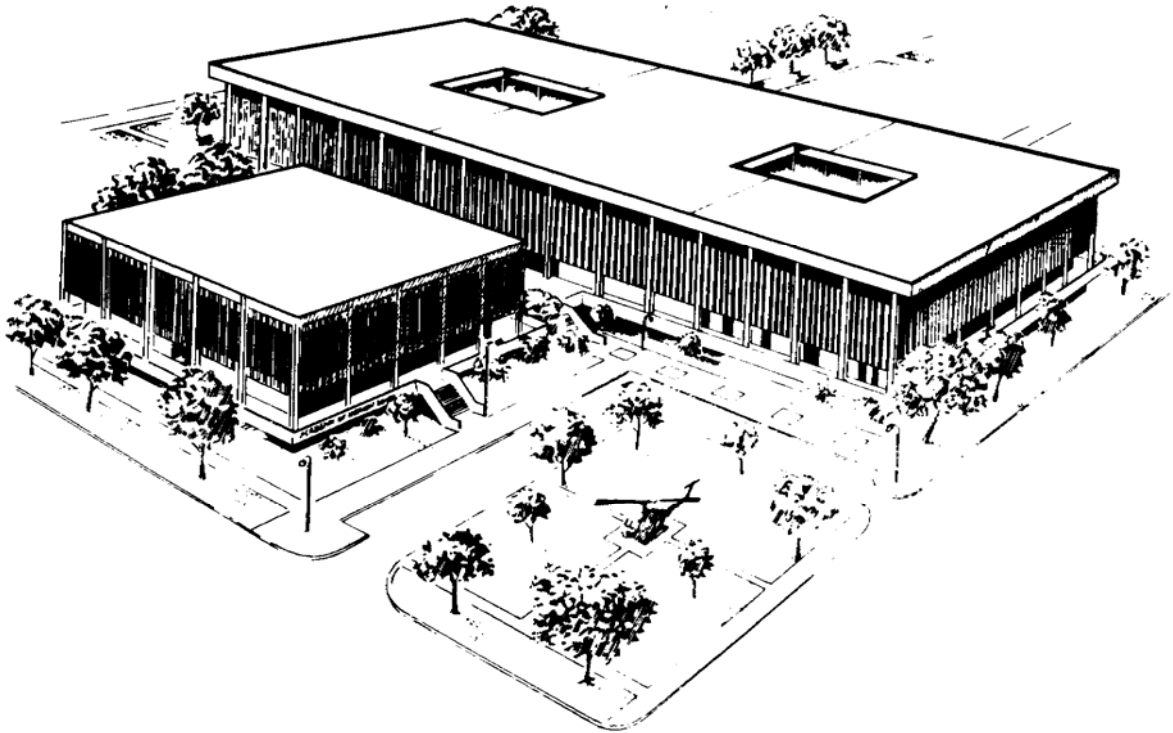

U.S. ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
FORT SAM HOUSTON, TEXAS 78234-6100



STORAGE AND SANITATION

SUBCOURSE MD0717

EDITION 100

DEVELOPMENT

This subcourse is approved for resident and correspondence course instruction. It reflects the current thought of the Academy of Health Sciences and conforms to printed Department of the Army doctrine as closely as currently possible. Development and progress render such doctrine continuously subject to change.

The subject matter expert responsible for content accuracy of this edition was the NCOIC, Nursing Science Division, DSN 471-3086 or area code (210) 221-3086, M6 Branch, Academy of Health Sciences, ATTN: MCCS-HNP, Fort Sam Houston, Texas 78234-6100.

ADMINISTRATION

Students who desire credit hours for this correspondence subcourse must meet eligibility requirements and must enroll in the subcourse. Application for enrollment should be made at the Internet website: <http://www.atrrs.army.mil>. You can access the course catalog in the upper right corner. Enter School Code 555 for medical correspondence courses. Copy down the course number and title. To apply for enrollment, return to the main ATRRS screen and scroll down the right side for ATRRS Channels. Click on SELF DEVELOPMENT to open the application and then follow the on screen instructions.

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CLARIFICATION OF TERMINOLOGY

When used in this publication, words such as "he," "him," "his," and "men" are intended to include both the masculine and feminine genders, unless specifically stated otherwise or when obvious in context.

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CORRESPONDENCE COURSE OF
THE UNITED STATES ARMY MEDICAL DEPARTMENT CENTER AND SCHOOL
SUBCOURSE MD0717
STORAGE AND SANITATION
INTRODUCTION

Food is surrounded by dangerous agents and conditions that can make people ill. As multiple handling and modern processing methods lengthen the journey from farm to table, the opportunities for food to become contaminated and/or spoiled increase. The veterinary food inspection specialist helps protect the food utilized by the military by insuring sanitary control of food establishments handling food for military use. This subcourse discusses these sanitary controls.

Subcourse Components:

The subcourse instructional material consists of the following:

- Lesson 1, Food Establishment Sanitation.
- Lesson 2, Installation Inspections.
- Lesson 3, Food Storage Facilities
- Lesson 4, Insect and Rodent Control and Fumigation of Subsistence.
- Appendix A, Extract From DOD 4145.19-R-1, Storage and Materials Handling.
- Appendix B, DD FORM 2531, Food Storage Facility Sanitation Compliance Checklist.
- Appendix C, DD FORM 2460, Commissary Sanitary Compliance Checklist.

Here are some suggestions that may be helpful to you in completing this subcourse:

- Read and study each lesson carefully.
- Complete the subcourse lesson by lesson. After completing each lesson, work the exercises at the end of the lesson, marking your answers in this booklet.

- After completing each set of lesson exercises, compare your answers with those on the solution sheet that follows the exercises. If you have answered an exercise incorrectly, check the reference cited after the answer on the solution sheet to determine why your response was not the correct one.

Credit Awarded:

To receive credit hours, you must be officially enrolled and complete an examination furnished by the Nonresident Instruction Branch at Fort Sam Houston, Texas. Upon successful completion of the examination for this subcourse, you will be awarded 10 credit hours.

You can enroll by going to the web site <http://atrrs.army.mil> and enrolling under "Self Development" (School Code 555).

A listing of correspondence courses and subcourses available through the Nonresident Instruction Section is found in Chapter 4 of DA Pamphlet 350-59, Army Correspondence Course Program Catalog. The DA PAM is available at the following website: <http://www.usapa.army.mil/pdffiles/p350-59.pdf>.

LESSON ASSIGNMENT

LESSON 1

Food Establishment Sanitation.

LESSON ASSIGNMENT

Paragraphs 1-1 through 1-5.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 1-1. Identify terms common to food establishment sanitation.
- 1-2. Identify five sources of sanitary requirements for establishments furnishing foods to the Armed Forces.
- 1-3. Identify the four types of sanitary inspections and the purpose of each.
- 1-4. Identify 20 aspects of general sanitary requirements for food establishments and relate them to sanitary inspections at installation facilities/activities.
- 1-5. Identify improper sanitary practices in the handling of subsistence in a food establishment.

SUGGESTION

After studying the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

LESSON 1

FOOD ESTABLISHMENT SANITATION

1-1. ORGANIZATION AND RESPONSIBILITIES FOR INSPECTION

a. **The Surgeons General.** The Surgeons General of the Army and Air Force will develop and assure that uniform and efficient inspection procedures are used by military veterinary personnel to determine if foods are wholesome or food establishments sanitarily acceptable.

b. **Health Services Command/Major Overseas Command.** The Commander, United States (US) Army Health Services Command (HSC), and each major overseas command are responsible for the inspection of food and food establishments performed by Army Veterinary Service personnel within their respective commands. The required coordination and supervision of veterinary inspections within each of these major commands are effected by technical letters and supervisory visits by the assigned command veterinarian.

(1) United States Army Health Services Command. The HSC serves as the manager for the Army's health care and health education functions within the continental United States (CONUS), Alaska, Hawaii, Panama, Puerto Rico, Guam, Johnston Island, and the Trust Territory of the Pacific Islands.

(a) These health care services include hospitalization, outpatient care, environmental hygiene, dental care, optometric care, veterinary services, nursing care, physical and occupational therapy, and dietetic services. United States Army medical centers (MEDCEN) and Army medical department activities (MEDDAC) provide these medical services.

(b) Health Services Command's responsibility for health care education, training, medical doctrine, and combat developments is consolidated under the Academy of Health Sciences (AHS) at Fort Sam Houston, Texas.

(2) Major overseas commands. The major overseas commands are located in Europe, Japan, and Korea.

c. **Military Veterinary Service.**

(1) Sanitary inspections of food establishments desiring to sell to the Department of Defense (DOD) are conducted by the personnel of the military veterinary service. The primary objective when inspecting food or food establishments will be to protect the health of military personnel from foodborne illnesses.

(2) The procedures used and the recommendations made when inspecting food for wholesomeness or food establishments for sanitation will be in accordance with Army Regulation 40-657, Veterinary Food Inspections.

1-2. DEFINITIONS

a. **Adequate.** A method is adequate if it accomplishes the intended purpose in keeping with accepted public health practices.

b. **Adulterated.** Food is adulterated if:

(1) It bears or contains any poisonous or deleterious substance in a quantity which may render it injurious to health.

(2) It bears or contains added poisonous or deleterious substance for which no safe tolerance has been officially established, or in excess of such tolerance if one has been established.

(3) It consists in whole or part of any filthy, putrid, or decomposed substance, or if it is otherwise unfit for human consumption.

(4) It has been processed, prepared, packed, or held under unsanitary conditions, whereby it may have become contaminated with filth, or whereby it may have been rendered injurious to health.

(5) It is in whole or in part the product of a diseased animal, or an animal which had died otherwise than by slaughter.

(6) Its container is composed in whole or in part of any poisonous or deleterious substance which may render the contents injurious to health.

c. **Contamination.** Contamination is the act or process of exposing the product to an adulterant or unwholesome material.

d. **Food.** Food is raw, cooked, or processed edible substance, ice, beverage, or ingredient used or intended for use or for sale in whole or in part for human consumption.

e. **Food Establishments.** Food establishments include the buildings, equipment, and vehicles used to handle, process, manufacture, assemble, store, freeze, or transport foods.

f. **Plant.** A plant is the building or buildings or parts thereof, used for or in connection with the manufacturing, processing, packaging, labeling, or holding of human food.

g. **Processing.** Processing is any step in the manufacture or preparation of a product into its final form.

h. **Production Area.** The production area is the room or area in which processing occurs.

i. **Product Area.** The product area is the production area and all other areas where the product, ingredients, and packaging materials are handled or stored.

j. **Product Zone (Food Contact Surface).** The product zone is the surface of any equipment or other material that contacts the product or ingredients during processing.

k. **Sanitize (Sanitization).** Sanitization is adequate treatment of product zones by a process that is effective in destroying vegetative cells of pathogenic bacteria and in substantially reducing other microorganisms. Such treatment must not adversely affect the product and shall be safe for the consumer.

l. **Wholesome.** Wholesomeness is that characteristic possessed by a food product that is conducive to good health and well being in the consumer.

1-3. PUBLICATIONS

a. **Army Regulation 40-657, Veterinary/Medical Food Inspections and Laboratory Service.** This document is a multiservice regulation used by the Army, Air Force, Navy, and Marines.

(1) This regulation defines the food inspection mission of the military veterinary services. It prescribes the general policies and procedures to be followed in the inspection of food and food establishments used to supply all military departments.

(2) This regulation applies to the inspection of food procured for the military services by local or central procurement activities with appropriated or nonappropriated funds. Its provisions are applicable to all food intended for human consumption. In addition, this regulation applies to the Army National Guard and the US Army Reserve, the military and civilian establishments, facilities, equipment, and methods used in the manufacturing, processing, storing, issuing, and shipment of food.

b. **Military Sanitary Standards.** General sanitary requirements for food establishments furnishing food to the military services are contained in military sanitary standards.

(1) There are military sanitary standards for shell-egg plants, food plants, milk-evaporating-and-drying plants, commissaries, bakeries, frozen-dessert plants, soft-drink plants, cheese and cheese product plants, meat processing plants in overseas areas, and butter plants.

(2) These military sanitary standards set forth sanitary requirements for establishments furnishing food to the Military Services. They provide standardization for sanitary inspection procedures and serve as the basis for determination of establishment approval.

(3) The reference source for the sanitary requirements discussed in lesson 1 of this subcourse Military Standard 909, Sanitation Standards for Food Storage Facilities. MIL STD 909 includes a detailed checklist for sanitary compliance, which is the DD Form 2531, Food Storage Facility Sanitation Compliance Checklist. This checklist is included in the subcourse in appendix B. You will want to refer to this checklist as you study this lesson.

c. **Standards of Other Agencies.** Rather than establish a duplicate system of inspection, the DOD recognizes the sanitary standards, inspections, and results of other Government agencies. Some of these agencies are the US Department of Agriculture (USDA), the US Department of Commerce (USDC), and the US Public Health Service (USPHS). If an establishment is found acceptable by one of these agencies, then the DOD will accept food items originating in that establishment.

d. **Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement.** This publication (short title, Directory) is published by HSC and each major overseas command.

(1) The Directory is published annually and is updated on a quarterly basis or as required.

(2) The Directory lists all establishments, alphabetically by state or country, that have been inspected for sanitation by the military veterinary service and found acceptable.

(3) Purchasing activities of the DOD will purchase foods only from establishments listed in the Directory.

(4) Establishments found acceptable by other Government agencies and listed in their "directories" may be exempt from listing in the Directory. These exemptions are found in AR 40-657.

e. **Location of Military Veterinary Personnel Available for Inspections and Services.** This publication (short title, Location List) will be published by The Surgeon General, Department of the Army.

(1) The Location List lists the locations of military veterinary personnel available for inspections and services required for central procurement action.

(2) The Location List includes the geographical areas of responsibility for each element of the military veterinary service inside the Continental US (CONUS). It also shows the assignment of inspection responsibilities in those foreign countries that are specifically within the area of responsibility of any overseas command.

1-4. SANITARY INSPECTIONS

There are four types of sanitary inspections: initial, routine, special, and update. These sanitary inspections are performed by military veterinary service personnel on commercial food establishments furnishing food items to the military.

a. **Initial.** Initial inspection determines the initial sanitary status of a commercial food establishment. It results in the establishment being approved or disapproved as a source of food for the military services. The veterinary officer uses the appropriate sanitary standard to determine compliance.

b. **Routine.** A routine inspection determines the current sanitary status of an establishment listed in the Directory. It results in the continued approval of the establishment or notification to its management of the possibility of disapproval if sanitary deficiencies present are not corrected in a reasonable amount of time. The inspector uses the appropriate sanitary standard to determine compliance. The frequency of routine inspections by the military veterinary services, of establishments actively engaged in supplying products to the military services, depends on the type of food item being supplied. For example, a bakery is inspected quarterly, whereas a seasonal processor of salmon is inspected annually during periods of production. AR 40-657 sets forth minimum frequency for routine inspections.

c. **Special.** A special sanitary inspection is performed at an approved Directory-listed plant to determine whether or not the plant will remain approved as a source of food for the military services. Special sanitary inspections of Directory-listed establishments may be initiated by the inspector when the plant has failed to correct, within a reasonable period of time, sanitary deficiencies found during a routine sanitary inspection. Also, these inspections may be performed as the result of a request by the commander of the HSC or major overseas command whenever it is indicated that foods produced by an establishment constitute a threat to the health of a consumer. The special sanitary inspection will be a complete inspection, similar in all details to an initial sanitary inspection.

d. **Update.** An updating sanitary inspection will be conducted every 4 years after the initial sanitary inspection, except when a special sanitary inspection has been performed in the meantime. The updating sanitary inspection will use the same format and be as comprehensive as an initial sanitary inspection.

1-5. FOOD ESTABLISHMENT SANITATION

A series of general sanitation requirements for food establishments are discussed in this paragraph. The information comes from Military Standard 909. There are 20 aspects or factors discussed. These requirements apply to sanitation inspections both at commissary stores and at Troop Issue Supply Activities.

a. **Premises.** The premises must present a clean and orderly appearance. They must be well drained. They must be free of environmental conditions and/or materials that are a nuisance or a hazard to sanitation. Adequate grounds maintenance is very important. The area must be free of weeds, debris, and unused equipment and materials. The area must be free of waste materials that are stored or handled in such a manner as to be a potential health hazard. The presence of any breeding area for insects, rodents, or birds must not be permitted. If the plant grounds are bordered by grounds not under the plant operator's control, care must be exercised in the plant by inspection, extermination, or other means to effect exclusion of pests, dirt, and other filth that may be a source of food contamination. The approaches to receiving and shipping docks must be kept clean and maintained to minimize dust.

b. **Raw Materials.** All raw materials must be obtained from approved sources as required by AR 40-657 and must be protected from contamination, adulteration, and deterioration.

c. **Single-Service Articles and Packaging Materials.** Single-service articles and packaging materials must be free of contamination and maintained in sanitary boxes, cartons, tubes, or otherwise protected and handled in a sanitary manner, as food items.

d. **Construction of Building.** The building must be large enough to accommodate the operation without hampering sanitary practices. Floors, walls, and ceilings must be constructed of materials that can readily be kept clean, sanitary, and in good repair. An unnecessary clutter of wiring, pipes, hangers, ducts, etc., must be avoided. Ceilings over areas with unpackaged food must be free of peeling paint (painted ceilings must be avoided) and condensates. The exterior openings, including doors, windows, conveyor openings, pipe openings, and vents, must be clean and in good repair. Where practicable, exterior openings should be equipped with screens or other effective means (that is, air curtains) to prevent the entrance of insects, rodents, and other animals. When the screening of openings is impracticable, such as in receiving areas, flying insect entry should be controlled by properly positioned air curtains large enough to cover the total door opening. Air curtains must comply with the National Sanitation Standard No. 37 for Air Curtains for Entranceways in Food Establishments. Screen doors should open outward and be self-closing. Rooms in the processing areas must not open directly into any barns or stables, living quarters, toilets, garages, or heavy maintenance shops.

e. **Lighting.** Each room must have sufficient natural or artificial lighting for the purpose for which it is to be used. Lighting intensities (brightness) must conform to the intensities established in the latest edition of the Illumination Engineering Society (IES) Lighting Handbook. Lights in the processing areas must be equipped with protective shields or must be of such construction that they will not shatter if broken.

f. **Ventilation and Humidity.** Humidity must be regulated in conjunction with ventilation or air movement to control condensation, objectionable odors, and mold growth on ceilings and walls in all areas. The humidity requirement depends on the product being stored or displayed. Air for ventilation must be adequately filtered through a closed or open system, as appropriate to prevent contamination. Ventilation systems must be kept clean and maintained in good repair.

g. **Water Supply.** The water supply must be readily accessible, of a sufficient quantity, and have an acceptable sanitary quality, as established in the National Interim Primary Drinking Water Regulations. The water heater must be of such capacity so as to be able to furnish an undiminished supply of hot water (120° to 140°F) for a complete food plant cleaning procedure at all times throughout a working day. There must be mixing valves at all scullery sinks and hose connections. There must be no cross-connection between potable and nonpotable lines, back-siphonage, or ineffective protection of wells from contamination by surface drainage or floods. Bacteriological examination and water test results must be maintained at the plant to show that the water supply has been approved by federal, state, or local health authorities within the past six months.* Within the CONUS, Hawaii and Alaska, a water supply approved by a federal, state, or local health authority will be considered potable, and certification of potability will normally not be required. Nonpotable water outlets, if present, must be located and identified by color code and labeled nonpotable so as to preclude the use of nonpotable water for other than the purposes designated. The color code used must be readily identifiable, prominently displayed, and clearly understood by plant personnel.**

*If Federal, state, or local health authorities do not have such evidence of water potability, applicable military regulations governing potable water supplies will be followed to approve the water supply(ies).

**The use of nonpotable water is permitted for the flushing of urinals and commodes, for boilers, and for such other similar uses provided it does not directly, nor indirectly, contact the ingredients, product, packaging materials, general product area, or personnel handling the product.

h. **Ice (if Used).** Ice must be made from a supply of potable water which has met the required bacteriological testing. See paragraph 1-5g. It must be manufactured, handled, stored, and used in a sanitary manner, as a food item.

i. **Disposal of Wastes.** Liquid wastes must be conveyed to a public sewer through enclosed piping or must be disposed of in another sanitary sewage system approved by local/state health authorities. Floor drains must be functional and properly trapped. Dry and product waste must be placed in suitable covered receptacles conveniently located throughout the plant and premises. All waste must be collected and disposed of at frequent intervals in a sanitary manner to prevent insect and rodent attraction and development of objectionable odors. Inside the plant, the waste receptacles, usually garbage cans must be water tight with lids, and stored on racks. Outside the plant, there are refuse containers or dumpsters. The doors of the receptacles must be kept closed at all times. Waste receptacles must be emptied when the waste products reach to within four inches from the top. The personnel who are handling waste must perform a thorough hand washing with a detergent and sanitizing agent before handling food products. The area around dumpsters and garbage can should be kept cleaned at all times because of the need for insect and rodent control.

j. **Toilet, Dressing Room, and Hand washing Facilities.**

(1) A sufficient number of sanitary toilets or privies must be provided. The minimum number of toilets is based on the number of employees. Toilet facilities required are shown in Table 1-1.

| Number of employees of same sex | Minimum number of toilets required* |
|---|---|
| 1-15 | 1 |
| 16-35 | 2 |
| 36-55 | 3 |
| 56-80 | 4 |
| 81-110 | 5 |
| 111-150 | 6 |
| Over 150 | 1 additional fixture for each additional 40 employees |
| *Where toilets are not used by women, urinals may be provided instead of toilets, except that the number of toilets in such cases must not be reduced to less than two-thirds of the minimum specified. | |

Table 1-1. Toilet requirements.

(2) Toilet rooms must be conveniently located, constructed of materials that can be easily and satisfactorily cleaned and sanitized, conveniently located, adequately lighted, and separately vented to the outside. They must be constructed so that they do not open directly into rooms or areas where components or products are processed or stored. The doors must be tight fitting and self-closing. A sign directing employees to wash their hands before returning to work must be conspicuously posted in all toilet rooms.

(3) Hand washing signs must be multi-lingual, as appropriate. Hand washing facilities, including hot and cold running water, soap (liquid or powder), soap dispenser, and sanitary single-service towels, continuous cloth towels, or hot air blower-type hand dryers must be conveniently located in the toilet rooms and throughout the processing areas.

(4) Toilets, dressing rooms, and hand washing facilities must be maintained in a clean, orderly manner. Restrooms must not be used for storage of cleaning equipment. Privies must be separate from the processing building, and of a sanitary type, location, and construction. Each employee must be furnished a locker or another suitable facility, and lockers and dressing rooms must be kept clean and orderly.

k. Equipment and Utensils and Contaminants/Toxic Substances.

Equipment and utensils must be designed, constructed, and used so as to preclude the adulteration of food with toxic lubricants, fuel, metal fragments, contaminated water, and any other contaminants. Lubricants used on contact surfaces of moving parts to pumps, product handling and processing equipment must be edible and nontoxic and should be used sparingly.

l. Construction and Repair of Equipment and Utensils. All equipment and utensils must be designed and be of such material and workmanship so as to be smooth, easily cleanable, and durable. The food contact surfaces of such equipment must, in addition, be easily accessible for cleaning, nontoxic, corrosion-resistant, and made up of nonabsorbent material. Food contact surfaces and solder must be corrosive-resistant and must not contain antimony, bismuth, cadmium, lead, zinc, and/or other toxic materials. Solder on the food contact surface must be hard solder of such formulation so as to be nontoxic under use conditions. Equipment must be so located as to provide adequate space for each cleaning, maintenance, and inspection.

m. Cleaning and Sanitizing Treatment. The methods used for cleaning and sanitizing must be such that the product will not be contaminated or adulterated. All products must be moved sufficiently far away or otherwise protected prior to the start of cleaning to avoid contamination or adulteration by splashing. All multiple-service containers, equipment, and utensils used in handling, processing, storing or transporting of exposed product must be disassembled, as applicable, cleaned thoroughly, and sanitized after every use. Chemicals used in cleaning and sanitizing treatments must be properly labeled and stored. Cleaning and sanitizing chemicals must be used in accordance with the manufacturer's recommendation. The only chemical compounds authorized for use are those listed in the USDA publication, "List of Chemical Compounds Authorized for Use under USDA Inspection and Grading Programs." If water is to be used as the sanitizer, it must be not less than 180°F (82°C). All rooms and areas used to receive, process, or store components or the finished product must be maintained in a clean, sanitary manner so as to preclude the possibility of microbiological, chemical, or physical contamination.

n. **Methods.** Methods used in the processing, handling, and storage must be conducted in a sanitary manner so as to prevent contamination or adulteration, and not contribute to deterioration of the product from a public health standpoint.

o. **Public Health Controls.** When applicable, means must be provided to assure adequate public health control of the raw materials and finished product. The means must include physical, chemical, and microbiological examinations necessary to establish that the product has not been adulterated or contaminated. Evidence that all necessary tests have been performed and records of such examinations must be on file and made available to the military inspector.

p. **Cooling and Refrigeration.** Cooler rooms must be free from objectionable odors and from mold. They also must be maintained in a sanitary condition. The coolers and freezers must be capable of obtaining and maintaining temperature and humidity necessary for the preservation of the foods being stored or processed. Refrigerated facilities should be equipped with an accurate + or - 3° (degree) Fahrenheit temperature.

q. **Storing and Storage Facilities.** Storage facilities must be provided for storing raw materials, packing and packaging materials, and finished products. They must be clean, sanitary, and in good repair. Storing methods which minimize deterioration and prevent contamination must be used. Shelves, cabinets, and dunnage (pallets) must be used to store all items, as a precaution to protect materials from contamination. Any food spilled must be cleaned up daily. Floors in storage facilities must be swept weekly, or more often, as needed.

r. **Control of Insects, Birds, and Animals.** Insects, birds, and animals must be excluded from the plant. Effective measures for the control of insects, birds, and animals must be maintained at all times. Operations or procedures which produce animal harborages or insect breeding areas are prohibited. Insecticides and rodenticides, if used, must be only those which appear in the "List of Chemical Compounds Authorized for Use under USDA Inspection and Grading Programs." These products must be used by approved methods and must be handled and stored in a safe manner.

s. **Vehicles and Transportation Facilities.** Vehicles and transportation facilities must be constructed and operated to protect contents from contamination and deterioration. They must be kept clean and in good repair. Transit temperature for frozen products might be no higher than 0° Fahrenheit, including time of delivery, exception for ice cream, which has a requirement of -10° Fahrenheit. The transit temperature for chilled products must be no higher than 45° Fahrenheit and no lower than 33° Fahrenheit.

t. Cleanliness and Health of Personnel.

(1) Cleanliness. All employees must wash their hands before beginning work and upon returning to work after using toilet facilities, eating, smoking, or otherwise soiling their hands. They must keep their hands clean and follow good hygienic practices while on duty. Eating, expectorating, or use of tobacco in any form must be prohibited in each room and compartment where any food products or supplies are prepared, stored, or otherwise handled. Personnel must not wear fingernail polish or insecure jewelry. All persons engaged in receiving, testing, processing, manufacturing, packaging, or handling food products must wear clean, white, or light-colored washable or disposable outer garments. Hairnets, headbands, caps, beard nets, or other effective hair restraints to effectively cover hair must be worn so as to prevent contamination of food and food contact surfaces. Employees' personal effects must not be stored in production areas.

(2) Health. No person afflicted with a communicable disease must be permitted in any room or compartment where products are prepared, manufactured, or otherwise handled. No person who has a discharging or infected wound, sore, boil, or lesion on hands, arms, neck, face, or other exposed portion of the body should be permitted to work in any processing rooms or in any capacity resulting in contact with the processing or handling of products, containers, or equipment. Where health authorities require health certificates, they must be kept on file at the plant office. Plant personnel must receive appropriate training in proper food handling techniques and food protection principles with on-the-job training on a frequent basis, and should be always alert to the danger of poor personal hygiene and unsanitary practices in regard to self, for fellow-workers, and to the public.

Continue with Exercises

EXERCISES, LESSON 1

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response(s) that best answer(s) the question or best completes the incomplete statement or by writing the answer in the space provided. For true/false exercises, indicate whether the statement is true or false.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. The act or process of exposing a product to an adulterant or unwholesome material is called _____.

SPECIAL INSTRUCTIONS FOR EXERCISES 2 THROUGH 7. Match the definition in Column I with the appropriate term in Column II.

Column I

2. _____ That characteristic possessed by a food product that is conducive to good health and well being in the consumer.
3. _____ The surface of any equipment or other material that contacts the product or ingredients during processing.
4. _____ The buildings, equipment, vehicles used to handle, process, manufacture, assemble, store, freeze, or transport foods.
5. _____ Room or area in which processing occurs.
6. _____ Any step in the manufacture or preparation of a product into its final form.
7. _____ Treatment of product zones by a process that is effective in destroying vegetative cells of pathogenic bacterial and in substantially reducing other microorganisms.

Column II

- a. Food establishments.
- b. Sanitization.
- c. Production area.
- d. Wholesome.
- e. Product zone.
- f. Processing.

SPECIAL INSTRUCTIONS FOR EXERCISES 8 THROUGH 11. Match the description in Column I with the appropriate publication in Column II.

| <u>Column I</u> | <u>Column II</u> |
|--|---|
| 8. ____ Sets forth sanitary requirements for establishments furnishing food to the military services. | a. Directory of Sanitarily Approved Food Establishments for Armed Forces Procurement. |
| 9. ____ Applies to the inspection of food procured for all the military services and for inspection of food establishments. | b. AR 40-657, Veterinary/Medical Food Inspections and Laboratory Service. |
| 10. ____ Lists all establishments that have been inspected for sanitation and found acceptable by the military veterinary service. | c. Location of Military Veterinary Personnel Available for Inspections and Services. |
| 11. ____ Lists the assigned station of veterinary service personnel, in case their services are required for central procurement action. | d. Military Sanitary Standards. |

12. List the four types of sanitary inspections performed by military veterinary service personnel on commercial establishments furnishing food to the military.

13. Food establishment premises must be well_____. Also, premises must be free of environmental conditions and/or materials that are a _____to sanitation.

14. All raw materials used in a food establishment must be obtained from approved sources as required by _____.
15. A _____ sanitary inspection of a Directory-listed establishment may be initiated by the inspector when the plant has not corrected deficiencies found during the performance of a _____ sanitary inspection.
 - a. Special, routine.
 - b. Forced, initial.
 - c. Update, military.
 - d. Military, initial.
16. Ceilings over areas with unpackaged food must be free of _____.
17. Where practicable, the exterior openings of a food establishment shall be equipped with screens or other effective means (for example, air curtains) to prevent the entrance of _____, _____, and _____.
18. Rooms in the processing areas must open directly into any barns or stables, _____, _____, _____ garages, or _____ shops.
19. Light intensity in each room must conform to the _____ of the Illumination Engineering Society (IES).
20. Air for ventilation must be adequately _____ as appropriate to prevent _____.
21. The water heater must be able to furnish an _____ supply of _____ water for complete food plant cleaning procedure during the day.
22. Water outlets must have readily identified color codes if they have _____ water.

23. All dry waste materials, in a food establishment, must be collected and disposed of at the end of the day.
- a. True.
 - b. False.
24. If a rest room serves 50 men, how many urinals are required?
- a. Five.
 - b. Three.
 - c. Two.
 - d. One.
25. Restrooms, in a food establishment, may be used for the storage of cleaning equipment.
- a. True.
 - b. False.
26. No lubricants can be used on product handling and processing equipment in a food establishment.
- a. True.
 - b. False.
27. The food contact surfaces of all equipment and utensils must be _____ under use conditions, easily accessible for cleaning, and _____ resistant.
28. Cleaning and sanitizing chemicals used in a food establishment must be listed in the USDA publication _____

29. If water is to be used as a sanitizer in a food establishment, it must be at least:
- a. 200°F.
 - b. 190°F.
 - c. 180°F.
 - d. 170°F.
30. Cooler rooms must be free from objectional _____ and from _____.
31. Effective measures for the control of insects, _____, and _____ must be maintained at all times.
32. Where food products or supplies are prepared or stored, the use of _____ is prohibited, as well as _____ or _____.
33. After intimate contact with infected or otherwise unsanitary areas of the body or scratching anywhere on the body, an employee must perform a thorough _____.
34. Employees' personal effects may be stored in the production area of a food establishment.
- a. True.
 - b. False.
35. No person should be permitted to work with the processing or handling of food products who has a _____ or _____ wound on hands, arms, neck, or face.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 1

1. Contamination. (para 1-2c).
2. d (para 1-2l)
3. e (para 1-2j)
4. a (para 1-2e)
5. c (para 1-2h)
6. f para 1-2g)
7. b (para 1-2k)
8. d (para 1-3b)
9. b (para 1-3a)
10. a (para 1-3d)
11. c (para 1-3e)
12. Initial
Routine
Special
Update (para 1-4)
13. Drained; hazard (para 1-5a)
14. AR 40-657 (para 1-5b)
15. a (para 1-4c)
16. peeling paint (para 1-5d)
17. insects, rodents, and other animals (para 1-5d)
18. living quarters; toilets; heavy maintenance (para 1-5d)
19. Lighting Handbook (para 1-5e)
20. filtered; contamination (para 1-5f)
21. undiminished; hot (para 1-5g)

22. nonpotable (para 1-5g)
23. b (para 1-5i)
24. d (para 1-5j)
25. b (para 1-5j)
26. b (Lubricants may be used if they are edible and nontoxic) (par 1-5k).
27. nontoxic; corrosion (para 1-5l)
28. List of Chemical Compounds Authorized for Use Under USDA Inspection and Grading Programs (para 1-5m)
29. c (para 1-5m)
30. odors; molds (para 1-5p)
31. bird; animals (para 1-5r)
32. tobacco; eating; expectorating (para 1-5t(1))
33. handwashing (para 1-5t(1)(2))
34. b (para 1-5t(1))
35. discharging; infected (para 1-5t(2))

End of Lesson 1

LESSON ASSIGNMENT

LESSON 2

Installation Inspections.

