

NOTICE OF
CANCELLATION

INCH-POUND

MIL-R-43900B
NOTICE 2
22 August 2000
Superseding
NOTICE 1
27 March 1992

MILITARY SPECIFICATION

REFRIGERATORS, FREEZERS, PREFABRICATED, MECHANICAL,
COMMERCIAL, WALK-IN

MIL-R-43900B, dated 20 June 1985, is hereby canceled without replacement.

Custodians:

Army – GL
Navy – SA
Air Force – 99

Preparing Activity:

DLA-SS
Project 4110-0540

Review Activities:

Army – MD, CR4
Air Force – 82

NOTICE OF
VALIDATION

INCH-POUND

MIL-R-43900B
NOTICE 1
27 March 1992

MILITARY SPECIFICATION

REFRIGERATORS, FREEZERS, PREFABRICATED, MECHANICAL,

COMMERCIAL WALK-IN

MIL-R-43900B, dated 20 June 1985, has been reviewed and determined to be valid for use in acquisition.

Custodians:

Army - GL
Navy - SA
Air Force - 99

Preparing Activity:

Army - GL

Review Activities:

Army - MD, ME
Air Force - 82
DLA - GS

User Activity:

Navy - YD

AMSC N/A

FSC 4110

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MIL-R-43900B
20 June 1985
SUPERSEDING
MIL-R-43900A (GL)
9 March 1977

MILITARY SPECIFICATION

REFRIGERATORS, FREEZERS, PREFABRICATED, MECHANICAL, COMMERCIAL, WALK-IN

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This document covers walk-in, commercial refrigerators and freezers with refrigeration units.

1.2 Classification. The refrigerators and freezers shall be of the following types, sizes, and styles as specified (see 6.2):

Type I - Refrigerator
Type II - Freezer

Size 1 - 7 feet wide by 9 feet long by 8 feet 6 inches high
Size 2 - 7 feet wide by 12 feet long by 8 feet 6 inches high
Size 3 - 8 feet wide by 8 feet long by 8 feet 6 inches high
Size 4 - 8 feet wide by 10 feet long by 8 feet 6 inches high
Size 5 - 8 feet wide by 12 feet long by 8 feet 6 inches high
Size 6 - 8 feet wide by 20 feet long by 8 feet 6 inches high

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: U.S. Army Natick Research and Development Center, Natick, MA 01760-5014 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this letter.

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Size 7 - 8 feet wide by 36 feet long by 8 feet 6 inches high
Size 8 - 9 feet wide by 12 feet long by 8 feet 6 inches high
Size 9 - 9 feet wide by 20 feet long by 8 feet 6 inches high
Size 10 - 10 feet wide by 10 feet long by 8 feet 6 inches high
Size 11 - 10 feet wide by 12 feet long by 8 feet 6 inches high
Size 12 - 8 feet wide by 16 feet long by 8 feet 6 inches high
Size 13 - 10 feet 6 inches high
Size 14 - 14 feet high

Style A - Floorless design
Style B - Floor panel design

2. APPLICABLE DOCUMENTS

2.1 Government documents. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this document to the extent specified herein.

SPECIFICATIONS

FEDERAL

BB-F-1421 - Fluorocarbon Refrigerants
PPP-B-601 - Boxes, Wood, Cleated-Plywood
PPP-B-621 - Boxes, Wood, Nailed and Lock-Corner
PPP-B-636 - Boxes, Shipping, Fiberboard
PPP-T-60 - Tape, Packaging, Waterproof

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MIL-C-104 - Crates, Wood; Lumber and Plywood Sheathed, Nailed and Bolted
MIL-P-116 - Preservation, Methods Of
MIL-B-121 - Barrier Material, Greaseproofed, Waterproofed, Flexible
MIL-P-15024 - Plates, Identification, Equipment
MIL-L-10547 - Liners, Case, and Sheet Overwrap; Water-Vaporproof or Waterproof, Flexible
MIL-C-52950 - Crates, Wood, Open and Covered

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STANDARDS

FEDERAL

FED-STD-601 - Rubber: Sampling and Testing

MILITARY

MIL-STD-105 - Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 - Marking for Shipment and Storage

MIL-STD-130 - Identification Marking of US Military Property

(Copies of documents required by manufacturers in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.2 Other publications. Unless otherwise specified, the following documents of the issue in effect on date of invitation for bids or request for proposal, form a part of this document to the extent specified herein.

