ITEM: HUMANITARIAN DAILY RATION (HDR) MONOGRAPH NO.: KA1
General Packaging Monograph

NSN: 8970-01-375-0516

APPROXIMATE CALORIC VALUE: 2253 Kilocalories average per daily ration
(ranges 2209-2323; minimum requirement of ~2200/day)

CHARACTERISTICS OF ITEM:

The complete packaging and packing system includes the primary package, which is the first wrap or container to come in direct contact with the food; the secondary container, in which several primary packages would be assembled to make up a menu; and a shipping container, in which several primary containers (menus) are packed for initial shipment to the customer.

Most of the food components of this HDR are packaged in flexible packages. Some of the packages are the same or very similar to MRE operational ration components, for example, the retort entrees and peanut butter, jam, biscuits and fruit pastry (although these packages are not pigmented). The entree cartons display blue and red or black printing. Also, there are no chemical heaters packed inside the menu bags. Some of the packages are vacuum packaged; others are a foil trilaminate, nonretortable pouch; others are a foil trilaminate, retortable pouch. Since almost all of the primary and secondary components of this HDR are packaged in trilaminate pouches, these will be the primary concern of this Monograph.

The retortable pouch is fabricated as a three-ply laminate consisting of, from inside to outside, 0.003 to 0.004 inch thick polyolefin, 0.00035 to 0.0007 inch thick aluminum foil, and 0.0005 inch thick polyester. This pouch should be able to withstand thermal (retort) processing and a wide temperature range sufficient to preclude damage during transportation and storage. Coloring is applied to either the exterior or interior surface of the polyester layer. While the pouch is considered a "tough" package, it is by no means indestructible. Entrees packaged in a foil trilaminate retort pouch listed in Table I.

The strength of the pouch and its resistance to damage comes from its trilaminate structure. Each of the three laminates has its own individual qualities that contribute to the success of the pouch. Individually, none is capable of providing all the essential attributes required of a package that undergoes the rigors of military handling, storage and distribution. The outer layer of polyester provides strength and resistance to tearing. The aluminum foil (middle layer) provides an almost absolute barrier to the transfer of gases (especially oxygen) and water vapor between the environment and the product in the pouch. The inner layer of polyolefin provides an inert product contact surface and is a heat sealable material essential for attaining a hermetic seal. The trilaminate structure is reliant on the synergism of the three layers. Delamination of one of the layers from another causes the pouch to be unserviceable or questionable in its integrity. One of the primary problems with the pouch is that it is prone to puncture by sharp objects both from external sources (e.g., grains of sand, gravel, twigs) and from internal sources (e.g., ice crystals of frozen product). To combat external sources of damage, the retort pouch is placed in a secondary package once called a folder and now referred to as a carton. This paperboard carton protects it

from externally induced abuses and its integrity is extremely important as a result. Those foods that are packaged in retort pouches rely on heat processing and package integrity for their shelf stabilization and protection against pathogenic and non-pathogenic microbial growth. The retort pouch carton is an essential part of the HDR packaging system.

The primary difference between the retort pouch and the non-retort pouch is the fact that the adhesive(s) used to laminate or bond the layers of the retort pouch together are extremely heat resistant while the adhesives used for the non-retortable pouches are much less heat resistant and consequently much less costly. Examples of food components packaged in non-retortable, foil trilaminate pouches are the peanut butter and strawberry jam. Biscuits (two per package), fruit pastry, shortbread (two per package) and fruit bar components are vacuum packaged in a foil trilaminate pouch.

The accessory packet is composed of very thin, clear low density polyethylene (LDPE), and it has a top and bottom seal and one fin seal. This packet contains condiments such as crushed red pepper, which is packed in a trilaminate paper/foil/polyethylene (PE) 3-sided seal pouch. The salt, pepper and sugar are in bilaminate paper/PE 3-sided seal pouches. The accessory packet also contains a napkin, spoon (white), and matches.