LESSON ASSIGNMENT

Paragraphs 2-1 through 2-8.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 2-1. Identify terminology related to commissary stores and troop issue subsistence.
- 2-2. Identify responsible agencies and officer responsibilities related to commissary stores and to troop issue subsistence.
- 2-3. Identify commissary-specific sanitation requirements.
- 2-4. Identify improper sanitary practices in handling subsistence in the commissary store.
- 2-5. State frequency of cleaning procedures for various areas of the commissary store.
- 2-6. Identify TISA-specific inspection guidelines.

SUGGESTION

After studying the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

Section I. COMMISSARIES

2-1. DEFINITIONS

a. **Commissary Officer.** Under the direct supervision of the field office director, the commissary officer is responsible for the day-to-day operational management of the commissary store and its assets.

b. **Commissary Store.** Located on a military installation, provides subsistence and household supplies for sale to authorized individuals.

c. **Field Office Director.** Is responsible for the management of all commissary store resale activities within his regional area.

d. **Troop Support Agency.** The Troop Support Agency (TSA) manages and operates commissary resale stores worldwide; commands commissary store regional field offices; provides technical guidance and procedures for the worldwide operation of the Army Food Service Program (garrison and field food service, excluding hospital, nonappropriated fund, and Cadet dining facility, US Military Academy Food Program), troop issue subsistence, laundry and dry cleaning activities, clothing sales stores, and initial issue points for clothing.

e. **Troop Support Agency Field Office.** The TSA Field Office is responsible for operational direction and accountability for all commissary stores within a designated geographical region.

2-2. RESPONSIBILITIES

a. **Troop Support Agency.** A field operating agency under the jurisdiction of the Deputy Chief of Staff for Logistics, is responsible for worldwide operation of resale commissary store activities.

b. **The Major Commands.** United States Army Forces Command (FORSCOM), Training & Doctrine Command (US Army) (TRADOC), overseas commands, and/or other commands, direct and control the operation of resale commissary store activities. They also determine the need for expansion of existing facilities or establishment of new commissary facilities, in accordance with Headquarters, Department of Army policy. The major commander designates a staff officer to serve as liaison in matters concerning commissary store activities within his jurisdiction.

c. **The Installation Commander.** Conducts liaison with the appropriate TSA element. Determines, in coordination with the supporting commissary officer, the requirements for services and hours of operation. The installation commander also provides base operations support.

d. **Troop Support Agency Field Offices.** In order for Troop Support Agency (TSA) to have a more effective control over commissary store activities, it has established five field offices: Northeastern Field Office with headquarters at Fort Meade, MD; Southeastern Field Office with headquarters at Fort Lee, VA; Midwestern Field Office with headquarters at Fort Sam Houston, TX; Western Field Office with headquarters at Fort Lewis, WA; and European Field Office with headquarters at Zweibruecken, Germany. These offices, under the direct supervision of TSA, manage and control the commissary resale activities within their regional areas.

e. **The Field Office Director.** The director of a TSA field Office is responsible for all commissary resale activities within his regional area. He is also accountable for subsistence supplies and funds for all commissary store resale activities within his regional area.

f. **Commissary Officer.** The commissary officer is under the direct supervision of the field office director. His responsibilities include:

- (1) Supervising all operations of the commissary store, including annexes.
- (2) Receiving, inspecting, storing, protecting, selling, and inventorying commissary resale supplies.
- (3) Coordinating the veterinary food inspection as required in AR 40-657.
- (4) Maintaining sanitary standards as prescribed in AR 40-5 and MIL-STD-903C, Sanitary Standards for Commissaries.
- (5) Providing proper storage of resale supplies as prescribed in the Army Commissary Operating Manual and Annexes.

2-3. CLASSES OF INSPECTION

The commissary store can be likened to a supermarket. In numerous ways, their operations are similar. As with a supermarket, most of the items sold are obtained directly from contractors and wholesalers, but the commissary also gets some of its products from government-owned stocks of perishable and semiperishable issue items. The veterinary specialist assigned to commissary store activities will perform Classes 4, 5, and 7 inspections.

2-4. SANITARY INSPECTION AT A COMMISSARY

Sanitary inspections of the commissary store are conducted periodically by a commissioned Medical or Veterinary Corps officer. These inspections are conducted using MIL-STD-903C, Sanitary Standards for Commissaries. The contents of Military Standard 903C have much in common with Military Standard 909 which is a more recent publication. The standards that are included in both references are exactly the same. MIL STD 903C includes a detailed checklist for sanitary compliance, which is the DD Form 2460, Commissary Sanitary Compliance Checklist. This checklist is included in the subcourse in Appendix C. You will want to refer to this checklist as you study this lesson. Military Standard 903C establishes certain minimum sanitary requirements for military commissary stores and a system of recording specific violations of these requirements to assure that military food protection programs are effective. The commissary officer is responsible for correcting any unsanitary conditions. At the discretion of the Deputy for the Veterinary Activities, more frequent sanitary inspections can be conducted by a veterinary officer or a qualified enlisted person, usually a veterinary food inspection specialist. Some of the areas included in these sanitary inspections are listed below.

a. **Construction and Repair of Equipment and Utensils.** All equipment and utensils must be designed to be smooth, easily cleaned and sanitized, and durable. They must be constructed of sanitary materials that are nontoxic under use conditions and are durable (that is, no wood). All equipment and utensils must meet the standards (approval) of the National Sanitation Foundation (NSF). All supervisors should be issued bimetallic thermometers to monitor temperatures. Unprotected type glass/mercury or alcohol type thermometers should not be used.

b. **Meat Market.**

(1) Hot water, detergent, and chemical sanitizer. An ample supply of hot water, a suitable detergent, and a chemical sanitizer must be available in the meat market at all times for use in cleaning and sanitizing all meat market equipment parts, product contact surfaces of equipment, display trays, and other immersible articles used in the market.

(2) Standards for equipment and meat market area. Walls, floors, ceiling, dunnage, trolleys, hooks, trees, and permanent shelving in meat processing room, refrigerated storage rooms, or refrigerators must be kept in good repair and kept clean and free of chipping or peeling paint, free of mold, and free of objectionable odors at all times. Floors and all equipment and utensils the meat market must be cleaned and sanitized daily, or more often if necessary.

(3) Two methods used for cleaning and sanitizing. The standard method has the following steps: a rough cleaning, an alkaline detergent cleaning, sanitizing, rinsing (if needed), and air drying. Steps for the one step method are: a rough cleaning, a germicidal cleaning and sanitizing, rinsing (if needed), and air drying. The chemical sanitizer used must be one that is approved by the USDA. Water temperature used with a chemical sanitizer must be 120-140°F. For hot water sanitizing, the water used must be 170 °F and the utensils must be in contact with the water for 30 seconds.

(4) Meat display cases. Meat display cases that have meat drippings or other residue must be cleaned and sanitized daily. Other meat display cases, on a weekly basis, must be emptied and thoroughly washed with a general purpose detergent, rinsed, sanitized, and dried. However, meat display cases containing only prepackaged meat items are to be cleaned and sanitized every two weeks.

(5) Electrically operated meat market equipment. Electrically operated meat market equipment (for example, power saws, meat slicers, meat grinders) must be kept clean and in good operating condition. Any equipment with more than 3 hours down time in any one shift must be completely disassembled, cleaned, and sanitized prior to further use in that day's operation or work shift, whichever is shorter. Additionally, all equipment must be disassembled, cleaned, and sanitized at the end of each day's operation or work shift, whichever is shorter. Equipment must be disassembled, cleaned, and sanitized according to manufacturers' equipment manuals or directives and technical manuals published by the military services.

(6) Temperature requirements in the meat processing area. The temperature of the meat processing area should not exceed 50°F during operations. If area temperature is between 50°F (10°C) or below during processing of raw meats, all equipment and area will be cleaned and sanitized every 8 hours or at the end of the shift, whichever is shorter. If, however, area temperature in the meat processing area is between 51°F (11°C) and 60° (15°C) during processing of raw meat, all equipment and contact surfaces used in processing will be completely disassembled, cleaned, and sanitized every 4 hours. This condition requires a mid-shift cleanup. If the temperature should exceed 60°F (15.5°C) during the processing of raw meats, operations must cease, with the product being returned to the meat cooler. The processing area must be thoroughly cleaned and sanitized. The room temperature must return to 55°F (12°C) before resuming limited operations with small quantities of meat with an internal temperature of 45°F (7°C) or less.

(7) Raw pork processing. When raw pork is processed, all equipment used in the processing must be completely disassembled, cleaned, and sanitized prior to processing other meat items. Personnel handling raw pork must change aprons and wash/sanitize hands prior to handling any other product.

(8) General requirements for the processing area. All commissary facilities are required to have separate refrigerated coolers for red meats, poultry, and waterfoods. Larger commissaries must have a separate cutting/trimming/reparation/processing/packaging area for each of these products. Smaller commissaries must clean and sanitize the surrounding area between the processing of these different food products. Three hours is the maximum time interval permitted to hold red meats, poultry, or waterfoods, whether cooked or raw, outside a refrigerated cooler, in an unsafe temperature range. For the Army, that range is 45°F (7°C) to 140°F (60°C). For the Navy, the unsafe temperature range is 40°F (4.5°C) to 140°F (60°C). For the tempering of edible raw products, the maximum air temperature permitted is 38°F.

(9) Prevention of cross-contamination. When cooked or ready-to-eat items, such as luncheon meats (cold cuts) or bulk cheeses are handled, sliced, or packaged in the raw meat area, they must be protected from cross-contamination. Personnel who stock or handle fresh prepackaged poultry or waterfoods must wear outer garments (aprons) maintained solely for handling those products and wash/sanitize hands prior to handling any other product. Packaging materials that will eventually be in contact with food products must never be placed or stored on the floor. Packaging materials for edible supplies must be treated the same as edible food products. Barrels and containers used for collecting fat and meat scraps may be a prime source of contamination. Disposable plastic bags (liners) are used in the barrels. Scraps and fat material are allowed to accumulate 6 to 8 inches from the top before being removed and delivered to the renderer's personnel at the outside door. Rendering company personnel must never be permitted to enter the coolers or the food handling areas of the store. Scrap and fat material must be collected by rendering company personnel at least once a week, or more often if necessary.

(10) Absorbing compounds/materials for meat juices and blood. Several granular, absorbent, anti-slip compounds are available for spot application to floors of meat-handling coolers, where there is drippage of meat juices and blood. Their use must be authorized in the USDA publication, "List of Proprietary Substances and Nonfood Compounds Authorized for Use under USDA Inspection and Grading Programs." The use of sawdust for this purpose is prohibited. In coolers where meat handling, hamburger grinding, or sausage grinding take place, the use of the compound must be limited to those areas directly under the hanging meat. All compounds must be removed and replaced at least daily. New, clean, brown paper or corrugated cardboard may be used on the floors of meat handling coolers and processing rooms, but they must be firmly secured to the floor for safety purposes. Brown paper or corrugated cardboard must be removed and replaced on a daily basis.

(11) Refrigeration areas. Refrigeration areas must be free from objectionable odors and from mold. They must also be maintained in a clean and sanitary condition. The coolers and freezers must be capable of maintaining temperatures and humidity necessary for the preservation of the foods being stored or processed. Commissary personnel designated in writing by the commissary officer will conduct temperature checks on all display cases and storage refrigerators and freezers at least three times each working day and once on nonworking days. The date, hour, temperature, and the checker's initials must be recorded. For chill meat (red meat, poultry, waterfoods) display cases, the temperature must not be lower than 29°F (-2°C) or higher than 35°F (2°C). Frozen food display cases must be capable of maintaining an air temperature of 0°F (-18°C) or lower. The load limit is designated by a distinctive line at the inside of each display case. These products should never be stored above the load line, to ensure proper air circulation. When packaged fresh poultry and waterfoods are held in a red meat display case, there must be a solid partition divider between the two areas. Packaged fresh poultry, waterfoods, and red meats must not be displayed together, as possible in a vertical stack display case.

c. **Produce Market.** An ample supply of hot water must be available to clean handtools, equipment parts, display trays, and other immersible articles used in the market. Storage refrigerators and display cases must be emptied, washed, cleaned, and sanitized at least once a week, with intermittent cleaning on a daily basis. The floor in the processing room must be kept free of fruit and vegetable debris. Floors in the processing and display areas must be washed with appropriate cleaning agents and dried thoroughly at the end of each day. Scales and immediate areas must be kept clean. There should be a separate holding cooler and a separate cutting/trimming/preparation/processing/ packaging area for produce. Sanitation procedures for packaging must be the same as those for food items. Storage facilities must be clean, sanitary, and in good repair. Product that has spoiled or has become contaminated or otherwise unfit for human consumption must be immediately disposed of or completely isolated from good (saleable) product.

d. **Grocery Market.**

(1) General sanitation requirements. Floors must be kept clean and free of all debris. Waste receptacles must be emptied and cleaned and trash removed from the store at least daily, or more often as necessary. The checkout counters must be cleaned daily and kept free of all extraneous materials. The shopping carts and the shelves must be kept clean.

(2) Fresh dairy and egg products areas. Display cases and storage refrigerators of the fresh dairy and egg products area must be cleaned and washed after spillage or leakage of products. On a weekly basis, the display cases and storage refrigerators must be emptied and thoroughly washed with a general purpose detergent, rinsed, sanitized, and dried. The inspector must examine the dairy display cases several times each day, with particular emphasis on code dates and operational defects such as tears or punctures in packages.

(3) Refrigeration areas. Refrigerated display cases of bakery products must, on a weekly basis, be emptied and thoroughly washed with a general purpose detergent, rinsed, sanitized, and dried. In general, refrigeration areas must be free from objectionable odors and from mold. They also must be maintained in a clean and sanitary condition. Temperature checks are required three times each working day and once on nonworking days. Chill items, such as dough products and dairy products, including milk and eggs, must be stored and displayed at temperatures below 40°F (4.4°C). Frozen products must be stored or displayed at a temperature of 0°F (-18°C) or below.

(4) Storing and storage. Storage facilities must be clean, sanitary, and in good repair. Shelves, cabinets, and dunnage or pallets must be used where necessary to protect materials from contamination. Product unfit for human consumption must be isolated from good product. Hazardous products, such as pesticides, insecticides, and other toxic materials, must be separated from all food products, and never stored, transported, or displayed together.

(5) Salvage area. The salvage area must be physically separated from all other products storage areas. The area must be cleaned on a daily basis. Salvageable items must be separated from non-salvageable items. Damaged hazardous items must not be placed in the salvage area at any time.

e. Warehouse Section.

(1) Cleaning. The warehouse must be kept clean and orderly. Food product spillage must be removed on a daily basis. Floors in the warehouse must be swept and cleaned on a weekly basis, or more often is necessary. Cleaning utensils and equipment must be stored separately from the storage areas.

(2) Refrigeration area. Refrigeration areas must be free from objectionable odors and from mold. They must be maintained in sanitary conditions. Refrigeration areas must be equipped with an accurate thermometer. Temperature checks are required on storage refrigerators and freezers at least three times each working day and once on nonworking days. The chill storage requirements and the freezer storage requirements are the same as for the meat market area and the grocery market area.

(3) Storing and storage. Storage facilities must be clean, sanitary, and in good repair. Shelves, cabinets, and dunnage or pallets must be used where necessary to protect materials from contamination. Storage practices must be in accordance with directives and technical manuals of the military services concerned. Storage facilities should be inspected daily for cleanliness and proper stock rotation. Damaged items, such as cans with missing labels, dents, leakers, swellers, or other defects, should be removed to the salvage area for thorough inspection. Recommendations are then made to the commissary officer as to the serviceability of the product. The commissary officer can then dispose of the product through regular issue, special sale at reduced prices, forced issue, or condemnation.

f. Delicatessen.

(1) Cleaning and sanitizing. The general requirements for cleaning and sanitizing are the same as those specified for other areas. In addition, food contact surfaces must be cleaned and sanitized after every use, after interruption of service, and if they are in continuous use, then at regularly scheduled intervals throughout the day. Display cases of the delicatessen area must be emptied, washed, rinsed, sanitized, and air-dried on a daily basis. If the product is placed on multi-service trays, then only the trays need cleaning and sanitizing on a daily basis and the display case on a weekly basis, or more often as necessary.

(2) Separation of areas, product, equipment, and personnel. The delicatessen preparation area, cooler areas, or display areas must be completely separated from the remainder of the operations insofar as traffic of materials and personnel are concerned. There must be a separate holding cooler and a separate cutting/trimming/preparation/processing/packaging area for luncheon meats and cooked delicatessen items. Raw foods in the delicatessen are limited to vegetables and/or salads sold or served from containers. No packaged or nonpackaged raw meats, poultry, or waterfoods may be stored or displayed in the delicatessen. For example, cooked seafood may be displayed in the delicatessen area but not with fresh (raw) seafood, which is displayed in another, specified area of the commissary. The same equipment must not be used for raw and cooked product (or biologically different items) without first cleaning and sanitizing in between the use of each product. This includes tools, utensils, saws, knives, tables, boards, and blocks. Only personnel assigned to the cooked processed meat area are permitted to handle cooked products. Delicatessen personnel cannot work or pass through other processing areas.

(3) Temperature. All delicatessen cooking operations, warming tables, holding ovens, and chilling must be monitored by thermometers to assure that the prescribed bacterial killing and growth prevention temperatures are maintained. Temperatures of all display cases and storage/freezers must be checked three times each working day and at least once during each nonworking day, with the date, hour, temperature, and checker's initials recorded. No potentially hazardous or temperature-sensitive perishable product, cooked or raw, should ever be held at unsafe temperatures for more than 3 hours. The unsafe temperature range prescribed by the Navy is between 40° and 140° Fahrenheit. The unsafe temperature range for the Army is between 45° and 140° Fahrenheit.

g. Cleanliness and Health of Personnel. Commissary officers or immediate supervisors of food service activities must inspect all personnel daily at the start of the work period. Persons who have signs of illness, skin disease, diarrhea (admitted or suspected), infected cuts, or boils will be referred to a medical facility for a determination as to their fitness for duty. Pre-employment and periodic medical examinations of commissary personnel are performed on individuals or groups when required by the appropriate local medical authority. Persons who have been absent from work for any length of time for reasons of communicable illness (including diarrheal

illness) must be referred to the medical facility for a determination as to their fitness for duty prior to resuming work. When they return to work, they must have a written clearance signed by a medical officer. All persons who handle food ingredients, prepare food, or touch surfaces contacted by such foods must:

- (1) Wear clean outer garments suitable for the work being performed.
- (2) Wash their hands thoroughly in an adequate hand washing facility before beginning work and upon returning to work after using toilet facilities, eating, smoking, or otherwise soiling their hands.
- (3) Wear hair nets, headbands, caps, beard nets, or other effective hair restraints so as to prevent contamination of food or food contact surfaces.
- (4) Not store clothing or other personal belongings in production areas or eat food, drink beverages, smoke, or use chewing tobacco where any food products or supplies are prepared, stored, or otherwise handled.
- (5) Maintain gloves used in food handling in an intact, clean, and sanitary condition. Gloves used for handling foods must not be used for any other purpose.

Section II. TROOP ISSUE SUBSISTENCE ACTIVITIES

2-5. DEFINITIONS

a. **The Troop Issue Subsistence Activity.** The troop issue subsistence activity (TISA) is the element of an installation responsible for acquiring, storing, issuing, selling, and accounting for subsistence supplies used for personnel authorized to subsist in appropriated fund dining facilities, and by organizations and activities authorized to purchase there from.

b. **The Troop Issue Subsistence Officer.** The Troop Issue Subsistence Officer (TISO) administers the functions of a Troop Support Agency.

2-6. RESPONSIBILITIES

a. **The Troop Support Agency.** Provides technical guidance and procedures for the worldwide operation of the Army Food Service Program (garrison and field food service and troop issue subsistence). Excluded from this program are hospital food programs, non-appropriated fund food programs, and Cadet Mess, US Military Academy.

b. **The Major Commands.** United States Army Forces Command (FORSCOM), TRADOC, overseas commands, and/or other commands, direct and control the operation of TISAs at installations under their jurisdiction. They also determine the need, in accordance with Headquarters, Department of Army policy, for the

establishment of TISAs or expansion of existing facilities, either as a result of a survey made by these commanders or based upon the recommendations of the TSA. The major commander designates a staff officer to supervise the operation of the TISAs under his jurisdiction.

c. **The Installation Commander.** Responsible for the troop issue mission of his installation. The installation commander, within resources furnished by the major commander, will provide adequate personnel and facilities and will be responsible for obtaining the necessary equipment and supplies to ensure efficient operation of the TISA under his command.

d. **The Troop Issue Subsistence Officer.** The TISO, under the general supervision of a designated staff officer, will be accountable for troop issue subsistence supplies and funds. Some of the responsibilities of the TISO are:

(1) Requisitioning, receiving, inspecting, storing, safeguarding, inventorying, issuing, and selling issue subsistence.

(2) Arranging and coordinating veterinary food inspections as prescribed by AR 40-656 and AR 40-657.

(3) Assuring proper storage of subsistence supplies as prescribed in MIL-STD-909, Sanitation Standards for Food Storage Facilities, and DOD 4145.19-R-1, Storage and Materials Handling.

(4) Maintain sanitary standards as prescribed in AR 40-5.

2-7. ORGANIZATION

The TISA is broken into two branches--the control branch, which functions as the administrative center for the TISA, and the storage/distribution branch. The storage/distribution branch receives, inspects, stores, and issues subsistence to authorized organizations and activities; receives issue slips and prepares issues for drawing organizations, units, or ration breakdowns; operates a self-service distribution center, where established; and assists in accomplishing inventories and advises the TISO as to the current status of stocks. The rations can be issued for the TISA by one of these methods:

- a. Issues in bulk to ration breakdown section; for example, infantry division.
- b. Self-shopping troop issue facility for semiperishable and/or perishable; for example, mini-mart or maxi-mart.
- c. Breaks and issues direct to supported units.
- d. Combination of above.

2-8. INSPECTIONS OF TROOP ISSUE SUBSISTENCE ACTIVITY

a. Cold Storage Facility.

(1) Normally, a TISAs cold storage facility is used to store chilled and frozen subsistence items to be issued to dining facilities. The veterinary food inspection specialist assigned to the cold storage facility will perform class 4, 5, 7, and 9 inspections.

(2) Daily inspections of the cold storage activity must be conducted. These inspections should include, but not be limited to:

(a) Temperatures. All recording and indicating thermometers should be observed. Temperature readings must be recorded on a chart provided for the purpose by TISA personnel.

(b) Sanitation. All storage refrigerators and storage rooms must be inspected for sanitation.

(c) Weights . Accurate scales maintained in good working condition will be used at the cold storage facilities for test-weighing supplies received.

b. **Dry (Semiperishable) Storage Facility.** The semiperishable section should also be inspected daily for cleanliness and proper stock rotation. Damaged items, swellers, or other defective items should be removed to the survey section for thorough inspection.

c. **First-In, First-Out.** Subsistence should be issued in the same order (date of pack should be considered) as received; i.e., on a "first-in, first-out" (FIFO) basis, except when issue is necessary to avoid losses by spoilage.

d. **Responsibility for Troop Issue Subsistence Activity Sanitary Inspections.** Sanitary inspections of the troop issue perishable and semiperishable subsistence warehouse are conducted by a veterinary officer periodically. At the discretion of the Deputy for the Veterinary Activity, more frequent sanitary inspections can be conducted by a veterinary officer or by a qualified enlisted person such as a veterinary food inspection specialist.

Continue with Exercises

EXERCISES, LESSON 2

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response(s) that best answer(s) the question or best completes the incomplete statement or by writing the answer in the space provided. For true/false exercises, indicate whether the statement is true or false.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. What agency manages and operates the Army commissary resale system?
_____.
2. The Troop Support Agency field office for the commissary store at Fort Riley, Kansas, has its headquarters at _____.
3. The commissary officer must maintain sanitary standards as prescribed in AR 40-5 and Military Standard _____, _____,
_____.
4. The troop issue subsistence officer (TISO) assures proper storage of subsistence supplies as prescribed in Military Standard _____, _____
_____ and DOD _____, _____.
5. All equipment and utensils used in the commissary store must have the approval of the _____.
6. All commissary supervisors should be issued _____
thermometers to monitor temperatures.
7. All walls, ceiling, dunnage, trolleys, hooks, and permanent shelving in the meat market area must be cleaned and sanitized at least _____.

8. List the steps in the standard method of cleaning and sanitizing.
- a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
9. For hot water sanitizing, the water used must be _____ Fahrenheit and the utensils must be in contact with the water for _____ seconds.
10. Meat display cases with meat drippings and residue must be cleaned and sanitized _____. Other meat display cases, _____.
11. Electrically operated meat market equipment must be completely disassembled, cleaned, and sanitized prior to further use if down for more than _____ hours.
12. A midshift cleanup, after four hours, is required if the temperature in the meat processing area is between _____ Fahrenheit and _____ Fahrenheit.
13. Operations must cease during the processing of raw meat if the temperature exceeds _____ Fahrenheit.
14. Personnel handling raw pork must _____ and _____/_____ hands prior to handling any other product.
15. What is the maximum time interval permitted to hold red meats, poultry, or waterfoods outside a refrigerated cooler in an unsafe temperature range?
_____.

16. Define "unsafe temperature range" for perishable products.
 - a. ARMY _____ to _____ Fahrenheit
 - b. NAVY _____ to _____ Fahrenheit

17. For the tempering of edible raw meat products, the maximum air temperature permitted is _____ Fahrenheit.

18. Personnel who handle fresh prepackaged poultry or waterfoods must wear _____ maintained solely for handling those products and _____/ _____ hands prior to handling any other product.

19. Scraps and fat material are allowed to accumulate _____ to _____ inches from the top of the barrel or container before being removed and delivered to the outside door for pickup.

20. Who must never be permitted to enter the coolers or the foodhandling areas of the store?
 _____.

21. The granular, absorbent compound used in the meat handling cooler as a sawdust substitute or brown paper or corrugated cardboard must be removed and replaced _____.

22. Refrigeration areas must be free from objectionable _____ and free from _____.

23. Temperature of the meat chill area must be between ____ and ____ Fahrenheit.

24. Frozen food display cases must maintain an air temperature of _____ Fahrenheit or lower.

25. Temperature checks in refrigeration areas must be conducted _____ times each working day and _____ time on non-working days. The _____, _____, _____ and checker's _____ must be recorded.
26. Produce storage refrigerator and display cases must be emptied, washed, cleaned, and sanitized at least _____.
27. Floors in the processing room and in the produce display area must be washed and dried _____.
28. Waste receptacles in the grocery market must be emptied and cleaned at least _____ or _____.
29. Refrigerated display cases of bakery products must be emptied and thoroughly washed and sanitized on a _____ basis.
30. In the grocery market, product in the chill state (such as dough products and dairy products) must be displayed at temperature below _____ Fahrenheit.
31. Hazardous products, such as pesticides, must be _____ from _____ products.
32. In the warehouse section, food product spillage must be removed on a _____ basis. Floors must be swept on a _____ basis or more often if necessary.
33. In warehouse storage _____, _____, and _____ (or pallets) must be used where necessary to prevent _____ or deterioration.
34. In the delicatessen area, food contact surfaces must be cleaned and sanitized _____ as well as after _____ of service.

35. Display cases in the delicatessen area must be cleaned and sanitized on a _____ basis.
36. Delicatessen personnel cannot _____ or _____ other product handling areas.
37. All delicatessen cooking operations, _____, _____, and _____ must be monitored by _____.
38. Gloves used in food handling must be maintained in an _____, _____, and _____ condition.
39. Employees who have been absent from work for any length of time for reasons of communicable illness (including diarrheal illness) must obtain a _____ signed by a _____.
40. Daily inspections of the TISA cold storage facility must be conducted. The inspections should check:
- _____.
- _____.
- _____.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 2

1. Troop Support Agency (TSA) (para 2-1d)
2. Fort Sam Houston, Texas (para 2-2d)
3. 903C, Sanitary Standards for Commissaries (para 2-2f(4))
4. 909, Sanitation Standards for Food Storage Facilities; 4145.19-R-1, Storage and Materials Handling. (para 2-1d).
5. National Sanitation Foundation. (para 2-2d).
6. Bimetallic (para 2-4a)
7. Daily. (para 2-4b(2)).
8.
 - a. Rough cleaning
 - b. Alkaline detergent cleaning
 - c. Sanitizing
 - d. Rinsing (if needed)
 - e. Air drying. (para 2-4b(3)).
9. 170°; 30. (para 2-4b(3)).
10. Daily; weekly. (para 2-4b(3))
11. Three (3) (para 2-4b(5))
12. 51°; 60° (para 2-4b(6))
13. 60° (para 2-4b(6))
14. Change aprons; wash/sanitize (para 2-4b(7))
15. Three hours. (para 2-4b(8)).
16.
 - a. 45° to 140°
 - b. 40° to 140° (para 2-4b(8))
17. 38° (para 2-4b(8))
18. Aprons; wash/sanitize (para 2-4b(9))
19. 6 to 8 (para 2-4b(9))

20. Rendering company personnel. (para 2-4b(9)).
21. Daily. (para 2-4b(10)).
22. Odors; mold. (para 2-4b(11)).
23. 20° and 35° (para 2-4b(11))
24. 0° (para 2-4b(11))
25. 3; 1; date; hour; temperature; initials (para 2-4b(11))
26. Weekly. (para 2-4c)
27. Daily. (para 2-4c)
28. Daily; more often as needed. (para 2-4d(1))
29. Weekly (para 2-4d(3))
30. 40° (para 2-4d(3))
31. Separated; food (para 2-4d(4))
32. Daily; weekly (para 2-4e(1))
33. Shelves, cabinets, and dunnage; contamination (para 2-4e(3))
34. After every use; interruption (para 2-4f(1))
35. Daily (para 2-4f(1))
36. Work or pass through (para 2-4f(2))
37. Warming tables, holding ovens, and chilling; thermometers. (para 2-4f(3))
38. Intact, clean, and sanitary (para 2-4g(5))
39. Written clearance; medical officer. (para 2-4g)
40. Temperatures.
Sanitation.
Weights. (para 2-8a(2))

End of Lesson 2

LESSON ASSIGNMENT

LESSON 3

Food Storage Facilities.

LESSON ASSIGNMENT

Paragraphs 3-1 through 3-17.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 3-1. Identify general factors affecting storage life of subsistence.
- 3-2. Identify factors relating to dry storage of semiperishable subsistence, including storage precautions and safe storage time periods.
- 3-3. Identify factors relating to chilled and frozen storage of perishable subsistence, including storage precautions, storage temperature guidelines, relative humidity, storage compatibility, and safe storage time periods.
- 3-4. Determine the approximate storage life of a specific food item, using the tables in DOD 4145.19-R-1.

SUGGESTION

After studying the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

Section I. INTRODUCTION

3-1. GENERAL

The military is unique in that it procures subsistence items in bulk which are then put into storage to be used at a later date. Sanitation in these food storage facilities is important. If neglected, the subsistence items will deteriorate faster than if kept under ideal conditions.

3-2. FOOD STORAGE FACILITIES

There are two types of food storage facilities: cold storage, for perishable subsistence, and dry storage, for semiperishable subsistence. The cold storage facilities require refrigeration while the dry storage facilities do not. These storage facilities may belong to the commissary (TSA), TISA, or the Army and Air Force Exchange Service (AAFES).