NATIONAL SANITATION FOUNDATION (NSF)

No. 7 - Food Service Refrigeration and Storage Freezers

Seal of Approval Listing of Food Service Equipment

(Application for copies should be addressed to the National Sanitation Foundation, 3475 Plymouth Road, P.O. Box 1468, Ann Arbor, MI 48106.)

UNDERWRITERS LABORATORIES, INC.

UL 207 - Refrigerant-Containing Components and Accessories, Nonelectrical

UL 471 - Standard for Commercial Refrigerators

(Application for copies should be addressed to the Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062.)

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

D 3951 - Standard Practice for Commercial Packaging

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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(Technical society and technical association documents are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document shall take precedence.

3. REQUIREMENTS

3.1 First article. When specified, a sample shall be subjected to first article inspection (see 4.3, 6.2 and 6.3).

3.2 Standard product. The refrigerators or freezers shall, as a minimum, be in accordance with the requirements of this document and shall be the manufacturer's standard commercial product with any added features needed to comply with the requirements of this document. Standard or modified commercial products furnished in accordance with this document shall be identified by all regular manufacturers or commercial service organizations servicing the brand involved. Service organizations shall be capable of providing complete parts and repair services on models furnished to the Government with their normal commercial practices.

3.3 Code and standards. The refrigeration unit components, as applicable, shall comply with the applicable requirements of UL 207 and electrical components shall comply with UL Standards, as applicable. The refrigerators or freezers shall conform to the applicable requirements of NSF 7.

3.3.1 Compliance. The contractor shall submit to the contracting officer or his authorized representative, satisfactory evidence that the machines he proposes to supply under this document, meet the applicable requirements of UL 471 and NSF 7.

3.3.1.1 UL. Acceptable evidence of meeting the requirements of UL shall be the UL label, a UL listing mark, or a certified test report from a recognized independent testing laboratory acceptable to the Government, indicating that the refrigeration units, and applicable components offered have been tested and conform to UL 471.

3.3.1.2 NSF. Acceptable evidence of meeting the requirements of NSF shall be:

(1) A listing in the current edition of the NSF "Listing of Food Service Equipment" and display of the NSF seal on the finished refrigerator or freezer, or;

(2) A certification for the refrigerator or freezers issued by NSF under their special one-time contract evaluation/certification service, or;

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(3) A certified test report from a recognized independent testing laboratory acceptable to the Contracting Officer with the advice of the Army Surgeon General, indicating that the refrigerators or freezers have been tested and conform to the applicable requirements of NSF 7.

3.4 Materials and components. Materials and components shall be as specified herein. Materials and components not definitely specified shall be of the quality normally used by the manufacturer provided the completed item complies with all provisions of this document (see 6.4).

3.4.1 Insulation. Insulation shall be foamed-in-place polyurethane material and shall have a manufacturers rated "K" factor of not more than 0.15. Insulation shall have a free rise density of not less than 1.7 pounds per cubic foot when tested as specified in 4.6.4.1, or an in-place density of not less than 2 pounds per cubic foot when tested as specified in 4.6.4.2.

3.4.2 Refrigerant. The refrigerant shall conform to type 12 (dichlorodifluoromethane), 22 (monochlorodifluoromethane) or 502 (monochlorodifluoromethane/monochloropentafluorethane) of BB-F-1421.

