

AA-R-200F
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 SUPERSEDING
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FEDERAL SPECIFICATION

REFRIGERATOR, MECHANICAL, FOOD: SELF-CONTAINED,
 REACH-IN AND PASS-THROUGH

This specification is approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers self-contained commercial refrigerators with electric-motor-driven condensing units.

1.2 Classification. Refrigerators shall be of the following types, sizes, and styles, as specified (see 6.2).

Type	Outer shell	Inner liner	Door
A	Organic finish on steel or organic finish on aluminum alloy.	Porcelain on steel.	Exterior same as outer shell. Porcelain on steel interior.
B	Organic finish on steel or organic finish on aluminum alloy.	Stainless steel or aluminum alloy.	Exterior same as outer shell. Interior same as inner liner.
C	Porcelain on steel.	Porcelain on steel.	Porcelain on steel exterior and interior.

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, Development, and Engineering Center, Natick, MA 01760-5014 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 4110

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Type	Outer shell	Inner liner	Door
D	Porcelain on steel.	Stainless steel.	Porcelain on steel exterior. Stainless steel interior.
E	Aluminum alloy.	Aluminum alloy.	Aluminum alloy exterior and interior.
F	Organic finish on steel or organic finish on aluminum alloy.	Porcelain on steel.	Porcelain on steel, exterior and interior.
G	Stainless steel front and sides. Stainless steel, galvanized steel or aluminum alloy rear, top, and bottom.	Aluminum alloy porcelain on steel.	Stainless steel exterior. Interior same as inner liner.
H	Stainless steel front top and sides. Stainless steel, galvanized steel, or aluminum alloy bottom or rear.	Stainless steel	Stainless steel exterior and interior.

Size (Minimum storage volume, cubic feet)

20	65
30	85
45	100

Style 1 - Reach-in (doors on front only)

Style 2 - Pass-through (doors on front and rear)

2. APPLICABLE DOCUMENTS

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

Federal Specifications:

O-F-506	- Flux Soldering Paste and Liquid
BB-F-1421	- Fluorocarbon Refrigerants.
FF-P-101	- Padlocks.
QQ-A-250/2	- Aluminum Alloy 3003, Plate and Sheet.
QQ-B-654	- Brazing Alloy, Silver.
QQ-C-320	- Chromium Plating (Electrodeposited).
QQ-S-571	- Solder, Tin Alloy: Tin-Lead Alloy and Lead Alloy.
QQ-Z-363	- Zinc-Base Alloy; Die Castings.
TT-E-529	- Enamel, Alkyd, Semi-Gloss.
TT-P-1757	- Primer Coating, Zinc Chromate, Low-Moisture Sensitivity.
LLL-B-810	- Building Board (Hardboard) Hard Pressed, Vegetable Fiber.
PPP-B-601	- Boxes, Wood, Cleated-Plywood.
PPP-B-621	- Box, Wood, Nailed and Lock-Corner.
PPP-B-636	- Box, Shipping, Fiberboard.
PPP-T-60	- Tape, Packaging, Waterproof.

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards, and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.)

(Single copies of this specification, other Federal specifications, and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents, and the Index of Federal Specifications, Standards and Commercial Item Descriptions from established distribution points in their agencies.)

Military Specifications:

MIL-C-104	- Crate, Wood, Lumber and Plywood Sheathed, Nailed and Belted.
MIL-P-116	- Preservation, Methods Of.
MIL-B-121	- Barrier Material, Greaseproofed, Waterproofed, Flexible.
MIL-H-2814	- Hooks, Materials Handling, Hand, Meat; and Hooks, Meat Hanging.

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- MIL-L-10547 - Liner, Case, and Sheet, Overwrap, Water Vaperproof or Waterproof Flexible.
- MIL-C-10578 - Corrosion-Removing and Metal Conditioning Compound (Phosphoric Acid Base).
- MIL-R-12323 - Refrigerator and Related Equipment, Packaging and Packing of.
- MIL-C-52950 - Crates, Wood, Open and Covered.

Federal Standards:

- FED-STD-141 - Paint, Varnish, Lacquer and Related Materials, Methods of Inspection, Sampling and Testing.

Military Standards:

- 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 U.S. Military Property.
- MIL-STD-461 - Electromagnetic Interference Characteristics, Requirements for Equipment.
- MIL-STD-462 - Electromagnetic Interference Characteristics, Measurement Of.
- DOD-STD-1866 - Soldering Process, General (Non-Electrical)

(Copies of Military specifications and standards required by contractors in connection with specific acquisition functions should be obtained from the procuring activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

American Society for Testing and Materials (ASTM)

- A 167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
- A 176 - Stainless and Heat-Resisting Chromium Steel Plate, Sheet, and Strip.
- B 117 - Salt Spray (Fog) Testing.
- B 280 - Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.
- C 177 - Steady State Thermal Transmission Properties by Means of the Guarded Hot Plate, Test.
- C 282 - Tests for Acid Resistance of Porcelain Enamel (Citric Acid Spot Test).

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- C 347 - Reflectivity and Coefficient of Scatter of White Porcelain Enamels.
- C 591 - Rigid Preformed Cellular Urethane Thermal Insulation.
- D 256 - Impact Resistance of Plastic and Electrical Insulating Materials.
- D 395 - Rubber Property - Compression Set, Test.
- D 570 - Water Absorption of Plastics.
- D 638 - Tensile Properties of Plastics.
- D 790 - Flexural Properties of Plastics and Electrical Insulating Materials.
- D 1203 - Loss of Plasticizer from Plastics (Activated Carbon Methods).
- D 2240 - Rubber Property-Durometer Hardness
- D 3951 - Standard Practice for Commercial Packaging.
- E 97 - Directional Reflectance Factor, 45-Deg, 0-Deg, of Opaque Specimens by Broad-Band Filter Reflectometry.

Underwriters' Laboratories, Inc. (UL)

- UL 471 - Commercial Refrigerators.
- UL 506 - Transformers, Specialty.
- UL 207 - Refrigeration Containing Components

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

American National Standards Institute, Inc. (ANSI)

- B38.1 - Method of Testing for Household Refrigerators, Combination Refrigerator-Freezers, and House Freezers.

(Application for copies should be addressed to the American National Standards Institute, Inc., 10 East 40th Street, New York, NY 10016 or the American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc., Circulation Sales Department, 345 47th Street, New York, NY 10017.)

American Welding Society, Inc. (AWS)

- B3.00 - Standard Qualifications Procedures.
- C1.2 - Recommended Practices for Spot Welding Aluminum and Aluminum Alloy.

(Application for copies should be addressed to the American Welding Society, United Engineering Center, 345 East 47th Street, New York, NY 10017.)

National Sanitation Foundation (NSF)

- No. 7 - Food Service Refrigerators and Storage Freezers.

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

Rubber Manufacturers' Association (RMA)

Engineering Standards IP-20 Classical Multiple V-Belts

(Application for copies should be addressed to the Rubber Manufacturers Association, 1400 K Street N.W., Washington, DC 20005.)

(Industry association specifications and standards 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 specification and the references cited herein, the text of this specification shall take precedence. Nothing in this specification however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection (see 4.3, 6.2, and 6.3).

3.2 Standard product. The refrigerators shall, as a minimum, be in accordance with the requirements of this specification and shall be the manufacturer's standard commercial product with any added features needed to comply with the requirements of this specification. Modifications to add features shall not incorporate different parts unless such parts are used on other current commercial models. Standard or modified commercial products furnished in accordance with this specification shall be identifiable by all regular manufacturer's 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 consistent with their normal commercial practices.

3.3 Codes and standards. The refrigerators shall comply with the applicable requirements of Underwriters' Laboratories Standard No. 471, and the applicable requirements of National Sanitation Foundation Standard No. 7 (see 4.4.7, 4.4.7.1, and 4.4.7.2). Prior to approval of the first article if one is submitted, or prior to commencing production, the contractor shall submit to the contracting officer, or his authorized representative, satisfactory evidence that these requirements have been met (see 4.4.7).

3.4 Materials. Materials not definitely specified shall be of the quality normally used by the manufacturer for his standard commercial refrigerators provided the completed items comply with all provisions of this specification.

3.4.1 Carbon steel sheet for porcelain enameling. Carbon steel sheet for porcelain enameling shall be: (1) a commercial grade vitreous-enameling type ingot sheet, (2) iron sheet stabilized with the addition of titanium when one-coat titanium process porcelainizing is used, or (3) may be a metal suitable for two-coat porcelain enameling provided the sheet is plated with a nickel "flash" prior to being porcelain enameled.

3.4.2 Aluminum alloy plate and sheet. Aluminum alloy plate and sheet shall be 3003-H14, 3003-H24 or the same alloy in any harder temper, conforming to QQ-A-250/2. The finish for aluminum alloy to be used as refrigerator inner liners or shelves shall not be coated with a protective lacquer or organic finish, and shall be free of stains and discolorations.

3.4.3 Die-cast zinc alloy. When die-cast zinc alloy is used, the zinc base alloy die-casting shall conform to AG40A or AC41A of QQ-Z-363. Components supplied as die-cast items shall not be used in food contact areas.

3.4.4 Copper tube. Tubing used for refrigerant lines shall conform to ASTM B 280.

3.4.5 Insulation. All insulation shall be industrial type fiberglass, expanded polystyrene, or expanded polyurethane, shall be homogenous throughout, and shall have a "K" factor determined using a 75 deg. F mean temperature and expressed in Btu per hour per square foot per degree temperature difference per inch of thickness. Loose fill type insulation is not acceptable.

3.4.5.1 Semirigid. Semirigid insulation shall be "B" fiber or finer industrial type fiberglass with a manufacturer's commercial rated "K" factor of not more than 0.250 and with a density of at least 1.0 but not more than 3.0 pounds per cubic foot and shall be held together with a thermosetting binder.

3.4.5.2 Pre-expanded. Pre-expanded insulation shall be polyurethane material conforming to ASTM C 591.

3.4.5.3 Foamed-in-place. Foamed-in-place insulation shall be polyurethane and have a manufacturer's rated K factor of not more than 0.15. Insulation shall have a core density of not less than 1.7 pounds per cubic foot when tested as specified in 4.5.5.2. The foamed-in-place insulation shall be dimensionally stable at 150 deg. F when tested as specified in 4.5.5.1.

3.4.6 Plastics. Plastics shall be virgin material except for reclaimed sprues, runners, or rejects from the same molding operation. The term "virgin" shall not preclude the use, in paint and plastic compounds, of reground ingredients from the same operation when this use is in accordance with the best commercial practice and when the materials reground have never before been fabricated. (The term "fabricated", in the case of plastic compounds, is defined as the manufacture of plastic products by the assembly of parts or standard engineering shapes by cutting, drilling, tapping, and similar machine

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operations, and fastening the parts or shapes together with mechanical devices or adhesives. The exclusion of such "fabricated" materials is intended to prevent the admixture of foreign matter during regrinding.)

3.4.6.1 Thermoplastic materials.

3.4.6.1.1 Styrene. Styrene type plastic shall be made by the polymerization of styrene or shall be styrene-rubber plastics. Styrene-rubber plastics shall consist of at least 50 percent styrene plastics combined with rubber and other compounding ingredients. Styrene-type plastics shall have an Izod impact resistance of at least 0.70 foot-pound (ft-lb) and where used for ornamentation, the Izod impact resistance shall be at least 0.25 ft-lb (see 4.5.6.1). Styrene plastics when in contact with foamed-in-place polyurethane shall be acrylonitrile-butadiene-styrene (ABS).

3.4.6.1.2 Vinyl-chloride plastics and synthetic rubber. Vinyl-chloride plastics and synthetic rubber shall have a compression set of less than 20 percent (see 4.5.6.2.1). The plasticizer used shall not migrate to enamels or other surfaces with which it is in contact on the refrigerator. Vinyl-chloride plastics shall have a minimum tensile strength of 1100 psi with a minimum elongation at rupture of 250 percent (see 4.5.6.2.2). Weight loss shall not exceed 2 1/2 percent (see 4.5.6.2.3).

3.4.6.2 Thermosetting plastics. Thermosetting plastics shall be phenolic or melamine plastic. Molded parts shall have a flexural strength of not less than 7500 psi and laminated parts shall have a flexural strength of not less than 10,000 psi. Molded parts shall have a maximum water absorption of 0.8 percent and laminated parts shall have a maximum water absorption of 4.0 percent (see 4.5.6.3).