3-3. INSPECTION DOCUMENTS

a. If the food storage facility is owned by the commissary, then Military Standard 903C, Sanitation Standards for Commissaries, will be used for the inspection.

b. If the food storage facility is owned by TISA, then Military Standard 909, Sanitation Standards for Food Storage Facilities, will be used.

c. There is no AAFES form or inspection format for sanitary inspections of AAFES food storage facilities. Procedures found in local standing operating procedure (SOP) will be used.

d. DOD 4145.19-R-1, Storage and Materials Handling (see appendix A), establishes uniform storage and materials handling policies, procedures, and responsibilities for use by DOD supply installations/activities involved in the receipt, storage, issue, and care of military supplies and equipment. Section 5 of chapter 5, of this regulation deals with the storage of subsistence.

3-4. FACTORS AFFECTING STORAGE LIFE

DOD 4145.19-R-1 (Chapter 5, Section V) lists the recommended approximate storage life for many semiperishable items stored under optimum conditions. This list should be used as a guide by the inspector in determining the shelf life of subsistence items. The period of safe storage becomes uncertain if items are exposed to extremes in temperature, humidity, or air circulation. The remaining storage life must always be based on a thorough inspection of the product. The main causes for deterioration or spoilage of subsistence are:

a. **Age.** All foodstuffs are subject to varying degrees of natural deterioration. This deterioration is inherent in the food itself. It should not, however, be confused with action of microorganisms, chemical agents, or other outside agents.

b. **Microorganisms.** Most perishable items deteriorate or spoil because of the action of microorganisms, especially bacteria, yeasts, and molds. Actions of microorganisms cause gas to form and this produces objectionable odors and taste. Some swellers in canned goods are the result of action by microorganisms.

c. **Insects.** Insects can cause great damage to stored food. They may attack both natural and manufactured food. Food stored at temperatures between 60E and 90°F is especially attractive to insects. Infested supplies must be segregated and, if not too heavily infested, may be "reconditioned" for use.

d. **Rodents.** Rodents not only physically destroy food by feeding, chewing, and cutting the bags for nests or nesting material. Rodents also contaminate food with their excreta and hairs. Rodents are carriers of filth and disease; the importance of controlling these pests is evident. The most effective method of control is to prevent entry of these animals.

e. **Environmental Factors.**

(1) Freezing. Freezing temperatures normally do not harm dry products, such as grains, flour, sugar, starch, cereals, and dehydrated foods, but products with large amounts of water, such as canned goods, will freeze and possibly burst. If the container does not rupture, the product inside may suffer changes in consistency and texture. Emulsions that separate when frozen, such as mayonnaise and mustard, can be recombined with the proper equipment.

(2) Heat (high temperatures). High temperatures are detrimental to canned goods and greatly shorten storage life of all subsistence because such temperatures accelerate the natural deterioration. High temperatures also speed up chemical reactions, such as oxidation and rancidity in fatty foods, or interaction between high acid content subsistence and metal cans and cause pinholing, spangling, hydrogen swells, or denting. A rule of thumb commonly used is that each rise of 18°F (10°C) above a specified storage temperature doubles the rate of deterioration. Subsistence stored at high temperatures is particularly susceptible to insect infestation and will require frequent inspection.

(3) Moisture (humidity). High humidity is detrimental in many respects. It accelerates the growth of bacteria and molds. It promotes insect infestation, it causes mustiness in flour, rice, and similar foods. High humidity causes products which readily absorb moisture, such as sugar and salt, to cake and become hard. Storage of perishable items at high relative humidities may allow water to condense upon or to be absorbed into the item. At lower relative humidities, the item may dry and shrink.

(4) Air circulation (ventilation). Along with proper temperature and humidity, air circulation in a storage room is an important factor in storage. This is facilitated by raising containers off the floor by the use of pallets and by stocking items so as to permit free circulation of air.

(5) Light. Damage from light is restricted to products that are packed in glass or transparent containers. Exposure causes color changes and may affect the flavor of foods containing, or composed of, edible oils and fats.

Section II. DRY STORAGE

3-5. RECEIVING AREA

The receiving area must be protected from dust, sun, rain, or snow. It must be adequately lighted and ventilated, have proper drainage, and be kept sanitary at all times. The inspection room must be accessible to both the receiving area and the cold storage facilities. The room should be large enough to permit the product to be moved in and out, and also to facilitate inspection. The inspection room should be constructed, equipped, and maintained in conformance with the highest sanitary standards to prevent contamination of the product and inspection samples.

3-6. GENERAL

a. Semiperishable subsistence can be safely stored for relatively long periods of time without refrigeration. The term semiperishable refers to canned, dried, and dehydrated items, such as salt, sugar, flour, coffee, or cereal. These are all items that do not require refrigeration. Semiperishable subsistence items are too often regarded as nonperishable commodities that do not require care or protection in storage. While semiperishable subsistence is not nearly as susceptible to spoilage as perishable subsistence, spoilage can and will occur if the products are mishandled, improperly stored, or stored for excessive periods of time. It is important to remember that the length of storage should be based on the date of packing and not on the date of receipt.

b. The container is one of the factors in the overall keeping period of an item. For example, flour in bags versus cans or coffee in bags or pouches versus coffee in vacuum-packed cans. The desirable properties of semiperishable food products, such as flavor, odor, and taste, often depend upon very unstable or volatile components, and deterioration may result from a breakdown or loss of these constituents.

3-7. STORAGE PRECAUTIONS

a. Care should be taken that items are not stacked so high as to cause bursting or crushing of the bottom layers. Also, items should not be stacked so high that the top layer is subject to the higher temperature more prevalent near the ceiling or overhead. Stacking in close proximity to steam or other heated pipes must be avoided.

b. Pallets must be used to raise subsistence off the floor. Individual lots must be piled in such a way as to permit the circulation of air around the lots.

c. Bagged items and those requiring fumigation and insect control should not be stored in large masses in corners of the storeroom or directly against the walls. Such storage leaves insufficient room for cleaning and inspecting.

d. Palletized storage is used as this facilitates handling of the food items and reduces losses by breakage in handling. All items should be properly cross-stacked to keep the stack solid and prevent it from toppling.

e. Adequate space must be maintained to separate lots from walls and interior partitions to permit cleaning, application of vector control measures, and to promote air circulation.

f. Semiperishable subsistence items must be clearly marked. They must be segregated so that oldest lots (date of pack) are issued first unless lots received at later dates show evidence of deterioration and/or impending spoilage.

3-8. STORAGE PERIODS (KEEPING TIME)

a. The safe storage period for dry subsistence items varies greatly. The safe storage period depends on such elements as temperature, humidity, care in handling, protection from weather, quality of the food when received, and the packing. Safe storage periods become very uncertain at extremes of temperature and under combat conditions.

(1) The fact that subsistence has been on hand up to the limit of the "safe" storage period does not mean that the subsistence should be condemned as unfit for consumption but that it should be consumed as soon as practicable.

(2) Subsistence which has been on hand beyond the safe storage period should be inspected carefully for spillage, leakage, or other damage. If still good, it should be issued as soon as possible. Such items will be given priority of issue over newer stocks.

(3) Relative humidity is one of the factors in the safe keeping time of semiperishable subsistence. The preferred relative humidity is 50-55 percent. Metal cans are susceptible to rust and most boxed or bagged foods to mustiness or molding when there is a relative humidity above 60 percent.

b. Table 5-8, "Dry storage of semiperishable subsistence," in DOD 4145.19-R-1 (see Appendix A) should be used as a guide. This table is based on the optimum rather than the maximum storage life.

Section III. CHILLED AND FROZEN STORAGE

3-9. GENERAL

Chilled and frozen subsistence is highly perishable and must be properly stored to avoid rapid deterioration prior to issue and use.

- a. Storage at temperatures which are too high or too low, under unfavorable conditions of humidity, or in the absence of proper air circulation in unsanitary storerooms will result in rapid spoilage and eventual loss of the product.
- b. Most spoilage of chilled and frozen subsistence is caused by microorganisms, particularly certain species of bacteria and fungi. The contamination spreads rapidly from the decayed items to the surrounding sound subsistence.
- c. Therefore, frequent inspection while in storage, followed by sorting and removal of the decayed items or portions thereof, is of basic importance in maintaining the products in top condition and in keeping losses to a minimum.
- d. Temperature recordings must be kept in a log by warehouse personnel. The quality assurance representative (QAR) is responsible to verify that proper storage temperature is maintained.

3-10. SPACE REQUIREMENTS

a. **Installation-Type Cold Storage Facilities (inside the Continental United States).** The installation-type cold storage facility in CONUS normally is used to receive, store for a short term, and issue perishable subsistence to authorized organizations and activities.

(1) A central meat processing facility, when authorized, will be attached and immediately adjacent to the cold storage facility. Each operation will, however, be separate and distinct from the other.

(2) The installation-type cold storage facility usually contains five refrigerated rooms, each designed for a definite purpose; a freezer room for the storage of frozen items, a chill room for the storage of carcasses and chilled meats, a chill room for storage of shell eggs and dairy products, and two chill rooms for the storage of fresh fruits and vegetables.

b. **Depot and Installation-Type Cold Storage Facilities (Overseas).** Depot and installation-type cold storage facilities (overseas) usually consist of four refrigerated rooms: a freezer room for the storage of frozen items, two chill rooms for the storage of fresh fruits and vegetables, and an egg and dairy products chill room. There is no chill room for the storage of chilled meats and carcasses.

3-11. STORAGE PRECAUTIONS

a. All shipments should be segregated and marked in such a manner to ensure that the oldest lots are issued first. (FIFO) However, it may become necessary to issue a lot more quickly if loss by spoilage will be thus avoided or when another lot of the same commodity is in a better condition for continued storage. Inventory control (accountability) must be maintained.

b. Along with proper temperature and humidity, air circulation in a storage room is an important factor in the proper storage of chilled and frozen subsistence. Items will be stacked on pallets in such a manner that will provide a 4-inch wall clearance, 2-foot ceiling clearance, and sufficient working aisles. Items will be stacked so as to permit free air circulation throughout the storage box from fans and/or air duct systems.

c. The introduction of outside air into the cold storage room holding fruits and vegetables is not necessary. However, when fresh fruits and vegetables are stored in a tight compartment at temperatures of 40°F or higher, the concentration of carbon dioxide produced by respiration may reach such a danger point that a match or candle will be extinguished. While this condition is not considered harmful to most products, personnel should not work in such rooms until a supply of fresh air has been introduced.

d. Quick-frozen fruits and vegetables are highly perishable unless properly stored. Correct handling and proper storage of such foods are imperative in utilizing frozen foods to the best advantage. Upon delivery, quick-frozen fruits and vegetables should be transferred promptly to a low-temperature storage space.

e. Meat items will not be stored on the bare floor. Pallets should be placed on the floor to allow free circulation of air under all items stored in the space. Generally, when the recommended temperature in all parts of the refrigerated space is uniform and is maintained within the stacks in the freezer space, the circulation of air may be considered to be adequate.

f. Egg cases should not be stacked more than five high. This avoids pressure damage.

3-12. STORAGE TEMPERATURES

a. Storage temperatures for most frozen subsistence items are required to be in the -10° to 0°F (-23.3° to -17.8°C) range. Ice cream, for example, should be stored at -10° Fahrenheit or below. Chilled subsistence items are generally stored in the range of 32° to 35°F (0° to 1.7°C).

b. The recommended temperatures of the five refrigerated rooms in the installation-type cold storage facility are:

| | |
|----------------------------------|------------------------|
| Fruits and Vegetables Chill Room | 35°F (1.7°C) |
| Eggs and Dairy Chill Room | 35°F (1.7°C) |
| Frozen Food Room | 0°F (-17.8°C) or below |
| Meat Chill Room | 35°F (1.7°C) |
| Fruits and Vegetables Chill Room | 50°F (10.0°C) |

NOTE: There are two chill rooms for fruits and vegetables. One, at 35°F (1.7°C), is used for highly perishable fruits and vegetables. The other, at 50°F (10.0°C), is used for fruits and vegetables that are not highly perishable. See paragraph 3-14a.

c. Each refrigerated storage room will be equipped with an indicating type thermometer and a 24-hour-recording thermometer. These instruments must be accurate and in a working condition. In order to promptly identify and correct temperatures that fluctuate above or below the accepted temperature ranges, a record of temperatures will be maintained in each storage area. As a minimum, temperatures will be recorded at the beginning and end of normal operating hours.

3-13. RELATIVE HUMIDITY

a. Humidity (moisture) within the storage area must also be controlled. Humidity, the amount of moisture in the air at a given temperature, is measured with a psychrometer. Air can absorb only a certain amount of moisture at a given temperature; the higher the temperature, the more moisture it can absorb. If the temperature drops or if more moisture is added, the excess water will condense and collect on exposed surfaces of the storage facility and the items in storage. If the humidity is too low, the air will extract moisture from the product and cause it to dry out, resulting in loss of flavor and quality.

b. The two most common psychrometers used are a wall-mounted psychrometer and a sling psychrometer. These instruments must be used in accordance with manufacturer's instructions.

c. Table 5-7, "Chill storage of perishable subsistence," in DOD 4145.19-R-1 (see appendix A) shows preferred relative humidities, which best inhibit the gain or loss of moisture in various items.

3-14. STORAGE COMPATIBILITY

a. The ideal cold storage warehouse is divided into five rooms. Each room is designed to store similar items in order to prevent assimilation of odor. The divisions of a cold storage warehouse usually include:

- (1) A fresh-fruits-and-vegetables room 35°F (1.7°C) to store highly perishable fruits and vegetables, such as apricots, pears, lettuce, and celery.
- (2) An eggs-and-dairy products room 35°F (1.7°C) to store such items as butter, shell eggs, cheese, and fresh milk.
- (3) A frozen foods room 0°F (-17.8°C) or below to store frozen subsistence.
- (4) A meat chill room 35°F (1.7°C) to store fresh chilled meat and meat products.
- (5) A ventilated storage 50°F (10.0°C) to store fruits and vegetables that are not highly perishable, such as potatoes, bananas, and onions.

b. To avoid absorption of aromas between noncompatible subsistence, the following items will not be stored in the same area:

- (1) Apples and pears will not be stored with potatoes as they will acquire an unpleasant earthy taste and odor from the potatoes.
- (2) Apples, pears, bananas, peaches, plums, cantaloupes, ripe honeydew melons, avocados, tomatoes, and ethylene-producing fruits or vegetables should not be stored with lettuce (causes russetting, a brownish roughened area), carrots (become bitter), cucumbers, green peppers, acorn or hubbard squash (loss of green color).
- (3) Apples and citrus fruits should not be stored with meat, eggs, and dairy products as they will readily absorb the odors from the apples and citrus fruits.

NOTE: Study the perishable subsistence storage compatibility groups in DOD 4145.19-R-1 (see appendix A, pages A-2 and A-3).

3-15. STORAGE PERIODS (KEEPING TIME)

a. Many of the considerations mentioned for semiperishable items (para 3-7a) are applicable to perishable items.

b. Table 5-6, "Storage life of frozen subsistence at 0°F or below," in DOD 4145.19-R-1 (see Appendix A) should be used as a guide for frozen subsistence.

c. Table 5-7, "Chill storage of perishable subsistence," in DOD 4145.19-R-1 (see Appendix A) should be used as a guide for chilled subsistence.

d. Storage life is the total elapsed time from date of pack to date of issue for immediate consumption. The approximate storage life given in these tables is the best estimate of expected life based upon experience for subsistence procured and stored in accordance with applicable specifications and regulations. Specific lots of items listed in tables 5-6 and 5-7 may be expected to show signs of quality loss approximately 20 percent of the time. Therefore, surveillance inspection procedures should be established from time of receipt until the subsistence item is issued and consumed. The frequency of inspection should be established through actual experience with various products and as prescribed in pertinent military publications.

Section IV. INSPECTION OF FOOD STORAGE FACILITIES

3-16. DISTINGUISHING BETWEEN PROPER AND IMPROPER SANITARY PROCEDURES IN FOOD STORAGE FACILITIES

a. The veterinary food inspection specialist needs to be on the alert for improper sanitary procedures in food storage facilities. The food storage facilities may be in a commissary store, post-exchange, dry storage, and/or cold storage.

b. Some of the improper sanitary procedures that the veterinary specialist will identify in food storage facilities are:

(1) Improper temperatures. See Subcourse MD0694, Basic Food Inspection Procedures, for procedures of determining temperatures of a storage area.

(2) Improper relative humidity. Humidity will be determined using the sling or wall-mounted psychrometer.

(3) Improper storage procedures. Refer to sections I thru III of this lesson for storage procedures and precautions.

(4) Improper sanitary conditions. Refer to para 1-5 of this subcourse for sanitation requirements.

(5) Improper sanitary practices by personnel. Refer to paragraph 1-5t for requirements for cleanliness and health of personnel.

3-17. REPORTING

The veterinary food inspection specialist reports all deficiencies noted to his supervisor and completes the appropriate form according to local SOP.

Continue with Exercises

EXERCISES, LESSON 3

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response(s) that best answer(s) the question or best completes the incomplete statement or by writing the answer in the space provided. For true/false exercises, indicate whether the statement is true or false.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. The two types of storage facilities used for storage of subsistence are _____ and _____.

2. What publication establishes uniform storage and materials handling policies, procedures, and responsibilities for DOD supply installations/activities?
_____.

3. How do the types of storage facilities differ from one another?
 - a. _____ storage requires refrigeration.
 - b. _____ storage does not require refrigeration.
 - c. Cold storage is for _____ subsistence.
 - d. Dry storage is for _____ subsistence.

4. From the following listing, select all the items which cause deterioration in semiperishable subsistence in storage.

- | | |
|--------------------|-------------------------|
| 1. Age. | 6. Lack of ventilation. |
| 2. Light. | 7. Dents. |
| 3. Removable dust. | 8. Rodents. |
| 4. Insects. | 9. Moisture. |
| 5. Heat | 10. Freezing. |

a. 1-2-3-4-5-6-7-8-9-10.

b. 1-3-4-6-8-10.

c. 1-2-4-5-6-8-9-10.

d. 1-4-5-7-8-9-10.

5. Which of these are important factors in the storage of perishable subsistence?
(More than one may be correct.)

- a. Temperature.
- b. Method of freezing the product.
- c. Humidity.
- d. Air circulation.

6. A rule of thumb commonly used is that each rise of _____ °F above a specified storage temperature doubles the rate of deterioration.

7. The storage life of a product is determined from:

- a. Date of receipt at the storage facility.
- b. Date of pack.
- c. Date of sale to the government.

8. A semiperishable food item has been on hand up to the limit of the "safe" storage period. It should be destroyed.
- a. True.
 - b. False.
9. An installation-type facility for cold storage in CONUS usually has _____ rooms; _____ for frozen foods and _____ for chilled foods.
10. The installation-type cold storage facility usually contains five refrigerated rooms. List type of subsistence stored in each of the five rooms.
- a. 50°F. _____.
 - b. 35°F. _____.
 - c. 35°F _____.
 - d. 35°F _____.
 - e. 0°F _____.

SPECIAL INSTRUCTIONS: Use the excerpt from DOD 4145.19-R-1 (appendix A), to answer questions 11 thru 20.

11. The approximate storage life for chicken, whole, ready to cook, stored at 0°F or below is:
- a. 8 weeks.
 - b. 10 weeks.
 - c. 8 months.
 - d. 10 months.

12. How much longer is the storage life for frozen haddock (fish fillets) than for frozen salmon (fish fillets)?
- a. 8 months.
 - b. 5 months.
 - c. 3 months.
 - d. 2 months.
13. How much less is the maximum storage temperature for tomatoes with full color development than the minimum storage temperature for mature green tomatoes?
- a. 10°F.
 - b. 20°F.
 - c. 23°F.
 - d. 35°F.
14. In chill storage, which product requires a greater percentage of relative humidity for optimal storage life?
- a. Watermelons.
 - b. Spinach.
 - c. Peaches.
 - d. Grapes.
 - e. Carrots.

15. You have perishable subsistence in chill storage at a temperature of 32° to 35°F and a relative humidity of 85 to 90 percent. The storage life of sliced bacon, type II, is how much longer than that for bulk pork sausage?
- a. 56 days.
 - b. 42 days.
 - c. 7 days.
 - d. Storage life is the same.
16. How much longer can peanut butter be kept in dry storage at 40°F than at 70°F?
- a. 60 months.
 - b. 36 months.
 - c. 24 months.
 - d. 18 months.
17. How much longer can tuna (water packed) be kept in dry storage at 40°F than at 70°F?
- a. 72 months.
 - b. 54 months.
 - c. 36 months.
 - d. 18 months.
 - e. 9 months.

18. What is the approximate storage life for the following frozen products in storage at the temperatures indicated?

| <u>Product</u> | <u>Temperature</u> | <u>Storage Life</u> |
|-------------------------------|--------------------|---------------------|
| a. Bacon, sliced, type 1. | 0°F | _____ |
| b. Ground beef patties. | 0°F | _____ |
| c. Shucked clams. | 0°F | _____ |
| d. Ice cream, novelties. | 0°F | _____ |
| e. Milk, whole, concentrated. | 10°F | _____ |

19. What is the approximate storage life of these chilled, perishable items at the given temperature and relative humidity?

| <u>Product</u> | <u>Temperature</u> <u>(°F)</u> | <u>Relative Humidity</u> | <u>Storage Life</u> |
|---------------------------|-----------------------------------|--------------------------|---------------------|
| a. Bacon, sliced, type 1. | 32-35 | 85-90 | _____ |
| b. Ground beef. | 32-35 | 85-90 | _____ |
| c. Cheddar cheese. | 30-34 | 65-70 | _____ |
| d. Bartlett pears. | 30-31 | 90-95 | _____ |

20. What is the approximate keeping time for the following foods in dry storage, the packaging indicated, and at the storage temperature specified?

| <u>Food</u> | <u>Package</u> | <u>Temperature</u> | <u>Keeping Time</u> |
|------------------------|----------------|--------------------|---------------------|
| a. Dried beans. | Bag | 70°F | _____ |
| b. Catsup, dehydrated. | Envelope | 90°F | _____ |
| c. Fruitcake. | Box | 40°F | _____ |
| d. Evaporated milk. | Can | 40°F | _____ |
| e. Tea, black, loose . | Carton | 70°F | _____ |

21. Apples and pears should not be stored with _____ as they will acquire an unpleasant earthy taste and odor.

22. Select the products that may be stored together in the same area. They are in the same perishable subsistence storage compatibility group. Consult DOD 4145.19-R-1, pages A-2 and A-3.

- a. Oranges, eggs, dairy products.
- b. Tomatoes, peaches, carrots.
- c. Snap beans, onions, eggplant.
- d. Lettuce, sweet corn, grapes.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 3

1. Dry and cold (para 3-2)
2. DOD 4145.19-R-1, Storage and Materials Handling. (para 3-3d)
3. a. Cold
b. Dry
c. perishable
d. semiperishable (para 3-2)
4. c (para 3-4)
5. a, c, d (para 3-4)
6. 18°F (para 3-4e(2))
7. b (para 3-6a)
8. b (para 3-8a(1))
9. 5; 1; 4 (para 3-10a(2))
10. a. Fruits and vegetables chill room-50°F
b. Fruits and vegetables chill room-35°F
c. Meat chill room-35°F
d. Eggs and dairy chill room-35°F
e. Frozen food room-0°F or below (para 3-2b)
11. d (Appendix A, page A-6)
12. a (Appendix A, page A-7)
13. b (Appendix A, page A-16)
14. Appendix A, pages A-11, A-13, A-14, A-15, A-16)
15. c. Storage life of bacon, type II-21 days
Storage life of bulk pork sausage-14 days
(Appendix A, pp. A-11 & A-15)
16. d. 36 months at 40°F
-18 months at 70°F
18 months (Appendix A, page A-28)

17. c (Appendix A, page A-31)
18. a 1 1/2 months
b 6 months
c 8 months
d 3 months
e 4 months. (Appendix A, table 5-6)
19. a 14 days
b 4 days
c 540 days
d 2-3 months (Appendix A, table 5-7)
20. a 12 months
b 6 months
c 12 months
d 24 months
e 18 months (Appendix A, table 5-8)
21. Potatoes (para 3-14b(1))
22. d (para 3-14; Appendix A, pages A-2 and A-3)

End of Lesson 3

LESSON ASSIGNMENT

LESSON 4

Insect and Rodent Control and Fumigation of Subsistence.

LESSON ASSIGNMENT

Paragraphs 4-1 through 4-18.

LESSON OBJECTIVES

After completing this lesson, you should be able to:

- 4-1. Identify the three general control measures for control of rodents and insects.
- 4-2. Identify environmental control measures for rodent infestation.
- 4-3. Identify chemicals used for rodent control.
- 4-4. Identify traps used in rodent control.
- 4-5. Identify environmental control measures for insect infestation.
- 4-6. Identify types of chemicals used to control insect infestation.
- 4-7. Identify characteristics of the fumigant, aluminum phosphide.
- 4-8. Identify safety measures to be observed in using aluminum phosphide.

SUGGESTION

After studying the assignment, complete the exercises of this lesson. These exercises will help you to achieve the lesson objectives.

Section I. CONTROL OF RODENTS

4-1. INTRODUCTION

a. Millions of dollars worth of subsistence are discarded each year because of insect infestation and damage by rodents. This fact, plus the capabilities of insects and rodents to transmit disease, makes the control of these pests necessary in order to provide quality products and adequate measures in preventing disease.

b. Diseases can be spread from their source to man by several means. One of these is by insects and rodents. The rat, housefly, and cockroach, among others, can spread disease to man through food. In order to prevent outbreaks of foodborne illness, we must break the chain of infection or contamination. The best way to break this chain, insofar as insects and rodents are concerned, is to keep them out of our food establishments. Any establishment may have an occasional pest so we must protect food and equipment from those that do get in despite our best efforts. It is the continual presence of insects or rodents that causes the major problems, which results from a lack of good sanitation and control measures.

c. The reference source for food pest problems is Military Standard 904, Guidelines for Detection, Evaluation, and Prevention of Pest Infestation of Subsistence.

4-2. RODENT/PEST CONTROL

a. Rodents are a class of mammals characterized by large incisor teeth, well adapted for gnawing and nibbling. The rodents that may be found in food storage facilities and food establishments are rats and mice, although sometimes squirrels may be found. The more general word pest is often used, as it refers to insects, rodents, birds, or other animals that may render subsistence partially or wholly unusable. Infestation refers to the presence of pests or their wastes in and around subsistence so that the product may be rendered unwholesome for human consumption. Pest control personnel are military or civilian personnel trained and certified or licensed to use or supply pesticide chemicals. Their services are usually employed on a regular, recurring basis.

b. No single measure will completely eliminate the problem caused by rodents that invade food establishments and storage facilities. However, when we analyze all the elements of a rodent control program, we find that the program is composed basically of three phases: environmental control, chemical control, and mechanical control. These phases are not separate and distinct. They are integral parts of each other, and one phase cannot adequately control the problem without the help of the other.

4-3. ENVIRONMENTAL CONTROL

a. There are several measures that can be taken to guard against rodent infestation. Rodents can be physically prevented from entering food storage facilities by closing off any openings. Structural harborages, such as double walls, must be sealed. Pest-proofing should include sealing of openings the size of a quarter or a nickel. The hiding places of rodents should be destroyed. This may preclude the stacking of crates or boards alongside walls and impose strict standards around dumpsters and garbage cans, as well as the general area maintenance. It is also important to eliminate all available sources of food and water for rodents by adherence to strict sanitation practices, such as immediately cleaning up food spillage, daily sweeping of floors, and hygienic practices in the employee locker areas. Poor storage practices can be eliminated. This includes following standard stacking procedures that will preclude crushing or other damage to containers. The mishandling of subsistence when it is being moved or rearranged, such as improper stacking or tossing the product around, should be avoided. Mechanical damage by forklift may also easily occur. New stocks of susceptible subsistence items should be isolated from old stock to prevent cross infestations. Poor product rotation allows insects to complete their life cycles, not only causing heavy damage but also attracting rodents. The need exists for an ongoing, regular pest management program by qualified pest control personnel.

b. The first of the three phases is environmental control. The best way to control rodents is to institute basic sanitation measures in and around the storage areas. This includes proper storage and disposal of refuse so as to deny a harborage in which rodents live and breed. Rodent proofing of buildings is also of significant importance. It includes installation of screens and door flashings, heavy mesh wire for vents and windows, and coverings for pipes and wires: all to prevent the entry of rodents into the establishment.

c. Some interesting and significant facts about rats which should be kept in mind when rodent-proofing buildings are:

- (1) Rats can enter holes as small as 0.5 inch in diameter.
- (2) Rats can climb both vertically and horizontally.
- (3) Rats can climb pipes up to 4 inches in diameter.
- (4) Rats can jump 3 feet high from a flat surface.
- (5) Rats can jump 4 feet horizontally.
- (6) Rats can jump 8 feet from an elevated position.
- (7) Rats can fall 50 feet without injury to themselves.

d. Rats prefer to travel and hunt for food at night. They are creatures of habit and almost always travel from their nests to their food sources and to the outside over the same paths. Perhaps for protection, their paths usually are in narrow, out of the way places, such as overhead pipes and beams, or along walls. When rats run from place to place, they hug the wall. Rat runs are easy to find because dirt and oil from the hair on the rat rub off and darken the surfaces that they touch.

e. Rodents are rarely seen except in heavy infestations. When you see a live or dead rodent, you can be sure that there are a number of others in the area. It is necessary to continually monitor for signs that indicate their presence. The presence of droppings, or feces, is one of the signs. House mouse feces are only 1/8 inch in length. Rat feces are from 1/2 to 3/4 inch in length and up to 1/4 inch in diameter. Older feces are brownish in color and often fall apart when touched with a pencil. If the droppings are moist, black and shiny, and hold together, a rodent has recently been in the vicinity. Rodent runways are usually along walls, steps, and rafters, when they move from their nests to sources of food. They leave rubmarks, which are visible streaks from their bodies. Rodents gnaw to reach sources of food. Their incisor teeth are so strong that they have gnawed through paperboard, sacks, and wood. If gnawings are recent, the inspector should notice teeth marks. Some people have spread talc in areas of suspected rodent infestation. Talc will make new tracks visible. Normally, tracks may be covered with dust, though sometimes sharp and distinct, if they are recent. Regular checks around the outside of the building may turn up rat burrows (rat-sized holes). It must be determined if they are fresh or old, because you want to allow the rats inside a way to get out before closing them up. Holes of 1/4 inch anyplace in a building will permit entry of rodents. Such openings must be repaired immediately. When there is other evidence of rodent presence, the use of ultraviolet light (Wood's light) is recommended to locate urine residue and stains.

4-4. CHEMICAL CONTROL

The second phase in controlling rodents is the use of chemicals, specifically rodenticides, to control those rodents that may have gained entrance to the area, whether within the buildings or on the surrounding premises.

a. Poisoning is probably the best way to get rid of rodents after proper sanitation and rodent proofing. However, poisoning will have to be repeated from time to time, because it only kills the rodents that are present at the time of poisoning and does not prevent other rodents from entering later. Poisoning should be started before proofing an existing building to ensure dying rodents are not caught inside the buildings with no chance of escape. Some of the most common rodenticides and fumigants are discussed below.

b. There is a group of rodenticides called anticoagulants that are effective against rodents. warfarin, pival, fumarin, and pindone are names of anticoagulant chemicals used commonly to destroy rodent populations. The chemicals cause internal hemorrhaging and prevent the blood from clotting. The rodent will simply bleed to death. The anticoagulant types are quite good in that rodents do not develop bait shyness. However, the rodent must consume this type of poison each day for several days before it is effective. Killing will be evident usually between 5 and 10 days after initial consumption. These chemicals are odorless and tasteless. Accidental ingestion by humans is normally not fatal.

c. Red squill and zinc phosphide are two rodenticides that initiate emesis (vomiting). Since rats are not capable of vomiting, these two chemicals will cause the rats to go into convulsions caused by their inability to regurgitate the toxic material. Red squill will ultimately cause death by heart paralysis, whereas zinc phosphide will cause severe liver damage, thus killing the rodent. Zinc phosphide has a garlic odor which attracts rats and is extremely toxic for short periods following ingestion.

d. Strychnine, which has a bitter taste and must be disguised, is a rat poison used occasionally. Once rats eat a sufficient amount, hyperstimulation of the central nervous system (CNS) will cause convulsions and a rapid death. Strychnine is also harmful to humans if ingested.

e. Arsenic trioxide is a very effective poison that can be used in solution form, dust, or as a bait poison against rats. It causes the blood vessels to relax and dilate producing shock. Death is therefore by exhaustion; the heart cannot pump hard enough to circulate the blood. Arsenic trioxide is also toxic to humans. Only trained personnel should apply this rodenticide.

f. Sodium monofluoroacetate, commonly known as "1080," is a rodenticide that is very toxic to rats and humans; therefore, special permission is needed for its use and then only by trained personnel. A significant rodent problem must occur before the use of "1080" is allowed. It is used in a water solution and causes CNS hyperstimulation thereby ultimately leading to cardiac arrest due to the inability of the heart to keep up with the stimulation by the nervous system.

g. Alphanaphthylthiourea (ANTU) is another rodenticide used occasionally. It is used predominantly in cases where the rodent problem is due to a population of Norway rats. It is very toxic to Norway rats due to their physiology and only slightly toxic to roof rats. The reason for this is not well known. It causes lung dropsy, a fluid buildup in the lungs. A disadvantage to ANTU is that some rats will develop immunity to it. It seems to be non-toxic to humans if only small amounts are ingested.

h. Two fumigants are commonly used against rodents.