3.5 Design and construction. The refrigerators or freezers shall be of floorless design for style A and floor panel design for style B. The prefabricated refrigerators or freezers shall be furnished in the sizes specified in 1.2, with a tolerance of minus 6 inches. Size 6 and 9 shall have a tolerance of minus 9 inches and size 12 shall be minus 7 inches. An evaporator and condensing unit sized for each refrigerator or freezer specified, shall be furnished. Insulated floor screeds shall be furnished with each style A refrigerator. The floor screeds shall be insulated with a minimum of 2-1/2 inches of foamed insulation. Style B floor panel design, shall be a minimum of 4 inch thick foamed insulation sandwiched between galvanized steel interior skin having a minimum thickness of 0.063 inches and patterned exterior aluminum skin 0.040 inches thick, minimum. When specified floor panel interior skins shall be 0.059 inches thick, type 304 stainless steel (see 6.2). The panels shall form an airtight vaporproof joint when assembled and the joint shall be formed by gaskets or basic foam construction, and patterned aluminum exterior skin, 0.040 inches thick. The panels shall have panel fasteners with cam type action. The panel fasteners shall not protrude from the panels when in the retracted position. Two sets of erection tools, compatible with the fasteners, shall be furnished with each refrigerator or freezer. The panels shall assemble to each other and no special tools, other than furnished, shall be necessary to assemble or disassemble the panels when tested as specified in 4.6.1. A heated type pressure relief port shall be provided for type II freezers. The refrigeration units (see 3.5.5) shall be remotely located and designed to maintain the interior temperature of the type I refrigerators at 37 deg. F, plus or minus 3 deg. F and

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the type II freezers at 0 deg. F, minus 10 deg. F, while the refrigerators or freezers are in an ambient of 110 deg. F with an interior (heavy usage) electrical load of 2 watts per cubic foot (see 4.6.3). Size 13 refrigerators shall be capable of maintaining 32 deg. -38 deg. F. The length and width of size 13 and 14 shall be as specified (see 6.2).

3.5.1 Heat leakage. The heat leakage of the complete refrigerators or freezers shall be no greater than 0.070 Btuh per degree F per square foot of outside refrigerator area when tested as specified in 4.6.2.

3.5.2 Panels. The side and top panels of the refrigerator or freezer shall be frameless or framed. No wood shall be used for framed panels. The panels shall have tongue and groove edges or flush joints with double seal serrated neoprene rubber gaskets to assure air and vapor tight joints. All panels except door and corner panels shall be minimum of 11-1/2 inches and maximum of 48 inches in width. Corner panels shall be angle section with each horizontal section being not less than 12 inches. All like sections shall be interchangeable. All space between panel skins shall be filled with a minimum of 4 inches of foamed-in-place insulation conforming to 3.4.1. The panel skins shall be patterned aluminum, with a minimum thickness of 0.040 inches. Prior to foaming the interior of the panel, inner and outer liners shall be treated in accordance with the manufacturer's standard commercial practice to insure permanent bonding of the insulation to the liner material.

3.5.2.1 Door panels. Door panel inner and outer skins shall be of 0.040 inch patterned aluminum. The panel shall be located on the approximate center of the width of each refrigerator or freezer, unless other use specified (see 6.2). The minimum door opening shall be 36 inches wide by 84 inches high, except for size 13 and 14. Unless otherwise specified (see 6.2), door dimensions for size 13 and 14 shall be 54 to 60 inches wide by 84 inches high. Each door panel shall have a remote bulb sensor with an exterior flush-mounted, waterproof thermometer with rust resistant case to register inside temperature; light switch, and an outside pilot light mounted on the exterior side. When specified (see 6.2), a recording thermometer shall be furnished. A vaporproof light shall be installed on the inside. The wiring, light fixture, switch, and pilot light shall be for operation on a nominal 120 volt, single-phase, grounded system. Unless otherwise specified (see 6.2), doors shall be right-handed and either swing or manual sliding type entrance doors. A right hand swing door shall be described as having cam lift type hinges on the right side of the door when facing the refrigerator or freezer. Unless otherwise specified (see 6.2), door panel anticondensing heaters shall be furnished around the perimeter of the door panel jambs to prevent condensation and frost formation. The door shall have a minimum of 4 inches of foamed-in-place insulation. The door shall have a resilient, non-magnetic type gasket or a thermoplastic gasket with a magnetic steel core and shall be installed on each side and top edge of the door's exterior. The bottom edge of the door shall contain an adjustable rubber or vinyl wiper gasket. Gaskets shall be resistant to oils, fats, water, sunlight and shall be replaceable.

