org)

B 479      Standard Specification for Annealed Aluminum and

**PCR-E-018**  
**3 March 2010**  
**W/Change 02 23 Nov 22 ES23-005 (DSCP-SS-23-00055)**

Aluminum-Alloy Foil For Flexible Barrier, Food Contact, and Other Applications

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|----------------|---|
| D 1238         | Standard Test Method for Melt Flow Rates of Thermoplastics by Extrusion Plastometer                 |
| D 1505         | Standard Test Method for Density of Plastics by the Density-Gradient Technique                      |
| D 1974         | Standard Practice for Methods of Closing, Sealing, and Reinforcing Fiberboard Boxes                 |
| D 2103         | Standard Specification for Polyethylene Film and Sheeting   |
| D 4727/D 4727M | Standard Specification for Corrugated Solid Fiberboard Sheet Stock (Container Grade) and Cut Shapes |
| D 5118/D 5118M | Standard Practice for Fabrication of Fiberboard Shipping Boxes                                      |
| F 88           | Standard Test Method for Seal Strength of Flexible Barrier Materials                                |

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Official Methods of Analysis (OMA) of the AOAC International