(1) Calcium cyanide is a chemical that produces hydrogen cyanide gas when exposed to the moisture in the atmosphere. The liberated gas is extremely toxic to all forms of animal life. The operation is dangerous and only trained personnel are allowed to carry it out. Gas masks are a must! It is one of the fastest acting fumigants known. A large dose will render the victim immediately unconscious followed by a quick death. Smaller lethal doses will initiate throat constriction, nausea, hyper blood pressure, cardiac depression, and finally death by respiratory failure.

(2) Carbon monoxide is sometimes used against rodents usually when other fumigants are not available, or when burrows are known to exist with rodents inhabiting them. The carbon monoxide gas is pumped into the burrow and causes death in approximately 10 minutes caused by the inability of the blood to carry oxygen to the cells. It can be called a blood poison.

4-5. MECHANICAL CONTROL

a. The third phase of rodent control is termed mechanical control. This utilizes traps of various kinds to either kill or capture the rodents. Traps are used where rodenticides are not advisable and as a clean-up operation for animals surviving poisoning. The advantage of using traps is that no dead animals will be left. The disadvantage lies in the fact that mass kills are not possible. It takes longer and is less convenient.

b. There are four kinds of traps used in rodent control.

(1) Spring traps, commonly referred to as mousetraps, which are used effectively against mice and small rats.

(2) Snap traps are like the spring traps, only larger, and are referred to as rat traps.

(3) Steel traps are much like a bear trap; each side of the trap is pulled open and will catch the rodent usually by the leg.

(4) Cages are sometimes employed when specimens are needed for identification or other needs. They are baited and have a trip door that is activated once the animal enters the cage.

Section II. CONTROL OF INSECTS

4-6. INTRODUCTION

a. Insects are small invertebrate arthropods and include such food pests as beetles, moths, ants, cockroaches, and houseflies. Insects that infest subsistence may be found at all life stages. Insects can harbor pathogenic microorganisms as well as, and perhaps better than, rodents. This is true by virtue of their small size and large numbers. They are capable of reaching and contaminating areas where rodents cannot get. Fortunately, there are relatively few species of insects that are an actual threat to man's well-being as far as diseases are concerned. However, of the 750,000 species of insects known today, many of them are capable of affecting man's well-being in ways other than harboring pathogenic micro-organisms. They may damage food in all of its phases of production and storage.

b. Insect infestation can cause a product to be unsuitable for its intended purpose. Esthetic value is involved. No customer wants to open a bag of flour and find it full of insects. There is a health hazard. Ingestion of a dermestid beetle, such as that of the genus Trogoderma, may cause gastrointestinal irritation, vomiting, and diarrhea when the hairs become imbedded in the walls of the various parts of the digestive tract. One such insect, living or dead, within the product itself is justification for condemnation of the lot. There is a cost involved when products are condemned or destroyed caused by insect infestation. The goal of storage standards and practices is insect free subsistence, that is, no insects, alive or dead, or parts of insects, able to be seen during inspection of subsistence.

4-7. CONTROL MEASURES

Control measures for insects are much the same as for rodents. Three phases of control are implemented in order to prevent insect infestation and to eliminate existing populations. They are environmental control, chemical control, and biological control.

4-8. ENVIRONMENTAL CONTROL

a. When an inspector looks for insect infestation, food products with a high potential for infestation are looked at with special care. These include dry pet food, operational rations not packed in cans, pasta products, flour, dry beans and peas, dried fruits, cookies and crackers, dehydrated soups, vegetables, gravy mixes, prepared breakfast cereals, and grains such as corn meal, rice, oats, barley. The general appearance of the product is noted. What can be looked for are holes along creases or folds of containers or penetration holes in the containers. Clumped-together food particles will be visible or insect webs, such as for the Indian meal moth. Live or dead insects may be found or insect larva or parts of insects.

b. The risk of insect infestation is increased if proven management guidelines are not followed. Temperature control even for dry storage is recommended. High temperature will accelerate the life cycle of insects and lead to record numbers of insects and heavy product damage in a relatively short period of time. Poor storage practices also contribute to insect infestation. This can include mishandling, such as improper stacking or tossing of product, mechanical damage to containers (possible with a forklift), and poor product rotation (not using old stock first). The standards for cleaning and sweeping must be strictly adhered to. The required monthly inspection by food inspection personnel must be a thorough and systematic inspection. There should also be a regular pest management program by qualified pest control personnel.

c. Environmental control is the most important and effective measure in preventing an insect problem. Sanitation is the primary step in a good environmental program. It includes general cleanliness that will eliminate food and harborage for insects. Cleanliness of the outside premises, of garbage and trash containers, of the building itself, and of all equipment used by the food facility will accomplish the most for elimination of insect foods. Proper storage techniques and construction of buildings will eliminate most harborage sites.

d. In addition to sanitation, the purchase of insect-free food is a great advantage in preventing new populations of insects from occurring. Rotation of stocks will keep infestations down also. Old stocks with perhaps some infestation can and will in time contaminate new stocks. Light infestation problems can become large if old and new stocks are not isolated from each other and if old stocks are not used first. The statement "first in, first out" is quite significant in the management of this problem.

e. Insect-proof containers should be utilized whenever possible. Properly sealed, multiwalled bags and boxes will inhibit the entrance of insects. Also, chemically treating the outside of the containers with some residual insecticide will help keep insects from entering containers.

f. Proper storage temperatures and humidity are also means of controlling insect populations. It has been discovered that temperatures below 60°F will prevent the egg production in many insects and temperatures below 50°F will inhibit the feeding and development of many insects. Low moisture content in foods may also retard the activities of some insects; however, one of the most remarkable features about insects in stored products is the fact that nearly all of them can live in products having a low moisture content. A certain minimum moisture level is needed, and this varies considerably for different species. Most of the insects require that their food contain 8 percent or more moisture. At the minimum level, development is frequently very slow and mortality is usually high. Other conditions being favorable, the rate of development generally increases as the moisture content of the food rises. Optimum conditions are usually obtained when the moisture content of the food reaches about 14 percent. Insects that live in food having low moisture content exhibit a remarkable capacity to

conserve and utilize water and are certainly well adapted for the environment in which they live. Adequate ventilation aids in the control of moisture (especially in grains) and of temperatures in storage areas.

g. Palletizing is a practice that should be followed when storing any subsistence product. This will eliminate harborage for insects, provide better ventilation, and provide for more efficient inspection to detect possible insect infestation.

h. Surveillance inspection for insect infestations must be an integral part of any environmental program. Usually, monthly inspections are adequate for recognizing any development of insect populations; however, during warm seasons and in warmer climates, specific insect infestation inspections should be carried out more frequently.

(1) Areas of inspection where infestations can be located are:

- (a) In vulnerably packed items, such as paper wrapped products.
- (b) In vulnerable food items, e.g., flour and cereal.
- (c) In all seams and folds in packaging.
- (d) In cracks and crevices about the building and pallets.
- (e) In and around windows and doors.
- (f) Around the building premises.

(2) Various signs indicating a population of insects are specimens or parts of insects, damaged containers, holes in grain products, spilled foodstuff, odors (cockroaches give a peculiar odor), and caking or webbing in foodstuffs. For example, the Indian meal moth and the Mediterranean flour moth will produce silken webs that will entangle flour. Another means of detecting insect infestation is to place a small container of the product in a heated oven. The insects will crawl out and an estimation of the degree of infestation can be determined.

i. Usually if nothing is done to check on an insect infestation in stored products, breeding will continue until the product is rendered worthless. Under favorable conditions, certain insects increase to almost unbelievable numbers, and it is not uncommon to find the product and the surrounding area swarming with insects.

4-9. CHEMICAL CONTROL

The second phase of an insect control program involves the use of chemicals. Various insecticides are available and these products can be classified into two groups: sprays and fumigants.

a. Residual sprays are applied to walls, floors, and around cracks and crevices or anywhere insects may gain access to a building. Among the most common residual sprays used by the military are sodium fluoride, chlordane, diazinon, lindane, and dieldrin. All of the above except sodium fluoride and diazinon are chlorinated hydrocarbons. Diazinon is an organophosphate and sodium fluoride is a fluorine compound.

b. Residual spray compounds are, as the term indicates, persistent. The main advantage is that insect kills are accomplished for some time after the actual application. Some of the compounds, however, are more persistent than others; and dieldrin is so persistent that some hazard to other animal populations occurs by virtue of the fact that foods consumed by these animals may have relatively high concentrations of the compound remaining on them. The other compounds listed with dieldrin may also be highly toxic and residual in nature, depending on their formulation. Also, the other toxic residual sprays are more specific to certain insects.

c. Another spray used as an insecticide is termed a space spray. These compounds are less toxic and do not exhibit residual effects. They are only effective against insects not already in a product or its container. They are applied as aerosols and are commonly used when excessive infestations are not apparent. The two compounds most commonly used by the military are malathion and pyrethrum. Malathion is an organophosphate and pyrethrum is from a class called pyrethrins.

d. All of the compounds discussed previously have toxic effects on the nervous system of insects and other animals as well. It is of utmost importance that the least toxic and minimum amount of compounds be used that will accomplish the eradication of the infestation problem at hand. Many of the insecticides can be more or less toxic and residual, depending on how they are formulated and applied. Some can be used both as residual sprays and space sprays.

e. Fumigant chemicals are also used frequently by the military as an effective procedure for elimination of insect infestations. In one instance, a fumigant is used as a preventive measure to avoid the possibility of infestations. Fumigants are different from ordinary insecticides due to their penetrative ability. Often times, fumigants are used in grain storage areas because the fumigant gas can penetrate several feet into the grain. Fumigants yield excellent destructive results of insects around and within containers of subsistence. Fumigants are potentially dangerous to humans as well as any other animal; therefore, trained personnel only may use fumigants. There are two fumigants

commonly used by the military: methyl bromide and aluminum phosphide. Methyl bromide was used almost exclusively until the cheaper, safer, and more effective aluminum phosphide was developed. Methyl bromide is very effective against stored grain and enclosed subsistence items due to its good penetrating ability. Toxic concentrations are usually produced quickly; however, death in insects is delayed for several minutes. The gas diffuses into the respiratory system and finally affects the nervous system. The compound is extremely toxic to man also; therefore, gas masks are a necessity when applying it. Methyl bromide is a colorless, noncorrosive and non-flammable gas having an odor similar to chloroform. It is usually applied by forcing the gas into a grain storage area or confined storage areas. The chemical leaves no harmful concentration of residue because, when aerated, the gas diffuses readily. The other fumigant, aluminum phosphide, will be discussed in detail later in Section III of this lesson.

4-10. BIOLOGICAL CONTROL

A third phase of insect control is a separate process from the previously discussed phases. Biological control is relatively new and at present not widely used. It appears to be an exciting development to be exploited in the future. Biological control could also be termed "natural control," for it utilizes natural ecological principles. Biological control involves predator-prey and parasite-host relationships.

a. Any specific environment with all of its naturally occurring species of life is termed an ecosystem. Ecosystems all have an equilibrium position of populations with minor fluctuations occurring from time to time either up or down from this position. Many of these fluctuations are predator-prey or parasite-host oriented. If the number of a given predator species is lower than normal for some reason, the prey species of the relationship will eventually rise somewhat. The same holds true for parasite populations and their hosts. Man is responsible many times for a decline in a predator species and finally an increase in the prey species will become manifested, sometimes way out of proportion to the natural fluctuation. It is easy to see why the "balance of nature" is a critical matter and, frequently, changes, which man considers insignificant, can mushroom into significant problems.

b. Many of the species of insects causing problems, as far as man is concerned, were brought to an area within the US with no knowledge of the insect's arrival; that is, on imported products. If the species survives and becomes established, it will usually develop into a large population, often times infesting areas of concern in man's environment. Most of the time when such an occurrence happens, the particular exotic species has no natural enemy; the predator or parasite did not make the move to the new environment; hence, the population of the new species will rise above the equilibrium position.

c. Since many of our problem species of insects were at one time exotic, it makes sense to find out where the insects originated and what their natural predators or parasites are. When this is achieved, the predator or parasite species can be obtained and established in the new area with the result that the equilibrium position should ultimately be reached. When this process has been successfully completed, adequate preventive measures should ensure any significant problems from occurring.

d. Other types of biological control include sterilization of males. A genetic representation of males of a particular problem species will be collected and sterilized. The sterilized males will then selectively be placed into problem areas at a concentration high enough to mate with most females. The result will be production of sterile eggs, hence, a drastic decrease in the number of offspring. Experiments of this sort have been successfully carried out with the screwworm fly in Florida and Texas. This species in the larvae form is parasitic to all forms of livestock. Success to some extent has also been achieved with the tsetse fly and black fly.

Section III. ALUMINUM PHOSPHIDE, FORMULATED

4-11. INTRODUCTION

The US Armed Forces suffered a \$25 million loss in semiperishable subsistence in South Vietnam in fiscal year 1968. The military supply system in South Vietnam during fiscal year 1968 condemned semiperishable subsistence having a total dollar value of \$25 million. This subsistence consisted primarily of cereal products, including flour, and was caused by insect infestation. Since that time, the Armed Forces have approved the use of a newly developed chemical fumigating agent which has proven effective as a means of controlling insect infestation in stored subsistence. That fumigant is aluminum phosphide, known commonly as Phostoxin[®].

4-12. CHARACTERISTICS OF ALUMINUM PHOSPHIDE

a. Phostoxin[®] is the trade name for aluminum phosphide made in tablet or pellet form and containing 55 percent aluminum phosphide, 41 percent ammonium carbamate, and 4 percent edible paraffin. The effectiveness of the fumigant is derived when hydrogen phosphide (also called phosphine or PH₃) is evolved by hydrolysis upon exposure of the tablet or pellet to atmospheric moisture. The initial decomposition of the tablet or pellet involves the ammonium carbamate component releasing ammonia (warning gas) and carbon dioxide. Carbon dioxide serves to reduce generation of heat in the reaction of phosphide with moisture. The tablets or pellets are impregnated with paraffin to provide a timed delay of this hydrolysis, thus providing a built-in safety factor for handling and applying the fumigant. The phosphine gas is liberated 15 to 30 minutes after exposure to the atmosphere.

b. The phosphine (not phosgene) gas has a pronounced carbide or garlic-like odor which becomes increasingly objectionable with continued exposure. The odor threshold varies with different people, but falls within a range of 0.005 to 0.5 ppm (parts per million). The maximum allowable concentration (MAC value) for continuous 8-hour daily exposure is 0.3 ppm.

c. Phosphine gas has excellent penetration characteristics; for example, it will penetrate 30 to 50 feet into a stack of stored grain. The high velocity and vapor pressure of the phosphine molecule permits deep penetration of even the most densely packed commodities. The same molecular velocity that permits deep penetration also produces highly desirable aeration characteristics. With normal ventilation procedures, phosphine gas concentrations will be removed from both the product and the fumigated stack of commodities within 60 minutes.

4-13. USES AND RESTRICTIONS OF ALUMINUM PHOSPHIDE

a. Aluminum phosphide is highly effective both as a stored-product and as a structural fumigant, and is specifically applicable to the following:

- (1) In-place fumigation of stored products indoors or outdoors under polyethylene or vinyl coated tarpaulin.
- (2) In-transit fumigation of sealed box or hopper cars, standing or rolling.
- (3) Structural or space fumigation for both stored product and dry wood pests.
- (4) Fumigation of raw agricultural commodities with or without tarpaulin.

b. Phosphine is highly toxic to all forms of human, insect, and other animal life. For this reason, application should be closely supervised by the engineer or medical entomologist. Personnel engaged in the application of this fumigant should be certified and specially trained.

c. Phosphine gas is explosive under vacuum conditions. Therefore, its use is restricted to atmospheric fumigation with or without a tarpaulin or cover. Cloth or canvas tarpaulins are not suitable for fumigation purposes. Polyethylene or vinyl-coated tarpaulins are satisfactory when properly sealed to the floor or base surface to prevent gas leakage.

d. In accordance with USDA label instructions, aluminum phosphide must not be used in such a manner to allow the pellets/ tablets or unreacted residues (ash) to come in contact with any processed food.

e. Proper exposure time is essential for effective and safe fumigation with phosphine. Label instructions regarding exposure at different temperature ranges must be observed.

f. Phosphine gas is chemically inert and will not combine in any form to produce a food residue.

4-14. SYMPTOMS OF PHOSPHINE POISONING

The early symptoms of phosphine poisoning are acute, obvious, and readily reversible.

a. **Slight Poisoning.** The symptoms include a sensation of tightness in the chest and diaphragm, vomiting, and diarrhea.

b. **Medium to Severe Poisoning.** This is evidenced by vertigo, numbness and cold sensation in the limbs, anxiety, tinnitus, dyspnea, dry cough.

c. **Serious Poisoning.** Symptoms include cyanosis, muscular spasms, cardiac insufficiency, and coma.

4-15. FIRST AID MEASURES

a. Remove immediately into the open air.

b. Call for medical assistance.

c. Treat as for shock -- place in recumbent position and keep quiet and warm.

d. Apply oxygen breathing equipment, if available.

e. Do not give any antidote. In particular, do not give any substance comprised of fats and oils (e.g., castor oil, butter, milk).

4-16. SAFETY MEASURES

a. One distinct advantage of fumigation with aluminum phosphide is the limited requirement for respiration safety equipment. It is important, however, to keep the containers for the tablets and pellets tightly closed except when they must be opened for use. Under normal conditions, the use of gas masks is not necessary. However, a gas mask and canister specific for phosphine gas **must always be available** to provide protection in the event of an unforeseen accident, or when using an expedient modification of guideline procedures. Only masks and canisters approved by the U.S. Department of Interior, Bureau of Mines, will be used in conjunction with aluminum phosphide fumigation (not GI masks).

b. Gas detection and concentration measurement devices specific for phosphine should be used to monitor the atmosphere both around and under fumigation. Routine monitoring procedures will provide information pertinent to safe working conditions.

c. DO NOT WORK ALONE. The normal fumigation requirement for a minimum of two pest control personnel to be present during fumigation is applicable when using Phostoxin[®].

d. Post Phostoxin[®] fumigation signs at all entrances and on stacks.

e. Gloves must be worn when handling Phostoxin[®] tablets or pellets and should be disposed of after each use. Usually, they are thin, rubber disposable gloves.

f. No smoking will be permitted by personnel engaged in Phostoxin[®] fumigation procedures.

g. The individual in charge of Phostoxin[®] fumigation will have the responsibility to notify station security and fire supervisors and the resident medical authority that fumigation operations will occur. The building number, the proposed length of fumigation time, and the name of the toxic material should be given to these supervisors.

4-17. MILITARY APPLICATION

a. The simplicity and safety associated with the handling and application of aluminum phosphide fumigation make it particularly adaptable to military use. It should be emphasized that when using other fumigants for warehouse application, the premises must be vacated. In-place fumigation under tarp with aluminum phosphide can be accomplished without disruption of normal warehouse work schedules and without vacating or restricting access to the area, providing recommended procedures are followed carefully.

b. In-transit railcar fumigation was implemented on all military flour contracts beginning 1 May 1970.

c. Employment of aluminum phosphide fumigation techniques can provide an effective fumigation capability at the station or unit level, both in CONUS and overseas.

4-18. RESIDUAL EFFECT

Phosphine fumigation offers no residual protection against subsequent infestation. Therefore, good sanitation practices, standard warehouse insect control procedures, and adequate segregation of highly infestable, suspect commodities (such as flour) are necessary to maintain insect control and limit reinfestation potential.

Continue with Exercises

EXERCISES, LESSON 4

INSTRUCTIONS: The following exercises are to be answered by marking the lettered response(s) that best answer(s) the question or best completes the incomplete statement or by writing the answer in the space provided. For true/false exercises, indicate whether the statement is true or false.

After you have completed all the exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers.

1. List three general control measures used in controlling both rodents and insects.

_____.

_____.

_____.

2. The most important control measure for both rodents and insects is _____ control.

3. Rat runs are easy to find because _____ from the hair on the rat rub off and _____ the surfaces they touch.

4. How many feet can rats fall without injuring themselves?
 - a. 100.
 - b. 60.
 - c. 50.
 - d. 40.

5. What is the length of rat droppings?
 - a. 1/2 to 3/4 inch.
 - b. 1/4 to 1/2 inch.
 - c. 1/8 to 1/2 inch.

6. What is the diameter of an opening that a rat can squeeze through?
 - a. 1 inch.
 - b. 2/3 inch.
 - c. 1/2 inch.
 - d. 1/4 inch.

7. What is Wood's Light used for? To locate:
 - a. Rodent nests.
 - b. Droppings.
 - c. Rodent tracks.
 - d. Urine residue.

8. A rodenticide very toxic to Norway rats, but not toxic to roof rats, is
 - a. 1080.
 - b. ANTU.
 - c. Arsenic trioxide.
 - d. Calcium cyanide.
 - e. Carbon monoxide.

9. Which of the following rodenticides are anticoagulants?

1. Warfarin.
2. Red squill.
3. Fumarin.
4. Pival.
5. Zinc phosphide.
6. Strychnine.
7. Arsenic trioxide.
8. Pindone.

- a. 2, 5, 6, 8.
- b. 1, 3, 6, 7.
- c. 2, 4, 5, 6.
- d. 1, 3, 4, 8.

10. Select a kind of trap used for larger rodents.

- a. Snap traps.
- b. Steel traps.
- c. Spring traps.
- d. Cages.

11. List the recommended storage practice that eliminates harborage for rodents and insects and provides better ventilation.

12. List five products with a high potential for insect infestation.

- a. _____.
- b. _____.
- c. _____.
- d. _____.
- e. _____.

13. What is the required frequency for surveillance inspection for insect infestations?

- a. Daily.
- b. Weekly.
- c. Monthly.
- d. Every two months.

14. Name the beetle that can cause gastrointestinal irritation, vomiting, or diarrhea when eaten.

_____.

15. List the two types of spraying methods used in control of insects.

_____.

_____.

16. Phosphine gas has a _____ odor.

17. With normal ventilation procedures, phosphine gas will be removed from the product and the fumigated stack of commodities within:
- a. 24 hours.
 - b. 12 hours.
 - c. 4 hours.
 - d. 1 hour.
 - e. 30 minutes.
18. Personnel engaged in the application of the fumigant aluminum phosphide should be _____ and specially _____.
19. What is the minimum number of pest control personnel required to be present during fumigation?
- a. 1.
 - b. 2.
 - c. 3.
 - d. 4.
20. The trade name for the fumigant, aluminum phosphide, is:
- a. Phostoxin[®].
 - b. Hydrogen phosphide.
 - c. Phosphine.
 - d. PH₃.

21. The compound which evolves from aluminum phosphide and which makes it effective as a fumigant is:
- Phostoxin[®].
 - Ammonium carbamate.
 - Hydrogen phosphide.
 - Phosphine or PH_3 .
 - c and d are names for the same component.
22. The effects of aluminum phosphide pellets or tablets coming in contact with processed food are:
- Harmful.
 - Unharmful.
23. You suspect a person is suffering from phosphine poisoning. What degree of poisoning do you suspect when he experiences numbness and cold sensation in his limbs, vertigo, anxiety, ringing in the ears, difficulty in breathing, and a dry cough?
- Slight.
 - Medium.
 - Serious.
24. Which of the following should you avoid doing for a person suffering from phosphine poisoning?
- Get him into the open air quickly.
 - Treat for shock.
 - Administer an antidote.
 - Call for a doctor.

25. Which of the following are considered **unsafe** acts or procedures when fumigating warehouses with Phostoxin[®]? (More than one may be correct.)
- a. Working alone.
 - b. Smoking on the job.
 - c. Having a gas mask and proper canister available for each person fumigating.
 - d. Posting Phostoxin[®] fumigation signs in the warehouse at each exit.
 - e. Working barehanded.
 - f. Notifying installation fire and security supervisors and the medical authority.
26. When using Phostoxin[®] as a fumigant under a tarp in a warehouse, the warehouse:
- a. Must be vacated from 48 to 72 hours.
 - b. Need not be vacated.

Check Your Answers on Next Page

SOLUTIONS TO EXERCISES, LESSON 4

1. Environmental
Chemical
Mechanical (paras 4-2 and 4-7).
2. Environmental control. (para 4-3).
3. Dirt and oil; darken (para 4-3b)
4. c (para 4-3a(7))
5. a (para 4-3e)
6. c (para 4-3c(1))
7. d (para 4-3e)
8. b (para 4-4g)
9. d (para 4-4b)
10. a (para 4-5b)
11. Palletizing (para 4-8g)
12. Select 5 items from the list in paragraph 4-8a. For example,

Pasta products.
Flour.
Grains.
Breakfast cereals.
Dry pet food.
13. c (paras 4-8b and h)
14. Trogoderma, a dermestid beetle (para 4-6b)
15. Residual
Space (para 4-9a,b,c)
16. Garlic-like (para 4-12b)
17. d (para 4-12c)
18. Certified; trained (para 4-13b)

- 19. b (para 4-16c)
- 20. a (para 4-12a)
- 21. e (para 4-12a)
- 22. a (para 4-13d)
- 23. b (para 4-14b)
- 24. c (para 4-15e)
- 25. a, b, d, e (para 4-16)
- 26. b (para 4-17a)

End of Lesson 4

APPENDIX A

DOD 4145.19-R-1

STORAGE AND MATERIALS HANDLING

CHAPTER 5

SECTION 5. SUBSISTENCE.

Section 5. SUBSISTENCE

| | |
|--|-----------------------|
| Perishable subsistence, chill and frozen storage | ----- Paragraph 5-501 |
| Semiperishable subsistence in dry storage | ----- 5-502 |

5-501. Perishable Subsistence, Chill and Frozen Storage

a. Prevention of deterioration.

(1) General. All chilled and frozen subsistence is highly perishable and subject to rapid deterioration when improperly stored. Storage at temperatures which are too high, or too low, under unfavorable conditions of humidity and in the absence of proper air circulation in unsanitary storerooms will result in rapid spoilage and eventual loss of the product. Most spoilage of chilled and frozen subsistence is caused by micro-organisms, particularly certain species of bacteria and fungi; the contamination spreads rapidly from the decayed items to the surrounding sound subsistence. Therefore, frequent inspection while in storage, followed by sorting and removal of the decayed items or portions thereof, is of basic importance in maintaining the products in top condition and in keeping losses and surveys to a minimum. All shipments should be segregated and marked in such a manner as will assure that the oldest lots are issued first, except when it may become necessary to issue a lot quickly to avoid loss by spoilage or when another lot of the same commodity is in a better condition for continued storage. Old lots of chilled or frozen subsistence should not be allowed to accumulate in storage rooms but should be issued promptly or surveyed if unfit for use. Frozen products will not be accepted in a partially thawed condition, nor will such products be refrozen after having been defrosted.

(2) Air circulation.

(a) General. Along with proper temperature and humidity, air circulation in a storage room is an important factor in the proper storage of chilled and frozen stored subsistence. This is facilitated by stacking the products on pallets in such a manner, that will provide a 4-inch wall clearance, 2-foot ceiling clearance and sufficient working aisleway.

(b) Fruits and vegetables. Containers should be raised off the floor by the use of pallets and individual lots should be stacked so as to permit free circulation of air. The use of a fan or duct system may be desirable in some cases to maintain proper circulation in all parts of the room. The introduction of outside air into cold storage rooms

housing fruits and vegetables is not necessary. However, when fresh fruits and vegetables are stored in tight compartment at temperatures of 40° For higher, the concentration of carbon dioxide produced by respiration may reach such a danger point that a match or candle will be extinguished. While this condition is not considered harmful to most products, personnel should not work in such rooms until a supply of fresh air has been introduced.

(c) Quick-frozen fruits and vegetables. Quick-frozen fruits and vegetables are highly perishable unless properly stored. Correct handling and proper storage of such foods are imperative in utilizing frozen foods to the best advantage. Upon delivery, quick-frozen fruits and vegetables should be transferred promptly to a low temperature storage space. Temperature of the load should be checked upon arrival by taking temperature readings of cartons selected from top layers inside of shipping cases. If the temperature of the product is higher than freezer room temperature, shipping cases should be scattered loosely about the room on hand-trucks or upon pallets on the floor with adequate space between individual cases to permit rapid lowering of the product temperature to freezer room temperature. The use of a portable fan to create an air current over the products will hasten temperature equalization. When the temperature of the product has been lowered sufficiently, cases should be stacked compactly. If the product temperature upon delivery is the same as or below temperature of freezer room, the cases should be stacked compactly immediately.

(d) Meat, meat products and poultry. A prime factor in keeping the temperature in all parts of meat storage spaces at the recommended levels is proper circulation of the refrigerated air. Meat items will not be stored on the bare floor pallets should be placed on the floor to allow free circulation of air under all items stored in the space. Generally, when the recommended temperature in all parts of the refrigerated space is uniform and is maintained within the stacks in the freezer space, the circulation of air may be considered to be adequate.

(e) Dairy products and eggs. To keep the air

in a cold storage room fresh, the room must be kept clean and the air must circulate slowly. Ordinarily, adequate air circulation can be provided by the use of pallets on the floor, and by proper stacking of the various lots. Egg cases should not be stacked more than **five** high to avoid pressure damage.

(3) Transport and Storage Compatibility of Fresh Fruits and Vegetables.

(a) General. Although it may be necessary to transport and store various fresh fruits and vegetables together, there are some products which should be separated whenever possible. Apples, pears, bananas, peaches, plums, cantaloupes, ripe honey dew melons, avocados, tomatoes and other ethylene producing fruits or vegetables should not be stored with lettuce (causes russetting), carrots (become bitter), cucumbers, green peppers, acorn or Hubbard squash (loss of green color). Odors from apples and citrus fruits are readily absorbed by meat, eggs and dairy products. Pears and apples acquire an unpleasant earthy taste and odor when stored with potatoes. Other combinations which should be avoided in storage rooms are apples or pears with celery, cabbage or onions, celery with onions or carrots, green peppers with pineapples and citrus fruit with any of the strongly scented vegetables. Green peppers can taint pineapples if the two are stored or shipped together. Onions, nuts, citrus fruit and potatoes should each be stored separately whenever possible.

(b) Perishable Subsistence Compatibility Groups. For transport and storage fresh fruits and vegetables have been divided into the following compatibility groups:

Group

Temperature: 32° to 34° F (1° to 1° C).
Relative humidity 90 to 95 percent.
Atmosphere: Normally used on berries and cherries only-10 to 20 percent CO₂.
Ice: Never in contact with commodity.

Note. Most members of this group not compatible with Group 6a or 6b because ethylene production by Group 1 can be high, and thus harmful to members of Group 6a or 6b.

Apples (except those varieties listed in Group 3.)
Apricots
Berries (except cranberries)
Cherries
Figs (not with apples, danger of odor transfer to figs; also see Group 6a)

Grapes (not fumigated with sulfur dioxide (SO₂) in vehicle and no chemicals that release SO₂ should be included in packages.

Peaches
Pears
Persimmons
Plums and prunes
Pomegranates
Quinces

Group 2

Temperature: 55° to 65° F (13° to 18° C).
Relative humidity 85 to 95 percent.
Ice: Never in contact with commodity.
Avocados
Bananas
Eggplant (also see Group 5)
Grapefruit¹
Guava
Limes
Mangos
Muskmelons, other than cantaloupes
Casaba
Crenshaw
Honey Dew
Persian
Olive, fresh
Papayas
Pineapples (not with avocados, danger of avocados' odor absorption)
Tomatoes, green
Tomatoes, pink (also see Group 4)
Watermelons (also see Groups 4 and 5)

Group 3

Temperature: 36° to 41° F (2° to 5° C).
Relative humidity: 90 to 95 percent; cantaloupes about 95 percent.
Ice: In contact only with cantaloupes.
Apples (Grimes Golden and Jonathan (both, certain areas), Yellow Newton (California) and McIntosh.)
cantaloupes
Cranberries
Lemons¹ (use 50 to 55° F for more than a month)
Lychees (also see Group 4)
Oranges¹ (Florida or Texas)
Tangerines

Group 4

Temperature: 40° to 45° F (4° to 7° C); beans 38° to 42° F (3° to 6° C).