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3.5.2.2 Protective bumpers. Unless otherwise specified (see 6.2), the exterior side of doors and refrigerator or freezer panels that are not installed against each other or against a wall shall be equipped with protective bumpers. Bumpers shall be fabricated from either 0.059 inches thick galvanized steel or stainless steel channel or from solid rubber or rubber-like materials having a durometer hardness of 75, plus or minus 15, in the "A" Scale when tested as specified in 4.4.1.1. Bumpers shall measure 5 inches, plus or minus 2 inches wide, by 1-1/4 inches, plus or minus 3/4 of an inch deep and shall be firmly assembled to the unit at a height of 34 inches plus or minus 1/8 of an inch from the floor to the centerline of the 5 inch dimension. Bumpers shall be capable of being removed and replaced when necessary.

3.5.2.3 Interior lighting. When specified (see 6.2) interior lights shall be provided for size 13 and 14 refrigerators and freezers. Provisions shall be made for attaching lights to ceiling panels and shall be of the incandescent type with vaporproof fixtures and necessary components and wiring shall be provided and designed to be connected to the exterior door panel light switch. Interior lights shall provide a 20 foot candle illumination level and unless otherwise specified (see 6.2), shall be 120 volt, 60 hertz single phase grounded system.

3.5.3 Hardware. Hardware shall be of stainless steel metal or of a metal that has been plated or coated to resist corrosion. Standard commercial cold storage door hinges shall be furnished on all refrigerator or freezer doors and shall be self-closing type with corrosion resisting steel pins and nylon cam type bearings. For sliding doors, ball bearing trolley rollers shall be provided on the overhead track. Hardware, overhead track and floor guides shall be stainless steel or have protective coating against corrosion. The door latch and striker shall be of the adjustable type and shall have provisions for a padlock. The latch shall have provisions for being opened from the inside, when locked from outside,, without damage to the door latch assembly. Safety release is required for both swing and slide type doors.

3.5.4 Gaskets. Gasket material shall be either natural or synthetic rubber. Where frames are used, the panels shall fit together with gaskets that are designed for 50 percent compression.

3.5.5 Refrigeration system. Unless otherwise specified (see 6.2), the refrigeration system shall be a remote and air cooled type. The system shall include but not be limited to, a hermetic or semi-hermetic compressor, condenser, receiver, dehydrator, liquid sight glass, expansion valve, thermostat, low-silhouette type evaporator, and all necessary controls for automatic operation and automatic system for defrosting the evaporator, including drain pan and drain line heaters. The refrigeration system shall be designed for use with the refrigerant specified in 3.4.2. Refrigeration system, including all components, shall operate and function properly, including the defrost cycle, and shall not leak when tested as specified in 4.6.3.

3.5.5.1 Condensing unit. The condensing unit shall be the manufacturer's standard unit providing it meets all requirements of this document. The

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condensing unit shall maintain the refrigerator or freezer interior temperature to the applicable temperature specified in 3.5, when tested as specified in 4.6.3.

3.5.5.2 Alarm system. Unless otherwise specified refrigerators and freezers shall be equipped with an alarm system consisting of a thermostat, amber pilot and red lights, buzzer and stepdown transformer to supply 12-volt power to the alarm system. The amber light will indicate that power is being supplied to the alarm system. An adjustable thermostat senses a rise in temperature and actuates the red warning light and buzzer. A switch shall be installed to silence the buzzer while adjustments are being made. A time delay shall be furnished to prevent actuation of the alarm during the defrost cycle. When specified a connector shall be provided to allow connection to a remote temperature alarm system (see 6.2).

3.5.5.3 Pressure relief port. A heated pressure relief port shall be provided for type II freezers to equalize the pressure differential on the exterior and pressure on the freezer interior as caused by sudden temperature changes. The relief port shall be installed in a side panel located away from the direct air stream discharge of the evaporator coil.