3.4.7 Refrigerant. The refrigerant shall conform to type 12, 22, or 502 of BB-F-1421.

3.4.8 Stainless steel. Stainless steel shall conform to ASTM A 167 or ASTM A 176.

3.5 Design. The refrigerators shall be self-contained units comprising a structurally sound insulated cabinet with shelving, air-cooled condensing unit, a forced-air cooling unit, controls for automatic operation, and accessories specified herein. Types, styles, and sizes shall be as indicated in 1.2. The style 1 refrigerator shall be a reach-in type for installation against a wall with the contents accessible from doors on the front only. The style 2 refrigerator shall be a pass-through type for installation in an open area with the contents accessible from doors located on both the front and what would normally be the rear. Evaporator fan, lights, and controls shall be designed for operation on nominal 115-volt, 1-phase, 60-hertz (Hz) power source unless otherwise specified (see 6.2). Transformers are permitted as part of the control system, and any transformers, relays, or other equipment necessary for a complete control system shall be furnished and installed as a integral part of

the refrigerator. When transformers are furnished, they shall meet the requirements of UL Standard No. 506. Power supply connections shall be as specified in 3.6.3.10.

3.5.1 Performance. The refrigerators shall maintain an average cabinet air temperature of 38 deg. F plus or minus 2 deg. F when operating in an ambient temperature of 110 deg. F under load (see 4.5.2). The running time shall not exceed 75 percent and the condensing unit motor shall not cycle on the motor protector. Ambient temperature operation for refrigerators with top-mounted condensing units shall be 115 deg. F. Refrigerators shall perform as specified in this paragraph when operated on the same type of electrical power system for which procured and the motors shall not be damaged when tested as specified (see 4.5.2).

3.5.2 No load performance. For no load operation, the refrigerators shall maintain an average cabinet air temperature of 38 deg. F, plus or minus 2 deg. F, in ambient temperatures of 90 deg. F and 110 deg. F with running times not exceeding 75 percent (see 4.5.3.1). On no load operation in an ambient temperature of 125 deg. F, the refrigerators shall maintain an average cabinet air temperature of 38 deg. F, plus or minus 2 deg. F, with no limitation on operating time (see 4.5.3.2). During no load operation at ambient temperatures of 90 deg. F, 110 deg. F, and 125 deg. F, the condensing unit motor shall not cycle on the motor protector.

3.5.3 Heat transfer characteristics. The heat transfer characteristics of the refrigerators shall be based on the number of square feet of external surface of the cabinet, not including the machine compartment, and shall be not greater than 0.12 British thermal units (Btu) per square foot per hour per degree F with a temperature differential of 75 deg. F (see 4.5.4). The specified heat transfer characteristics shall be determined while the temperature on the exterior of the refrigerator is held at a constant value between 60 deg. F and 80 deg. F.

3.5.4 Physical characteristics. Unless otherwise specified (see 6.2), the dimensions of the refrigerators shall be as indicated in table I. The total storage shelf area shall be as indicated in table I or 6.2. The net volume and area usable for storage of food shall be determined in accordance with ANSI-B38.1. The maximum dimensions indicated in table I shall be for the cabinet exclusive of removable and replaceable doors, hardware, and legs. The shelf area shall be the actual area of the shelves and the floor area of the inner liner or floor racks, as applicable.

TABLE I. Physical characteristics

Size	Minimum shelf area (square feet)	Maximum overall dimensions (inches)		
		Width	Depth	Height (without legs)
20	30	39	38	80
30	40	52	38	80
45	60	60	38	80

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TABLE I. Physical characteristics (cont'd)

Size	Minimum shelf area (square feet)	Maximum overall dimensions (inches)		
		Width	Depth	Height (without legs)
65	70	87	38	80
85	100	111	38	80
100	110	120	38	80

3.5.5 Ease of maintenance. All major assemblies and installed attachments shall be accessible for maintenance, repair, and replacement. Access panels, covers, and plates shall be provided as required for component adjustment, repair, or replacement and shall be fastened with quick-disconnect fasteners or screws.

3.6 Construction.

3.6.1 Structural soundness. The completely assembled refrigerator shall not be damaged by raising the refrigerator on one end so that the bottom of the refrigerator makes an angle of 45 degrees with the horizontal (see 4.5.7). Completely assembled refrigerators shall withstand shock and shall show no evidence of failure when tested as specified in 4.5.8.

3.6.2 Protection against electrolytic or galvanic corrosion. Joints between dissimilar metals which may become wet in service shall be protected against electrolytic or galvanic corrosion by proper selection of materials by coating, isolating, gasketing, or similar means. Bolts, nuts, pins, screws, and other fastening and fittings of metal shall be of the same material as the materials being joined or shall be cathodic to the materials being joined.

3.6.3 Cabinet. The insulated cabinet shall consist of an outer shell and inner liner. The space between the outer shell and inner liner shall be completely filled with a minimum of 2 inches of insulation specified in 3.4.5 through 3.4.5.3 as applicable except that semirigid insulation shall not be used for the bottom of the cabinet. The insulation shall be so installed that it shall not pack, settle, or be displaced during shipping, testing, or operation. Where fibrous or preformed insulation is used, the insulation shall be full thickness or layered and shall be cut to the shape of and slightly larger than the spaces to be filled so as to require compressing and forcing into place, and where layered, joints shall be staggered. Rigid preformed insulation shall be bedded in waterproof adhesive mastic. If fibrous insulation is used for the top, sides, and back of the cabinet, these spaces shall have approximately 15 percent rigid insulation installed, fitted tightly, and cemented in place to prevent displacement of the inner liner relative to the outer shell. The rigid insulation shall be cut roughly square in cross section and shall extend in full section from front to back and across the full width or height on the back. The

design of the insulated compartments shall be such that no visible condensation shall occur on the outside of the cabinet or doors (see 4.5.9). Electric heating in doors, door mullions, and sills may be used to prevent condensation. The coil evaporator and housing to be hung from the liner shall be anchored by fasteners extending into framing members or structural support installed on the insulation side of the door or cabinet. Tapping plates for all hardware shall be installed when machine screws are used. All cabinet outer shell areas, except on units with foamed-in-place insulation, shall have panel stiffeners installed on the concealed surfaces. Fasteners shall engage not less than 3/16-inch screw threads in metal supports, metal framing, or metal tapping plates. Three-sixteenths-inch thick metal tapping plates shall be secured in position by welded cages, by welding, or by other means, to prevent accidental slippage from correct position. Tapping plates shall have a contact surface with the inner liner or outer shell at least equal to 125 percent of the contact surfaces of the item being fastened, and the threaded screw holes shall be not closer than 1/2-inch to the edge of the tapping plate except where space limitations require a smaller size. Panel stiffeners shall be fabricated from the same material to which fastened and shall be 1-inch or larger tee sections or 1-inch angles fastened back to back, and located on 18-inch centers or closer as required to provide firm panels. Steel framing members shall be phosphatized and coated with a rust preventive paint primer or shall be corrosion-resisting steel or a combination of these materials. Openings in the outer shell necessary for refrigerant tube, pipe, and electrical fittings shall be mechanically sealed upon completion of installation to prevent moisture infiltration into insulation.

3.6.3.1 General construction. Cabinets shall include a heavy duty structural base fastened by welding, bolting, or riveting so as to be an integral part of the cabinet. The cabinet shall be fastened to the perimeter of the base on 6 inch centers or less without regard to the type of fastening used. Stiffeners, not over 18 inches on centers, shall be installed on the concealed surfaces of the outer shell except with foamed-in-place insulation, where outer shell and inner liner are bonded to the insulation (see 3.6.3.5.2 and 3.6.3.6.2). Structural support members shall be installed to provide support and backing of evaporators and hardware, all welded and secured to the insulation side of the outer shell or inner liner (see 3.6.3.5 and 3.6.3.6). An independent frame design, if used, shall provide a rigid structure and shall incorporate stiffening members for cabinet and support of perimeter door openings, hardware, and evaporator as specified above. Such framing shall be fabricated of welded steel or aluminum alloy.

3.6.3.2 Cabinet base. The base shall be constructed of structural steel shapes or may be rolled structural aluminum alloy shapes for refrigerators with aluminum alloy outer shells. Diagonal cross-bracing between rails with lateral ladder-bracing at ends and centerline shall be welded to form a rigid structurally sound support for the cabinet and condensing unit base. The base shall provide for secure method of attaching the condensing unit base. Steel gusset plates for steel bases and aluminum alloy gusset plates for aluminum alloy bases not less than 1/4-inch thick shall be welded to the base for support

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of all legs. All exposed surfaces of the base that require organic finish shall be phosphatized in accordance with MIL-C-10578 and primed. Bottoms of all refrigerators may be unpainted galvanized steel.

3.6.3.3 Cabinet door thresholds. The thresholds of all door openings shall be reinforced and supported structurally. This shall be accomplished by one of the following means: (1) Furnish structural support, as part of the framing for the cabinet, to provide bearing for the primary breaker strip; (2) install structural frames for the door openings with the bottom member providing bearing for the primary breaker strip and the entire frame around opening welded into an integral structural shape and in turn welded to the outer shell; (3) Reinforce the outer shell and inner liner below the door openings with metal sheet of compatible material equivalent in strength to 14-gage (0.0747 inch nominal) sheet steel. Reinforcement shall be continuous, shall have at least two breaks to provide rigidity, shall be welded to the outer shell and inner liner, and shall provide at least 3/4-inch support along the entire length on each side of the primary breaker strip. (4) When polyurethane foam is used, a minimum of 2-3/4 inches of 2-pound density insulation shall be placed directly under the threshold area. The front primary breaker strip shall be 1/4-inch thick PVC material having structurally strong channel shape configuration and shall interlock with the outer shell and inner liner.

3.6.3.4 Door mullions. Mullions shall be constructed, fastened, reinforced, and supported internally for strength and rigidity. Mullion shell shall be welded in place top and bottom or fastened with bolts or machine screws with lockwashers. Except when framed type construction is used, and a frame member passes through a mullion for support, use double thickness metal on outer shell and inner liner of mullions with not less than three supporting spacers between the outer shell and inner liner of the mullion. If two layers of metal are used to obtain double thickness specified, the sheets shall be welded together to form an integral unit. Spacers shall be of tempered hardboard conforming to type II, surface 2, finish D, design W of LLL-B-810, or other low heat conductive material of comparable strength. Spacers shall fit snugly against outer shell and inner liner, and shall be fastened to primary breaker strips. Spacers shall be required where foamed-in-place insulation is used in mullions.

3.6.3.5 Outer shell. The outer shell shall be fabricated of metal according to type of refrigerator indicated in 1.2. Except as specified for back plate, bottom plate, or top plate, and except when incompatible materials are joined, the outer shell shall be of all welded construction with all seams and joints sealed except no further sealing of seams and joints shall be required when foamed-in-place, insulation is used. Back plate, bottom plate, or top plate, when used, shall be one-piece or welded construction and shall be attached to the cabinet by welding or by securing with self-tapping screws. The joints shall be sealed. All flanged joints in final assembly shall be drawn tight. Metal tapping plates shall be mounted inside the shell to allow not less than 3/16-inch screw engagement for door hardware and other items fastened to the cabinet.

3.6.3.5.1 Stainless steel sheet outer shell. Stainless steel sheet when used in fabricating the outer shell shall be as specified in 3.4.8 and not less than 20-gage (0.0355 inch nominal) thick. 22-gage (0.0239 inch thick) may be used with foamed-in-place insulation.

3.6.3.5.2 Aluminum alloy sheet outer shell. Aluminum alloy sheet, when used in fabricating the outer shell, shall be as specified in 3.4.2 and not less than 16-gage (0.050 inch nominal) thick. When foamed-in-place insulation is used, the aluminum alloy may have a nominal thickness of 0.040 inch. The insulation side of the aluminum alloy shall be coated to provide a bond between the metal and the insulation and to inhibit corrosion when foamed-in-place insulation is used.

3.6.3.5.3 Outer shell for porcelain enamel finish. Sheet for porcelain finished enamel outer shells shall be one of the materials specified in 3.4.1. The thickness of the sheet and the method of fabrication shall enable enameling without warping.