Relative humidity: About 95 percent.

Ice: Never in **contact** with commodity.

Beans, snap

Lychees (also see Group 3)

okra

Oranges¹ (California or Arizona)

Peppers, green (not with beans)

Peppers, **red** (if with green peppers, temperature **adjusted toward top of range**)

Squash, summer

Tomatoes, pink (also see *Group 2*)

Watermelons (also see *Groups 2 and 5*)

Group 5

Temperature 50° to 55° F (10° to 13° C); ginger not below 55 F.

Relative humidity: 85 to 90 percent.

Ice Never in contact with commodity.

cucumbers

Eggplant (also see *Group 2*)

Ginger (not with eggplant, also see *Group 7*)

Potatoes (late crop)

Pumpkin and Squashes, winter

Watermelon (temperature **adjusted** for other members of **group**; also see *Groups 2 and 4*).

Group 6a

This group, except for figs, grapes and mushrooms, is compatible with *Group 6b*.

Temperature: 32° to 34° F (0° to 1° C).

Relative humidity 95 to 100 percent.

Ice: Never in contact with asparagus, figs, grapes, and mushrooms.

Artichokes

Asparagus

Beeta, red

carrots

Endive and escarole

Figs (also see *Group 1*)

Grapes (not fumigated with sulfur dioxide (SO₂) in vehicle and no chemicals that release SO₂ should be included in packages.

Greens

Leek (not with figs or grapes)

Lettuce

Mushrooms

Parsley

R. 00

Parsnips

Peas

Rhubarb

Salsify

Spinach

Sweet Corn

Watercress

Group 6b

This group is compatible with *Group 6a*, except for figs, grapes, and mushrooms.

Temperature 32° to 34° F (0° to 1° C).

Relative humidity 95 to 100 percent.

Ice: Contact acceptable for all.

Broccoli

Brussels sprouts

Cabbage

Cauliflower

Celeriac

Celery

Horseradish

Kohlrabi

Onions, green (not with rhubarb, figs, or grapes; probably not with mushrooms or sweet corn).

Radishes

Rutabagas

Turnips

Group 7

Temperature: 55° to 65° F (13° to 18° C).

Relative humidity 85 to 90 percent.

Ice: Never in contact with commodity.

Ginger (also see *Group 5*)

Potatoes, early crop (temperatures adjusted for others)

Sweetpotatoes

Group 8

Temperature: 32° to 34° F (0° to 1° C).

Relative humidity: 65 to 70 percent.

Ice: Never in contact with commodity.

Garlic

onions, dry

¹ Citrus fruits-Biphenyl fungicide may impart off odors to other commodities.

The above information was extracted from Lipton, W. J. and J. M. Harvey, Compatibility of Fruits and Vegetables During Transport in Mixed Loads, US Department of Agriculture, Agricultural Research Service, ARS 51-48 (September, 1972).

(c) *Chill injuries to certain products.* Although the shelf lives of many fruits and vegetables are significantly extended by storage at 32° F, there are some fruits and vegetables which are subject to chill injury when stored at low but **nonfreezing temperatures.**

| Commodity | Approximate lowest safe temperature F° | Character of injury when stored between 32° F and safe temperature |
|--|--|--|
| Apples Grimes Golden (certain areas) Jonathan (certain areas) Yellow Newton (certain areas) McIntosh | 36-38 | Internal browning, brown core, soggy breakdown, soft scald. |
| Asparagus | 36 | Chill damage |
| Avocados | 40-55 | Grayish-brown discoloration of flesh. |
| Bananaa, green or ripe | 53-56 | Dull color when ripened. |
| Beans (snap) | 45 | Pitting and russeting. |
| Cranberries | 36 | Rubbery texture, red flesh. |
| Cucumbers | 45 | Pitting, water-soaked spots, decay. |
| Eggplants | 45 | Surface scald, Alternaria rot. |
| Grapefruit | 50 | Scald, pitting, watery breakdown. |
| Lemons | 52 | Pitting, membranous staining, red blotch. |
| Limes | 45-48 | Pitting |
| Mangos | 50-55 | Grayish scaldlike discoloration of skin, uneven ripening. |
| Melons Cantaloupes | 36 | Pitting, surface decay |
| Honey Dew | 45-50 | Pitting, surface decay, failure to ripen. |
| Casaba | 45-50 | Pitting, surface decay, failure to ripen. |
| Crenshaw and Persian | 45-50 | Pitting, surface decay, failure to ripen. |

| Commodity | Approximate lowest safe temperature F° | Character of injury when stored between 32° F and safe temperature |
|---|--|---|
| Watermelons | 40 | Pitting, objectionable flavor. |
| okra | 45 | Discoloration, water-soaked areas, pitting, decay. |
| Olives, fresh | 45 | Internal browning |
| Oranges , California and Arizona | 38 | Pitting, brown stain |
| Papayas | 45 | Pitting, failure to ripen, off flavor, decay. |
| Peppers, sweet | 45 | Sheet pitting, Alternaria rot on pods and calyxes. |
| Pineapples | 45-50 | Dull-green when ripened |
| Potatoes | 38 | Mahogany browning (Chippewa and Segao), sweetening. |
| Pumpkins and hardshell squashes | 50 | Decay, especially Alternaria rot. |
| Sweetpotatoes | 55 | Decay, pitting, internal discoloration. |
| Tomatoes Ripe | 45-50 | Watersoaking and softening, decay. |
| Mature-green | 55 | Poor color when ripe; Alternaria rot. |

(4) *Recommended average storage period for frozen perishable subsistence.*

(a) *Temperature.* Storage temperature for all frozen subsistence items shall not exceed 0° F. During shipment the temperature shall not be higher than 10° F. For ice cream the recommended temperature is -10° F and in no case should the temperature exceed 0° F.

(b) *Condition.* The recommended average storage periods listed for frozen items are based on the assumption that products delivered to the **Government** were processed and procured in accordance with current **specifications** and were in good condition at time of delivery. Condition should be the deciding factor when determining if an item is suitable for shipment to an oversea area. Exception to this rule is listed in *f* below. In no case should

a product received in a thawed state be refrozen for storage. Thawing will reduce the average storage life of most frozen subsistence items below the desired economical storage period.

(c) *Packaging.* The nature and condition of the packages are important factors which influence storage life expectancy. Example: packaging materials permeable to water vapor or which are defective will permit dehydration by sublimation (freezer burn) or other defects and materially **de-****tract** from the quality and appearance of the stored product. **A program should** be established to reseal **or repackage all** damaged frozen cargo before it is stored or transshipped.

(d) *Detection of deterioration.* Deterioration due to time in storage and/or variations in temperatures can be detected by **organoleptic** inspection for such defects as dehydration (freezer burn), undue softness or mealy texture, discoloration, off odor, evidence of weeping and evidence of rancidity and/or mold.

(e) *Initial quality or grade.* The initial quality of a product at time of receipt by the Government is an important factor which influences storage life expectancy. Initial quality of the product is determined by method of processing and handling, as well as the grade of the ingredients.

(f) *Limitations.* Frozen subsistence items with a recommended average storage life of 6 months or less should not be stored for shipment to overseas areas. Such items will have exceeded the recommended storage life prior to issue in overseas area. Prior to shipping frozen subsistence items with a recommended average life of less than 6 months, a careful inspection by veterinary personnel should be made with a view toward assuring that there is sufficient storage life remaining to enable routine issue within the overseas command.

(g) *Approximate storage life.* Storage life is the total elapsed time from date of pack to date of issue for immediate consumption. The approximate storage life given in tables below is the best estimate of expected life, based upon experience gained through subsistence procured and stored in accordance with the applicable specifications and regulations. Specific lots of subsistence maybe expected to show signs of quality loss within $\pm 20\%$ of the time listed. Therefore, procedures shall be established to provide surveillance from time of receipt until the subsistence is issued and consumed. The frequency of inspection should be established through actual experience with various products, and as prescribed in pertinent military publications.

Table 5-6. Storage life of frozen subsistence at 0° F or below.

| | <i>Approx. Storage Life (Months)</i> |
|---|--|
| Apples ----- | 18 |
| Apple juice, concentrated ----- | 30 |
| Asparagus ----- | 12 |
| Bacon:^{2,3} | |
| prefried ----- | 9 |
| slab, type I ----- | 5% |
| slab, type H ----- | 12 |
| sliced, type I ----- | 1½ |
| sliced, type I, vacuum packed ----- | 3 |
| sliced, type II ----- | 2% |
| sliced, type H , vacuum packed ----- | 5½ |
| Canadian ----- | 6 |
| Beans | |
| green ----- | 12 |
| lima ----- | 14 |
| wax ----- | 12 |

See footnotes at end of table.

Table 5-6-Continued

| | <i>Approx. Storage Life (Months)</i> |
|---|--|
| Beef:² | |
| „ boneless, fabricated ----- | 12 |
| carcass, wholesale cuts ----- | 12 |
| corned ----- | 6 |
| cutlets, boneless (restructured) . . . ----- | 9 |
| diced and diced (restructured) ----- | 9 |
| dried, sliced ----- | 12 |
| ground ----- | 9 |
| ground patties ¹ ----- | 6 |
| liver, whole or portion cut ----- | 4 |
| tongue, fresh ----- | 4 |
| tongue, cured or smoked, type 1 ----- | 6 |
| tongue, cured or smoked, type 2 . ----- | 4 |
| Blackberries ----- | 18 |
| Blueberries ----- | 18 |
| Bologna:^{2,3} | |
| Lebanon ----- | 8 |
| 50% beef ----- | 3-4 |
| 60% beef ----- | 3-4 |
| 75% beef ----- | 6 |
| Boysenberries, dewberries, loganberries, youngberries ----- | 18 |
| Bread dough ² ----- | 6 |
| Bread yeast raised (and rolls fresh) ² ----- | 6 |
| Broccoli ----- | 14 |
| Brussels sprouts ----- | 12 |
| Burritos ----- | 6 |
| Butter prints and patties ² ----- | 18 |
| Cakes, coffee, layer, loaf, cheese ----- | 12 |
| carrots ----- | 24 |
| Cauliflower ----- | 14 |
| Cervelat:^{2,3} | |
| dry ----- | 6 |
| soft (thuringer) ----- | 3-4 |
| Cherries, RTP and dark, sweet, pitted ----- | 24 |
| Cheese, pizza blend, shredded ----- | 12 |
| Chicken:² | |
| gizzards ----- | 6 |
| parts, cut up, ready to cook ----- | 8 |
| whole, ready to cook ----- | 10 |
| Chitterlings: | |
| raw ----- | 3 |
| precooked ----- | 6 |
| Clams, shucked ² ----- | 8 |
| Corn ----- | 24 |
| Corn on the cob ----- | 9 |
| Crabs ----- | 8 |

See footnotes at end of table.

Table 5-6—Continued

| | <i>Approx. Storage Life (Months)</i> |
|---|--|
| Cranberry juice cocktail | 24 |
| Crawfish tail | 8 |
| Dates | 12 |
| Duck² | 10 |
| Egg roll | 6 |
| Eggs: | |
| whole (including table grade) ² | 12 |
| whites² | 12 |
| yokes, sugared or salt added² | 12 |
| Enchiladas | 6 |
| Fish: | |
| fish inlets, steaks² | |
| fatty (mackerel, salmon) | 3 |
| moderately fatty (halibut, perch, rockfish) | 6 |
| lean (cod, haddock, flounder) | 11-12 |
| fish sticks and portions | <i>1-2 less than above</i> |
| Frankfurters—50 percent pork^{2,3} | |
| type I, carton | ½ |
| type I, flexible package | 1 |
| type II, carton | 2½ |
| type H, flexible package | 6 |
| type III, flexible package | 12 |
| type HI, can with thaw indicator | 15 |
| Grape juice, concentrated | 24 |
| Grapefruit juice, concentrated | 24 |
| Grapefruit-orange juice, concentrated | 24 |
| Grapefruit sections | 12 |
| Greens, leafy | 14 |
| Hams:² | |
| boneless, cooked | 6 |
| Ice cream, sherbets or ices | 9 |
| Ice cream, novelties | 3 |
| Lamb:² | |
| boneless, fabricated | 12 |
| carcass, wholesale cuts | 12 |
| cutlets, boneless (restructured) | 9 |
| slices, chops | 9 |
| telescoped | 12 |
| Lard | 12 |
| Lemon juice, concentrated | 18 |
| Lemonade, concentrated | 18 |
| Lime juice, concentrated | 18 |
| Lime juice, single strength | 18 |
| Lobster tail² | 8 |
| Lobster, whole² | 8 |

See footnotes at end of table.

Table 5-6—Continued

| | <i>Approx. Storage Life (Months)</i> |
|--|--|
| Luncheon loaf ^{2,3} ----- | 3-4 |
| Manicotti ----- | 6 |
| Margarine, prints and patties ² ----- | 12 |
| Meal, precooked, (TV dinners, pot pies, etc.) ^{1,6} ----- | 6 |
| Milk fat anhydrous ² ----- | 12 |
| Milk, pasteurized, homogenized ² ----- | 1 |
| Milk, aseptically processed and packaged ² ----- | 1 |
| Milk, whole, concentrated ^{2,4} ----- | 1 |
| Okra ----- | 18 |
| Onion rings, french fried and raw ----- | 14 |
| Orange juice, concentrated ----- | 24 |
| Oysters ² ----- | 8 |
| Pastrami ----- | 6 |
| Peaches ----- | 18 |
| Peas: | |
| Mack eye ----- | 12 |
| dehydrofrozen ----- | 14 |
| green ----- | 14 |
| Peas and carrots ----- | 14 |
| Pepperoni ----- | 6 |
| Peppers ----- | 14 |
| Pies, fruit, baked and unbaked: ² | |
| cream filled ----- | 6 |
| fruit filled ----- | 12 |
| Pineapple ----- | 12 |
| Pineapple juice, concentrated ----- | 24 |
| Pizza ----- | 6 |
| Pizza shells ² ----- | 6 |
| Pork* | |
| barbecued ----- | 6 |
| cutlets, boneless (restructured) ----- | 8 |
| diced and diced (restructured) ----- | 8 |
| hocks, feet ----- | 6 |
| hocks, smoked ----- | 3 |
| loin, boneless, fabricated ----- | 8 |
| slices, chops ----- | 8 |
| wholesale cuts ----- | 8 |
| Potatoes | |
| white, french fries, precooked rounds ----- | 12 |
| white, hash brown ----- | 12 |
| Rabbit? | |
| ready-to-cook ----- | 8 |
| ready-to-cook, cut up ----- | 8 |
| Raspberries ----- | 18 |
| Rhubarb ----- | 24 |
| Ravioli ----- | 6 |

See footnotes at end of table.

Table 5-6—Continued

| | <i>Approx. Storage Life (Months)</i> |
|---|--|
| Salami: ^{2,3} | |
| cooked ----- | 3-4 |
| ¹ dry ----- | 5 |
| Sausage: ^{2,3} | |
| beef ----- | 6 |
| liver ----- | 3-4 |
| New England style ----- | 4 |
| pork, bulk style ----- | 3 |
| pork links: | |
| type I, carton ----- | ¾ |
| type II, carton ----- | 2 |
| type III, carton ----- | 3 |
| type III, can ----- | 9 |
| pork, precooked, Polish, Italian ----- | 3-4 |
| pork and beef, precooked ----- | 6 |
| Scallops ² ----- | 8 |
| Scrapple ----- | 6 |
| Shrimp: ^{2,7} | |
| raw, peeled/unpeeled ----- | 8 |
| raw, breaded, molded ----- | 8 |
| Soups ⁵ ----- | 12 |
| Spinach ----- | 14 |
| Spinach, chopped ----- | 10 |
| Squash, summer and fall, cooked ----- | 24 |
| Strawberries ----- | 15 |
| Succotash ----- | 12 |
| Sweet goods, yeast raised ² ----- | 2 |
| Tamales ----- | 6 |
| Topping, dessert ----- | 24 |
| Tortillas, corn or wheat ----- | 18 |
| Turkey: ² | |
| boneless, cooked ----- | 7 |
| boneless, raw ----- | 7 |
| whole, ready-to-cook ----- | 9 |
| gizzards ----- | 6 |
| Veal: ² | |
| cutlets, boneless, breaded (restructured) ----- | 9 |
| diced, cutlets, breaded ----- | 9 |
| boneless, fabricated ----- | 12 |
| carcass, wholesale cuts ----- | 12 |
| semi-boneless ----- | 12 |
| Vegetables, mixed ----- | 12 |
| Waffles* ----- | 6 |

¹ Any evidence that meal has been thawed is reason for discarding.

² Many of the products listed herein are also storable under chill conditions (above 32° F). See a(4)

³These products suffer deteriorative changes as a result of freezing. If frozen storage is necessary, storage times indicated **will** tend to minimize rancidity development.

⁴Storage life above 0° F is 4 months.

⁵Cream style soups which have broken down during freezing will be **satisfactory** when heated.

⁶These meals may be used for their intended purpose up to 9 months after date of pack provided surveillance inspections performed at least every 30 days subsequent to the 6 months period result in the product being accepted for consumption.

1 ⁷The quality of frozen shrimp **will** deteriorate within 30 days if held between 14° "and 18° F.

(b) *Chill storage of perishable subsistence freezing point, storage temperature, relative humidity and storage life.* The following table (table 5-7) is for the guidance of personnel in computing the storage life of subsistence held in chilled storage. Many of the considerations mentioned in paragraph a(1) above are applicable to **chilled** storage. The storage periods given are applicable only to products processed and procured in accordance with specifications.

(a) *Temperature.* Chill storage is generally within a temperature range of 32-35° F. For some items, better quality is maintained at temperatures higher or lower than these and are shown as **accepted** storage temperature. Some items are damaged by slow freezing, for these, the average freezing points are given.

(b) *Humidity.* Preferred relative humidities shown in the table are those which best inhibit the

gain or loss of moisture in the item. Storage at higher relative humidities may allow water to condense on or be absorbed in the item, while at lower relative humidities, the item may dry and shrink.

(c) *Approximate storage life.* Storage life is the total elapsed time from date of pack to date of issue for immediate consumption. The approximate storage life given in table 5-7 is the best estimate of expected life based upon experience for subsistence procured and stored in accordance with applicable specifications and regulations. Specific lots of subsistence may be expected to show signs of major quality loss within $\pm 20\%$ of the time listed. Therefore, procedures shall be established to provide surveillance from time of receipt until the subsistence is issued and consumed. The frequency of inspection should be established through actual experience with various products, and as prescribed in pertinent military publications.

Table 5-7. Chill storage of perishable subsistence.

| Item | Average Freezing Point | Accepted storage Temperature | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|--|------------------------|------------------------------|-------------------------------|---------------------------------|
| Artichokes, globe | 30 | 32 | 95 | 14 |
| Artichokes, Jerusalem | 23 | 32 | 30-100 | 150 |
| Apples ⁴ | 29 | 32 | 90 | See Note 2 |
| Red delicious, Washington | 30 | 32 | 90 | See Note 2 |
| Apricots³ | 30 | 32 | 90 | 7-21 |
| Asparagus, fresh^{3,19} | 31 | 32 | 95 | 10 |
| to prevent chill damage during extended storage ..... | ..... | 36 | 95 | 14-21 |
| Avocados: | | | | |
| cold tolerant³ Mexican & Guatemalan var. usually rough skinned | 31 | 40-45 | 35-90 | 14-28 |
| cold intolerant West Indian var. usually smooth skinned | 31 | 55 | 85-90 | 14 |
| (b) (summer months) | | | | |

See footnotes at end of table

Table 5-7. Chill storage of perishable **subsistence**—Continued

| Item | Average Freezing Point | Accepted Storage | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|---|------------------------|------------------|-------------------------------|---------------------------------|
| Bacon* | | | | |
| slab, type I ..... | ..... | 32-35 | 85-90 | 42 |
| slab, type II ..... | ..... | 32-35 | 65-90 | 70 |
| sliced, type I ..... | ..... | 32-35 | 85-90 | 14 |
| sliced, type I, vacuum packed ..... | ..... | 32-35 | 65-90 | 21 |
| sliced, type H ..... | ..... | 32-35 | 85-90 | 21 |
| sliced, type 11, vacuum packed ..... | ..... | 32-35 | 35-90 | 35 |
| Banana; | | | | |
| green | 31 | 56-58 | 90-95 | 7-10 |
| ripe ..... | ..... | 56-58 | 85 | 2-4 |
| Beans: | | | | |
| green or waxed | 31 | 4S50 | 95 | 7-10 |
| lima, unshelled, shelled | 31 | 32 | 95 | 7 |
| Beef: | | | | |
| carcass and wholesale cuts ..... | ..... | 32-36 | 85-90 | 10-14 |
| corned ..... | ..... | 32-35 | 65-90 | 9-11 |
| dried, sliced ..... | ..... | 32-35 | ..... | 28-42 |
| ground ..... | ..... | 32-35 | 85-90 | 4 |
| tongue, fresh ..... | ..... | 32-35 | 85-90 | 35-42 |
| tongue, smoked ..... | ..... | 32-35 | 85-90 | 35-42 |
| Beets, bunch | 31 | 32 | 95 | 10-14 |
| Beets, topped ¹¹ | 30 | 32 | 95-100 | 20-180 |
| Berries, black, rasp, logan, boy | | | | |
| sen, young, dew | 31 | 32 | 95 | 2-3 |
| Berries, straw | 31 | 32 | 90-95 | 5-7 |
| Blueberries | 30 | 32 | 90-95 | 14 |
| Bologna:⁹ | | | | |
| Lebanon ..... | ..... | 32-35 | 85-90 | 60 |
| 50 percent beef ..... | ..... | 32-35 | 65-90 | 12 |
| Broccoli⁸ | 31 | 32 | 95 | 10-14 |
| Brussel sprouts | 31 | 32 | 95 | 21-35 |
| Butter, prints and patties ..... | ..... | 32-35 | Less than 55 | 30 |
| Cabbage: | | | | |
| red | 31.7 | 32 | 95-100 | 21-42 |
| summer types | 31 | 32 | 95-100 | 21-42 |
| winter types | 31 | 32 | 95-100 | 90-120 |
| Chinese, table ready shredded | 31 | 33-35 | ..... | 7-10 |
| cantaloupe: | | | | |
| hard ripe ⁶ | 30 | 36 | 90-95 | 15 |
| fullslip | 30 | 32-35 | 90-95 | 5-14 |
| Carrots:^{11,20} | | | | |
| table ready, sliced | 30 | 32-35 | ..... | 10-14 |
| mature, topped | 30 | 32 | 98-100 | 50-270 |
| immature, topped | 31 | 32 | 96-100 | 28-42 |
| bunch | 30 | 32 | 95-98 | 10-14 |
| Casaba melon | 30 | 45-50 | 90 | 28-42 |
| Catsup: | | | | |
| boat, envelopes ⁷ ..... | ..... | 50 | 30-90 | 160 |
| cup, foil pouch ⁷ ..... | ..... | 50 | ..... | 365 |
| Cauliflower ⁵ | 31 | 32 | 95 | 14-28 |
| Celeriac | 30 | 32 | 95-100 | 90-120 |

See footnotes at end of table

Table 5-7. Chill storage of perishable **subsistence**—Continued

| Item | Average Freezing Point | Accepted storage Temperature | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|--|------------------------|------------------------------|-------------------------------|---------------------------------|
| Celery: | | | | |
| northern grown ¹ | 31 | 32 | 95 | 30-60 |
| California or Florida ²¹ | 31 | 32 | 95 | 35-42 |
| Cervelat:⁹ | | | | |
| dry ¹⁰ | | 32-35 | 75-80 | 45 |
| soft (thuringer) | | 32-35 | 85-90 | 14 |
| Cherries, sweet ¹⁸ | 29 | 30-31 | 90-95 | 14-21 |
| Chicory | 30 | 32-34 | 85-95 | 10-30 |
| Chives, potted | 30 | 35-45 | 90-98 | 14 |
| Cheese: | | | | |
| blue veined, natural | | 32-35 | 70 - 75 | 180 |
| cheddar, natural | 25 | 30-34 | 65-70 | 540 |
| cottage | 30 | 32-35 | | 14 |
| cream (hot pack process) | | 32-35 | 70-75 | 120 |
| mozzarella, natural | | 35 | 70-75 | 30 |
| process American, piemento or Swiss loaf | 25 | 32-35 | 65-70 | 540 |
| sliced | | 32-35 | 65-70 | 360 |
| parrnesan, natural | | 32-35 | 70-75 | 360 |
| pizza blend | | 35 | 70-75 | 180 |
| provolone, natural | | 35 | 70-75 | 360 |
| Romano, natural | | 32-35 | 70-75 | 360 |
| Swiss, natural | 25 | 32-35 | 70-75 | 360 |
| Chocolate drink | 29 | 32-35 | | 7 |
| Clams, shucked | | 32-35 | | 4 |
| Cookie dough | | 32 | | 90 |
| Corn on the cob, top-iced ¹ | 31 | 32 | 95 | 4-8 |
| Cranberry: | | | | |
| fresh | 30 | 36-40 | 90-95 | 60-120 |
| sauce, cup ¹¹ | | 50 | | 180 |
| Cream: | | | | |
| half and half, including filled .. | 31 | 32-35 | | 7 |
| sour, cultured | 31 | 32-35 | | 14 |
| table, including filled | 31 | 32-85 | | 10 |
| whipping | 31 | 32-35 | | 10 |
| whipping, ultra-pasteurized (UP) ²² | 31 | 35-45 | | 84 |
| Crenshaw melon | 30 | 45-50 | 90-95 | 14 |
| Cucumbers | 31 | 50-55 | 90-95 | 10-14 |
| Currants | 30 | 31-32 | 90-95 | 10-14 |
| DaSheens, (taro root) | 30 | 45-47 | 98-100 | 60-120 |
| Dates, pitted, cured: | | | | |
| cane sugar types | 1 | 32 | 70-75 | 180 |
| invert sugar types | 5 | 32 | 76 | 180 |
| Eggnog | 28 | 32-35 | | 14 |
| Eggnog (UP) ²³ | 28 | 32-35 | | 84 |
| Eggs, shelled | | | | |
| fresh | 27 | 29-31 | 80-85 | 150-180 |
| oil processed | 27 | 29-31 | 70-80 | 150-180 |
| Egg plant ^{4,6} | 31 | 45-50 | 90-95 | 7-10 |

See footnotes at end of table

Table 5-7 Chill storage of perishable subsistence—Continued

| Item | Average Freezing Point | Accepted Storage Temperature | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|---|------------------------|------------------------------|-------------------------------|---------------------------------|
| Elderberry | 30 | 31-32 | 90-95 | 60-120 |
| Fennel | 30 | 32 | 90-98 | 60-120 |
| Figs, fresh | 27 | 32 | 85-90 | 7-10 |
| Frankfurters, 50 percent beef, 50 percent pork:⁹ | | | | |
| type I, carton | | 32-35 | 85-90 | 10 |
| type I, flexible package | | 32-35 | 85-90 | 21 |
| type II, carton | | 32-35 | 85-90 | 35 |
| type II, flexible package | | 32-35 | 85-90 | 35 |
| French "dressing, "cup, boat or envelope | 31 | 50 | 80-90 | 80-90 |
| Fruitcake, fresh | | 40 | 50-60 | 300 |
| Fruits, dried | 22-26 | 32-40 | 50-60 | 80-360 |
| Garlic, dry | 30 | 32 | 65-70 | 8(L210 |
| Ginger, rhizomes | | 55 | 65 | 180 |
| Gooseberries | 30 | 31-32 | 90-95 | 14-28 |
| Grapefruit^{16,17} | 30 | 50 | 85-90 | 28-42 |
| Grapefruit, Florida September to February harvest ^{16,17} All Calif. & Arizona | 30 | 58-60 | 85-90 | 28 |
| Grapefruit, sections | | 35-45 | | 540 |
| Grapes: | | | | |
| American, types ¹ | 30 | 32 | 85 | 21-56 |
| European, types | 28 | 30 | 90-95 | 60-180 |
| Greens: | | | | |
| endives, escarole" | 31.9 | 32 | 95 | 14-21 |
| collards, kale, rape, beet, mustard turnip, ⁵ chicory | 31 | 32 | 95 | 10-14 |
| Ham:⁹ | | | | |
| cured, canned | | 32-35 | 60-65 | 270 |
| boneless, cooked | | 32-35 | 85-90 | 28 |
| smoked ¹⁰ | | 3%35 | 85-90 | 28 |
| Honeyball, melon | 31 | 45-90 | 90-95 | 21-28 |
| Honeydew, melon | 30 | 45-50 | 90-95 | 21-28 |
| Horseradish, prepared | 30 | 32 | | 90 |
| Horseradish, root | 29 | 30-32 | 35-100 | 100-360 |
| Huckleberries | 29 | 32 | 80-85 | 7-10 |
| Jams, jellies, preserves: | | | | |
| boat, envelope" | | 50 | 80-90 | 180 |
| cup, foil pouch" | | 50 | | 365 |
| Kohlrabi ³ | 30 | 32 | 95 | 14-28 |
| Kumquats | 29 | 33-35 | 85-90 | 60-120 |
| Lamb, carcass, wholesale cuts ¹ | | 32-35 | 85 | 7-10 |
| Lard, service style | | 45 | 90-95 | 120-240 |
| Leek ⁴ | 31 | 32 | 95 | 30-90 |
| Lettuce, iceberg, individual: wrapped in polystyrene film ¹² | 32 | 32-44 | 95-100 | 14-21 |
| Lettuce, leaf, romaine | 32 | 32-44 | 95-100 | 5-8 |
| Lettuce, table ready, whole or chopped | 32 | 32-34 | | 5-7 |
| Lobster, live in water | | 33-50 | | 7 |
| Lemons ⁸ | 30 | 55 | 85-90 | 30-90 |

See footnotes at end of table

Table 5-7 Chill storage of perishable subsistence—Continued

| Item | Average Freezing Point | Accepted storage Temperature | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|---|------------------------|------------------------------|-------------------------------|---------------------------------|
| Lemon juice , reconstituted, ind. serving, pkg. | 30 | 50 | ..... | 120 |
| Limes..... | 29 | 48-50 | 85-90 | 42-56 |
| Luncheon, loaf..... | ..... | 32-35 | 85-90 | 14 |
| Mangoes..... | 30 | 55 | 85-90 | 14-21 |
| Margarine, prints and patties ¹..... | ..... | 32-35 | 40-70 | 60-W |
| Meal, combat, individual..... | ..... | 32 | 50 | 7 years |
| Milk: | | | | |
| buttermilk..... | 31 | 32-35 | ..... | 14 |
| chocolate flavored..... | 29 | 32-36 | ..... | 7 |
| chocolate flavored (UP) ²⁸ | 29 | 35-45 | ..... | 84 |
| concentrated..... | 29 | 32-35 | ..... | 6 |
| fluid, pasteurized, all types..... | 30 | 32-35 | ..... | 7 |
| fluid, homogenized (UP) ²⁸ | 31 | 35-45 | ..... | 34 |
| ice, mix, fresh, liquid..... | 31 | 3X35 | ..... | 10 |
| shake, mix, fresh, liquid..... | 31 | 3X35 | ..... | 10 |
| Mushrooms..... | 30 | 3%34 | 90 | 3-4 |
| Mustard: | | | | |
| boat, envelope ⁷ | 30 | 50 | 80-90 | 90 |
| cup, foil pouch ¹⁷ | 30 | 50 | ..... | 270 |
| Nectarines..... | 30 | 31-32 | 90 | 14-28 |
| okra..... | 29 | 45-50 | 90-95 | 7-10 |
| Olives..... | 29 | 45-50 | 85-90 | 28-42 |
| Onions: 13 | | | | |
| Bermuda, dry..... | 31 | 32 | 65-70 | 30-60 |
| globe, dry..... | 30 | 32 | 65-70 | 130-240 |
| green, top-iced..... | 30.4 | 32 | 95 | 21-26 |
| Spanish..... | 31 | 32 | 6s70 | 90-1s0 |
| peeled or green, table ready .. | 31 | 32-35 | 65-70 | 5-7 |
| oranges: | | | | |
| California ²² Arizona..... | 30 | 4044 | 65-90 | 28-42 |
| Florida, Texas..... | 30 | 32 | 85-90 | 56-84 |
| Temple, Tangelos..... | 30 | 36-40 | 90-95 | 14-23 |
| sections..... | ..... | 35-45 | ..... | 540 |
| Orange juice..... | 30 | 32 | ..... | 21 |
| Oysters , shucked in ice..... | ..... | 32-35 | ..... | 4 |
| Papaya..... | 30 | 55-60 | 8690 | 7-21 |
| Parsley..... | 30 | 32 | 95 | 30-60 |
| Parsnips..... | 30 | 32 | 38-100 | 60-180 |
| Peaches ⁸ | 30 | 31-32 | 90 | 14-28 |
| Peanut butter: | | | | |
| boat, envelope..... | ..... | 50 | 80-90 | 180 |
| cup, foil pouch..... | ..... | so | 80-90 | 366 |
| Pears ^{3,7,8} | 29 | 29-31 | 90-95 | See note 8 |
| Peas, unshelled..... | 31 | 32 | 95 | 7-14 |
| Peppers, sweet | 31 | 45-50 | 90-95 | 14-21 |
| Peppers, dry, chili..... | ..... | 32-50 | 6(L70 | 130 |
| Pepperoni, dry ⁹..... | ..... | 32-35 | 75-80 | 23 |
| Persian melons..... | 31 | 45-50 | 90-95 | 14 |
| Persimmons..... | 28 | 30 | 90 | 90-120 |
| Pies | | | | |
| fruit, fresh..... | ..... | 35 | 80-85 | 3 |
| fried, fresh..... | ..... | 35 | 80-90 | 6 |