3.5.5.4 Outdoor weather covers. Unless otherwise specified (see 6.2), for outdoor installation, a prefabricated watertight metal roof cover and door rain hood shall be provided and shall be of the same finish as the refrigerator or freezer. All necessary fastening devices and accessories for installation shall be furnished.

3.5.5.5 Outdoor condensing unit cover. Unless otherwise specified (see 6.2), for outdoor installation, a protective weather cover shall be provided to protect the condensing unit from adverse weather conditions. The protective cover shall be designed with louvers to provide adequate air flow with maximum weather protection and shall be fabricated from heavy gage aluminum. The cover shall be easily removable to provide ready access for servicing.

3.5.5.6 Outdoor controls. Unless otherwise specified (see 6.2), for outdoor operation in ambient temperatures of 50 deg. F or lower, winter controls shall be provided. Controls shall consist of a head pressure valve, crankcase heater and any other components deemed necessary for safe operation.

3.5.5.7 Strip curtains. Unless otherwise specified (see 6.2), doors shall be furnished with transparent flexible vinyl reinforced strip curtains and all necessary mounting hardware. The strips shall be a minimum of 8 inches in width and a minimum of .080 inches thick. The strips shall overlap a minimum of 2 inches. The strips shall have no sharp edges and shall be capable of retaining its shape and strength in low temperature ambients.

3.5.6 Electrical characteristics. Unless otherwise specified (see 6.2), the refrigeration compressor motor shall be designed for operation on a nominal 208/220 volt, 3 phase, 60 hertz (Hz) system.

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3.6 Identification marking. The type, size and material for the identification plate shall conform to MIL-D-15024 when specified (see 6.2) and shall be marked in accordance with MIL-STD-130 and shall include the following:

1. National Stock Number (NSN).
2. Manufacturers nomenclature and identifying number.
3. Serial number with assigned suffix letter, when required by the contract.
4. Contract number (procurement document identification number).
5. Government ownership designation (US).
6. Special characteristics, if applicable.
7. Manufacturer's code.

3.7 Finish. Unless otherwise specified (see 6.2), the interior and exterior finish shall conform to the manufacturer's standard finish, provided it meets NSF No. 7 requirements.

3.8 Workmanship. All components of the assemblies of refrigerator or freezer shall be free from dirt and other harmful extraneous material, burrs, slivers, rough die, tool and die marks, dents and cracks. Molded parts and stampings, if used, shall be free from sand, flashing, pits, blowholes and sprues. External surfaces shall be free from sharp edge and corners.

3.8.1 Metal fabrication. Metal used in the fabrication of the end item shall be free from kinks. Forming and shearing shall not cause damage to the metal and shall be done neatly and accurately. Corners shall be of uniform size and shape. Metal pans shall be precision formed with metal dies and checked with gages for uniformity.

3.8.2 Welding. The surface of the parts to be welded shall be free from rust, scale, paint, grease and other foreign matter. Welds shall be smooth and free of cracks, burn holes, undercuts or incomplete fusion. All scale and flux shall be removed from the weld area.

3.8.3 Fastening device. Threaded fastener and rivet holes shall be accurately punched or drilled and shall have burrs removed. Threaded fasteners shall not be broken, cracked or stripped and shall be drawn tight. Rivets shall fill the hole completely and the heads shall be in full contact with mating surfaces and concentric with the hole.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or purchase order, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the document where such

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inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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

- a. First article inspection (see 4.3).
- b. Quality conformance inspection (see 4.4).
- c. Packaging inspection (see 4.9).

4.3 First article. When a first article is required (see 6.2), it shall be examined for the defects specified in table I, for dimensions specified in 4.4.4 and tested as specified in 4.6.1 through 4.6.4.2. The presence of any defect shall be cause for rejection of the first article.

4.4 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.4.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this document or applicable purchase document.

4.4.1.1 Rubber or rubber-like bumper testing. The rubber or rubber-like bumpers, when applicable, shall be tested for conformance to the hardness requirement of 3.5.2.2 in accordance with Method 3021 of FED-STD-601. Any non-conformance shall be recorded as a defect. The lot size shall be expressed in units of bumpers. The sample unit shall be one bumper. The inspection level shall be S-1 and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0.