The shelf life of this ration is the amount in time (in months) that the ration remains serviceable during storage, and is dependent on the ability of the packaging system to protect its contents from bacterial contamination and deterioration of food quality. The shelf life estimation for the ration in this evaluation is based on an assessment of the barrier properties of the packaging materials used for the entrees and other high caloric foods at 80°F. The limiting factor of the shelf life of properly formulated and processed foods is the packaging material. A foil trilaminate retort pouch that has excellent barrier properties and possesses an inert food contact layer and external layer will afford a 36-month shelf life, as a minimum, at 80°F or lower. An extended shelf life will be determined upon the criteria of storage conditions (temperature, relative humidity, etc.); the lower the storage temperatures (i.e. at 50°F) may increase the shelf life beyond the 12 month recommeded shelf life.

Water proofness of the shipping container is based upon the shipping container being constructed of weather-resistant fiberboard (i.e., V2s or V3c grade) and taped around all edges with water-resistant tape. Non-water-resistant fiberboard is considered to be of "domestic" grade, which rapidly deteriorates and loses strength when wet. This shipping container is of V2s grade,which is water resistant; but is not water proof.

Insect resistance of the shipping container is dependent upon the shipping container being sealed (taped) around all seams and joints. The shipping containers are typically not taped (glued only), and are susceptible to insect penetration. However, the menu bags (secondary packaging) of this ration are insect resistant. The menu bags are composed of 10 to 11 mil thick LDPE tubing, which is heat-sealed on the top and bottom.

One of the most important factors concerning the packaging of the HDR components is the information that is printed on the package itself. For example, most entree and vegetable pouches

and/or the cardboard protection pakaging contain numerous required markings. They include the product name, date of pack, the official establishment number, the lot number, production shift number, retort cook number, and the hot-fill equipment identification number. Almost every one of the components in a meal will be Julian Date coded in addition to the traditional markings. It is essential that inspectors extract as much information from the component package as possible when a problem arises during an inspection and/or while the product is being consumed. All too often reports/complaints are received where the only information received is that from the shipping container.

The HDR shipping container has required markings that are essential, but by themselves are not sufficient to track down the cause of a component problem. For example, lot 22 of assembled rations may contain only one component lot of an entree or (as is more often the case), it may contain two, three or even thirty or more component lots of one particular entree. In the latter case, if only the assembly lot number is received, it is impossible to know which one of the component lots should be investigated. The bottom line is that the inspection form that accompanies this Monograph must be completely filled out during inspections and while investigating a complaint.

DEFECTS LIKELY TO OCCUR: Tears, cuts, holes and, when applicable, inadequate vacuum are the most often encountered defects in this HDR component packaging. Delamination is also a defect often encountered in laminated packages. It is seen as the separation of one laminant (i.e., one layer) from another. Its significance varies depending on the area of the pouch that is delaminated (e.g., the body of the pouch or the seal area) and the extent of the delamination. Also, look for defects such as vacuum loss, leakage of product, swelling of the package, and unglued flaps on the shipping container.

UNIQUE EXAMINATION/TEST PROCEDURES: To test for vacuum loss, grab two opposite seals of the pouch, gently and slowly pull them out, and then release the tension; the material should pull back and hug the product if a vacuum is present. If it goes back slightly, or not at all, then there is a vacuum loss. To examine for leaks in packages without a vacuum, squeeze the package gently between the palms of both hands and look for product loss. The vacuum desiccator test can also be performed on a random sample of packages to test for leaks, or on a specific package if a leak is suspected but the defect is not obvious. To check for minute tears, cuts or holes in any package, insert a pocket flashlight inside the package while in a dark room. This usually aids in identifying the amount, size and location of the defects.

SPECIAL NOTES: Due to the color and glossy finish characteristic of retort and non-retort pouches, tiny tears, cuts, and holes are often impossible or at best extremely difficult to see with the naked eye. At the point of origin, retort item lots are subjected to zyglo dye testing to detect microscopic holes that are not easily discernable with the naked eye and microscopic holes that by definition cannot be seen with the naked eye. This test is also available to inspectors in the field and should be requested of the supporting laboratory if the integrity of the retort pouches is in question.