3.6.3.5.4 Outer shell for organic finish. Carbon steel for outer shells of type A, B, and F refrigerators shall be phosphatized carbon steel sheet or phosphatized zinc-coated steel sheet. The insulation side of the outer shell shall be treated in accordance with any of type I thru V of MIL-C-10578 and primed to make it rust resisting. The thickness of the sheet shall be not less than 20-gage (0.0355 inch nominal) thick. Aluminum alloy for outer shells of types A, B, or F refrigerators (see 1.2) shall be as specified in 3.6.3.5.2.

3.6.3.6 Inner liner. The inner liner shall be fabricated of metal according to the type of refrigerator indicated in 1.2. The liner, if other than porcelain, shall have the top, sides, front, rear, and bottom of integral construction with welded joints. Porcelain inner liners may be sectional but shall be sealed tight. Exposed side of welded seams shall present a smooth appearance with all discoloration removed. If seams are spot-welded, sufficient welds shall be made to assure structural rigidity approximately equal to that of a continuous welded liner and all seams in the bottom pan shall be above the liquid over flow level (threshold) of the food storage compartment. Seams shall be sealed to form a permanent water-tight seal for the insulation except for any openings in the liner designed for vapor migration. Such openings shall be protected from entrance of free water and shall be located at least 1 foot above the liner floor(s). Backing plates, tapping plates, and reinforcing as required shall be welded or otherwise fastened with cages or captive devices to the insulation side of the inner-liner to provide support for items to be hung from the liners, all as specified for the outer shell in 3.6.3.

3.6.3.6.1 Stainless steel sheet for inner liner. Stainless steel sheet when used in fabricating the inner liner shall be as specified in 3.4.8 and not less than 20-gage (0.0355 inch nominal) thick.

3.6.3.6.2 Aluminum alloy sheet for inner liner. Aluminum alloy sheet, when used in fabricating the inner liner, shall be as specified in 3.4.2 and not less

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than 0.050 inch. When foamed-in-place insulation is used, the aluminum alloy may have a nominal thickness of 0.040 inch. The insulation side of the aluminum alloy shall be coated to provide a bond between the metal and to inhibit corrosion when foamed-in-place insulation is used.

3.6.3.6.3 Inner liner for porcelain enamel finish. The sheet for porcelain enamel inner liners for type A, C, F, and G refrigerators shall be as specified in 3.6.3.5.3 and not less than 20-gage (0.0355 inch nominal) thick.

3.6.3.7 Breaker strips. Primary and secondary breaker strips shall be used around perimeter of all door openings, except that the secondary plastic breaker strip may be omitted on thresholds covered with a stainless steel shield. The primary breaker strip shall be tempered hardboard conforming to type II, surface 2, finish D design W of LLL-B-810 and shall be not less than 3/16-inch thick except that hardboard for the thresholds shall be 1/4-inch thick. Secondary breaker strips shall conform to the requirements of 3.4.6.1.1 covering styrene-type plastics, 3.4.6.2 covering, thermosetting plastics, or ethyl cellulose plastics and shall be not less than 3/32-inch thick. The primary breaker strips shall join the inner liner with the outer shell so as to eliminate metal to metal contact, shall make vapor seal with the inner liner and outer shell, shall provide strength and rigidity to the mullions and edges of door openings, and shall provide a backing plate for the secondary breaker strips. The secondary breaker strips shall provide a finished appearance and conceal the primary breaker strips. All edges shall be eased or rounded. Where secondary breaker strip ends meet at the door opening corners, stainless steel corner clips or premolded plastic corner inserts shall be installed to close the joint, facilitate cleaning, secure secondary breaker strip ends, and complete the trim. Plastic breaker strips may be installed without corner clips or inserts if connecting joints are smooth and waterproof. The breaker strips shall be attached to the inner liner and outer shell with aluminum alloy screws, chromium plated steel screws, stainless steel screws, or chromium plated or nickel plated brass screws, except that secondary breaker strips may be mounted with concealed clips or a combination of these means. Screws shall be of a type that can be removed with a screwdriver. Where rigid preformed or foamed-in-place insulation is used for the mullions, threshold, and the front of the cabinet including the entire space around door openings, the primary and secondary breaker strips may be a combination plastic unit of the structurally rigid plastic materials specified, designed to perform the specified functions. A threshold shield of stainless steel specified in 3.4.8 and not less than 20-gage (0.0355 inch nominal) thick, shall be installed over each threshold of the refrigerator door openings. The shield shall be full width of the opening and full depth of the sill, and shall be fastened in place. The shield shall be fabricated with a return on the front and back to eliminate raw metal edges.

3.6.3.8 Cabinet legs. Stainless steel or cast or forged aluminum alloy legs shall be provided at or near each corner plus additional center legs as required to prevent any unsupported edge span of greater than 5 feet. The legs shall be attached to the bottom of the refrigerator by bolts through gusset plates to provide support without damage to the bottom of the refrigerator. Center legs,

in addition to being secured parallel to the plane of the edge, shall also be secured at a point not less than 2-1/2 inches from the center line of that parallel, to prevent buckling when cabinet is moved. The legs and base supports shall be capable of bearing the load of the refrigerator when it is raised on an end to an angle of 45 degrees with the horizontal (see 4.5.7). Unless otherwise specified (see 6.2), the legs shall be 6 inches in length.

3.6.3.9 Condensate disposal. A condensate evaporator pan with thermostatically controlled electric heater or hot gas tube(s) and a drip pan drain pipe from the cooler drip pan direct to the evaporator pan shall be provided for disposal of condensate. Evaporator pan shall be porcelain enamel on steel, stainless steel, or aluminum. The drip pan drain pipe shall be stainless steel, aluminum, brass, or copper tube, shall include an "S" trap, and shall be large enough for cleaning, or shall be removable for cleaning. The electric heater shall heat the condensate to a temperature between 140 deg. and 150 deg. F. The air from the condenser fan shall vaporize the condensate. Openings in the cabinet walls for passage of the drip pan drain pipe shall be mechanically sealed. The evaporator pan shall be removable and accessible for cleaning. The evaporator pan shall be mounted in the condensing unit compartment, except that for top mounted units, pan shall be shaped as a trough having an overflow fitting and mounted on the back of the refrigerator.

3.6.3.10 Electrical. Refrigerators shall be furnished completely wired and ready for connection to a source of electrical power. All refrigerators designed to be used on electrical systems up to 115-volts shall be provided with a three-wire self-grounding supply cord. All refrigerators designed to be used on electrical systems over 115-volts shall be provided with a type SO supply cord, and where supply cords are prohibited by UL-471, wiring shall terminate in an outlet box. Power supply cords shall be at least 10-feet long, shall have a three-wire self-grounding type attachment plug, and shall be furnished as part of the refrigerator. Each refrigerator shall be equipped with interior lighting. The lighting arrangement shall consist of a light or lights to illuminate each compartment of the refrigerator. A switch for the light or lights shall be operated automatically by opening any door and shall be extinguished when the door is closed, or if a single light is used for the entire refrigerator, this light shall be extinguished when the last door is closed. The switch shall be of the plunger type. Unless otherwise specified (see 6.2), the light receptacle shall be a rubber or porcelain-covered, medium screw-base type, and shall be fitted with a 115-volt, 25-watt, inside frosted, incandescent bulb and screw type shatter proof globe of the polycarbonate type plastic. The portion of the switch behind the breaker strip shall be supported structurally and independently of the fastening to the breaker strip unless supported by a collar plate that is firmly screwed to the primary and secondary breaker strips. The structurally independent support may be obtained by providing and fastening a support to the frame of the refrigerator or to the inner liner or outer shell. When sliding or glass doors are furnished, a manually-operated switch shall be provided in lieu of a door-operated switch.

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3.6.3.11 Doors. Doors shall conform to 3.6.3.11.1 or 3.6.3.11.2, as required and shall be full-size or half-size as specified (see 6.2). When specified (see 6.2), one side of the pass-through refrigerators shall be provided with glass doors for viewing interior.

3.6.3.11.1 Regular. Unless otherwise specified (see 3.6.3.11.2 and 6.2), doors shall be of the overlapping type. Doors shall have square or beveled jambs and rounded outside edges. The outside surface of the door, except for type F refrigerators, shall be constructed of the same material as the front outer shell of the refrigerator and the inside surface of the doors shall be constructed of the same material as the inner liner. Miter joints of the inner and outer panels of the door shall be sealed by continuous welding. When framed doors are used, panels shall completely conceal the framing and shall be affixed to the framing. Edges of metal sheet panels shall be concealed or nosed into the gasket or framing. Doors shall have sufficient insulation of the proper type, and shall be otherwise constructed to prevent condensation on any external surface (see 4.5.9). Air venting shall be provided in the door liners for migration of any moisture contained in the insulated section of doors unless foamed-in-place insulation is used. Each door shall be equipped with hinges, adjustable as required to compensate on the hinge side of the door for at least 10 percent reduction in original gasket thickness. Adjustment may be provided by means of shims. Each door shall be equipped with means for holding it in a closed position with sufficient force to effect a tight gasket seal (see 4.5.10) and with a handle for opening and closing. The device used for holding doors closed shall be adjustable to compensate for reduction in original gasket thickness of at least 10 percent or shall be designed to automatically provide sufficient holding force to effect this compensation. Original gasket thickness shall be measured at the free side of the door closure as adjusted by the manufacturer to effect the door seal test.

3.6.3.11.2 Glazed. When specified (see 6.2), glazed sliding doors or glazed hinged doors shall be furnished in lieu of the doors specified in 3.6.3.11.1. The doors shall be glazed with multiple-paned glass to cover the greatest possible surface of the door without unduly impairing its structural strength. The multiple-paned glass shall be completely prefabricated and consist of two or more separated panes of glass enclosing dry air at atmospheric pressure hermetically sealed at the place of manufacture. The multiple-paned units shall float in a cushion of permanently resilient material within the door frame. Sliding doors shall be mounted in tracks or grooves and shall be removable without use of tools, but shall not be removable accidentally by any normal sliding action. Sliding doors shall be so suspended that the sliding action shall not be impeded by slight foreign material in the grooves, and shall be designed so that any friction wear shall take place on stainless, long wearing, replaceable pads or rollers. Sliding doors shall be fitted and means shall be used to reduce heat leakage to a minimum. Refrigerators with sliding doors shall have provisions built-in for drainage to remove condensation accumulations from lower track.

3.6.3.11.3 Gaskets. Hinged doors shall be furnished with replaceable cushion-type, one-piece gaskets of synthetic rubber or plastic. Plastic gaskets shall comply with the requirements in 3.4.6. The gaskets shall be close fitting and symmetrically installed to provide air-tight sealing. Sliding doors shall be gasketed. The gasket shall be attached by pressure of the door inner panel, by use of stainless metal stripping, or by pressure of a breaker strip through which stainless steel screws shall be installed. Magnetic gaskets may be used at the supplier's option.

3.6.3.11.4 Door hardware. Door hardware screws shall be squarely and properly driven (not by hammer). All screws shall be set and when driven by powered screwdrivers, care shall be taken that the screws are not overdriven. Door hardware when attached to metal backing shall be attached with chromium plated brass or with stainless steel screws. All screws into metal shall have machine screw threads. Self-tapping sheet metal screws shall not be used. The door hardware shall be all of one style and of the same design in appearance, finish, and construction. Doors full height of refrigerator shall have three hinges. Doors located above and below the machine compartment shall have a minimum of two hinges. No two doors shall close into the same strike assembly.

3.6.3.11.4.1 Latch. Each door latch and strike assembly shall be of commercial heavy-duty quality and constructed of parts replaceable from supplier's current stock. When specified (see 6.2), each latch and striker assembly shall be recessed to prevent damage from bumping of mobile carts, racks, tables, etc. Door latch and strike assembly shall be fabricated of malleable iron or steel plated with separate layers of copper, nickel, and chromium finish; or cast or forged brass plated with separate layers of nickel and chromium finish; or of diecast zinc with separate layers of copper, nickel, and chromium finish. If escutcheon is used, stainless treatment shall be required for concealed metallic parts only. The door latch and strike assembly shall have roller or spring action, or shall be a magnetic type and shall be adjustable. Design of latch shall permit locking the door with a padlock conforming to type EPA, 1-1/8-inch size of FF-P-101, or the latch or door shall have a built-in lock with key. When latch or hinges are fastened to the side edge of a door, the door construction, bracing, or reinforcing and the method of fastening the hardware to the door shall prevent any flexing of the door edge when a torsional force is exerted on the handle of the latch or on the hinges. When magnetic door gaskets are used, latches may be eliminated, however if latches are not used, the door shall have a built in lock with key.