4.4.2 In-process inspection. Examination shall be made of the following processes to establish conformance with specified requirements. Whenever non-conformance is noted, correction shall be made to the process and all items processed:

- (a) Insulation installed as specified (see 3.5.2).
- (b) Use of proper metal for panel skins (see 3.5.2).

4.4.2.1 Insulation density testing. Prior to beginning each day's production of refrigerators or freezers, one sample of the insulation to be used in that day's production shall be tested as specified in 4.6.4 for conformance to the applicable density requirement specified in 3.4.1. Any test failure shall be cause for rejection of the insulation lot.

4.4.3 End item visual examination. The end item shall be examined for the defects listed in table I. The lot size shall be expressed in units of end items of one type, style, and size only. The sample unit shall be one completed end item. The inspection level shall be S-2 and the AQL, expressed in terms of

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defects per hundred units, shall be 2.5 for major defects and 6.5 for total (major and minor combined) defects.

TABLE I. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Finish	Does not conform to NSF requirements	X	
Design, construction and workmanship	Panel joints not interlocking	X	
	Panel fasteners protrude from panels in retracted position		X
	No thermometer, light, or switch on door panel		X
	Sheet metal or structural shapes bent		X
	Latch cannot be opened from inside when locked	X	
	Evaporator not type specified	X	
	Sheet metal or holes inaccurately sheared or punched		X
	Fasteners not drawn tight		X
	Holes not sized properly		X
	Accessory insecurely fastened		X
	Materials not as specified	X	
Bumpers	Not as specified, missing, not removable, loosely assembled	X	
Marking	Missing, incomplete, illegible, not affixed or marked as specified	X	
Identification plate	Missing, not as specified, not in a conspicuous location, or does not contain required information	X	

4.4.4 End item dimensional examination. The end items shall be examined for conformance to the specified dimensions. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of end items of one type, style, and size only. The sample unit shall be one end item. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

4.4.5 End item testing. When a first article is not required, the first produced refrigerator or freezer of each size produced, shall be tested as specified in 4.6.1 through 4.6.4.2. Any end item unit failing one or more tests shall be rejected.

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4.4.6 Packaging inspection. An examination shall be made to determine that preservation, packing, and marking comply with the section 5 requirements. Defects shall be as specified in table II. The sample unit shall be one shipping container fully packaged. The lot size shall be the number of containers in the inspection lot. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

TABLE II. Packaging defects

Examine	Defect
Markings	Missing, incorrect, illegible; of improper size, location, sequence, or method of application.
Materials	Components missing, damaged, or otherwise defective.

4.5 Certificate examination. Certificates of compliance, certified test reports or listing marks for codes and standards, as applicable, that are submitted as proof of compliance with the document requirements, shall be examined and validated.

4.6 Methods of inspection. The test specified in 4.6.2 may be performed on a minimum size 1 refrigerator or freezer fabricated for the test when refrigerator or freezer is other than size 1 as specified in the contract.

4.6.1 Assembly test. The panels for one complete refrigerator or freezer shall be assembled and disassembled to determine compliance with assembly requirements of 3.5. Inability to assemble or disassemble the refrigerator or freezer panels shall constitute failure of this test.

4.6.2 Heat leakage test. The heat leakage test shall be conducted with the refrigerator or freezer erected in a controlled temperature ambient installed on a minimum 3-inch insulated floor slab and a monitored fixed steady rate heat input supplied to the refrigerator or freezer to determine compliance with 3.5.1. All calculations, using the formula below, and all data on time, temperature, and heat input shall be recorded.

$$\text{Heat leakage} = \frac{\text{Total watt-hours, input} \times \text{Btu/watt-hour}}{\text{Length of test (hours)} \times \text{temperature difference (F)} \times \text{total outside area of refrigerator (square feet)}}$$

$$\text{Length of test (hours)} \times \text{temperature difference (F)} \times \text{total outside area of refrigerator (square feet)}$$

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The temperature difference shall be not less than 60 deg. F nor more than 100 deg. F. The ambient temperature shall be the average of eight readings taken at points located 6 inches from each outside corner of the box. The internal, or box temperature, shall be the average of eight readings taken at points located 6 inches from the inner walls at each corner of the box. Eight ambient and box temperature readings shall be taken at consecutive 1/2 hour intervals with ambient temperature variations not more than plus or minus 2 deg. F and box temperature variations not more than plus or minus 1 deg. F. At least one interior and one exterior temperature reading shall be taken on a recording instrument. Heat leakage in excess of 0.070 Btuh per degree F, per square foot, shall constitute failure of the test.