See footnotes at end of table

Table 5-7. Chill storage of perishable subsistence—Continued

| | Average Freezing Point | Accepted Storage Temperature | Referred Relative Humidity % | Approximate Storage Life (Days) |
|---|------------------------|------------------------------|------------------------------|---------------------------------|
| Pineapple: | | | | |
| mature, green ⁶ | 30 | 50-55 | 85-90 | 21-28 |
| ripe ⁸ | 30 | 45 | 85-90 | 14 |
| Plums | 30 | 32 | 90-95 | 21-28 |
| Pomegranates | 27 | 32 | 90 | 14-28 |
| Pork, wholesale cuts ⁹ | | 32-35 | 85-90 | 5 |
| Poultry, all forms | 27 | 30 | M-100 | 5 |
| Potatoes, sweet (cured at 85° F) ^{5,6} | 30 | 55-60 | 85-90 | 2CL210 |
| Potatoes, white:¹⁴ | | | | |
| early crop, uncured | 31 | 50 | 90 | 60 |
| early crop, cured before storage | 31 | 40 | 90 | 120-150 |
| late crop | 31 | 40 | 90 | 50-240 |
| peeled, table ready | 31 | 35 | 95 | 5-9 |
| Potatoes, white, irradiated, LPPD | 30 | 40-45 | 85-90 | 380 |
| Prunes, Italian | 30 | 32 | 90-95 | 14-21 |
| Pumpkins | 31 | 50-55 | 70-75 | 60-90 |
| Quinces | 28 | 31-32 | 90 | 00-90 |
| Radishes: | | | | |
| spring, topped, poly bag | 31 | 32 | 95 | 21-28 |
| spring, table ready | 31 | 32 | 95 | 10-12 |
| winter, topped | 31 | 32 | 95-100 | 60-120 |
| Rhubarb | 31 | 32 | 95 | M-28 |
| Rolls, brown and serve | | 32 | 80-85 | 21 |
| Rutabagas, topped | 30 | 32 | 38-100 | 120-180 |
| Salad dressing, cup, boat, envelope? ⁷ | 31 | 50 | 80-90 | 90 |
| Salmon steaks | | 32-35 | 85-90 | 28 |
| Salami:^{9,10} | | | | |
| dry | | 32-35 | 75-80 | 80 |
| cooked | | 32-35 | 85-90 | 14 |
| Salsify | 30 | 32 | 98-100 | 60-120 |
| Sausage:⁹ | | | | |
| liver | | 32-35 | 85-90 | 14 |
| New England style | | 32-35 | 85-90 | 10 |
| pork links: | | | | |
| type I | | 32-35 | 85-90 | 14 |
| type II | | 32-35 | 85-90 | 21 |
| pork bulk | | 32-35 | 85-90 | 14 |
| Scallops | | 32-35 | | 4 |
| Shallots | 31.7 | 32 | 95 | 21-28 |
| Shortening compound, can, carton, cube | | 32-35 | <i>less than 55</i> | 1800 |
| Shrimp, unpeeled, in ice | | 32-35 | | 14 |
| Syrup, imitation maple, cup, boat or envelope ¹⁷ | | 50 | 80-90 | 385 |
| Spinach⁸ | 31.5 | 32 | 95 | 10-14 |
| Squash, fall and winter, Hubbard | | | | |
| acorn | 30 | 50-55 | 70-75 | 180 |
| butternut | 30.5 | 50 | 70-75 | 35-56 |
| summer | 30 | 50 | 50 | 60-90 |
| to prevent chill damage during extended storage | 31 | 32-40 | 90 | 4-5 |
| Swiss chard ⁸ | 31 | 32 | 95 | 10-14 |

See footnotes at end of table

Table 5-7. Chill storage of perishable subsistence—Continued

| Item | Average Freezing Point | Accepted Storage Temperature | Preferred Relative Humidity % | Approximate Storage Life (Days) |
|--|------------------------|------------------------------|-------------------------------|------------------------------------|
| Tangerines..... | 30 | 32 | 85-90 | 14-28 |
| Tomatoes: | | | | |
| mature, green ^{5,6} | 31 | 55-70 | 85-90 | 7-21 |
| pink..... | 31 | 50-55 | 85-90 | 3-5 |
| firm, ripe..... | 31 | 45-50 | 85-90 | 4-7 |
| full color development..... | 31 | 32-35 | 85-98 | 21 after development of full color |
| Trees, Christmas, cut..... | ..... | 22-32 | 85 | 60 |
| Turnips..... | 30 | 32 | 95 | 120-150 |
| Veal and calf sides, wholesale cuts ¹..... | ..... | 32-35 | 85 | 6 |
| Watercress..... | 31 | 32-35 | 90-95 | 7 |
| Watermelon ² | 31 | 40-50 | 85-90 | 14-21 |
| Yeast, bakers: | | | | |
| active, dry..... | ..... | 30-39 | 60-70 | 180-360 |
| compressed cake..... | ..... | 30-32 | 80-90 | 30-90 |
| Yogurt, plain or fruit flavored... .. | 30 | 30-35 | ..... | 30 |

Table 5-7. Footnotes

¹ Soybean oil margarine is considered by some authorities to be less stable than cottonseed oil margarine.

² The length of time apples can be held successfully in cold storage at 32° F, unless otherwise specified, will vary with the variety, with the district where grown, as well as with their condition when harvested. Controlled atmosphere can extend storage life an additional 2 to 4 months,

| Variety | Storage period (month) | | Variety | Storage period (months) | |
|-----------------------------------|------------------------|-----------|-------------------|-------------------------|---------|
| | N o d | M - u r n | | Normal | Maximum |
| Baldwin | 4t05 | 7 | Northern Spy | 4t05 | 8 |
| Cortland | 3t04 | 5 | Rhode Island | | |
| Delicious | 4t05 | 8* | Greening | 3t04 | 6 |
| Golden Delicious | 4 to 6 | 8* | Rome Beauty | 4t05 | 7 |
| Grsvenstein | o to 2 | 3 | Stsymsn Winesap | 4t05 | 6 |
| Grimes Golden | | | Wealthy | o to 2 | 3 |
| (some areas 34-36° F) | 2t03 | 4 | WineSap | 5-7 | 8 |
| | | | Yellow Newton | 5t06 | 8 |
| | | | (Calif. 38-48° F) | | |
| Jonathan (some areas 35-36° F) | 2t03 | 4 | York Imperial | 4t05 | 6 |
| McIntosh (some areaa 38° F) | 2t04 | 5 | | | |

*Stored in polyethylene bag liners (unsealed)

³ Commodities not recommended for export, but which are suitable for immediate use by shore activities and by ships in port or shortly after sailing.

⁴ Not recommended for export since the European type of grape from California with better keeping quality is available during the same period.

Table 5-7. Footnotes—Continued

⁵Foothill grown lemons stored better than coastal grown lemons, especially late picked; at Receiving Markets only “Strong” lots of lemons should be stored and frequently inspected.

⁶ Damage will result if item is stored at lower temperature than indicated.

⁷ For best ripening, pears should be held at about 65° F. for 2 to 3 days prior to serving.

⁸ Pears—Length of safe storage for certain varieties of pairs.

| Storage of Pear varieties at 30 to 31° F. | Length of Storage Period (months) |
|---|-----------------------------------|
| Stored immediately after harvest at 30° to 31° F. | |
| Anjou | 4 to 6* |
| Bartlett, Cornice, Hardy and Kieffer | 2 to 3 |
| Bose and Seckel | 3 to 4* |
| Packam | 5 to 6 |
| Winter Nelis | 6 to 7 |

* The storage life of Anjou, Bartlett, Bose and Cornice pears may be extended for an additional 1-2 months by packaging in polyethylene liner.

⁹ Carcasses *and cuts*: Quarters, carcasses, and cuts of beef, lamb and veal should be hung or placed on racks when in chill space. If such items are in a solid frozen condition when received, stow compactly as possible in the freezer space. Frozen boneless beef should be stacked compactly. Veal carcasses or cuts, particularly of the lighter weights and lower grades, are subject to rapid deterioration. Holding time of such items in the chill space should be held to a minimum. Fresh chilled pork cuts should be treated as highly perishable.

Variety meats and sausage: Such items are highly perishable. Hold storage time to a minimum.

Cured and smoked meat: The keeping qualities of cured and smoked meats depend upon the type of cure, the length of smoking period, and the method of packaging. The storage life of such items is further influenced by the condition of the storeroom with regard to humidity, temperature and sanitation.

Growth of mold and development of rancidity in hams and bacon can be retarded by stowing such items in the chill space for current consumption and in freezer space for seasonal stocks. Since the growth of mold on cured and smoked meats is favored by the presence of condensed water, excessive humidity should be avoided. If the relative humidity is higher than recommended, it is essential that good circulation of air be maintained.

Hams and bacon which have been individually wrapped in one or more layers of paper have a tendency to retain upon the surface of the meat any moisture which may have come from the product after wrapping. This moisture, in a measure, stimulates mold and bacterial growth. If hams so wrapped are held at temperatures of 45° F. or above for a considerable length of time, mold and slime will form on the surface of the meat. Surface slime and mold make the ham unattractive and unpleasant to handle, but do not necessarily indicate spoilage. Accordingly, such products should be carefully inspected to determine how far the mold has penetrated. In most cases, where only the surface is affected, the mold can be removed from the meat by brushing with a stiff-bristled brush, wiping with a clean cloth moistened with a vinegar or salt-water solution, and allow to air dry. When the mold growth is heavy it may be trimmed away. If the ham does not have deep cracks or abrasions, the meat underneath the surface usually is found to be perfectly sound and wholesome. When mold growth

Table 5-7. Footnotes-Continued

or spoilage is evidenced deeply between the muscles" and around the bone, a survey is usually necessary.

¹⁰ Very susceptible to mold growth or surface. Inspect and wipe often.

¹¹ **This** item keeps better unwashed.

¹² Export pack only for ships and oversea shipments. Ice packed lettuce will encourage the growth of mold on other commodities. The storage life shown for lettuce is lengthened substantially by trimming closely and wrapping heads individually in polystyrene **film**.

¹³ This commodity should not **be** stored **with** items such as apples **and** grapefruit since they will acquire **an** onion taste. compartments should **be** kept dark.

¹⁴ Early **and** "intermediate crop potatoes may possess better or poorer keepings qualities than potatoes shown on **the** table. Many lots of **early** potatoes are too immature for export and some intermediate crop potatoes are not suitable for export because of poor quality and condition. Extreme care must **be** exercised in the selection of potatoes for export *from* the middle of May to the middle of August. The quality and condition of available supplies must govern the final choice between old and new crop stock for export during the first part of this period and such factors also must govern the choice of stocks of new crop potatoes for export later in this period.

¹⁵ Deleted

¹⁶ The refrigerated storage of Florida **grapefruit** is not recommended for more than a limited period and then only if the fruit is inspected at intervals. Grapefruit is very susceptible to rind pitting and aging at comparatively low temperatures, especially at 38° F. (as compared with 32° F). At higher temperatures, such as 50° F the rapid development of decay is troublesome..

¹⁷ Keeping time in uncontrolled storage (dry space) is less than 3 months because of desiccation and because of swelling due to microbial activity.

¹⁸ Sweet cherries packed in sealed polyethylene bag liners can be stored for up to 21 days.

¹⁹ Asparagus held too long at 32° F is subject to chill injury. The butts of asparagus should be placed in absorbent material during storage.

²⁰ Carrots may become **bitter** if stored with fruits which give off ethylene, such as apples and pears. If carrots are bitter, they should be stored at room temperature for several days before use.

2. Polyethylene liners will extend storage life an additional 7-14 days.

²² California and Arizona varieties are more susceptible to low temperature rind disorders.

²³ Imperfect seals will reduce shelf life.

Much of the above information was extracted from Lutz, **J.M.** and **R.E.** Hardenburg, Agricultural Research Service, Agriculture Handbook No. 66 (October 1968). The **Commerical** Storage of Fruits, **Vegetables** & Florists & Nursery Stocks, and American Society of Heating, Refrigerating and Air Conditioning Engineers Handbook and Product Directory-1974 Applications.

5-502. **Semiperishable** Subsistence in Dry Storage

a. The product. The term **seriperishable** subsistence refers to food items that are canned, dried, dehydrated, or otherwise processed to the extent that such items may, under normal conditions, be

stored in nonrefrigerated spaces. Semiperishable subsistence too often is regarded as nonperishable commodities which do not require care or protection in storage. While **semiperishable** subsistence is not nearly as susceptible to spoilage as perishable subsistence, spoilage can and will occur if the products

are mishandled, improperly stored, or stored for excessive periods of time. It is important to remember that the length of storage should be based on the date of packing and not on the date of receipt.

b. Storage. Careful, correct storage methods not only prevent **damage** to items in storage but assure speed and efficiency in the receipt, handling and issue of such items. Shipments should be segregated and clearly marked so that the oldest lots, as packed and not as received, are issued first, unless the newer lots, show evidence of deterioration or **poilage**. **The particular** method used for storing each item depends on the nature of the container, the nature of the commodity, and the bursting or breaking strength of the bottom layers. For example: items packed in glass containers with cork stoppers should be inverted to prevent the drying out of the stoppers and subsequent leakages.

(1) *Storage precautions*. Care should be taken that items are not stacked so high as to cause a bursting or crushing of the bottom layers; nor should items be stacked so **high** that the top layer is subject to the higher temperature more prevalent near the ceiling or overhead. Stacking in close proximity to steam or other heated pipes shall be avoided. Pallets are used to raise subsistence off the floor and individual lots piled in such a way as to permit the circulation of air around the lots. Bagged items and those requiring fumigation and insect control should not be stored in large masses in corners of the storeroom or directly against the walls; **such** storage leaves insufficient room for cleaning and inspecting. **Palletized** storage is used as this facilitates handling of the stores and reduces losses by breakage in handling. All items should be properly cross-stacked to keep the stack solid and prevent it from toppling.

(2) *Storage periods (keeping time)*. The safe storage period for dry subsistence items varies greatly, depending on such elements as temperature, humidity, care in handling, protection from weather, quality of the food when received and the packing. Safe storage periods become very uncertain at extremes of temperature and under combat conditions. The fact that subsistence has been on hand up to the limit of the "safe" storage period does not mean that the subsistence should be surveyed but should be consumed as soon as practicable. Subsistence which has been on hand beyond the safe storage period should be inspected care-

fully for spillage, leakage, or other damage and if still good issued as soon as possible; such items will be given priority of issue over newer stocks.

c. Causes of spoilage.

(1) *Age*. All foodstuffs are subject to varying degrees of natural deterioration; this deterioration is inherent in the food itself. It should not, however, be confused with the action of micro-organisms, chemical agents, or other outside agents. Such facts compel an observance of the basic principle of storage that the oldest lots of the item always should be used first, except under conditions indicated in a(1) above.

(2) *Insects (roaches, flies, weevils, and moths)*. Insects can cause great damage to stored food; attacking both natural and manufactured food. Food stored at temperatures between 60° and 90° F is especially attractive to insects. Infested supplies must be segregated and if not too heavily infested may be "reconditioned" for use. Cornmeal, especially, is susceptible to insect infestation and rancidity. Insect repellents should be used carefully so as not to contaminate the foods or cause damage by the absorption, by the food, of the fumigant or insecticide flavor. Roaches and flies not only contaminate the foods but may spread disease. (See 111, sect. 4 this regulation for information on pest management).

(3) *Rodents (rats and mice)*. Rodents not only physically destroy food by feeding, chewing and cutting the bags for nests or nesting material, but also contaminate food with their excreta and hairs. Rodents are carriers of filth and disease; the importance of controlling these pests is evident. The most effective method of control is to prevent entry of these animals.

(4) *Physical environmental factors.*

(a) *Freezing*. Dry products such as grains, flour, sugar, starch, cereals and dehydrated foods, ordinarily are not **injured** by **freezing**. If foods containing relatively large amounts of water, such as canned products, are **frozen**, the usefulness and palatability of such products have not been harmed. However, the physical appearance may suffer due to change in consistency and texture (softening). Emulsions such as canned cheese and butter, prepared mustard, and mayonnaise may be broken (separated) by freezing although the food is not spoiled.

(b) *Heat (high temperatures)*. A high temperature over long periods of time is very detri-

mental to the keeping of almost all food products. High storage temperature encourages bacterial growth, mold growth and insect infestation and is particularly dangerous when accompanied by high humidity. Chemical action is accelerated, causing rancidity in many items; action of the food acids naturally present within the cans is accelerated, resulting in pinholing, blackening of the interior, and hydrogen swells. High temperature is the chief cause of accelerated spoilage in canned foods and should be controlled when possible by providing adequate ventilation. Flour and associated products (barley, cereals, cornmeal, cornstarch, cracker and biscuit, hominy, noodles, oats, rice, spaghetti and macaroni, tapioca, and uncooked wheat) are subject to insect infestation, particularly at high temperatures. Flour and cereals will absorb odors and should be kept away from subsistence or materials giving off distinctive odors. Cocoa will keep years under cool, dry storage conditions. The formation of a white "bloom" (described as a "whitening" or "graying" due to storage under fluctuating temperatures) has little or no effect on the flavor of cocoa. Long periods of storage at higher temperatures may cause mustiness or rancidity. Cocoa does absorb moisture and odors; cans, therefore, should be kept tightly closed. Roasted, ground coffee rapidly develops a weak and stale flavor. If coffee is not hermetically sealed it will absorb odors affecting the flavor.

(c) *Moisture (humidity)*. High humidity is detrimental to stored subsistence in many respects; accelerating the growth of bacteria and molds promoting insect infestation and causing mustiness in flour, rice and similar foods. High humidity causes products which readily absorb moisture, such as sugar and salt, to cake and become hard. Tea will absorb odors and high humidity causes it to become musty and sour. It should be emphasized that dehydrated products are perishable and should not be handled or stored carelessly. Such products are subject to moisture absorption, insect infestation and mold. A loss of flavor and discoloration (darkening) will occur with age; this action is progressive and is accelerated at high temperatures. Dried vegetables and fruits are subject to insect infestation and molding (particularly fruits) and should be inspected at frequent intervals.

(d) *Ventilation*. Where sharply fluctuating temperatures and high humidity prevail, the lack of proper ventilation may cause excessively high

temperatures. Proper ventilation is one of the most important factors in protecting foods, particularly in tropical areas. In extreme cases, it may be necessary to open doors and use fans to induce circulation.

(e) *Light. Damage* from light is restricted to products that are packed in glass or transparent containers. Exposure causes color changes and may affect the flavor of foods containing, or composed of, edible oils and fats.

d. *Physical factors for canned products*.

(1) *Subject to spoilage*. Canned products such as meats, fish, poultry, vegetables, fruits and juices are subject to several physical environmental factors causing spoilage.

(2) *Spoilage factors*.

(a) *Rust*. Rust, unless it actually penetrates the can causing leakage, will not injure the contents or render them inedible.

(b) *Dents*. Dents, unless so severe as to cause leakage, do not indicate that the contents are in an unsatisfactory condition.

(c) *High temperature*. High temperatures are detrimental to all canned provisions and reduce the storage life to a considerable degree.

(d) *Freezing*. Freezing causes loss in palatability and may cause breakdown of the texture. Alternate freezing and thawing may cause delamination of the protective enamel.

(3) *Major defects*.

(a) *Quality change*. Fading of color, loss of flavor, or softening of contents is due to chemical action and the natural aging process.

(b) *Discoloration*. Discoloration of contents on inside of can because of chemical action is found usually in products containing sulphur compounds, that is, corn, peas, and meat products.

(c) *Swells*. Swells, springers and flippers are caused either by chemical or bacterial action, or by overfilling. Regardless of the primary cause, cans exhibiting such defects should be discarded, or referred to a Medical or Veterinary officer for recommendation as to disposition.

(d) *Pinholing*. Pinholing is due to the chemical action of the food acids on the tin. Pinholing is more often found in enamel lined cans; brine-packed or vinegar-packed items, and in water-packed tins.

(e) *Flat sours*. Flat sours are caused by bacterial action, causing changes in odor, color, or turbidity of the product, but not accompanied by gas production which would cause swelling of the can.

e. *Exterior can coating.*

(1) *Purpose.* Exterior can coatings are applied to protect the tin plate from external conditions promoting rusting and, depending on the coating specified, to camouflage the bright can surface.

(2) *Types of coating.* Three types of exterior coatings are used. **Specification** 'IT-C-495, Coatings, Exterior, for Tinned Food Cans, lists these as follows:

(a) *Type I. Precoated camouflage (O.D. colored coating applied to tin plate before can fabrication). Precoated cans* do not have the side seam area coated as manufactured. Depending on contract requirements, the side seam may or may not be striped with O.D. lacquer following filling and sealing.

(b) *Type II. Post-coated camouflage (O.D. colored coating applied to the cans sometime following filling and sealing).*

(c) *Type III. Precoated unpigmented (clear lacquer applied before can fabrication-commonly called "gold coat").*

(3) *Labeling of coated cans.* Precoated cans will normally have completed label information lithographed on the body or one end of the cans. Post-coated cans will usually show only the name of the product or an abbreviation thereof since these cans have to be labeled after coating, and equipment for complete labeling is impractical for the packer to maintain. While it is intended that most postcoated cans will have as near as possible the full name stamped on the side or one end, there is the possibility that some cans will be embossed or im-

pressed on the end only with an abbreviated legend (See MILL-1497.)

f. *Storage periods.*

(1) *General.* Table 5-8 "Dry storage of semiperishable subsistence" should be used only as a guide. This table is based on the optimum rather than the maximum storage life.

(2) *Over-aged stock.* Activities receiving a pack older than that indicated on the storage life table should not on this basis alone consider the product as unfit or undesirable. Subsistence stored for periods in excess of the storage life shown in the table, but at temperatures lower than those listed therein, should not be automatically considered as over-age stock.

(3) *Containers.* Since the container is one of the factors in the overall keeping period of an item, the container should be considered if it markedly differs: that is, flour in bags vs. cans, coffee in bags vs. coffee in vacuum-packed tins. Thus supply officers should be guided by the appearance, odor, color and condition of the item.

(4) Subsistence, *table of safe keeping time for dry storage¹ of semiperishable subsistence.*

Note. These products are not always subject to same spoilage as are other foods. Their desirable properties of flavor, odor, and taste often depend upon very unstable or volatile components, and deterioration may result from a breakdown or loss of these constituents. However, excessive heat and moisture, contamination by insects, rodents and microorganisms, dirt and dust, and inadequate packaging and packing can be major factors contributing to deterioration.

Table 5-3. Dry storage of **semiperishable** subsistence.

| Item | Keeping time in rths (approximate) | | | |
|------------------------------------|------------------------------------|--------|--------|--------|
| | Packaging | 40° F. | 70° F. | 90° F. |
| Almond paste | Can | 36 | 9 | 3 |
| Antioxidant compound, food service | Bag | 60 | 36 | 24 |
| Apple: | | | | |
| Regular pack | Can | 48 | 24 | 12 |
| Pie style, dehydrated | Can | 48 | 36 | 18 |
| Butter | Can/jar | 36 | 18 | 9 |
| sauce | Can | 48 | 24 | 12 |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Dehydrated (instant) | Can | 48 | 24 | 12 |
| Dietetic pack | Can | 48 | 24 | 12 |
| Junior food | Jar | 36 | 18 | 9 |
| Juice | | | | |
| Dehydrated ¹¹ | Can | 72 | 36 | 18 |
| Single strength | Can | 36 | 18 | 9 |
| Spiced, rings | Can | 36 | 18 | 9 |

Table 5-8. Dry storage of **semiperishable** subsistence-Continued

| | Keeping time in months (approximate) | | | |
|--|--------------------------------------|--------|--------|--------|
| | Packaging | 40° F. | 70° F. | 90° F. |
| Apricots: | | | | |
| Regular pack | Can | 48 | 24 | 12 |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Dietary pack | Can | 36 | 18 | 9 |
| Dried | Carton | 24 | 3 | 1 |
| Freeze, dehydrated | Can | 24 | 12 | 5 |
| Apricot nectar: | | | | |
| Regular pack | Can | 48 | 24 | 12 |
| Freeze dehydrated | Can | 24 | 12 | 5 |
| Asparagus | can | 36 | 18 | 9 |
| Baby formula preparation | Can | 24 | 12 | 6 |
| Bacon: | | | | |
| Sliced | Can | 48 | 24 | 12 |
| Sliced, irradiated | Can | 48 | 24 | 12 |
| Sliced, prefried | Can/flexible package | 48 | 24 " | 12 |
| Bakery mixes, extended shelf life except biscuit, cheese cake, cookie, corn bread or pie crust mix, see specific item | | | | |
| | Can | 72 | 36 | 9 |
| Bakery mixes, commercial | Bag/carton | 12 | 6 | 3 |
| Baking powder | Can | 24 | 12 | 6 |
| Baking soda | Carton | indef | indef | indef |
| Barley, pearl | Bag/carton | 60 | 48 | 24 |
| Banana, baby food, strained | Jar | 24 | 12 | 6 |
| Beans: | | | | |
| Drys ¹² | Bag/carton | 24 | 12 | 9 |
| Green, baby food, strained | Jar | 36 | 18 | 9 |
| Green, regular | Can (plain body) | 36 | 18 | 9 |
| | Can (enamel- ealed) | 48 | 24 | 12 |
| Green junior food | Jar | 36 | 18 | 9 |
| Green, dehydrated | can | 84 | 60 | 24 |
| Green dehydrated, compressed | Can | 84 | 60 | 24 |
| Kidney | Can | 72 | 36 | 18 |
| Lima | Can | 72 | 36 | 18 |
| Pinto | Can | 72 | 36 | 18 |
| Lima, dehydrated | Can | 72 | 36 | 18 |
| Sprouts | Can | 48 | 24 | 12 |
| wax | Can (plain body) | 36 | 18 | 9 |
| | Can (enamel- ealed) | 48 | 24 | 12 |
| White, dehydrated | Can | 48 | 24 | 6 |
| White with pork in sweet sauce | can | 72 | 36 | 18 |
| White with pork in tomato sauce | Can | 48 | 24 | 12 |
| Bean refried | Can | 72 | 36 | 18 |
| Beef, liver, pork, or veal: | | | | |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Junior food | Jar | 36 | 18 | 9 |
| Beef: | | | | |
| Broth, baby food, strained | Jar | 36 | 18 | 9 |

See footnotes at end of table

Table 5-8. Dry storage semiperishable subsistence—Continued

| Item | Packaging | Keeping time in months (approximate) | | |
|---|-----------|--------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Chunks with natural juices | Can | 60 | 36 | 18 |
| Corned | Can | 60 | 36 | 18 |
| Diced, raw, dehydrated | Can | 72 | 36 | 18 |
| Flakes and shaped, raw, dehydrated | Can | 72 | 36 | 18 |
| With gravy | Can | 72 | 36 | 18 |
| Patties, dehydrated | Can | 60 | 36 | 18 |
| w/spiced sauce | Can | 60 | 24 | 12 |
| Beef steak, raw, dehydrated | Can | 60 | 36 | 18 |
| Beets: | | | | |
| Baby food, strained | Jar | 24 | 12 | 6 |
| Junior food | Jar | 24 | 12 | 6 |
| Regular pack, Gulf states | Can | 36 | 18 | 9 |
| except Gulf states | Can | 48 | 24 | 12 |
| Berries; black, etc. | Can | 36 | 18 | 9 |
| Beverage base: | | | | |
| Cocoa, powder | Can | 72 | 36 | 24 |
| Imitation, liquid | Bottle | 24 | 12 | 6 |
| Powder | Envelope | 48 | 24 | 12 |
| Beverage, base, liquid for post mix: | | | | |
| colapi, pepper | Can | 2 | 1 | ½ |
| fruit punch, lemon-lime, orange, root beer, ginger ale, grape | | 18 | 8 | 3 |
| Biscuit, mix | Can | 36 | 18 | 6 |
| Blueberries | Can | 36 | 18 | 9 |
| Bouillion, dried, cubes, beef or chicken | Can | 48 | 24 | 12 |
| Bread crumbs | Bag | 8 | 4 | 2 |
| Cabbage: | | | | |
| Red, sweet, sour | can | 48 | 24 | 12 |
| Raw, diced, dehydrated and dehydrated compressed | can | 60 | 24 | 12 |
| Cake, fresh | | | | |
| Layer, coffee | | ½ (2 days) | | |
| Loaf | | ¼ (4 days) | | |
| Candy | | | | |
| Carmel | Box | 12 | 9 | 4 |
| Coated (bridge mix) | Box | 24 | 12 | 4 |
| Hard | can | 72 | 36 | 18 |
| Starch jelly | Box | 24 | 12 | 6 |
| Carrot: | | | | |
| Baby food, strained | Jar | 48 | 24 | 12 |
| Junior food | Jar | 48 | 24 | 12 |
| Puree | can | 60 | 30 | 15 |
| Regular pack | can | 60 | 30 | 15 |
| Dehydrated, compressed, N pack | can | 36 | 18 | 9 |
| Catsup: | | | | |
| Regular pack | Bottle | 48 | 24 | 12 |
| Dehydrated | Envelope | 36 | 18 | 9 |
| Dehydrated | can | 72 | 24 | 6 |

See footnotes at end of table

Table 5-8. Dry storage of **semiperishable** subsistence-Continued

| Item | Packaging | Keeping time in months (approximate) | | |
|--|------------------|--------------------------------------|----------|----------|
| | | 40° F. | 70° F. | 90° F. |
| Cereal: | | | | |
| Baby food, strained, barley | Container | 24 | 12 | 6 |
| Quick cooking | Carton | 24 | 12 | 6 |
| Ready to eat, rolled oats | Can | 48 | 24 | 12 |
| Sugar, coated | Pkg | 24 | 12 | 6 |
| Chalupa shells, corn | Container | 12 | 6 | 3 |
| Cheese: | | | | |
| Cheddar , processed | Can | 48 | 24 | 12 |
| Cottage; dehydrated | Can | 24 | 12 | 6 |
| Grated | Container | 18 | 6 | 3 |
| Processed, American, dehydrated | Can | 36 | 18 | 9 |
| Cheese cake mix | Bag | 12 | 6 | 3 |
| Cherries: | | | | |
| Dehydrated | Can | 48 | 24 | 12 |
| Dietetic pack | Can | 36 | 18 | 9 |
| Maraschino | Jar | 36 | 18 | 9 |
| RTP (Red tart pitted) | Can | 36 | 18 | 9 |
| Sweet, dark | Can | 36 | 18 | 9 |
| Sweet, light | Can | 36 | 18 | 9 |
| Chewing gum | Carton | 9 | 4 | 2 |
| Chicken: | | | | |
| Dehydrated | Can | 60 | 36 | 18 |
| Regular pack | Can | 60 | 36 | 18 |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Chili con carne: | | | | |
| w/o beans | Can | 48 | 30 | 15 |
| Dehydrated, w/beans | Can | 72 | 36 | 12 |
| Chili sauce | Bottle | 48 | 24 | 12 |
| Chives, dehydrated | Can | 24 | 12 | 6 |
| Chocolate, cooking | | | | |
| Semi-sweet chips ¹⁶ | Pkg | 36 | 18 | 6 |
| Unsweetened* | Carton | 48 | 24 | 12 |
| Chocolate sirup, beverage | Can | 72 | 36 | 18 |
| Chutney sauce | Jar | 48 | 24 | 12 |
| Clams | Can | 72 | 36 | 18 |
| Cocoa, natural | Carton | 36 | 18 | 9 |
| Can | Can | 72 | 36 | 18 |
| Cocoanut, prepared | | | | |
| Sweetened | Can | 36 | 18 | 6 |
| Container | Container | 24 | 6 | 1 |
| Unsweetened | Bag | 24 | 6 | 1 |
| Coffee | | | | |
| Instant | Envelope | 36 | 18 | 9 |
| Jar | Jar | 72 | 36 | 18 |
| Roasted and ground | Pouch | 9 | 2 | 1 |
| Can | Can | 18 | 12 | 6 |
| Cookie mix, chocolate & sugar | Can | 36 | 18 | 9 |
| Cookies | Carton | 6 | 4 | 2 |
| Corn bread mix | Can | 24 | 12 | 3 |
| Corn, cream, and whole grain styles | Can | 72 | 36 | 18 |
| Corn, dehydrated, uncooked, comp. | Can | 48 | 24 | 12 |
| <i>Corn</i> , chips | Pkg | 1 | 74 | 1/4 |