3.6.3.11.4.2 Hinges. Hinges for doors shall be semi-concealed or fully exposed type and shall match the latch and strike in finish and appearance. The hinges shall be adjustable to compensate for gasket wear. The hinges shall have case hardened ball bearings or stainless steel washers and be of the fixed, steel-pin type. Hinges shall be made of cast or forged brass and shall be plated with nickel and chromium finish, or shall be die-cast zinc plated with separate layers of copper, nickel, and chromium finish. The hinges shall be constructed so that the unsupported section of the wing shall be the strongest part of the hinge. All hinges mounted on door mullions shall be equipped with

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stops to prevent contact with adjacent doors. Stops shall be fabricated as an integral part of the hinge or shall be an assembly manufactured by the hinge manufacturer for adaption to the hinge for this characteristic and shall allow the hinge wing and door a maximum swing of 135 degrees from closed door position. Hinges and latches shall be mounted so as to give a uniform appearance to all doors. Hinges on each door shall be mounted so that all pins are on the same axis and shall be plumb with the cabinet. Doors shall be removable from hinges.

3.6.3.12 Shelving and supports.

3.6.3.12.1 Shelving. Shelves shall not deflect more than 3/4-inch when statically loaded with a 100-pound test load, or take a permanent set more than 3/32-inch when the load is removed. Shelves shall be fabricated of steel or aluminum and shall have the manufacturer's standard commercial finish provided it meets NSF requirements. Shelving shall show no visible corrosion on the surface when wiped with a damp cloth after a 96-hour exposure to salt spray (see 4.5.15). When procurement is for the Navy (see 6.2), each shelf shall have a front guard wire of 0.020-inch minimum diameter providing a curb approximately 3/4-inch above the shelf surface. Shelves shall be welded construction. Shelves shall be adjustable on not greater than 2-inch centers. Provisions shall be made to prevent accidental withdrawal of shelves from the refrigerator or damage to the liner. Shelves shall deflect not more than 3/4-inch or have a permanent set of more than 3/32-inch when statically loaded with a 100-pound test load (see 4.5.11a). Shelves shall have not more than a 3/32-inch permanent set when a 25-pound load is dropped from a height of 4 inches onto the shelf (see 4.5.11b).

3.6.3.12.2 Supports for shelves and accessories. Shelf supports, pilasters, and accessory supports for shelves shall be made of stainless steel, aluminum, or brass plated with nickel and chromium. Supports shall be secured to the refrigerator liner and shall extend vertically from within 6 inches of the floor to a plane at the height of the underside of the evaporator, or to within 6-1/8 inches of the ceiling when the evaporator is not located within the food storage space. The supports shall be removable for cleaning without the use of tools. Supports shall be installed to allow interior shelves and accessories to be held in a plane parallel to floor of liner without tipping or rocking. Brackets or clips shall be of the self-locking type requiring no special tools for assembly. The weight, strength, design, and manner of attachment of all supports shall be such that they shall not crack, craze, become permanently distorted, or become loosened when the loaded refrigerator is dropped from a height of 3 inches onto a concrete floor (see 4.5.8), or when the shelves are subjected to a static load of 100 pounds (see 4.5.11a), or a load of 25 pounds is dropped onto the shelves from a height of 4 inches (see 4.5.11b).

3.6.3.13 Thermometer. A circular thermometer with a range of 0 deg. F to 150 deg. F shall be provided and shall be installed with the mounting ring flush on the front and near the top outside of the door or cabinet body to be accessible for viewing at all times. Installation shall be made to insure a seal around the

periphery of the case and the passage through the cabinet wall. The bulb shall be mounted to permit circulation of air around the bulb and where it shall be out of the direct discharge of air from the evaporator.

3.6.3.14 Floor racks. Floor racks with runners shall be furnished for the entire floor of the refrigerator, including the floor above the condensing unit space, with size 45 and larger refrigerators. Racks shall be constructed of the same material and finish as specified for shelves. The design of the racks shall provide for a 100-pound static load or a 25-pound load to be dropped repeatedly onto the rack from a height of 4 inches without the rack warping, bowing, or otherwise becoming permanently deformed, or failing (see 4.5.11c), and the rack shall not deflect under the impact to permit the top members of the rack to touch the floor of the refrigerator. The rack runners shall be sized to provide a bearing load less than the allowable compressive yield strength of the insulation used in the floor of the refrigerator. The top of the floor racks shall be not lower than the threshold. The runners supporting the racks shall be of such height that a 3/4-inch minimum clearance for air circulation is provided under the racks. Racks shall be rigid and shall not rock or tilt when in place. Racks shall be sectionalized and shall be removable for cleaning.

3.6.3.15 Optional equipment. The following optional equipment shall be furnished, as specified.

3.6.3.15.1 Roll-out shelves. When specified (see 6.2), shelves equipped with slides or rollers with bearings shall be furnished for specified door compartments. The shelves shall be capable of being pulled out in extended position for loading and unloading of stored products and shall support full load when in extended position (see 4.5.11d). Shelves shall be fabricated of stainless steel or aluminum alloy. Shelving shall show no visible corrosion on the surface when wiped with a damp cloth after a 96-hour exposure to salt spray (see 4.5.16). Shelves may be of one-piece construction with turned flanges, or riveted to reinforcing frame with flush-type rivets of the same material or welded with all welds ground flush. Shelves shall be adjustable on not greater than 2-inch centers and shall be supported by standard supporting members of the same material as the shelves. Telescoping members of shelf supports shall be removable from the refrigerator for cleaning. Automatic stops shall be provided to prevent accidental withdrawal of the shelf from the refrigerator. Shelves shall be installed on supports in such a manner that they shall not vibrate when refrigeration unit is operating. Shelf supports shall with stand the 100-pound and 25-pound loads as specified in 3.6.3.12.2 (see 4.5.11a and 4.5.11b).

3.6.3.15.2 Meat rails.

3.6.3.15.2.1 Roll-out. When specified (see 6.2), a roll-out meat rail shall be furnished for supporting meat cuts on hooks hung from the meat rail. The meat rail shall be constructed of 1/4-inch minimum by 2-inch minimum bar stock fabricated from stainless steel or aluminum alloy. The meat rail shall be capable of supporting a 150-pound load at any point without visible sagging, bending, or twisting when extended from the refrigerator (see 4.5.11e). The

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meat rail shall be provided with rollers with bearings. Meat rails shall be fastened to and supported by telescoping channels which in turn shall be held by a standard support member of the same material. Telescoping channels shall be removable from the refrigerator for cleaning. An automatic stop shall be provided to prevent accidental withdrawal of the channel or rail from the refrigerator. The meat rail shall be equipped with 12 meat hooks conforming to any classification of MIL-H-2814.

3.6.3.15.2.2 Stationary. When specified (see 6.2), a stationary meat rail shall be furnished of 1/4-inch minimum by 2-inch minimum bar stock fabricated from stainless steel or aluminum alloy. The meat rail shall be supported by supports welded or riveted to it and attached to the inner lining of the refrigerator and shall be reinforced. The meat rail shall be equipped with 12 meat hooks conforming to type II, style C, size 3-1/16 loop of MIL-H-2814. The rail shall be capable of supporting 150 pounds at any one point without visible sagging, bending, or twisting of rail or inner liner of refrigerator (see 4.5.11e).

3.6.3.15.3 Biological, roll-out, drawer cabinet. When specified (see 6.2) a roll-out drawer cabinet insert shall be furnished fabricated of stainless steel sheet not less than 20-gage (0.0355 inch nominal) thick or bright finish aluminum alloy sheet not less than 0.040 inch thick, perforated to allow for air circulation inside of cabinet. Stainless steel drawer fronts and cabinet front shall have a No. 4 finish. The drawer bottom and sides shall be of one-piece construction with all edges turned and corners spotwelded. The drawer fronts shall be equipped with pulls and identification card holders. The drawers shall run in and out of the cabinet on bearings and shall be provided with automatic stops to prevent accidental withdrawal of the drawer from the refrigerator. The drawers shall be removable from the cabinet for cleaning, and all internal corners or angles shall have a continuous and smooth minimum radius of 1/4-inch. Each self-contained drawer cabinet shall consist of drawers approximately 4 inches high and be of a depth and width to fill compartment space behind each door.

3.6.3.15.4 Tray slides. When specified (see 6.2), tray slides shall be supplied for the number of door opening compartments required. Tray slides shall be fabricated of stainless steel or aluminum-alloy angles, channels, bar or rod, shall be rack type and shall be removable as well as adjustable on not greater than 2-inch center. Unless otherwise specified (see 6.2), each pair of tray slides shall accommodate two 14-inch by 18-inch cafeteria trays. The tray slides shall be supported by inner liner of refrigerator suitably reinforced, or by pilasters secured to the liner. The tray-slide supporting area shall be wide enough to avoid tipping of the tray if tray is turned at an angle when being handled.

3.6.3.15.5 Protective bumpers. When specified (see 6.2), refrigerators shall be equipped with protective bumpers on all sides. Bumpers shall be fabricated from rubber or rubberlike materials (see 4.4.1.5) having a durometer hardness of 75 plus or minus 15 on the A Scale when tested as specified in 4.5.18. Bumpers

shall measure 3-1/2 inches plus or minus 1/2-inch wide by 7/8-inch plus or minus 3/8-inch deep and shall be firmly assembled to the refrigerator at a height of 34 inches plus or minus 1/8 inch from the floor to the centerline of the 3-1/2 inch dimension. If bumpers cannot be assembled at this height due to space between half size doors they shall be assembled to the bottom edge of the top door and to the top edge of the bottom door. Bumpers shall be capable of being removed and replaced when necessary.

3.6.4 Refrigeration system. The condensing unit, cooling unit expansion valve, and other refrigerant control devices shall be recommended by the manufacturer of such units for the particular application specified herein. The completely assembled refrigeration system shall not leak refrigerant more than 0.5 ounce per year (see 4.5.12).

3.6.4.1 Condensing unit. The condensing unit shall be designed to operate on the frequency and voltage specified (see 6.2). The use of any transformer to obtain the specified frequency and voltage is prohibited. The condensing unit shall be of an air-cooled medium temperature type complete with compressor, motor, condenser, condenser fan and motor, receiver, dehydrator, combination moisture and liquid indicator, piping, wiring, valves, and other necessary accessories, all mounted on a steel frame to prevent the transmission of vibration to the refrigerator cabinet. Standard vibration elimination units shall be installed for the motor-compressor base mounting. The installed vibration elimination units shall be recommended by the manufacturer of such units for application with the installed condensing unit. When motor-compressors internally suspended within a hermetic shell are used, vibration eliminator pads under the motor-compressor unit or under the condensing unit bed-plate are not required. The compartment shall have a removable door or panel. Removable doors or panels located at the front of the cabinet shall be louvered and removable doors or panels located at the rear of the cabinet shall be louvered or expanded metal. The back of the refrigerator condensing unit compartment shall have an opening (expanded metal) equal in size to the finned surface of the condenser. Expanded metal panel shall have a metal frame fabricated to form a permanent part of the panel and will cover all sharp cut edges of the expanded metal. Openings in the bottom shall be provided with permanently attached expanded metal panels. Baffles of nonferrous metal or steel finished in baked enamel shall be fitted and fastened to the condensing unit or machine compartment to provide air flow with a minimum of recirculation. The condensing unit assembly shall be accessible for condenser cleaning and unit servicing and repair. The electrical characteristics of the condensing unit shall conform to requirements for motors (see 3.6.4.1.2.1 and 6.2). Condensing units may be of the hermetic, semi-hermetic, or open type. All refrigerant containing components shall be supported to minimize strain and vibration. Suction and discharge service shut-off valves with sealed type caps shall be furnished. The condensing unit compartment may be located at the top of the refrigerator, provided: (1) that the cabinet design has stability, (2) that the cabinet is reinforced structurally to support the condensing unit without damage

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from vibration or deformation from shock and impact tests, and (3) the overall dimensions indicated in table I or 3.5.4 are not exceeded. Refrigerators furnished with a top mounted condensing unit shall maintain the performance specified in 3.5.1 when tested as specified in 4.5.2. All condensing units shall be furnished as installed components of the refrigerators. Open type condensing units with multiple belts shall have V-belt drives conforming to RMA Engineering Standard IP-20 Classical Multiple V-Belts having a service factor of 1.5.