4.6.3 Operation and performance test. The operation test shall be conducted at normal control setting to determine that the refrigeration and control systems operate and cycle as specified in 3.5. Upon completion of the operation test, the refrigeration unit shall be tested for leaks with halide or electronic leak detector to determine compliance with the leakage requirement of 3.5.5. Inability of the refrigeration system to maintain the refrigerator plus the added heat load, at specified design temperatures, component operation failure or system leaks shall constitute failure of the test.

4.6.4 Insulation density test. The density of the insulation shall be determined by the method specified in either 4.6.4.1 or 4.6.4.2.

4.6.4.1 Free rise method. The sample shall be a 6-inch cube cut from the center of a minimum 8-inch free foam cube of the insulation. The 6-inch cube shall be weighed and the density shall be calculated as follows:

$$\text{Density (lbs/ft}^3\text{)} = \text{Weight of 6-inch cube (lbs)} \times 8$$

4.6.4.2 In place method. The weight and interior volume of a refrigerator or freezer panel without foam insulation shall be determined. The panel shall then be foamed and weighed. The foam density shall be calculated as follows:

$$\text{Density (lbs/ft}^3\text{)} =$$

$$\frac{\text{Panel weight (lbs) after foaming} - \text{Panel weight (lbs) before foaming}}{\text{Panel interior volume}}$$

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5. PACKAGING

5.1 Preservation. Preservation shall be level A or Commercial as specified (see 6.2).

5.1.1 Level A.

5.1.1.1 Disassembly. The extent of disassembly shall be determined by the manufacturer. This determination shall be based on the need for protection of parts susceptible to damage during transit or storage and for the reduction in cubage. Attaching hardware shall be replaced on one of the mating parts or placed in a cloth drawstring bag and the bag attached to one of the mating parts. Parts removed shall be adequately identified or tagged. Where disassembly affects the operation of the equipment, warning tags or labels indicating the disassembly shall be attached. Instruction for assembly shall be included either as a part of the warning tag, or label, or as a separate sheet or folder attached to the equipment. Disassembly shall not be such that special skills or special tools, other than those furnished, or both, are required to place the equipment in operation.

5.1.1.2 Cleaning. All exposed, uncoated, ferrous metal surfaces of the equipment and disassembled components shall be cleaned in accordance with process C-1 of MIL-P-116.

5.1.1.3 Preservation. After drying in accordance with MIL-P-116, all cleaned, uncoated ferrous metal surfaces, except stainless steel, shall be coated with type P-2 preservative of MIL-P-116. Coated surfaces, from which preservative might be removed by contact with packaging materials, shall be covered or wrapped with barrier material conforming to type I or II, grade A, class 2 of MIL-B-121 and secured in place with tape conforming to type III, class 1 or 2 of PPP-T-60. All openings in the electric motor, gauge glasses, switches, control boxes and similar areas shall be covered with barrier material conforming to type I or II, grade A, class 2 of MIL-B-121 and secured in place with tape specified herein.

5.1.1.4 Servicing of refrigerating unit. The refrigerating system shall be serviced for shipment according to the manufacturer's recommended procedure. All floating mechanisms and tubing not rigidly fixed shall be secured in a fixed position to minimize vibration and subsequent damage during handling and shipment. Floating mechanism is defined as any part that is inherently flexible or removable, or any part that is rubber, spring, bracket, or otherwise mounted which might vibrate during shipment.