See footnotes at end of table

Table 5-S. Dry storage of semiperishable subsistence—Continued

| Item | Packaging | Shelf life (approximate) | | |
|---|--------------|--------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Corn flake crumbs | Carton | 24 | 12 | 6 |
| Corn meal | Pkg | 24 | 12 | 6 |
| | Can | 48 | 24 | 12 |
| Cranberries, spiced | Can | 36 | 18 | 9 |
| Crab | Can | 72 | 36 | 18 |
| Crackers: | | | | |
| Graham | Carton | 4 | 2 | 1 |
| Other than graham | Carton | 12 | 6 | 3 |
| Crumbs | Bag | 12 | 6 | 3 |
| Cranberry sauce | Can | 36 | 18 | 9 |
| Cranberry juice cocktail | Can | 30 | 12 | 3 |
| Cream: | | | | |
| Coffee type, aseptically processed and packaged ¹⁹ | Bottle | 60 | 12 | 3 |
| Whipping, aseptically processed and packaged ^{7,19} | Can | 12 | 6 | 1 |
| Substitute | Can/envelope | 48 | 24 | 12 |
| Whipping, dry | Can | 8 | 6 | 4 |
| cream of tartar | Container | indef | indef | indef |
| Cup, ice cream, edible | Box | 24 | 12 | 6 |
| Currants, dried | Carton | 24 | 12 | 6 |
| Custard pudding, baby food strained | Jar | 24 | 12 | 6 |
| Dessert powder: | | | | |
| Gelatin, base, all flavors ¹⁴ | Can | 72 | 36 | 18 |
| Starch, base, all flavors ¹⁴ | Can | 48 | 24 | 12 |
| Instant, all flavors ¹⁴ | Can | 48 | 24 | 12 |
| | Carton | 36 | 18 | 9 |
| Doughnuts | | | | |
| Cake | Pkg | 1/10 (3 days) | | |
| Yeast | Pkg | 1/30 (1 day) | | |
| Eggnog (APP) ¹⁹ | Can | 12 | 6 | 1 |
| Egg mix, dehydrated | Can | 60 | 36 | 18 |
| Eggs, whole, dry | Can | 72 | 36 | 18 |
| Emulsifier, bread and rolls | Bag/can | 24 | 12 | 6 |
| Enchiladas | Can | 48 | 24 | 12 |
| Figs | Can | 48 | 24 | 12 |
| Fish, dehydrated: | | | | |
| squares | Can | 60 | 36 | 18 |
| Flavoring: | | | | |
| Imitation maple or vanilla | Bottle | indef | indef | indef |
| Nonalcoholic, all flavors not listed | Bottle | 24 | 18 | 6 |
| Rye | Fiber drum | 12 | 6 | 3 |
| Tablet, imitation maple or vanilla | Bottle | indef | indef | indef |
| Flour: | | | | |
| Rye ^{1*} | Bag | 24 | 12 | 6 |

See footnotes at end of table

Table 5-8. Dry storage of semiperishable subsistence—Continued

| Item | Shelf life in months (approximate) | | | |
|--|------------------------------------|--------|--------|--------|
| | Packaging | 40° F. | 70° F. | 90° F. |
| Wheat, bread or general purpose | Can | 36 | 18 | 9 |
| | Bag | 24 | 12 | 6 |
| Food coloring, liquid | Bottle | indef | indef | indef |
| Food coloring, paste | Jar | 48 | 24 | 12 |
| Food packet: | | | | |
| In flight | Carton | 48 | 24 | 12 |
| Long-range patrol | Case | 84 | 36 | 6 |
| Survival, abandon ship | Carton | 84 | 84 | 72 |
| Survival, aircraft, liferaft | Can | 84 | 84 | 72 |
| Survival, general purpose | Carton | 60 | 48 | 24 |
| Frankfurter | Can | 60 | 36 | 18 |
| Fruitcake | Box | 12 | 6 | 1 |
| Fruit, candied | Jar | 12 | 6 | 3 |
| Fruit cocktail | Can | 48 | 24 | 12 |
| Fruit mix, freeze dehydrated | Can | 24 | 12 | 6 |
| Fruit puree | Can | 48 | 24 | 12 |
| Fry mix, breading | Bag | 36 | 18 | 9 |
| Garlic: | | | | |
| Dehydrated | Can | 48 | 24 | 12 |
| Dry | Box | 5 | 4 | 3 |
| Gelatin, plain, edible | Container | 72 | 36 | 18 |
| Grape juice: | | | | |
| Dehydrated* | Can | 72 | 36 | 18 |
| Single strength | Can | 24 | 12 | 6 |
| Grapefruit | | | | |
| Regular pack | Can | 48 | 24 | 12 |
| Juice, dehydrated (instant) ¹ | Can | 72 | 36 | 18 |
| Juice, single strength | Can | 48 | 24 | 12 |
| Grapefruit-orange juice blend: | | | | |
| Single strength | Can | 48 | 24 | 12 |
| Grapefruit-pineapple juice blend, | | | | |
| single strength | Can | 48 | 24 | 12 |
| Ham chunks | Can | 60 | 36 | 18 |
| Hamburgers, without gravy | Can | 60 | 36 | 18 |
| Hash, corned beef or roast beef | Can | 72 | 36 | 18 |
| Hominy: | | | | |
| Grits | Container | 24 | 12 | 6 |
| Whole | can | 72 | 36 | 18 |
| Honey, extracted | Jar | 48 | 24 | 12 |
| Horseradish, dehydrated | Bottle | 48 | 24 | 12 |
| Ice cream mix and ice milk mix: | | | | |
| Powder | Can | 36 | 18 | 6 |
| Icing mix | Can | 72 | 36 | 18 |
| Inhibitor, mold, bread and rolls ¹⁴ | Bag | 18 | 9 | 5 |
| Jam, fruit | Can/jar | 36 | 18 | 9 |
| | Pkg | 24 | 12 | 6 |
| Jelly, fruit | Can/jar | 36 | 18 | 9 |
| | Pkg | 24 | 12 | 6 |
| Lard, service style | Carton | 12 | 6 | 3 |
| Lemon juice, dehydrated ¹¹ | can | 72 | 36 | 18 |
| Lime juice, single strength | can | 24 | 12 | 6 |
| Luncheon meat | Can | 60 | 36 | 18 |
| Macaroni ¹ | Carton | 72 | 36 | 18 |

See footnotes at end of table.

Table 5-8. Dry storage of **semiperishable** subsistence-Continued

| Item | Packaging | Storage time in months (approximate) | | |
|---|-------------------------|--------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Malted cereal sirup | Can | 48 | 24 | 12 |
| Margarine | Can | 36 | 18 | 9 |
| Marmalade | Jar | 36 | 18 | 9 |
| Marshmallow | Container | 12 | 9 | 1 |
| Mayonnaise | Can/jar | 12 | 6 | 3 |
| Meal, combat, individual | Case | 60 | 24 | 12 |
| Meat spread | Can | 36 | 18 | 9 |
| Meringue powder | Can | 48 | 24 | 1 |
| Milk | | | | |
| Chocolate (cocoa, flavored), dry | Envelope | | | |
| ..... | Vacuum) | 40 | 20 | 10 |
| ..... | Envelope | | | |
| ..... | (No Vacuum) | 24 | 12 | 6 |
| Chocolate, aseptically processed & packaged | Can | 12 | 6 | 3 |
| Dry, non-fat | Can | 32 | 16 | 8 |
| ..... | Drum/bag/ carton | 24 | 12 | 3 |
| Evaporated | Can | 24 | 12 | 6 |
| Filled dry, including chocolate | Can | 24 | 12 | 6 |
| Ice and milk shake mix, dehydrated | Can | 24 | 12 | 6 |
| Malted, dry | can | 48 | 24 | 9 |
| Whole, dry | Can (zero oxygen pouch) | 6 | 3 | 1 |
| Whole, aseptically processed and packaged ¹⁹ | can | 12 | 6 | 1 |
| Mincemeat | Can | 48 | 24 | 12 |
| Molasses | Can | 48 | 24 | 12 |
| Monosodium glutamate | Container | indef | indef | indef |
| Mustard, prepared | Can/jar | 36 | 18 | 9 |
| Mushrooms | can | 48 | 24 | 12 |
| Noodles: | | | | |
| Chow mein | can | 8 | 4 | 2 |
| Egg ¹⁴ | Carton | 72 | 36 | 18 |
| Nuts: | | | | |
| Shelled, roasted | can | 60 | 24 | 12 |
| Unshelled | Bag | 24 | 12 | 6 |
| Okra | can | 48 | 24 | 12 |
| Olives: | | | | |
| Green | Jar | 48 | 24 | 12" |
| Ripe | can | 48 | 24 | 12 |
| Olive oil | can | 18 | 6 | 4 |
| Onions, dehydrated and dehydrated compressed | can | 48 | 24 | 12 |
| Onions, whole, acidified | can | 36 | 18 | 9 |
| Orange juice: | | | | |
| Dehydrated (instant)" | can | 72 | 36 | 18 |
| Single strength | can | 48 | 24 | 12 |
| Parsley, dehydrated | can | 30 | 24 | 12 |
| Peaches: | | | | |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Dietetic pack | Can | 48 | 24 | 12 |

See footnotes at end of table

Table 5-8. Dry storage of **semiperishable** subsistence-Continued

| Item | Packaging | Storage time in months (approximal) | | |
|---|---------------|-------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Regular pack | Can | 48 | 24 | 12 |
| Slices (freeze dehydrated) | can | 24 | 12 | 6 |
| Peanut butter | Can/jar | 36 | 18 | 9 |
| Pears: | | | | |
| Baby food, strained | Jar | 40 | 20 | 10 |
| Dietetic pack | Can | 36 | 18 | 9 |
| Freeze dehydrated | Can | 24 | 12 | 9 |
| Regular pack | can | 36 | 18 | 9 |
| Peas: | | | | |
| Baby food, strained | Jar | 40 | 20 | 10 |
| Blackeye | Can | 72 | 36 | 18 |
| Dehydrated, compressed | Can | 60 | 24 | 12 |
| Drys ¹² | Bag/carton | 24 | 12 | 9 |
| Green | can | 72 | 36 | 18 |
| Peas and carrots | Can | 60 | 30 | 15 |
| Peppers, green dehydrated | can | 60 | 24 | 12 |
| Peppers, pickled, cherry | Jar | 36 | 18 | 9 |
| Peppers, jalapeno | can | 24 | 12 | 6 |
| Peppers, red sweet | Can | 48 | 24 | 12 |
| Pickles: | | | | |
| Cucumber, cured | Jar | 48 | 24 | 12 |
| Cucumber, fresh pack | can | 24 | 12 | 6 |
| Mixed | Jar | 36 | 18 | 9 |
| Relish | can | 18 | 9 | 4 |
| Relish | Jar | 48 | 24 | 12 |
| Relish | Can | 24 | 12 | 6 |
| Relish | Jar | 48 | 24 | 12 |
| Relish | can | 24 | 12 | 6 |
| Pie crust mix | can | 36 | 18 | 6 |
| Pie filling, prepared fruit, apple, blueberry, cherry, peach, lemon ¹⁶ | can | 24 | 12 | 6 |
| Pie shell, graham cracker | Container | 8 | 4 | 2 |
| Pimentos | Can | 48 | 24 | 12 |
| Pineapple: | | | | |
| Dietetic pack | can | 48 | 24 | 12 |
| Freeze dehydrated | can | 24 | 12 | 6 |
| Juice, dehydrated | Can | 72 | 36 | 18 |
| Juice, single strength | Can | 48 | 24 | 12 |
| Regular pack | can | 48 | 24 | 12 |
| Plums: | | | | |
| Dietetic pack, red | can | 36 | 18 | 9 |
| Dietetic pack, green | Can | 48 | 24 | 12 |
| Regular pack, red | Can | 36 | 18 | 9 |
| Regular pack, green | can | 48 | 24 | 12 |
| Popcorn, unpopped | can | 72 | 36 | 18 |
| Popcorn | Carton | 2 | 1/4 | 1/8 |
| Popcorn | Cello bag | 24 | 3 | 1 |
| Pork chops, raw, dehydrated | can | 60 | 36 | 18 |
| Potato: | | | | |
| Chips | Pkg | 1 | 1/2 | 1/4 |
| Chips | Can, air | 4 | 2 | 1 |
| Chips | Can, nitrogen | 24 | 12 | 6 |
| Chips | Can, vacuum | 12 | 6 | 3 |

See footnotes at end of table

Table 5--8. Dry storage of **semiperishable** subsistence-Continued

| | Packaging | Storage time in months (approximate) | | |
|--|---------------|--------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Sticks | Can | 48 | 24 | 12 |
| Sweet | Can | 48 | 24 | 12 |
| Sweet, instant , dehydrated | Can | 48 | 24 | 12 |
| White | Can | 60 | 30 | 15 |
| White, dehydrated, granules | Can | 60 | 36 | 18 |
| White, dehydrated, granules-8% H ₂ O | Can | 24 | 12 | 6 |
| White, dehydrated, slices | Can | 36 | 18 | 9 |
| White, dehydrated, slices-8% H ₂ O | Poly bag | 1 6 | 18 | 4 |
| White , dehydrated, slices-8% H ₂ O | Kraft bag | 12 | 6 | 3 |
| Mix, dehydrated for french fries | Can | 18 | 9 | 5 |
| | Bag | 12 | 6 | 3 |
| Prunes | | | | |
| Baby food, strained | Jar | 18 | 9 | 6 |
| Dehydrated/pitted (low moisture) | Can | 24 | 12 | 5 |
| Dried | Can | 36 | 18 | 9 |
| Dried | Carton | 18 | 9 | 5 |
| Dried, soaked | Can | 36 | 18 | 9 |
| *Pumpkin | Can | 48 | 24 | 12 |
| Raisins, dried | Can | 36 | 18 | 9 |
| | Carton | 18 | 9 | 5 |
| Ration, supplement aid station | Case | 72 | 36 | 18 |
| Ravioli w/meat sauce | Can | 48 | 24 | 12 |
| Rice | | | | |
| Instant ¹⁴ | Carton | 36 | 18 | 9 |
| Milled ¹ | Bag | 48 | 24 | 12 |
| Parboiled ¹⁴ | Container/bag | 30 | 20 | 10 |
| Rolls, fresh | | | | |
| Bagel | Pkg | $\frac{1}{30}$ (1 day) | | |
| Sweet or finger | Pkg | $\frac{1}{15}$ (2 days) | | |
| English muffin | Pkg | $\frac{1}{4}$ | | |
| Salad dressing, spoonable ⁴ | Can/jar | 8 | 5 | 2 |
| Salad dressing, pourable ⁴ | Bottle | 7 | 5 | 2 |
| Salad oil ⁹ | Can | 24 | 12 | 6 |
| Salmon | Can | 72 | 36 | 18 |
| salt: | | | | |
| Celery, garlic, onion | Container | 72 | 36 | 18 |
| Substitute | Envelope | indef | indef | indef |
| Table⁶ | Bag envelope | indef | indef | indef |
| Sauces, Hot, Kitchen, Meat, Soy or Worcestershire | | | | |
| Worcestershire | Bottle | 60 | 30 | 15 |
| Sauerkraut | Can | 36 | 18 | 9 |
| Sardines | Can | 72 | 36 | 18 |
| Sardines in tomato sauce | Can | | 15 | 8 |
| Sauce mix, brown gravy, spaghetti, taco seasoning | Can | 36 | 18 | 9 |
| Sausage, pork, link | Can | 60 | 36 | 18 |
| Shortening compound:¹⁰ | | | | |
| Bakery type ⁹ | Can/cube | 48 | 24 | 12 |
| Deep fry, cooking type, fluid | Can | 48 | 24 | 12 |

See footnotes at end of table

Table 5-8. Dry storage of semiperishable **subsistence**—Continued

| Item | Packaging | Keeping time in months (approximate) | | |
|--|------------|--------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Deep fry, cooking type, plastic | Can | 48 | 24 | 12 |
| General purpose regular | Can/cube | 48 | 24 | 12 |
| General purposes, high stability | Can/cube | 60 | 30 | 15 |
| Shrimp | Can | 72 | 36 | 18 |
| Shrimp, dehydrated | Can | 60 | 36 | 18 |
| Sirup: | | | | |
| Blended | Can | 72 | 36 | 18 |
| Maple sirup, imitation | Bottle/can | 72 | 36 | 18 |
| Soup: | | | | |
| Baby food, chicken, strained | Jar | 36 | 18 | 9 |
| Beef, instant, dehydrated | kg | 24 | 12 | 6 |
| Beef, noodle, dehydrated | kg | 24 | 12 | 6 |
| Beef, vegetable, noodle, dehydrated | Can | 36 | 18 | 9 |
| Chicken, chunk, dehydrated | kg | 24 | 12 | 6 |
| Chicken or chicken flavored instant dehydrated | kg | 24 | 12 | 6 |
| Chicken, noodle, dehydrated | Can | 60 | 30 | 15 |
| Condensed ¹³ | kg | 24 | 12 | 6 |
| Condensed ¹³ | Can | 72 | 36 | 18 |
| Cream of onion, instant, dehydrated | kg | 24 | 12 | 6 |
| Cream of potato, instant, dehydrated | kg | 24 | 12 | 6 |
| Green pea, simmer type, dehydrated | Can | 60 | 30 | 12 |
| Onion, dehydrated | kg | 24 | 12 | 6 |
| Onion, dehydrated | Can | 60 | 30 | 12 |
| Onion, dehydrated | Pkg | 24 | 12 | 6 |
| Onion, instant, dehydrated | kg | 24 | 12 | 6 |
| Ready to serve | Can | 48 | 24 | 12 |
| Tomato-vegetable w/noodle, dehydrated | Can | 48 | 24 | 9 |
| Vegetable, dehydrated | Pkg | 24 | 12 | 6 |
| Soup and gravy base: | | | | |
| Beef flavored | Can/jar | 60 | 30 | 15 |
| Beef flavored | Envelope | 24 | 12 | 6 |
| Chicken, flavored | Can/jar | 60 | 30 | 15 |
| Chicken, flavored | Envelope | 24 | 12 | 6 |
| Ham flavored | Can/jar | 60 | 30 | 15 |
| Ham flavored | Envelope | 24 | 12 | 6 |
| Sour cream sauce mix | Can | 24 | 12 | 4 |
| Spaghetti¹⁴ | Carton | 72 | 36 | 18 |
| Spices, seasoning, herbs ⁶ | Can | 48 | 24 | 12 |
| Spices, seasoning, herbs ⁶ | Container | 36 | 18 | 3 |
| Spices, seasoning, herbs ⁶ | Bottle | 36 | 18 | 9 |
| Spinach: | | | | |
| Baby food, strained | Jar | 36 | 18 | 9 |
| Dehydrated, compressed | Can | 60 | 24 | 12 |
| Junior food | Jar | 36 | 18 | 9 |
| Regular pack | Can | 48 | 24 | 12 |
| Puree | can | 48 | 24 | 12 |
| Starch: | | | | |
| Corn, edible | Carton | 96 | 48 | 24 |

See footnotes at end of table

Table 5-8. Dry storage of semiperishable subsistence—Continued

| Item | Packaging | Storage time in months (approximate) | | |
|--|------------------------|--------------------------------------|--------|--------|
| | | 40° F. | 70° F. | 90° F. |
| Pregelatinized, edible ¹⁴ | Can/bag | 96 | 48 | 24 |
| Sugar: | | | | |
| Brown ¹⁷ | Carton/bag | 36 | 18 | 4 |
| Confectioners ¹⁷ | Carton/bag | 36 | 18 | 6 |
| Refined, granulated' | Bag/can, envelope | indef | indef | indef |
| Sugar, substitute | Envelope | indef | indef | indef |
| Tamales | Can | 48 | 24 | 12 |
| Tapioca ¹⁴ | Carton | 96 | 48 | 24 |
| Taco shells, corn | Container | 12 | 6 | 3 |
| T e a | | | | |
| Black, bags or loose | Can/carton | 36 | 18 | 9 |
| Instant | Envelope | 36 | 18 | 9 |
| Tomato: | | | | |
| Juice, concentrated 3 + 1 | Can | 36 | 18 | 9 |
| Juice, single strength | Can (plain body) | 36 | 18 | 9 |
| | Can (enamel- ealed) | 48 | 24 | 12 |
| Paate, instant, dehydrated | Can | 72 | 36 | 18 |
| Paate, regular pack | Can | 36 | 18 | 9 |
| Puree | Can | 48 | 24 | 12 |
| Regular pack | Can | 48 | 24 | 12 |
| Tomatoes and okra | Can | 48 | 24 | 12 |
| Topping, dessert: | | | | |
| Prepared, ice cream, non acid syrup | Can | 72 | 36 | 18 |
| Prepared, ice cream, fruit acid syrup | Can | 36 | 18 | 9 |
| Dehydrated | Can | 36 | 24 | 6 |
| Tortillas, corn | Can | 36 | 18 | 9 |
| Tuna: | | | | |
| Dietetic water pack, no added salt | Can | 72 | 36 | 18 |
| Oil pack | Can | 72 | 36 | 18 |
| Water | Can | 72 | 36 | 1 8 |
| Turkey | | | | |
| Regular pack | can | 72 | 36 | 18 |
| Loaf | Can | 72 | 36 | 18 |
| Vegetable: | | | | |
| Baby food, mixed strained | Jar | 36 | 18 | 9 |
| Juice, single strength | Can | 36 | 18 | 9 |
| Mix, dehydrated, compressed | Can | 36 | 18 | 6 |
| Vinegar: | | | | |
| Liquid | Bottle | 60 | 30 | 15 |
| Synthetic, dry | Flexible bag | 24 | 12 | 6 |
| Water | Can | 120 | 60 | 30 |
| Wheat base ^{2, 14} | Bag | 48 | 36 | 12 |
| Yeast, baker's, active dry | Can | 6 | 1 | ¼ |
| Yeast food | Bag | 48 | 24 | 12 |

Table 5-8. Footnotes

¹ In general, relative humidity 50-55 percent. Metal cans are susceptible to rust and most boxed or bagged food to mustiness or molding above r. h. 60 percent.

² Flour should be stored under cool, dry conditions. The major problem is protection against dampness, insects and rodents. Low temperatures, 32-40° F, protect against

Table 5-8. Footnotes—Continued

insects, relative humidity greater than 70 percent leads to mustiness. Best storage conditions are at temperatures below 50° F and approximately 60 percent relative humidity.

³ Designed to be edible after one month at 140° F.

⁴ Separates at high temperatures or after freezing.

⁵ Humidity above 90 percent will cause caking. "Caked" salt is usable.

⁶ Above 100° F there is complete loss of flavor in less than 6 months. "Whole" spices keep longer than "ground" spices.

⁷ Guaranteed to whip only if stored below 50° F.

⁸ Cases should be turned every 30 to 60 days to prevent separation of butterfat. Separated or grainy milk can be used for cooking.

⁹ When held below 32° F may show solid material which will disappear on warming.

¹⁰ If held above 90° F changes may occur in texture unfavorable to normal creaming properties.

¹¹ Store at cool temperatures below 75° F during the first 3 months.

¹² High temperatures harden, high humidity causes molding.

¹³ Cream style soups break down on freezing, but are not spoiled.

¹⁴ Highly susceptible to damage by moisture.

¹⁵ Freezing alters appearance of starch thickening. Baking restores desirable appearance.

¹⁶ Do not stem near other material capable of imparting odor to chocolate.

¹⁷ Keeping time based on relative humidity not more than 60 percent. For storage longer than 1 month, sugar should be covered with tarpaulins and not stored on damp or concrete floors or near cold walls.

¹⁸ Rye flour loses its most delicate flavor after 2 months at 40° F, 1 month at 70° F, or 1 week at 90° F. After this time further flavor change is very slow. It is said that only experts can detect this first, subtle flavor change.

¹⁹ These items should be stored at temperatures below 72° F. For long holding, chill storage is recommended. Do not freeze.

(5) *Chill Storage of Selected B-ration components.* The following guidance is provided for storage of selected canned B-ration components in commercial warehouses in refrigerated storage at temperatures between 31½° F and 34-42° F and at a relative humidity of 55 percent or less.

Table 5-9. Selected B-Ration Components

| Item | Approx. Storage life (months) |
|---|-------------------------------|
| Apples, pie style, dehydrated | 48 |
| Applesauce, instant | 48 |
| Apricots, freeze dehydrated | 36 |
| Bacon, prefried | 54 |
| Beans, green, dehydrated | 100 |
| Beef chunks, w/natural juices | 60 |
| Beef, corned | 60 |
| Beef patties, dehydrated | 60 |
| Beefsteak, dehydrated | 60 |
| Cabbage, raw, diced, dehydrated & dehydrated compressed | 72 |
| Cherries, dehydrated | 60 |
| Cheese, processed, American, dehydrated | 42 |
| Chicken, boned | 60 |
| Chicken, dehydrated | 60 |
| Chili con carne, w/o beans | 48 |
| Egg mix, dehydrated | 60 |
| Fish squares, dehydrated | 60 |
| Flour, wheat, bread | 54 |

Table 5-9. Selected B-Ration Components-Continued

| <i>Item</i> | <i>Approx . Storage life (months)</i> |
|--|---|
| FranHurters | 60 |
| Fruit mix, freeze dehydrated | 36 |
| Ham, chunks | 60 |
| Hamburgers w/o gravy | 60. |
| Luncheon meat | 60 |
| Onions, dehydrated | 60 |
| Parsley , dehydrated | 30 |
| Peaches , freeze dehydrated | 3 6 |
| Pears, freeze dehydrated | 3 6 |
| Peas, cooked, dehydrated | 72 |
| Peppers, green dehydrated | 72 |
| Pineapple, freeze dehydrated | 36 |
| Pork chops, dehydrated | 60 |
| Pork sausage | 60 |
| Potatoes, sweet, instant | 60 |
| Potatoes, white, granules dehydrated | 60 |
| Potatoes, white, slices, dehydrated | 54 |
| Prunes, low moisture | 36 |
| Rice, parboiled | 30 |
| Shortening compound, general purpose | 60 |
| Shrimp, dehydrated | 60 |
| Spinach, cooked, dehydrated | 60 |
| Tomato paste, instant | 72 |
| Vinegar, dry, Synthetic (can ad flex-pack) | 30 |

APPENDIX B

DD FORM 2531

FOOD STORAGE FACILITY SANITATION COMPLIANCE CHECKLIST

FROM

MILITARY STANDARD 909

| FOOD STORAGE FACILITY SANITARY COMPLIANCE CHECKLIST (This appendix is an integral part of MIL-STD-909 and its application is mandatory.) | | 1. DATE OF INSPECTION (YYYYMMDD) | |
|--|--|--|--|
| 2. PLANT INSPECTED | | | |
| a. NAME | | b. ADDRESS | |
| 3. PLANT OWNER | | | |
| a. NAME OF COMPANY OR INDIVIDUAL | | | b. TELEPHONE NUMBER |
| 4. ACCOMPANYING INDIVIDUAL | | | |
| a. NAME | | b. TITLE | |
| SANITATION DEFECTS (1) | | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 5. PREMISES | | | |
| a. Not clean or well organized | | 3 | |
| b. Not well drained | | 3 | |
| c. Not free from nuisances and sources of contamination | | 5 | |
| d. Approaches to receiving and shipping docks not clean or not maintained to minimize dust | | 5 | |
| e. Garage, truck maintenance, and/or truck washing area does not meet requirements | | 5 | |
| f. Trash dumpsters, receptacles or compactors do not meet requirements | | 5 | |
| 6. FOOD | | | |
| a. Food destined for DoD not obtained from approved source or not properly segregated from nonapproved food | | Critical | |
| b. Not inspected upon receipt and at other times as needed for determination of adulteration, contamination, or infestation | | 5 | |
| c. Adulterated, contaminated or pest infested food is accepted for storage and distribution | | Critical | |
| d. When used, single-service articles and packaging materials not protected | | 4 | |
| 7. CONSTRUCTION OF BUILDING | | | |
| a. Not large enough to accommodate the operation without hampering sanitary practices | | 4 | |
| b. Walls, floors, and ceilings not in good repair or not constructed of materials that can easily be kept clean | | 4 | |
| c. Unnecessary clutter of wiring, pipes, hangers, and ducts | | 4 | |
| d. Exterior openings not clean or not in good repair | | 4 | |
| e. Exterior openings do not prevent the entrance of insects, birds, rodents, or other pests | | 4 | |
| f. Air curtains, if used, not in compliance with NSF standards | | 3 | |
| g. Screen doors not outward opening and not self-closing | | 3 | |
| h. Storage area opens directly into living quarters, garages, or maintenance shops | | 4 | |
| i. Expansion joints do not meet requirements | | 5 | |
| j. Window ledges not clean or not free of evidence of storage pests | | 5 | |
| k. Openings/spaces not sealed where appropriate to prevent the entrance of insects or rodents | | 5 | |
| l. Doorways not closed when not being used at the present time | | 3 | |
| m. Upper areas of walls and doorways not free of bird droppings or nests | | 5 | |
| n. Walls up to 2 feet from ground level not free of holes or other potential entry sites for rodents | | 5 | |
| 8. LIGHTING | | | |
| a. Insufficient lighting | | 4 | |
| b. Lights in processing area not equipped with shields where appropriate | | 5 | |
| c. Burned out lights not replaced or nonfunctional lights not repaired as appropriate | | 5 | |
| 9. VENTILATION AND HUMIDITY | | | |
| a. Insufficient control of ventilation or air movement | | 5 | |
| b. Mold present on walls or ceilings | | 5 | |
| c. Accumulation of condensates on walls or product | | 5 | |
| d. Ventilation system not clean and in good repair | | 5 | |
| e. Air not filtered and/or directed outward where required | | 5 | |
| 10. WATER SUPPLY | | | |
| a. Not easily accessible | | 4 | |
| b. Inadequate in quantity | | 5 | |
| c. Undiminished supply of hot water not available | | 5 | |
| d. Cross-connection exists between potable and nonpotable water supply or sewage | | Critical | |
| e. Lacks protection against possible back-siphonage | | 5 | |
| f. Potability certificate not current or available | | 5 | |