3.6.4.1.1 Air-cooled condenser. The air-cooled condenser shall be of the forced air type constructed of brass, copper, aluminum alloy, or steel suitably protected on the outside after fabrication to resist corrosion. Fins shall be soldered, welded, or mechanically bonded to the tubes to insure permanent contact and shall be spaced not more than eight per inch. The fan shall be dynamically balanced and located centrally at the condenser face. For uniform air flow, a fan shroud shall be provided. The fan and fan shroud shall be constructed of steel or aluminum alloy treated to resist corrosion, of aluminum alloy, of stainless steel, of asphalt impregnated hardboard, a combination of these materials, or the material normally used by the manufacturer for this purpose.

3.6.4.1.2 Compressor. The compressor shall be balanced with all other components of the refrigeration system and shall be suitable for the refrigerant specified in 3.4.7. The lubrication of all moving compressor parts shall be inherent in the mechanism or shall be accomplished automatically. The speed of the compressor shall not exceed the compressor manufacturer's published recommended speed for the intended service. Evidence shall be provided that the compressor operating at the selected speed has been in field service other than experimental for a period of at least 1 year. Open-type compressors shall be equipped with a positive shaft-sealing device completely replaceable without the use of special tools and without the replacement or removal of the crankshaft. If a suction strainer is not provided with compressor, a separate line type strainer shall be installed.

3.6.4.1.2.1 Compressor motors. Compressor motors shall have sufficient capacity to start the refrigerating system under full load. Unless otherwise specified (see 6.2), compressor motors up to and including 3/4 hp shall be designed to operate on 115-volt, 60-Hz, 1-phase electrical system, and compressor motors over 3/4 hp shall be designed to operate on 208/230-volt, 60-Hz, 1-phase, electrical system. Motors shall be protected against damage from overloads and voltage fluctuations when starting or running. Unless otherwise specified (see 6.2), motors for open type compressors shall have drip-proof enclosures. When 50-Hz operation is specified, see 6.2.

3.6.4.1.2.1.1 Motor starter. Automatic starters shall be supplied for all 1-phase motors over 1 hp. The compressor motor starter shall be across-the-line type, continuous duty, suitable for automatically starting the condensing unit compressor motor when actuated by the automatic temperature control device. The

starter shall be mounted in a drip-proof enclosure. The motor starter shall be equipped with a thermal overload protector if the motor is not otherwise equipped with such protection. All relays shall be of the "quick-trip" type, factory calibrated for the particular motor application.

3.6.4.1.3 Refrigerant receiver. The receiver shall be fabricated from steel. The capacity of the receiver shall be 25 percent greater than the maximum operating refrigerant charge at a refrigerant temperature of 135 deg. F. The receiver shall be fitted with back seating outlet valve with plugged 1/8-inch female National Taper Pipe (thread) Fine (NPTF) opening for charging refrigerant. A 1/8-inch male NPTF by 1/4-inch flare fitting capped with a copper seal and 1/4-inch flare nut shall be installed in the 1/8-inch female NPTF opening. The receiver shall contain a fusible plug for protection against excessive temperatures.

3.6.4.2 Forced air cooling unit. The forced air type cooling unit shall consist of an evaporator, fan with motor, and housing with grilled openings. The cooling unit or units shall be mounted at the ceiling, rear wall, or behind mullions. Unit cooler mounting brackets or attaching devices shall conform to framing, stiffeners, or spacing members in the insulated space of the ceiling or walls where cooler shall be attached so that the cooler weight shall be supported. There shall be no visible flexing of the ceiling or walls at or near points of attachment when refrigerator, without additional support for unit cooler, is subjected to a drop test (see 4.5.8). With each cooling unit there shall be installed an adjustable thermostatic expansion valve or other metering device, and electrical connection box, heat exchanger, inlet and outlet connection, and a watertight drip tray having a 1/2-inch or larger pipe or tube flared connection for drain. The evaporator inlet shall be located so that liquid line shall have sufficient surplus to allow the expansion valve to be replaced by one having different connection locations. When 50-Hz operation is specified, see 6.2.

3.6.4.2.1 Evaporator. The evaporator shall be a standard commercial type of finned-tube construction with either copper or aluminum alloy fins and copper tubing. Fins shall be spaced not more than six fins per inch. Fittings and joints shall be brazed or silver soldered. If a multi-circuit or split-circuit coil is furnished, the loads on all circuits shall be balanced with each other.

3.6.4.2.2 Fan. The fan and hub shall be made of electro-tin plated brass, aluminum alloy treated to resist corrosion, stainless steel, nylon, or injection molded polycarbonate. The fan shall be directly connected to the motor. Fan and motor shall be accessible for servicing or replacement.

3.6.4.2.2.1 Fan motor. Fan motors shall be provided with overload protection. Alternating-current motors under 250-watts input may be of the shaded pole type. Motors shall be of the continuous-duty type, having permanently lubricated, sealed bearings running to a reservoir of oil and provided with vibration absorbing mounts.

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3.6.4.2.2.2 Housing. The housing, grilled openings, and fan shroud shall be constructed of aluminum alloy, porcelain enamel on steel, stainless steel, or injection molded polycarbonate. Housing shall be provided with an inspection hole or slot located to provide minimum interference to air flow pattern and for observing coil frost accumulation.

3.6.4.2.3 Drip pan and other vessels. Each refrigerator shall be equipped with a drip pan suitable for collecting and conveying condensate and defrost water to the drainage system at the bottom of the refrigerator. The drip pan shall be constructed of the same material as the unit cooler housing. Other interior pans, baffles, or special storage vessels furnished with the refrigerator shall be constructed of stainless steel or steel finished porcelain enamel except when stainless steel is specified for the outer shell and inner liner, baffles and special purpose vessels shall be of stainless steel.

3.6.4.3 Control system. An automatic refrigeration control system shall be provided to start and stop the condensing unit. The control device shall be adjustable to maintain any desired temperature between 35 deg. and 50 deg. F within the refrigerator when tested in accordance with 4.5.13. Automatic refrigeration controls shall be accessible for adjustment and servicing. The control device shall be a dual "high" and "low" pressure control device or automatic electric thermostat to provide safe operation and to regulate the temperature of the evaporating unit in response to suction pressure. Temperature adjustment shall be provided by means of a single external adjusting knob to vary the differential by varying the "cut-out" setting with adjustment limited to not more than 4 psi above or below normal setting. Control range shall be adjustable, but knob shall not be mounted to provide for user making such adjustment. The "cut-out" position of the high pressure control shall provide safe operation by shutting down the compressor when a preset pressure reading is attained. The pressure control of each production unit shall be set at the same control position as the final setting on the first article or initial production unit. Control shall be mounted in the machine compartment or diffuser housing with scales facing to the front and readily visible. When 50-Hz system is specified (see 6.2), controls shall comply with the operational and electrical requirements. Controls rated at 115-volt, single phase, 60-Hz system may be used with a 50-Hz frequency system provided that the power is obtained from either a hot line and neutral or through a transformer and that the overall performance of the system is not affected. Relays and transformers, or any other component necessary for a complete control system, shall be furnished as an integral part of the end item.

3.6.4.4 Tubing. All refrigerant tubing shall be the copper tubing specified in 3.4.4. The tubing shall be arranged not to interfere with with the servicing or removal of the condensing unit. Fittings shall be of wrought or forged copper. The refrigeration unit design shall prevent condensation on suction lines within the machine compartment. The run of suction line exposed to room air including the section in the machine compartment shall be insulated with flexible preformed 3/8-inch plastic foam material so that no condensation appears on the

line when tested as specified in 4.5.9. Linear and butt ends and terminal ends shall be sealed with adhesive manufactured for that purpose by the same manufacturer supplying the insulation. Where liquid and suction lines are fastened together, the insulation shall be installed to cover both lines. All tubing connections shall be soldered, except flared connections shall be provided on expansion valve inlet and outlet connections, dehydrator inlet and outlet connections, receiver outlet valve, and any other locations normal in manufacturer's standard design. Silver solder conforming to QQ-B-654 shall be used for making tubing connections. Where soldering temperatures will be deleterious to any adjacent fitting or component, the joint shall be soft soldered with solder conforming to the composition Sb5 of QQ-S-571 using flux conforming to type I of O-F-506. Tubing shall be installed with bends of ample radius to maintain full inside diameter and shall be clamped to rigid members or otherwise supported to eliminate vibration. A loop in suction line near the compressor shall be provided to minimize vibration. The loop shall be installed with sufficient clearance to prevent abrasion when refrigeration unit is operating. Where tubing of different materials is joined, a shrink-fit plastic sleeve or other method shall be used to prevent wetting of the surfaces for at least 1 inch to each side of the joint.

3.6.4.5 Electromagnetic compatibility. When specified (see 6.2) refrigerators shall be designed and equipped for electromagnetic compatibility in accordance with class IIB equipment of MIL-STD-461 (see 4.5.14).

3.6.4.6 Refrigeration system charging. Each refrigeration system shall be dehydrated, evacuated, and charged with the necessary amount of refrigerant specified in 3.4.7 to meet operating requirements and oil recommended by compressor manufacturer. The refrigerant shall not contain moisture in excess of 10 parts per million (ppm) and after charging shall not contain moisture in excess of 25 ppm (see 4.5.13). Moisture content shall be determined by a moisture indicator.

3.6.5 Welding qualification. Welding qualification for steel shall be in accordance with AWS B3.00, and spot welding of aluminum alloy shall be in accordance with AWS C1.2. The surfaces of parts to be welded shall be clean and free of scale or other foreign matter. Welds shall be of the maximum strength consistent with the base metal, welding rod, and welding method used. All scale or flux deposits shall be removed from the finished welds. All exposed welds at joints or seams in the final assembly shall be ground and polished. Soldering and welding of aluminum alloy, other than covered by AWS C1.2, shall be in accordance with the aluminum alloy manufacturer's recommended procedures and practice.

3.6.6 Soldering. Soldering shall conform to the applicable method of DOD-STD-1866.

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3.6.7 Galvanizing. Galvanizing of small parts and components shall be done after fabrication of the part to be galvanized and shall be of a uniform thickness of not less than 0.002 inches. Galvanizing shall be tightly adherent to the base metal, shall completely cover the metal surfaces, and shall be free from excessive scratches or abrasions.

3.7 Finish. The outer shell and inner liner finish shall be according to type of refrigerator specified (see 1.2.1).

3.7.1 Uncoated aluminum alloy. Uncoated aluminum alloy outer shells and inner liners shall be cleaned and polished. Finish shall be as specified in 3.4.2. Protective lacquers or organic finishes shall not be applied to the exposed surfaces of the inner liners.

3.7.2 Porcelain (vitreous) on steel. Vitreous enamel on steel and vitreous glaze on bisque finish shall have all coats fused at a temperature to give a satisfactory color, proper adhesion, and a hard, glossy finish, and when used on inner liners shall be acid-resistant (see 4.5.15.2). Vitreous enamel or vitreous glaze shall not be discolored, chipped, blistered, lumpy, or fish scaled; or have burn-off, crazing, beads of enamel or glaze, lumps, scumming, or other imperfections. Not less than one bisque finish coat shall be given each side. When vitreous enamel is applied to sheet enameling steel, the visible exposed finish shall consist of at least one ground coat and one finish coat. The ground coat shall completely cover both sides of the metal. Elimination of the ground coat when titania opacified porcelain enamel is used, will be acceptable provided steel commercially accepted for this purpose is used. The vitreous finish shall not exceed 0.018 inch in thickness. Edges, rims of holes, reoperation areas, and similar locations shall not exceed a thickness of 0.025 inch. The reflectance of white vitreous finish shall be not less than 75 percent (see 4.5.15.1).