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5.1.1.5 Unit packing. Disassembled parts shall be unit packed method III of MIL-P-116 in a snug-fitting fiberboard box conforming to style RSC, type CF, variety SW, or type SF, class domestic, grade 125 of PPP-B-636. Box closure shall be in accordance with the appendix of PPP-B-636.

5.1.2 Commercial. The refrigerators or freezers shall be preserved in accordance with ASTM D 3951.

5.2 Packing. Packing shall be level A, B, or Commercial as specified (see 6.2).

5.2.1 Level A packing. Refrigerator or freezer components, preserved as specified in 5.1, shall be packed in a shipping container conforming to style A, type III, of MIL-C-52950; type I, class 1 or 2, style a of MIL-C-104; class 2, style 2 or 4 of PPP-B-621; or overseas type, style A or J, of PPP-B-601. The dimensional and weight limitation of the applicable container specification shall not be exceeded. Contents shall be anchored in accordance with the appendix of MIL-C-104 or MIL-C-52950. Each shipping container, except those conforming to MIL-C-104, shall be waterproofed in accordance with the appendix of MIL-C-52950 or provided with a type I or II, grade C case liner conforming to MIL-L-10547.

5.2.2 Level B packing. Refrigerator or freezer components, preserved as specified in 5.1, shall be packed in a shipping container conforming to type optional, style A or B of MIL-C-52950; type I, class 1 or 2, style A of MIL-C-104; class 1, style 2 or 4 of PPP-B-621; or domestic type, style A or J of PPP-B-601. The dimensional and weight limitation of the applicable container document shall not be exceeded. Contents shall be anchored in accordance with the appendix of MIL-C-104 or MIL-C-52950.

5.2.3 Commercial packing. Refrigerator or freezer components shall be packed in accordance with ASTM D 3951.

5.3 Marking. In addition to any special marking required by the contract, for purchase order, shipping containers shall be marked in accordance with MIL-STD-129 or ASTM D 3951, as applicable.

6. NOTES

6.1 Intended use. The refrigerators and freezers are intended for use in dining facilities and commissaries for meat, dairy and produce storage.

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6.2 Ordering data. Acquisition documents should specify the following:

- a. Title, number, and date of this document.
- b. Type, style and size of refrigerator or freezer required (see 1.2).
- c. When a first article is required (see 3.1, 4.3 and 6.3).
- d. When left-handed door openings or sliding type doors are required or otherwise specified (see 3.5.2.1).
- e. When door heaters are not required (see 3.5.2.1).
- f. When protective bumpers are not required (see 3.5.2.2).
- g. When refrigeration system shall be other than remote type (see 3.5.5).
- h. When electrical characteristics are other than specified (see 3.5.6, 3.5.2.1, and 3.5.2.3).
- i. When finish is other than specified (see 3.7).
- j. Selection of applicable levels of preservation and packing (see 5.1 and 5.2).
- k. Length and width required (see 1.2 and 3.5).
- l. When door size for size 13 and 14 is other than specified (see 3.5.2.1).
- m. When recording thermometer is required (see 3.5.2.1).
- n. When connector for remote temperature alarm system is required (see 3.5.5.2).
- o. When outdoor weather cap is required (see 3.5.5.4).
- p. When outdoor condensing unit cover is required (see 3.5.5.5).
- q. When outdoor controls are required (see 3.5.5.6).
- r. When strip curtains are required (see 3.5.5.7).
- s. When alarm system is required (see 3.5.5.2).
- t. When stainless steel floor panels are required (see 3.5).
- u. When identification plate data is required (see 3.6).

6.3 First article. When a first article is required, it shall be inspected and approved under the appropriate provisions of FAR 52.209. The first article should be a preproduction sample consisting of one complete refrigerator or freezer. The contracting officer should include specific instructions in all acquisition instruments regarding arrangements for inspection, test and approval of the first article.

6.4 Recycled material. It is encouraged that recycled material be used when practical as long as it meets the requirements of the document (see 3.4).

6.5 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

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Custodians:

Army - GL
Air Force - 99
Navy - SA

Preparing activity:

Army - GL
Project No. 4110-0380

Review activities:

Army - MD, ME, GS
Air Force - 82