| FOOD STORAGE FACILITY SANITARY COMPLIANCE CHECKLIST | | |
|--|-------------------------------------|--|
| SANITATION DEFECTS (1) | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 10. WATER SUPPLY (Continued) | | |
| g. Potable water supply found to be nonpotable | Critical | |
| h. Nonpotable water outlets not identified by prominently displayed color code and labels | 5 | |
| i. Wells not effectively protected from contamination by surface drainage or floods | Critical | |
| 11. ICE | | |
| a. Not made from potable water | Critical | |
| b. Not manufactured, handled, stored, or used in a sanitary manner | 5 | |
| 12. DISPOSAL OF WASTES | | |
| a. Liquid wastes not disposed of in a sanitary manner | 5 | |
| b. Floor drains not functional or properly trapped | 3 | |
| c. Waste not collected in properly covered containers or not disposed of at required intervals or in a sanitary manner | 4 | |
| 13. TOILET/DRESSING ROOM AND HANDWASHING FACILITIES | | |
| a. Sufficient number of toilets or privies not provided | 5 | |
| b. Toilet rooms or privies not conveniently located | 4 | |
| c. Toilet rooms constructed of materials that are not easily cleaned | 4 | |
| d. Toilet rooms or privies not adequately lighted | 2 | |
| e. Toilet rooms not separately vented to the outside | 5 | |
| f. Toilet rooms open directly into product area | 3 | |
| g. Doors not self-closing and tight-fitting | 3 | |
| h. Handwashing sign absent | 3 | |
| i. Water at suitable temperature not available; or, mixing valve, soap, soap dispenser, appropriate hand-drying facilities, not conveniently located | 5 | |
| j. Sanitary waste receptacles not present in toilet rooms | 3 | |
| k. Toilet/dressing rooms, privies, or handwashing facilities not maintained in a clean, orderly fashion | 4 | |
| l. Toilet rooms used for storage of cleaning equipment | 3 | |
| m. Privies not separate from the building | Critical | |
| n. Privies not of sanitary type, location, or construction | 5 | |
| o. Each employee not furnished a locker or other suitable facility | 5 | |
| p. Continuous cloth towel dispensers, if used, not in compliance with NSF Standards | 3 | |
| 14. CONSTRUCTION AND REPAIR OF EQUIPMENT AND UTENSILS | | |
| a. Design, construction, and use of equipment and utensils does not preclude the adulteration of food | Critical | |
| b. Equipment and/or utensils not clean or not in good repair | 5 | |
| c. Equipment not easily accessible for cleaning, maintenance, or inspection | 5 | |
| d. Prohibited lubricants used on food contact surfaces | Critical | |
| e. Lubricants not used in a manner that prevents contamination of food or food contact surfaces | 5 | |
| f. Pallets, storage racks, or shelves do not meet requirements | 5 | |
| 15. CLEANING AND SANITIZING TREATMENT | | |
| a. Cleaning or sanitizing methods do not prevent product contamination or adulteration | Critical | |
| b. Food not moved or otherwise protected prior to equipment/area cleaning to avoid contamination or adulteration | Critical | |
| c. Multiservice containers, equipment, and utensils not cleaned and sanitized after use | Critical | |
| d. Cleaning and sanitizing chemicals not properly labeled or stored | 5 | |
| e. Unauthorized chemical compounds used for cleaning and sanitizing | Critical | |
| f. Hot water used as sanitizer less than 170°F (99°C) and/or contact time less than 30 seconds | Critical | |
| g. Rooms and areas not maintained in a clean manner | 5 | |
| h. Test kit, other device, or approved method not used when chemical sanitizers are utilized | 5 | |
| i. Cleaning and sanitizing chemicals not used as prescribed by manufacturer's recommendations | Critical | |
| 16. METHODS | | |
| a. Methods permit contamination/adulteration of product | Critical | |
| b. Methods permit deterioration of product | 5 | |
| 17. REFRIGERATION AND FREEZING | | |
| a. Refrigerated or freezer rooms not free of ice buildup, objectionable odors, or mold | 5 | |
| b. Refrigerated or freezer rooms not maintained at proper temperatures and humidities | Critical | |
| c. Refrigerated or freezer rooms not equipped with suitable thermometers | 5 | |
| d. Items requiring refrigerated or frozen storage not properly handled | Critical | |
| e. Drip pans, fans, and coils of refrigeration/freezer units not maintained properly | 5 | |
| f. Freezing equipment or procedures do not meet requirements | Critical | |

| FOOD STORAGE FACILITY SANITARY COMPLIANCE CHECKLIST | | | |
|---|--|-------------------------------------|--|
| SANITATION DEFECTS (1) | | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 18. STORING AND STORAGE FACILITIES | | | |
| a. | Storage facilities not clean or in good repair | 3 | |
| b. | Storage methods do not minimize deterioration or contamination | 5 | |
| c. | Shelves, cabinets, or dunnage not used where necessary to prevent contamination or deterioration | 5 | |
| d. | Wall, floor, and ceiling clearance not provided as appropriate | 5 | |
| e. | Adequate inspection aisles not provided | 5 | |
| f. | Semi-perishable storage area does not have thermometer with log noting daily temperatures | 5 | |
| g. | Damaged products not properly reported | 5 | |
| h. | Area around cases with forklift damage shows evidence of rodent or other pest infestation | 5 | |
| i. | Pallets away from warehouse center aisle not free of rodent droppings | 5 | |
| j. | Placards not displayed where appropriate | 5 | |
| k. | Toxic chemicals or other potential adulterants not stored away from food and food packaging or packing materials | Critical | |
| l. | Recoup area not physically separated from other product areas | Critical | |
| m. | Recoup methods do not prevent contamination of salvageable products | Critical | |
| 19. CONTROL OF INSECTS, BIRDS, RODENTS, AND/OR OTHER PESTS | | | |
| a. | Presence of insects, birds, rodents, and/or other pests or signs of these pests in production area | Critical | |
| b. | Presence of insects, birds, rodents, other pests or signs of them in nonproduction area | 5 | |
| c. | Effective measures for control of insects, birds, rodents and/or other pests not maintained at all times | 3 | |
| d. | Pesticides not controlled or applied by trained personnel | Critical | |
| e. | Unauthorized insecticides/rodenticides used | Critical | |
| f. | Insecticides or rodenticides not used as prescribed by label directions | Critical | |
| g. | Insecticides or rodenticides are handled or stored in an unsafe manner | Critical | |
| h. | Rodent bait station(s) not of metal, plastic, other durable construction, or appear not to have been recently checked by pest control | 5 | |
| i. | Rodent bait station(s) not identified with proper warning | Critical | |
| j. | Rodent bait station(s) not sealed to prevent tampering | Critical | |
| k. | Insect/rodent harborages present | 4 | |
| l. | Rodent bait station(s) or glue boards not located close to doorways or openings in walls | 5 | |
| m. | One side of bait station or glue board not completely against the wall | 5 | |
| n. | Area of rodent bait station(s) and glue boards not free of rodent droppings | 5 | |
| o. | Contents of rodent-bait station(s) caked, moldy, not fresh-appearing, or not free of insect contamination | 5 | |
| p. | Pest control log or location system not maintained for bait station(s) and glue boards | 5 | |
| q. | Glue boards and bait station(s) not free of dirt, debris, or insects | 5 | |
| 20. VEHICLE AND TRANSPORTATION FACILITIES | | | |
| a. | Not constructed, equipped, or operated to protect contents from contamination or deterioration | Critical | |
| b. | Not properly maintained or not clean | 3 | |
| c. | Shipping Vans not checked for insects as required | 5 | |
| 21. CLEANLINESS AND HEALTH OF PERSONNEL | | | |
| a. | Employees not washing hands after contamination | Critical | |
| b. | Failure of employees to be hygienically clean | 4 | |
| c. | Personnel not prohibited from eating, smoking, chewing gum, tobacco, or expectorating in food storage or food handling areas | 3 | |
| d. | Fingernail polish or unauthorized jewelry worn by personnel handling unpackaged food | 3 | |
| e. | Employees not wearing garments/hair restraints suitable for work being performed | 5 | |
| f. | Storage of employee's personal effects in production area | 3 | |
| g. | Employees affected with or a carrier of a communicable or infectious disease not excluded from product areas | Critical | |
| h. | Warehouse employees that have an infectious wound, sore, or lesion on hands, arms, or other exposed parts of the body not excluded from product area | Critical | |
| i. | Prescribed medical examinations of personnel not being made and/or records of such not available | 4 | |
| j. | Warehouse personnel not instructed in acceptable hygienic practices and proper sanitary rules of food handling | Critical | |
| 22. FORMULA | | TOTALS | 415 0 |
| SCR = $\frac{\text{Net Total of Column 2} - \text{Net Total of Column 3}}{\text{Net Total of Column 2}} \times 100$ | | MINUS NONAPPLICABLE DEFECT POINTS | - - 0 |
| | | NET TOTAL DEFECT POINTS | 415 0 |
| 23a. SCR COMPUTATIONS | b. SCR ASSIGNED | c. NUMBER OF CRITICAL DEFECTS | |

FOOD STORAGE FACILITY SANITARY COMPLIANCE CHECKLIST

24. OTHER REGULATORY AGENCIES CONCERNED WITH SANITATION OF THIS ESTABLISHMENT *(Record the agency, date, and results of last inspection.)*

25. METHODOLOGY SECTION *(Record narrative information describing the storage facility, premises, equipment, and procedures.)*

FOOD STORAGE FACILITY SANITARY COMPLIANCE CHECKLIST

26. REMARKS/RECOMMENDATIONS *(Key discrepancies noted to the subparagraph numbers above.)*

27. INSPECTOR

| | | | |
|---------------|--|----------|---------------------------|
| a. TYPED NAME | | b. TITLE | |
| c. SIGNATURE | | d. GRADE | e. DATE SIGNED (YYYYMMDD) |

End of Appendix B

APPENDIX C

DD FORM 2460

COMMISSARY SANITARY COMPLIANCE CHECKLIST

FROM

MILITARY STANDARD 903C

| COMMISSARY SANITARY COMPLIANCE CHECKLIST (This appendix is an integral part of MIL-STD-903C and its application is mandatory.) | | 1. DATE OF INSPECTION (YYYYMMDD) | |
|--|--|--|--|
| 2. COMMISSARY INSPECTED | | | |
| a. NAME | | b. ADDRESS | |
| 3. COMMISSARY OFFICER | | | |
| a. NAME | | b. GRADE | c. TELEPHONE NUMBER |
| 4. ACCOMPANYING INDIVIDUAL | | | |
| a. NAME | | b. TITLE | |
| SANITATION DEFECTS (1) | | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 5. PREMISES | | | |
| a. Not clean or well organized | | 3 | |
| b. Not well drained | | 3 | |
| c. Not free from nuisances and sources of contamination | | 5 | |
| d. Approaches to receiving and shipping docks not clean or not maintained to minimize dust | | 5 | |
| 6. RAW MATERIALS | | | |
| a. Not from approved sources | | Critical | |
| b. Not inspected upon receipt and at other times as needed for determination of adulteration, contamination, or infestation | | 5 | |
| c. Single-service articles and packaging materials not protected | | 4 | |
| 7. CONSTRUCTION OF BUILDING | | | |
| a. Not large enough to accommodate the operation without hampering sanitary practices | | 4 | |
| b. Building's flow of dissimilar products is not channeled through separate routes | | 4 | |
| c. Walls, floors, ceilings not in good repair or not constructed of materials that can easily be kept clean and sanitary | | 4 | |
| d. Unnecessary clutter of wiring, pipes, hangers, ducts and so forth | | 4 | |
| e. Exterior openings not clean and in good repair | | 4 | |
| f. Exterior openings do not prevent the entrance of insects, birds, rodents or other animals | | 4 | |
| g. Air curtains, if used, not in compliance with NSF standards | | 3 | |
| h. Screen doors not outward opening and not self-closing | | 3 | |
| 8. LIGHTING | | | |
| a. Insufficient lighting | | 4 | |
| b. Lights in processing area not equipped with shields when required | | 5 | |
| 9. VENTILATION AND HUMIDITY | | | |
| a. Insufficient control of ventilation or air movement | | 5 | |
| b. Presence of mold on walls or ceilings in processing or storage areas | | 5 | |
| c. Accumulation of condensates in processing or storage areas | | 5 | |
| d. Ventilation system not kept clean and maintained in good repair | | 3 | |
| e. Air not filtered and not directed outward when required | | 5 | |
| 10. WATER SUPPLY | | | |
| a. Not easily accessible | | 4 | |
| b. Inadequate in quantity | | 5 | |
| c. Undiminished supply of hot water not available | | 5 | |
| d. Mixing valves not available at all scullery sinks and hose connections | | 4 | |
| e. Hose connections not available where required | | 5 | |
| f. Cross-connection exists between potable and nonpotable water supply or sewage | | Critical | |
| g. Not adequate protection against possible back-siphonage | | 5 | |
| h. Potability certificate not current or available | | 5 | |
| i. Potable water supply found to be nonpotable | | Critical | |
| j. Nonpotable water outlets not identified by prominently displayed color code and labels | | 5 | |
| 11. ICE (If used) | | | |
| a. Not made from potable water which meets requirements | | Critical | |
| b. Not manufactured, handled, stored, or used in a sanitary manner | | 5 | |

| COMMISSARY SANITARY COMPLIANCE CHECKLIST | | |
|---|-------------------------------------|--|
| SANITATION DEFECTS (1) | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 12. DISPOSAL OF WASTES | | |
| a. Liquid wastes not disposed of in a sanitary manner | 5 | |
| b. Floor drains not functional or properly trapped | 3 | |
| c. Waste not collected in suitable, properly covered containers and disposed of at frequent intervals and/or in a sanitary manner | 4 | |
| d. Garbage cans not clean, watertight, or do not have tight fitting lids | 3 | |
| e. Garbage cans not kept outside on racks that can be cleaned easily | 3 | |
| f. Contents of garbage cans allowed to accumulate above level of 4 inches from the top | 3 | |
| g. Personnel handle unpackaged food after cleaning garbage cans without taking appropriate personal sanitizing measures | Critical | |
| h. Refuse container doors not tight fitting or kept closed | 3 | |
| i. Refuse container or refuse container area not cleaned periodically or as required | 3 | |
| 13. TOILET/DRESSING ROOM, AND HANDWASHING FACILITIES | | |
| a. Sufficient number of toilet facilities not provided | 5 | |
| b. Toilet rooms not conveniently located | 2 | |
| c. Toilet rooms constructed of materials not easily cleaned | 2 | |
| d. Toilet rooms not adequately lighted | 2 | |
| e. Toilet rooms not separately vented to outside | 5 | |
| f. Toilet rooms open directly into product area | 5 | |
| g. Doors not self-closing and tight-fitting | 3 | |
| h. Absence of handwashing sign or not multilingual as prescribed | 3 | |
| i. Absence of water at suitable temperature, soap, soap dispenser, or sanitary single-service towels | 5 | |
| j. Sanitary waste receptacles not present | 3 | |
| k. Toilet/dressing rooms, privies, or handwashing facilities not maintained in a clean, orderly fashion | 4 | |
| l. Restrooms used for storage of cleaning equipment | 3 | |
| m. Each employee not furnished a locker or other suitable facility | 5 | |
| 14. CONSTRUCTION AND REPAIR OF EQUIPMENT AND UTENSILS | | |
| a. Design, construction, and use of such equipment and utensils does not preclude the adulteration of food | Critical | |
| b. Product-contact surfaces not of impervious material, smooth, nor of corrosion-resistant material | 4 | |
| c. Product-contact surfaces not of nontoxic material | Critical | |
| d. Not clean or not in good repair | 5 | |
| e. Not constructed so that all surfaces are readily sanitizable | 5 | |
| f. Use of wooden cutting boards | Critical | |
| g. Equipment not easily accessible for cleaning, maintenance, and inspection | 5 | |
| h. Thermometer not provided for each zone in which temperature must be closely controlled | 3 | |
| i. Supervisors not issued or using thermometer for monitoring | 3 | |
| j. Defective thermometers not repaired or replaced immediately | 3 | |
| k. Lubricants not used in a manner that prevents contamination of food or food contact surfaces | 5 | |
| 15. MEAT MARKET | | |
| 15.1 CLEANING AND SANITIZING | | |
| a. Cleaning or sanitizing methods do not prevent product contamination or adulteration | Critical | |
| b. All products not moved away or protected prior to equipment or area cleaning to avoid contamination or adulteration | Critical | |
| c. All multiservice containers, equipment, and utensils not cleaned and sanitized after use | Critical | |
| d. Cleaning and sanitizing chemicals not properly labeled or stored | 5 | |
| e. Unauthorized chemical compounds used for cleaning and sanitizing | Critical | |
| f. Test kits or other device not used when chemical sanitizers are utilized | 5 | |
| g. Drainboards or racks not provided after sanitizing | 3 | |
| h. Improper cleaning utensils and equipment being utilized | 5 | |
| i. Cleaning equipment and utensils not properly stored | 5 | |
| j. Cleaning equipment and utensils not cleaned and sanitized following use | 3 | |
| k. Water used as a sanitizer less than 170°F | 5 | |
| l. Areas and equipment not in good repair and cleaned and sanitized as required | 3 | |
| m. Meat display cases not cleaned and sanitized as required | 3 | |
| n. Cleaning and sanitizing frequency for equipment and contact surfaces not as required | 5 | |

| COMMISSARY SANITARY COMPLIANCE CHECKLIST | | |
|--|-------------------------------------|--|
| SANITATION DEFECTS (1) | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 15. MEAT MARKET (Continued) | | |
| 15.2. PROCESSING AREA | | |
| a. Perishable product held at unsafe temperatures for more than three hours | Critical | |
| b. Complete physical separation of raw and ready-to-eat products not attained in holding coolers or preparation areas | 5 | |
| c. Tempering edible products does not follow recommended procedures | Critical | |
| d. Cooked or ready-to-eat items contaminated by raw products | Critical | |
| e. Personnel handling poultry or fish not wearing an apron maintained for this purpose | 5 | |
| f. Personnel handling poultry or fish not washing and sanitizing hands prior to handling other product | Critical | |
| g. Packaging materials that will be in contact with product not properly handled or stored | 5 | |
| h. Stored packaging materials unprotected from dust and other contaminants during cleaning procedures | 4 | |
| i. Containers used for collecting fat and meat scraps not cleanable, not in good condition, or with flaking paint | 3 | |
| j. Barrels not lined with plastic bag as required | 3 | |
| k. Rendering company personnel entering coolers or food handling areas | 5 | |
| l. Scrap and fat material allowed to collect for more than one week | 5 | |
| 15.3 REFRIGERATION AREAS | | |
| a. Refrigeration areas not free from objectionable odors and from mold | 5 | |
| b. Refrigeration areas not maintained in a sanitary condition | 5 | |
| c. Product not stored at proper temperature and humidity | 5 | |
| d. Accurate thermometer not indicating a representative air temperature | 3 | |
| e. Temperature checks not conducted as required | 5 | |
| f. Temperature of meat freezer area not 0°F or below | 5 | |
| g. Temperature of meat chill area not between 29° and 35°F | 5 | |
| h. Temperature of meat display cases/storage space not as required | 5 | |
| i. Product load line not designated | 3 | |
| j. Perishable products placed above the load line level | 5 | |
| k. Product designed to be maintained in chill state not displayed chilled | Critical | |
| l. Product designed to be maintained frozen not displayed frozen | Critical | |
| m. Display cases with dividers obstruct air circulation | 3 | |
| n. Packaged fresh poultry, waterfoods, and red meats not displayed as required | 5 | |
| o. Temperature in meat processing room 60°F or above | Critical | |
| 15.4 STORING AND STORAGE FACILITIES | | |
| a. Storage facilities not clean, sanitary, or in good repair | 3 | |
| b. Storing methods do not minimize deterioration or contamination | 5 | |
| c. Shelves, cabinets, or dunnage not used where necessary to prevent contamination or deterioration | 5 | |
| d. Recommended storage practices not followed | 5 | |
| e. Absorbents/antislip compounds not used as specified | 5 | |
| f. Paper or corrugated cardboard not new and removed on a daily basis | 5 | |
| g. Unsaleable product not immediately disposed of or segregated | 5 | |
| h. Product held for disposal not in a waterproof tote bin or container with lid that may be cleaned as needed | 3 | |
| i. Luncheon meats in final consumer package not held in separate area as required | 5 | |
| j. Poultry and waterfoods in the red meat cooler not segregated as required | 5 | |
| 16. PRODUCE MARKET | | |
| 16.1 CLEANING AND SANITIZING | | |
| a. Cleaning or sanitizing methods do not prevent product contamination or adulteration | Critical | |
| b. All products not moved away or protected prior to equipment or area cleaning to avoid contamination or adulteration | Critical | |
| c. All multiservice containers, equipment, and utensils not cleaned and sanitized after use | Critical | |
| d. Cleaning and sanitizing chemicals not properly labeled or stored | 5 | |
| e. Unauthorized chemical compounds used for cleaning and sanitizing | Critical | |
| f. Test kits or other device not used when chemical sanitizers are utilized | 5 | |
| g. Drainboards or racks not provided after sanitizing | 3 | |
| h. Improper cleaning utensils and equipment being utilized | 5 | |
| i. Cleaning equipment and utensils not properly stored | 5 | |
| j. Cleaning equipment and utensils not cleaned and sanitized following use | 3 | |

| COMMISSARY SANITARY COMPLIANCE CHECKLIST | | |
|---|-------------------------------------|--|
| SANITATION DEFECTS (1) | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 16. PRODUCE MARKET <i>(Continued)</i> | | |
| 16.1 CLEANING AND SANITIZING <i>(Continued)</i> | | |
| k. Water used as a sanitizer less than 170°F | 5 | |
| l. Areas and equipment not in good repair and cleaned and sanitized as required | 3 | |
| m. Storage refrigerators not emptied, washed, and cleaned at least weekly or more if necessary | 3 | |
| n. Produce display cases not emptied, washed, cleaned, and sanitized at least weekly with intermittent cleaning on a daily basis | 3 | |
| o. Floors in the processing and display area not free of fruit and vegetable debris | 2 | |
| p. Floors in processing room not washed and dried at end of each day | 3 | |
| q. Scales and immediate areas not clean | 3 | |
| 16.2 PROCESSING AREA | | |
| a. Separate holding cooler and processing packaging area not provided | 5 | |
| b. Packaging materials that will be in contact with products not properly handled or stored | 5 | |
| c. Stored packaging materials not protected from dust or other contaminants during cleaning process | 4 | |
| 16.3 STORING AND STORAGE FACILITIES | | |
| a. Storage facilities not clean, sanitary, or in good repair | 3 | |
| b. Storing methods do not minimize deterioration or contamination | 5 | |
| c. Shelves, cabinets, or dunnage not used where necessary to prevent contamination or deterioration | 5 | |
| d. Recommended storage practices not followed | 5 | |
| e. Unsaleable product not immediately disposed of or segregated | 5 | |
| f. Product held for disposal not in a waterproof tote bin or container that may be cleaned as needed | 3 | |
| 17. GROCERY MARKET | | |
| 17.1 CLEANING AND SANITIZING | | |
| a. Cleaning or sanitizing methods do not prevent product contamination or adulteration | Critical | |
| b. All products not moved away or protected prior to equipment or area cleaning to avoid contamination or adulteration | Critical | |
| c. All multiservice containers, equipment, and utensils not cleaned and sanitized after use | Critical | |
| d. Cleaning and sanitizing chemicals not properly labeled or stored | 5 | |
| e. Unauthorized chemical compounds used for cleaning and sanitizing | Critical | |
| f. Test kits or other device not used when chemical sanitizers are utilized | 5 | |
| g. Drainboards or racks not provided after sanitizing | 3 | |
| h. Improper cleaning utensils and equipment being utilized | 5 | |
| i. Cleaning equipment and utensils not properly stored | 5 | |
| j. Cleaning equipment and utensils not cleaned and sanitized following use | 3 | |
| k. Water used as a sanitizer less than 170°F | 5 | |
| l. Areas and equipment not in good repair and cleaned and sanitized as required | 3 | |
| m. Floors not clean or free of debris | 2 | |
| n. Waste receptacles not emptied and cleaned as often as necessary | 2 | |
| o. Checkout counters not cleaned daily or kept free of extraneous matter | 2 | |
| p. Shopping carts not clean | 2 | |
| q. Shelves not clean | 2 | |
| r. Display cases and storage refrigerators of fresh dairy and egg product area not cleaned and washed after spillage or leakage of products | 3 | |
| s. Display cases and storage refrigerators of fresh dairy and egg product area not cleaned and sanitized on a weekly basis | 3 | |
| t. Refrigerated display cases of bakery products not cleaned and sanitized on a weekly basis | 3 | |
| 17.2 REFRIGERATION AREAS | | |
| a. Refrigeration areas not free from objectionable odors and from mold | 5 | |
| b. Refrigeration areas not maintained in a sanitary condition | 5 | |
| c. Product not stored at proper temperature and humidity | 5 | |
| d. Accurate thermometer not indicating a representative air temperature | 3 | |
| e. Temperature checks not conducted as required | 5 | |
| f. Temperature of freezer area not 0 F or below | 5 | |
| g. Temperature of dairy products display cases and storage areas not as required | 5 | |
| h. Product load line not designated | 3 | |
| i. Perishable products placed above the load line level | 5 | |

| COMMISSARY SANITARY COMPLIANCE CHECKLIST | | |
|--|-------------------------------------|--|
| SANITATION DEFECTS (1) | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
| 17. GROCERY MARKET <i>(Continued)</i> | | |
| 17.2 REFRIGERATION AREAS <i>(Continued)</i> | | |
| j. Product designed to be maintained in chill state not displayed chilled | Critical | |
| k. Product designed to be maintained frozen not displayed frozen | Critical | |
| l. Display cases not equipped with separators to provide false walls | 3 | |
| 17.3 STORING AND STORAGE FACILITIES | | |
| a. Storage facilities not clean, sanitary, or in good repair | 3 | |
| b. Storing methods do not minimize deterioration or contamination | 5 | |
| c. Shelves, cabinets, or dunnage not used where necessary to prevent contamination or deterioration | 5 | |
| d. Recommended storage practices not followed | 5 | |
| e. Hazardous products not segregated from all food products in storage, during transportation, and while on display | 5 | |
| f. Hazardous products stored, transported, or displayed above food products | 5 | |
| g. Garden and lawn supplies not handled the same as hazardous products | 5 | |
| h. Salvage area not cleaned and physically separated from product areas | 3 | |
| 18. WAREHOUSE SECTION | | |
| 18.1 CLEANING | | |
| a. Warehouse not cleaned and orderly in appearance | 3 | |
| b. Food product spillage not removed on a daily basis | 3 | |
| c. Floors not swept and cleaned at least weekly, or more if necessary | 3 | |
| d. Cleaning equipment and utensils not properly stored | 5 | |
| 18.2 REFRIGERATION AREAS | | |
| a. Refrigeration areas not free from objectionable odors and from mold | 5 | |
| b. Refrigeration areas not maintained in a sanitary condition | 5 | |
| c. Product not stored at proper temperature and humidity | 5 | |
| d. Accurate thermometer not indicating a representative air temperature | 3 | |
| e. Temperature checks not conducted as required | 5 | |
| f. Product designed to be maintained in chill state not so maintained | Critical | |
| g. Product designed to be maintained in frozen state not so maintained | Critical | |
| 18.3 STORING AND STORAGE FACILITIES | | |
| a. Storage facilities not clean, sanitary, or in good repair | 3 | |
| b. Storing methods do not minimize deterioration or contamination | 5 | |
| c. Shelves, cabinets, or dunnage not used where necessary to prevent contamination or deterioration | 5 | |
| d. Recommended storage practices not followed | 5 | |
| 19. DELICATESSEN | | |
| a. Cleaning or sanitizing methods do not prevent product contamination or adulteration | Critical | |
| b. All products not moved away or protected prior to equipment or area cleaning to avoid contamination or adulteration | Critical | |
| c. All multiservice containers, equipment, and utensils not cleaned and sanitized after use | Critical | |
| d. Cleaning and sanitizing chemicals not properly labeled or stored | 5 | |
| e. Unauthorized chemical compounds used for cleaning and sanitizing | Critical | |
| f. Test kits or other device not used when chemical sanitizers are utilized | 5 | |
| g. Drainboards or racks not provided after sanitizing | 3 | |
| h. Improper cleaning utensils and equipment being utilized | 5 | |
| i. Cleaning equipment and utensils not properly stored | 5 | |
| j. Cleaning equipment and utensils not cleaned and sanitized following use | 3 | |
| k. Water used as a sanitizer less than 170°F | 5 | |
| l. Areas and equipment not in good repair and cleaned and sanitized as required | 3 | |
| m. Display cases not cleaned and sanitized as required | 3 | |
| n. Not completely separated from the remainder of the operations flow of material | 3 | |
| o. Meat received for further slicing not held in the delicatessen cooler | 5 | |
| p. Cooked delicatessen items not held in a separate area | Critical | |
| q. Raw and cooked products in display counters in contact or respective containers in contact and not separated by a solid divider | 5 | |
| r. Packaging materials that will be in contact with product not properly handled or stored | 5 | |
| s. Stored packaging materials not protected from dust or other contaminants during cleaning process | 4 | |

| COMMISSARY SANITARY COMPLIANCE CHECKLIST | | | ASSIGNED DEFECT POINTS (2) | INSPECTOR'S DEFECT POINTS (3) |
|---|--|--------------------------------------|--|-------------------------------|
| SANITATION DEFECTS (1) | | | | |
| 19. DELICATESSEN (Continued) | | | | |
| t. | Equipment used for raw products not washed prior to use for cooked product | | Critical | |
| u. | Personnel involved in preparing or selling cooked items not possessing required training in sanitation | | 5 | |
| v. | Personnel of other than cooked processed meat areas handle cooked products | | 3 | |
| w. | Cooked products handled without taking proper sanitary precautions | | 5 | |
| x. | Delicatessen personnel pass through other product handling areas | | 3 | |
| y. | All delicatessen operations (heating, holding, and chilling) not controlled by thermometers | | Critical | |
| z. | Temperature checks not conducted as required | | 5 | |
| aa. | Perishable product held at unsafe temperatures for more than three hours | | Critical | |
| bb. | Wastes not collected in properly covered suitable containers and disposed of at frequent intervals and/or in a sanitary manner | | Critical | |
| 20. CONTROL OF INSECTS, BIRDS, RODENTS, AND/OR OTHER ANIMALS | | | | |
| a. | Presence of insects, birds, rodents, and/or other animals in production area | | Critical | |
| b. | Presence of insects, birds, rodents, and/or other animals in nonproduction area | | 5 | |
| c. | Effective measure for the control of insects, birds, rodents and/or other animals is not maintained | | 3 | |
| d. | Rodent harborages or insect breeding places present | | 4 | |
| e. | Unauthorized insecticides or rodenticides used | | Critical | |
| f. | Insecticides or rodenticides not used by approved methods | | 5 | |
| g. | Insecticides or rodenticides are handled or stored in an unsafe manner | | 5 | |
| 21. VEHICLE AND TRANSPORTATION FACILITIES | | | | |
| a. | Not constructed or operated to protect contents from contamination or deterioration | | Critical | |
| b. | Not properly maintained or not clean | | 3 | |
| c. | Supplies not elevated three or four inches above the truck bed | | 2 | |
| d. | Vehicle used to transport food is used to carry materials that might contaminate subsistence supplies | | 5 | |
| e. | Temperature of chilled or frozen foods not maintained at recommended levels | | 5 | |
| 22. CLEANLINESS AND HEALTH OF PERSONNEL | | | | |
| 22.1 CLEANLINESS | | | | |
| a. | Employees not washing hands after contamination | | Critical | |
| b. | Failure of employees to be hygienically clean | | 4 | |
| c. | Personnel not prohibited from eating, smoking, chewing tobacco, or expectorating in product handling areas | | 5 | |
| d. | Fingernail polish or unauthorized jewelry worn by plant personnel | | 3 | |
| e. | Employees not wearing garments/hair restraints suitable for work being performed | | 5 | |
| f. | Storage of employee's personal effects in production room | | 3 | |
| g. | If gloves used, not maintained as required | | 3 | |
| h. | Handwashing signs not prominently displayed in processing areas or multilingual as prescribed | | 3 | |
| i. | Employee break rooms and eating areas not maintained in a clean and sanitarily acceptable manner | | 5 | |
| 22.2 HEALTH OF PERSONNEL | | | | |
| a. | Employees affected with or a carrier of a communicable or infectious disease not excluded from product areas | | Critical | |
| b. | Employees having an infectious wound, sore, or lesion on hands, arms, or other exposed parts of the body not excluded from contacting ingredients, products, or product zone | | Critical | |
| 22.3 MEDICAL EXAMINATIONS | | | | |
| a. | Prescribed medical examinations of personnel not being made or records of such not available | | 4 | |
| 23. EDUCATION AND TRAINING | | | | |
| a. | Supervisor not having education and experience to provide competency for protection of safe food | | 5 | |
| b. | Food handlers and supervisors not instructed in acceptable hygienic practices and proper sanitary rules of food handling | | Critical | |
| c. | Responsibility for assuring compliance with this Standard not clearly assigned to competent supervisory personnel | | 5 | |
| 24. FORMULA | | | TOTALS | 855 |
| $SCR = \frac{\text{Net Total of Column 2} - \text{Net Total of Column 3}}{\text{Net Total of Column 2}} \times 100$ | | | MINUS NONAPPLICABLE DEFECT POINTS | - |
| | | | NET TOTAL DEFECT POINTS | 855 |
| 25a. SANITARY COMPLIANCE RATING COMPUTATIONS | b. SANITARY COMPLIANCE RATING ASSIGNED | c. NUMBER OF CRITICAL DEFECTS | | |

COMMISSARY SANITARY COMPLIANCE CHECKLIST

26. OTHER REGULATORY AGENCIES CONCERNED WITH SANITATION OF THIS ESTABLISHMENT *(Record the agency, date, and results of last inspection)*

27. METHODOLOGY SECTION *(Record narrative information describing the storage facility, premises, equipment, and procedures).*

COMMISSARY SANITARY COMPLIANCE CHECKLIST

28. REMARKS/RECOMMENDATIONS *(Key discrepancies noted to the subparagraph numbers above)*

29. INSPECTOR

| | | |
|---------------|----------|---------------------------|
| a. TYPED NAME | b. TITLE | |
| c. SIGNATURE | d. GRADE | e. DATE SIGNED (YYYYMMDD) |

End of Appendix C