3.7.3 Organic finish on steel and aluminum alloy. Organic finishes shall be baked white synthetic enamel or baked white acrylic enamel applied over a coat of primer to provide a smooth and uniform finish that is durable, tightly adherent, and nonabsorbent. The finish shall not be discolored and shall not have runs, sags, streaks, seeds, orange peel, dusting, mottling, or other imperfections. The primer for steel and aluminum alloy shall be a zinc-chromate conforming to TT-P-1757. The minimum thickness of the finish coat of synthetic enamel shall be 0.0015 inch and of acrylic enamel shall be 0.0013 inch. Primers shall have a dry film thickness of 0.0004 to 0.0006 inch. The organic material shall be hard and tough, shall adhere to the metal and primed surface, shall withstand bending without cracking or flaking, shall be hydrocarbon fluid and water resistant, shall not be self-lifting or show evidence of film irregularity, and shall show no visible corrosion of the surface when surface is wiped with a damp cloth of term a 96-hour exposure to salt-spray (see 4.5.17). A baked vinyl coating having a fine textured surface and in a white color may be used in lieu of the baked enamel provided it conforms to the test requirements specified

for enamel. A mill finish on aluminum alloy will be acceptable for the exterior shell top back and bottom of the refrigerator. Aluminum alloy to have organic finish may be mill finish and shall be treated in accordance with MIL-C-10578.

3.7.4 Chromium plating. Chromium plating of brass, aluminum alloy, and zinc alloy shall be as indicated in table II. Unless otherwise specified (see 6.2), the regular grade of plating in table II shall be used. Chromium plating on steel shall conform to class 1, type II of QQ-C-320 and shall have the thickness specified in table II. Plating shall be uniform and durable and shall cover all of the surface. Visible chromium plating on the exterior of the refrigerator shall be bright or polished.

TABLE II. Chromium plating

Base metal and finish	Minimum thickness (inch)
Chromium plating on brass:	
Copper	Optional
Nickel	0.0003
Chromium	0.00001
Chromium plating on aluminum alloy, steel or on zinc alloy die castings:	
Copper	0.0003
Nickel	0.0003
Chromium	0.00005
Total plating, copper plus nickel	0.0006 [1]

[1] 0.0006 inch if copper is omitted.

3.8 Servicing after testing. After testing, the refrigerator shall be allowed to come to equilibrium with room temperature. The interior shall be dried of any condensation and thoroughly aired and inspected, and required adjustment of temperature control (see 3.6.4.3) shall be made prior to final preparation for packing and packaging. Refrigeration condensing units shall be pumped down, secured to prevent movement of the unit on vibration elimination mountings during shipment, and tagged to indicate condition and procedure for startup.

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3.9 Data-name plates. The refrigerators shall be furnished with a data name plate in accordance with the applicable requirements of MIL-STD-130 except the requirements for; (a) Methods of applying, (b) Identification tags, (c) Information not required and (d) Optional marking information shall not apply. The data plates shall be made of minimum 20-gauge corrosion-resisting metal and attached to the refrigerators by rivets, screws, or welding in such a manner as to meet the applicable National Sanitation Foundation sanitary requirements for this equipment. The plate shall contain the following information which shall be stamped, engraved, or applied by photosensitive means:

National Stock Number
Procurement Instrument Identification Number
Specification Data
Manufacturer's Name, Address and Telephone Number
Supplier's Name, Address and Telephone Number (List only if
different from Manufacturer)
Manufacturer's Model Number
Government Approved Manual Number (see 6.2).

Each plate shall be placed so that it is readily visible to the operator during normal operating use and so as to not adversely affect the life and utility of the item.

3.10 Instruction plate. Instruction plates shall be made of corrosion-resisting metal and shall be attached to the cabinets by either rivets, drive screws or welding. The instruction plates shall have the wiring diagram and refrigerator cycle diagram. The plates shall also contain instructions for start-up, operation, shutdown, preventive maintenance and the type of refrigerant as supplied in the system. In addition, information as required by UL Standard No. 207 shall also appear on the plate. Lettering shall not be less than 1/16-inch high.

3.11 Workmanship. Sheet metal or structural sections used in fabrication of the refrigerators shall not be kinked, bent, or have wrinkles. Shearing and forming shall be done accurately and cleanly on all portions of the work and shall be neatly finished. All bolt and rivet holes shall be accurately and cleanly punched or drilled. Rivets, when used, shall be driven to completely fill the holes, with full-sized heads neatly finished and in full contact with the surface of the member. Holes for machine screws shall be drilled straight and sized in accordance with tables in applicable ANSI Standards. Bolts, nuts, and screws shall be drawn tight and so secured that they shall not work loose under vibration. Optional equipment, accessories, and piping shall be securely fastened and braced to prevent damage or loosening during operation.

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 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 this specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items must meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

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

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

4.3 First article inspection. When a first article is required, it shall be examined for the defects shown in table IV, dimensions specified, and tested as specified in table III as applicable to first article. The presence of any defect, or failure of any test shall be cause for rejection of the first article.

TABLE III. Test schedule

Requirement paragraph	Test paragraph	Test characteristic	Test [1]		
			A	B	C
3.5.1	4.5.2	Performance		X	
3.5.2	4.5.3.1	No load, 90 deg. F and 110 deg. F		X	
3.5.2	4.5.3.2	No load, 125 deg. F		X	
3.5.3	4.5.4	Heat transfer		X	

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TABLE III. Test schedule (cont'd)

Requirement paragraph	Test paragraph	Test characteristic	Test [1]		
			A	B	C
3.4.5.3	4.5.5.1	Heat stability	X		
3.4.5.3	4.5.5.2	Density	X		
3.6.1, 3.6.3.8	4.5.7	Inclination		X	
3.6.1, 3.6.3.12.2, 3.6.4.2	4.5.8	Drop		X	
3.6.3, 3.6.3.11.1, 3.6.4.4	4.5.9	Condensation		X	
3.6.3.11.1	4.5.10	Door seal		X	X
3.6.3.12.1 3.6.3.12.2, 3.6.3.14, 3.6.3.15.1, 3.6.3.15.2.1, 3.6.3.15.2.2	4.5.11	Shelf and components		X	
3.6.4	4.5.12	Refrigerant leakage		X	X
3.6.4.3, 3.6.4.6	4.5.13	Operation		X	X
3.6.4.5	4.5.14	Electromagnetic compatibility		X	
3.7.2	4.5.15.1	Porcelain reflectance	X		
3.7.2	4.5.15.2	Acid-resistance	X		
3.6.3.12.1, 3.6.3.15.1	4.5.16	Salt spray	X		
3.7.4	4.4.2.2.2	Chromium plating	X		

[1] A = In-process

B = First article or representative unit

C = Production units

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 specifications, standards, and drawings unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.4.1.1 Insulation. The supplier shall furnish certification that the "K" factors for the insulation specified in 3.4.5.1, 3.4.5.2, and 3.4.5.3 were determined in accordance with ASTM C 177.

4.4.1.2 Plastics. The plastic tests shall be performed as specified in 4.5.6.1 through 4.5.6.3. The inspection lot shall be the amount of each type of plastic or synthetic rubber offered for inspection at one time. The supplier shall furnish certification that the plasticizers shall not migrate as specified in 3.4.6.1.2.

4.4.1.3 Material for organic finishes. Materials for organic finishes shall be tested as specified in 4.5.17. Sampling and inspection shall be in accordance with Methods 1022 and 1031 of FED-STD-141.

4.4.1.4 Foamed-in-place insulation. The density of foamed-in-place insulation shall be tested as specified in 4.5.5.2 by obtaining a foamed sample prior to each day's production.

4.4.1.5 Bumper material. The bumper material shall be tested for hardness as specified in 4.5.18. The sample unit shall be one bumper. The lot shall consist of all bumpers offered for acceptance at one time. 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.

4.4.2.1 Visual examination of operations. Examination shall be made of the following operations to establish conformance to specified requirements. Whenever nonconformance is noted, correction shall be made to the affected items and to the operation.

ABS plastic contact (see 3.4.6.1.1).

Protection of dissimilar metals (see 3.6.2).

Installation of insulation (see 3.6.3).

Sealing of openings in cabinet shells (see 3.6.3).

When applicable steel shall be treated for rust prevention (see 3.6.3).

Coil and housing suspension attachment (see 3.6.3).

Panel stiffener installation (see 3.6.3).

Tapping plate installation (see 3.6.3).

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Fastener installation (see 3.6.3).
Cabinet and bracing (see 3.6.3.2).
Threshold construction (see 3.6.3.3).
Door mullion construction (see 3.6.3.4).
Outer shell construction (see 3.6.3.5).
Coating of insulation side of aluminum (see 3.6.3.5.2, 3.6.3.6.2).
Primary and secondary breaker strips (see 3.6.3.7).
Leg installation (see 3.6.3.8).
Condensate disposal installation (3.6.3.9).
Door construction (see 3.6.3.11).
Hardware installation (see 3.6.3.11.4).
Control provision adjustment and installation (see 3.6.4.3).
Soldering procedure (see 3.6.4.4).
Refrigeration charge (see 3.6.4.6).
Welding procedure (see 3.6.5).
Galvanizing (see 3.6.7).
Application of porcelain finish (see 3.7.2).
Application of organic finish (see 3.7.3).
Application of chromium plating (see 3.7.4).
Punching and drilling of all holes and the forming of metal with dies or fixtures (see 3.11).

4.4.2.2 Finish thickness examination.

4.4.2.2.1 Primer thickness. Prior to applying the final, organic finish, the primer thickness as specified in 3.7.3 shall be measured. The inspection lot shall consist of all the outer shells offered for inspection at one time. The sample unit shall be one completely fabricated outer shell. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.4.2.2.2 Plating thickness. Prior to chromium plating, the plating thicknesses of subcoatings on brass, aluminum, steel, and zinc alloy shall be measured to determine compliance with 3.7.4 (see QQ-C-320). No single thickness measurement shall be less than the minimum thickness specified in table II. The inspection lot shall consist of all of each different component offered for inspection at one time. The sample unit shall be one completely fabricated component. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.4.2.3 In-process testing.

4.4.2.3.1 Shelving. Shelving shall be tested for resistance to corrosion as specified in 4.5.16. The inspection lot shall be the number of shelves offered for inspection at one time. The sample unit shall be one shelf. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.4.2.3.2 Porcelain (vitreous) enamel coated inner liners. Porcelain (vitreous) enamel coated inner liners shall be tested for reflectance as specified in 4.5.15.1 and for acid resistance as specified in 4.5.15.2. The inspection lot shall be the number of inner liners offered for inspection at one time. The sample unit shall be one completely fabricated inner liner. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 2.5.

4.4.2.3.3 Insulation heat stability and density. The heat stability and density of insulation shall be tested as specified in 4.5.5.1 and 4.5.5.2 respectively, by obtaining samples prior to each day's production.

4.4.3 End item visual examination. The end item shall be examined for the defects listed in table IV. The lot size shall be expressed in units of refrigerators. The sample unit shall be one refrigerator. The inspection level shall be II and the AQL, expressed in terms of defects per hundred units, shall be 4.0 for major defects and 10.0 for total (major and minor combined) defects.

TABLE IV. End item visual defects

Examine	Defect	Classification	
		Major	Minor
Finish	Not finished where required	X	
	Base metal exposed or thinly covered, blistered, peeled, chipped	X	
	Type of finish not as specified	X	
	Discolored, fish scale, burn-off, beads of enamel or glaze, lumps, scumming, scratched, runs, sags, drips, or other imperfections		X
	Stained or foreign matter imbedded in finish		X
	Plasticizer migrated	X	
	Burrs, rough or sharp edges, sharp corners, or slivers	X	
	Color not as specified	X	
Construction and workmanship, general applicable to all components and assemblies)	Any part missing or not specified type or size	X	
	Any part fractured, split, punctured, sprung, torn, dented, creased, deteriorated, bowed, decayed, malformed, or otherwise impaired	X	
	Functioning component that is inoperative or will not function as intended	X	

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TABLE IV. End item visual defects (cont'd)

Examine	Defect	Classification	
		Major	Minor
Construction and workmanship, general applicable to all components and assemblies) (cont'd)	Defective plumbing	X	
	Adjustable assembly that cannot be adjusted or is not adjusted to perform the function intended	X	
	Castings badly miscast, incomplete, or contain blowholes		X
	Component not accessible for servicing where required	X	
	Component or assembly damaged or defective	X	
	Item not in accordance with manufacturers standard product except for changes specified herein	X	
	Leg length not as specified	X	
Rivets (when applicable)	Missing, loose, broken, or inadequately peened		X
Welding (where applicable)	Missing, incomplete, burn holes, cracked, porous, fractured, or otherwise not fused	X	
	Slight slag inclusion, slight undercut, not polished, not smooth and uniform, scale or flux deposit not removed	X	
Soldering	Missing, not adherent, or incomplete	X	
	Not clean (flux or flux residue not removed), not smooth, or pinholes in solder	X	
Bolts, nuts, screws and other types of threaded components	Missing, not type specified, broken, stripped, or fractured		X
Electrical wiring and connections	Wiring cut, abraded, loose at terminal, or not inclosed where required	X	
	Adequate slack not provided for wiring to relieve strain, or insulation stripped from wiring		X

TABLE IV. End item visual defects (cont'd)

Examine	Defect	Classification	
		Major	Minor
Switches, starters, controls	Not type specified, inoperative, or otherwise defective	X	
Bumpers	Not as specified, missing, not removable, loosely assembled	X	
Assembly	Any component not properly assembled	X	
Material	Not as specified	X	
Data-name plates	Omitted or not as specified		X
	Information incomplete or not legible		X
	Not located so as to be readily visible to operator		X

4.4.4 End item dimensional examination. The end item shall be examined for conformance to the dimensions specified in 3.5.4 and table I. Any dimension not within the specified tolerance shall be classified as a defect. The lot size shall be expressed in units of refrigerators. The sample unit shall be one refrigerator. The inspection level shall be S-2 and the AQL, expressed in terms of defects per hundred units, shall be 6.5.

4.4.5 End item testing.

4.4.5.1 Representative unit testing. One representative production unit shall be selected at random from the end item lot and tested as indicated by column B of table III. Any test failure shall be cause for rejection of the lot.

4.4.5.2 Production unit testing. Every end item production unit shall be tested as indicated by column C of table III. Any test failure shall be cause for rejection of the unit.

4.4.6 Packaging inspection. The inspection shall be in accordance with the quality assurance provisions of MIL-R-12323 to determine conformance with the requirements of section 5.

4.4.7 Certification compliance examination. Certifications, certified test reports, or listing marks for codes and standards, as applicable, submitted in accordance with 3.3, shall be examined and validated as proof of compliance (see 4.4.7.1 and 4.4.7.2).

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4.4.7.1 Underwriters' Laboratories, Inc. (UL). Acceptable evidence of meeting the applicable requirements of the Underwriters' Laboratories standards specified in 3.3 shall be the UL label, a UL listing mark, or a certified test report from a recognized independent laboratory, acceptable to the Government, indicating that the unit has been tested and conforms to the applicable requirements of the specified UL standards.

4.4.7.2 National Sanitation Foundation (NSF). Acceptable evidence of meeting the applicable requirements of the National Sanitation Foundation standards specified in 3.3 shall be one of the following:

- a. A listing in the current edition of the National Sanitation Foundation "Listing of Food Service Equipment", and display of the NSF seal on the finished unit.
- b. A certification for the unit issued by NSF under their special one-time contract evaluation/certification service.
- c. A certified test report acceptable to the contracting officer with the advice of the Army Surgeon General, from an independent testing laboratory, indicating that the unit has been tested and conforms to the specified NSF standards.

4.5 Methods of inspection.

4.5.1 Conditions for performance tests. The following conditions shall be used for the performance test of 4.5.2 and the no-load tests of 4.5.3 through 4.5.3.2:

a. The cabinet with refrigerating mechanism shall be assembled and set up exactly as it would be in service and as nearly as practicable in accordance with the intentions of the manufacturer as far as stated or known. Food shelves or other accessories shall not be removed during tests.

b. Before starting the first performance test, the refrigerator shall be given a "run-in" period of not less than 8 hours. The "run-in" shall be made at room temperature.

c. In preparation for any operating test, the refrigerator shall be operated under specified test conditions for sufficient time to establish steady or repetitive state. Immediately after this preliminary period the refrigerator shall be operated for the specified test period during which the desired elements of performance are determined by observation or measurement.

d. The electric power supply shall be within plus or minus 2 volts of the voltage with which the refrigerator is designed to operate. The actual power supply used for tests shall be reported. Units procured for 50-Hz system shall be tested on a 50-Hz power supply.

e. In all operating tests, each refrigerator with legs in place shall be placed on a separate solid-top platform with all sides open for free air circulation wider than the platform. The top of the platform shall be 1 foot above the normal room floor and shall extend at least 1 foot, but not more than 2 feet, beyond each side of the refrigerator.

f. Circulation of air about the refrigerator under test shall be restricted by vertical false partitions. A rear partition shall be placed adjacent to spacers, if spacers are provided at the rear of the cabinet. Such rear partitions shall be not less than 2-1/2 inches nor more than 6 inches from the rear wall of the cabinet. Vertical side partitions shall extend 1 foot forward from the rear partition and shall be placed 1 foot from the sides of the cabinet. The partitions shall extend vertically from the platform to a point not less than 1 foot above the top of the cabinet or unit, whichever may be higher.

g. The refrigerator and partitions shall be placed far enough away from all other objects in the hot room to eliminate the possibility of any partition being at temperature other than the ambient temperature.

h. The refrigerator shall be placed or shielded to prevent direct radiation to or from the space-cooling or space-heating equipment. Windows in the test room shall be provided with suitable radiation shields. The opening in the rear panel of the refrigerator at the machine compartment shall be completely blocked.

i. Air circulation in the room shall be such that the specified uniformity of temperature distribution is obtained. The refrigerator under test shall be shielded from forced-air currents with a velocity above 50 feet per minute.

j. Ambient temperatures shall be measured at points located 3 feet above the platform and 10 inches from the middle of each side and the front of the cabinet. Ambient temperatures at each point shall be maintained within plus or minus 2 deg. F of the various ambient temperatures specified in the tests. This condition shall be maintained during stabilization periods as well as during actual test runs.

k. The ambient temperature shall be measured with thermocouples, resistance thermometers, or glass thermometers.

l. The temperature-sensitive part of the temperature-measuring device shall possess, or shall be in good thermal contact with, a metallic mass to bring about a total heat capacity not less than 10 or more than 20 grams of water.

m. The temperature gradient in any foot of vertical distance from the platform to a height of 7 feet shall not exceed 0.5 deg. F per foot.

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n. The food compartment temperature shall be the average of eight temperatures observed at points designated at T1, T2, T3, T4, T5, T6, T7, and T8 as designated in ANSI B 38.1. These temperatures shall be taken mid-way between front and back of food storage space. In case of interference, the temperature measurements may be taken not more than 1 inch from the indicated positions. If the interior arrangement of refrigerator does not conform to that shown in ANSI B 38.1, temperature measurements shall be taken as nearly as possible with the intent of this specification and ANSI B38.1

o. Internal temperatures shall be taken either with thermocouples or with resistance thermometer. Each thermocouple or temperature-sensitive element of a resistance thermometer shall possess, or shall be in good thermal contact with, a metallic mass to bring about a total heat capacity of not less than 10 or more than 20 grams of water, and shall be supported so that there shall be at least 1/2 inch of air space separating the thermal mass from direct contact with heat-conducting surfaces in the refrigerator. Leads from temperature-measuring devices shall be brought outside of the cabinet so as to interfere as little as possible with air seals.

p. Temperatures shall be recorded graphically, or observed and recorded by an operator. Temperature measurements shall be accurate to +/- 5 deg. F.

4.5.2 Performance test. A performance test shall be conducted under test conditions of 4.5.1 to determine compliance with requirements of 3.5.1. The sample refrigerator shall be precooled to a temperature of 38 deg. F, plus or minus 2 deg. F, with a 110 deg. F (115 deg. F for top-mounted condensing unit) ambient temperature, and maintained under these temperatures for not less than 5 hours before test run. The performance test shall commence without interruption at the end of the precooling period and continue for a period of at least 8 hours. Test shall cover an equal number of off-periods and on-periods of compressor operation. Refrigeration units procured for operation on a frequency of 50 Hz shall be also tested with full load by operating for 4 hours at the specified frequency and at 90 percent of the specified system voltage followed by an operating test of 4 hours at specified frequency and at 110 percent of specified system voltage. Ambient refrigerator cabinet conditions for these 50 Hz operation tests shall be normal room temperature (60 deg. to 100 deg. F) with 50 to 60 percent relative humidity (RH). The motor shall not be damaged and shall not cut out on either inherent or external overload protectors during these tests. Substitution of any piece of equipment not identical to the piece tested shall demand a complete rerunning of the test. Usage load shall be simulated by electrical heating elements of any desired type but shall not include evaporator fan heat load. If incandescent heaters or lamps are used, they shall operate at one-half of their rated voltage by connecting them two in series to reduce the effects of radiant heat. The heating elements shall be placed in the center of the refrigerator not more than 6 inches from the floor. The load shall be in accordance with table V.

TABLE V. Simulated refrigerator heat loads

Refrigerator size (cubic feet)	Watts
20	150
30	150
45	150
65	290
85	290
100	330

Data to be recorded shall include:

- a. Refrigerator temperature.
- b. Ambient temperature.
- c. Percent running time.
- d. Electric power consumption of the compressor motor.
- e. Electrical power consumption of the heating elements; measure with a watt-hour meter.

The contractor shall furnish the government representative evidence of the accuracy of the instruments used during tests, including evidence of calibration of instruments where such calibration is required. The pressure control setting shall be made so that the refrigerator shall be maintained at the specified average temperature and shall operate on the defrost cycle. Temperature observations shall be made continuously or at equal intervals of not greater than 15 minutes. Reported temperatures shall be the arithmetical average of all readings taken at equal time intervals. Inability to maintain the temperatures in the running time specified in 3.5.1 shall constitute failure of this test.

4.5.3 No-load test. The following test conditions, in addition to those in 4.5.1, shall be used for the three no-load tests in 4.5.3.1 and 4.5.3.2:

a. Data to be recorded shall include:

- (1) Ambient temperature.
- (2) Food compartment temperature.
- (3) Temperature control position.
- (4) Percent running time.

b. Prior to each of the three no-load tests, the sample refrigerator shall be completely defrosted and dried. In preparation for the tests, the temperature control shall be set so the average cabinet air temperature is 38 deg. F, plus or minus 2 deg. F, based on the arithmetical average of readings taken at 5-minute intervals for at least two complete cycles or for at least 1 hour, whichever is the longer, after repetitive temperature conditions have been

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observed for at least two complete cycles. The refrigerator shall then be operated for a stabilizing period of at least 6 hours at test conditions, and the average food compartment temperature shall have indicated repetitive values within 0.5 deg. F for two automatic cycles.

c. Each test shall commence without interruption at the end of the stabilizing period. Each test shall have an equal number of off-periods and on-periods of compressor operation. Refrigerator doors shall not be opened during the stabilizing period or test period.

d. If defrosting occurs, the temperatures observed during defrosting shall be included in the overall average for the no-load test.

e. Temperature observations shall be made continuously or at equal intervals of not greater than 15 minutes. Reported temperatures shall be the arithmetical average of all readings taken at equal time intervals.

4.5.3.1 No-load tests at ambient temperatures of 90 deg. F and 110 deg. F. Two no-load tests, one at an ambient temperature of 90 deg. F and the other at an ambient of 110 deg. F shall be conducted on the sample refrigerator under conditions of 4.5.1 and 4.5.3 to determine compliance with 3.5.2. Each test shall be conducted for a period of 8 hours. The condensation test of 4.5.9 may be performed concurrently with the 90 deg. F ambient temperature test specified herein. Inability of the refrigerator to maintain the specific temperature under the specified conditions shall constitute failure of this test.

4.5.3.2 No-load test at ambient temperature of 125 deg. F. A no-load test at an ambient temperature of 125 deg. F shall be conducted on the sample refrigerator under conditions of 4.5.1 and 4.5.3 to determine compliance with 3.5.2. The test period shall be 2 hours. Failure of the refrigerator to maintain the specified temperature under the specific conditions shall constitute failure of this test.

4.5.4 Refrigerator heat transfer test. The sample refrigerator shall be placed in a test room in which the room air is held at a constant temperature plus or minus 2 deg. F, between 60 deg. and 80 deg. F. Eight thermocouples or thermometers previously checked against a secondary standard thermometer shall be placed to record the room temperature as follows: One instrument for temperature reading shall be placed at each of the eight corners 6 inches from the cabinet. The room temperature shall be the average of these eight temperatures. Electric resistors surrounded by shields, to keep radiation at a minimum, shall be placed within the refrigerator. In the event that incandescent heating elements such as light bulbs are used, they shall be operated at one-half normal voltage by connecting pairs in series. Six thermocouples previously checked against a secondary standard thermometer shall be placed inside the refrigerator as follows: One each in the center of the rear wall, front wall, each side, ceiling, and lower floor surface. In the event of cooling unit interference, the face of the cooling unit shall be considered to be a surface. Each thermocouple shall be placed to measure the air temperature 2 inches from the

surface to which it is attached. Interior temperature shall be considered as the average of these six temperatures. An electric fan shall be placed within the refrigerator to provide sufficient interior air circulation to assure close average temperature reading or recording. Electric current, measured by watt-hour meter, shall be sent through the resistors and fan to provide the heat level within the refrigerator. When the interior temperature has reached a stationary level, the amount of heat required to hold this level within plus or minus 2 deg. F for 6 hours shall be measured in terms of total watt-hours. The heat transfer valued per square foot of external surface of the refrigerator shall be determined for compliance with 3.5.3. An interior cabinet air temperature shall be selected so a temperature difference of 75 deg. F, plus or minus 2 deg. F, between the inside and outside of the refrigerator is maintained during the test. Heat transfer greater than that specified in 3.5.3 shall constitute failure of this test.

4.5.5 Insulation tests.

4.5.5.1 Heat stability test. A sample of the foamed-in-place insulation used in production shall be measured and placed in an oven or heated room and held at 150 deg. F for 24 hours. After removal of the sample from the oven, any indication of swelling shall require a measurement to determine if the foam had a swell of more than 5 percent to determine conformance with 3.4.5.3. Inability of the insulation to remain stable within 5 percent shall constitute failure of this test.

4.5.5.2 Density test for foamed-in-place insulation. One free foamed sample of insulation specified in 3.4.5.3 shall be taken. The sample shall be a cube, 8 inches on a side. A cube, 6 inches on a side, shall be cut from the center of the sample and weighed. This weight of the 6-inch cube shall be multiplied by 8 to determine compliance with the density requirement of 3.4.5.3. In addition, a daily record of the foam insulation shall be kept as follows and made available to the contracting officer: Calibration of mix (mix proportion), amount of flow (per box), time of flow (per box). A density less than 1.7 pound per cubic foot shall constitute failure of this test.

4.5.6 Plastic tests.

4.5.6.1 Styrene plastic impact resistance test. Styrene plastic shall be tested for impact resistance in accordance with ASTM D 256 to determine compliance with 3.4.6.1.1. Inability of the plastic to comply with the Izod impact specified in 3.4.6.1.1 shall constitute failure of this test.

4.5.6.2 Vinyl-chloride plastic and synthetic rubber tests. The test specimens for gasket material may be a piece of gasket 5 inches long.

4.5.6.2.1 Compression set test of vinyl-chloride and synthetic rubber. A 1-inch section of the material shall be compressed in the direction of normal use to 60 percent of the original free height in a device described in method B

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of ASTM D 395 and held for 7 days at 70 deg. F. The free height shall be measured 30 minutes after removal from the test block to determine if the compression set is within the limits of 3.4.6.1.2. A compression set of 20 percent or greater shall constitute failure of this test.

4.5.6.2.2 Tensile strength test of vinyl-chloride. Vinyl-chloride plastic shall be tested for tensile strength in accordance with ASTM D 638 to determine compliance with 3.4.6.1.2. Inability to comply with the specified tensile requirements shall constitute failure of this test.

4.5.6.2.3 Weight loss test of vinyl-chloride and synthetic rubber. Vinyl-chloride and synthetic rubber shall be tested for weight loss in accordance with ASTM D 1203 to determine compliance with 3.4.6.1.2. Weight loss in excess of 2-1/2 percent shall constitute failure of this test.

4.5.6.3 Thermosetting plastic tests. Thermosetting plastics shall be tested for flexural strength in accordance with ASTM D 790, and for water absorption in accordance with ASTM D 570, to determine compliance with 3.4.6.2. Inability of the plastics to comply with 3.4.6.2 shall constitute failure of this test.

4.5.7 Inclination test. To determine conformance to 3.6.1 and 3.6.3.8, the completely assembled refrigerator with all doors latched shall be raised on one end until it reaches an angle of 45 degrees with the horizontal and then lowered. The test shall then be repeated except that doors shall be unlatched and free to swing. Doors may be restrained from swinging open more than 30 degrees by use of flexible means such as rope. Inability of the structure to withstand the inclination shall constitute failure of this test.

4.5.8 Drop test. To determine compliance with 3.6.1, 3.6.3.12.2, and 3.6.4.2, a drop test shall be conducted in the following manner: All shelves shall be loaded at 12 pounds per square foot, with the weight generally distributed over the entire shelf area. The material used for shelf loading shall either be nonrigid or shall consist of increments, each covering not more than 10 percent of each surface under test. Legs shall be attached and door shall be latched. The refrigerator shall then be tilted 3 inches off a level concrete floor and be allowed to drop free, one side at a time and in the following order: Left side, rear, right side, front. The refrigerator shall be tilted in the elevator position for the drop test by a single support which can be withdrawn so the refrigerator is not hampered in its free fall or caused to fall in a plane other than parallel to the specified direction of fall. The test shall then be repeated except that doors shall be unlatched and free to swing. Sliding doors may be taped closed. Doors may be restrained from swinging open more than 30 degrees by use of flexible means such as rope. Following the drop tests, inspection of the refrigerator shall be made, but not limited to outer shell, inner liner, shelves, shelf supports, plastic parts, trays, baffles, refrigeration system, doors, latches, legs; the leak test of 4.5.12, the door seal test of 4.5.10, and the operation test of 4.5.13 shall be performed. Inability of any part of the refrigerator to withstand the drop shall constitute failure of this test.

4.5.9 Condensation test. To determine conformance to 3.6.3, 3.6.3.11.1, and 3.6.4.4, the refrigerator shall be operated for a period of not less than 8 hours at control setting that produces an average food-compartment temperature of 38 deg. F plus or minus 2 deg. F as determined in 4.5.3.1 in an ambient temperature of 90 deg. F, plus or minus 2 deg. F and a relative humidity between 63 and 68 percent. During and at the end of the 8-hour test the entire exterior of the refrigerator including door latch, hinges, visible portion of the door gasket, and the suction line shall be inspected for condensation visible to the eye. This test may be performed concurrently with the test of 4.5.3.1. Visible condensation on any surface shall constitute failure of this test.

4.5.10 Door seal test. To determine conformance to 3.6.3.11.1, the seating and sealing of door gaskets shall be tested at the four corners and midpoints on all doors by trying to insert a 0.005-inch leaf-type feeler gage between the gasket and the seating face. Resistance to this insertion shall be noticeable. Nonresistance to leaf gage shall constitute failure of the test.

4.5.11 Shelf, rail, shelf support, and rack tests. For the following tests, components being tested shall be mounted in the refrigerator as intended for use. Components not being tested and impeding the test may be removed. Inability of the shelves, rails, racks, or supports to withstand the static load shall constitute failure of this test.

a. To determine compliance with static load requirement of 3.6.3.12.1, 3.6.3.12.2, and 3.6.3.15.1, a load of 100 pounds shall be applied to a 12-inch by 12-inch square, 5/8-inch thick piece of plywood centrally located on the shelf so as to be centered on the door opening.

b. To determine compliance with dropped-load requirement of 3.6.3.12.1, 3.6.3.12.2, and 3.6.3.15.1, a solid load of 25 pounds shall be dropped onto the shelf three times from a height of 4 inches, twice at the center of the shelf and once about 2 inches forward (toward door) of the center.

c. To determine compliance with 3.6.3.14, a solid load of 100 pounds having a base of approximately 120 square inches shall be dropped on the floor rack, six times from a height of 12 inches.

d. To determine compliance with 3.6.3.15.1, roll-out shelves shall be extended to their maximum distance and statically loaded with 100 pounds so as to evenly distribute the load between the extending devices.

e. To determine compliance with 3.6.3.15.2.1 and 3.6.3.15.2.2, a load of 150 pounds shall be suspended from the meat rails. The test shall be repeated several times with the 150-pound load at various locations along the meat rail.

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4.5.12 Refrigerant leakage test. To determine conformance to 3.6.4, all refrigerant-containing components shall be tested for leaks with an electronic leak detector. Any leakage exceeding that as specified in 3.6.4 shall constitute failure of this test, with the exception of the compressor shaft seal where the limit is 3.0 oz per year.

4.5.13 Operation test. To determine conformance to 3.6.4.3 and 3.6.4.6, the refrigerator shall be operated at least 1 hour to demonstrate that all parts are in working order, that controls function according to settings, and that the refrigeration system has been properly evacuated and dehydrated. The operation test shall be conducted at normal production room temperatures. During this operating test, the system shall indicate "dry" on the moisture and liquid indicator. In the event there is an indication of moisture in the system, drier replacements shall be made and the system operated until the moisture indicator shows dry. Nonconformance to specified operation shall constitute failure of this test.

4.5.14 Electromagnetic compatibility control tests. When electromagnetic compatibility is required, the unit shall be tested by the contractor in accordance with test methods CE03 and RE02 of MIL-STD-462. The Government reserves the right to witness tests performed by the contractor or an independent testing agency. The contractor shall furnish the contracting officer written certification that the Interference Control Plan, the EMI/EMC Test Plan, the Electromagnetic Compatibility Test Report and the requirements meet MIL-STD-461. Any noncompliance with the requirements specified shall constitute failure of this test.

4.5.15 Tests for porcelain (vitreous) finishes.

4.5.15.1 Reflectance test. To determine compliance with the requirements of 3.7.2, the porcelain (vitreous) enamel finish shall be tested for reflectance in accordance with ASTM C 347 and ASTM E 97. Failure to meet the 75 percent reflectance shall constitute failure of this test.

4.5.15.2 Acid-resistance test (for inner liners only). The test for porcelain enamel for resistance to acid to determine compliance with 3.7.2 shall be performed using ASTM C 282. Any test area failing to meet the class A requirement shall constitute failure of this test.

4.5.16 Salt spray test for shelving. Shelving shall be subjected to a 96-hour salt spray test in accordance with ASTM B 117 to determine compliance with 3.6.3.12.1 and 3.6.3.15.1. Inability of the metal to withstand the specified test criteria shall constitute failure of this test.

4.5.17 Test for organic finish materials. To determine compliance with 3.7.3, the flexibility test, the knife test, the recoating test, the hydrocarbon fluid resistance test, and the water resistance test of TT-E-529 shall be performed. To determine compliance with the salt spray exposure requirement of 3.7.3, organic material shall be tested in accordance with ASTM B 117. Any visible corrosion shall constitute failure of this test.

4.5.18 Bumper hardness test. The bumpers shall be tested for hardness in accordance with ASTM D 2240. Nonconformance shall constitute failure of the test.

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 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 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 document 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 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 components shall be packed in accordance with ASTM D 3951.

5.3 Marking. In addition to any special marking required by the contract, or 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 are intended to be used for storing perishable food at 38 deg. F in ambient temperatures up to 100 deg. F.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

- a. Title, number, and date of this specification.
- b. Type, style, and size of refrigerator required (see 1.2).
- c. When a first article is required (see 3.1, 4.3, and 6.3).

- d. When electrical characteristics other than specified are required, the contracting officer shall provide voltage, phase, cycle, and other necessary requirements to facilitate operation and installation (see 3.5, 3.6.3.10, 3.6.4.1, 3.6.4.1.2.1, 3.6.4.2 and 3.6.4.3).
- e. Dimensions, if other than specified (see 3.5.4.).
- f. When leg length is other than specified (see 3.6.3.8).
- g. When light receptacle is other than specified (see 3.6.3.10).
- h. Door arrangement required and whether see-through doors are required (see 3.6.3.11).
- i. When sliding or glazed hinged doors are required in lieu of overlapping type (see 3.6.3.11.1 and 3.6.3.11.2).
- j. When latch and striker assembly shall be recessed (see 3.6.3.11.4.1).
- k. When procurement is for Navy (see 3.6.3.12.1).
- l. When roll-out shelves are required (see 3.6.3.15.1).
- m. When roll-out meat rails are required (see 3.6.3.15.2.1).
- n. When stationary meat rails are required (see 3.6.3.15.2.2).
- o. When roll-out biological drawer cabinet is required (see 3.6.3.15.3).
- p. When tray slides are required and the size if other than specified (see 3.6.3.15.4).
- q. When protective bumpers are required (see 3.6.3.15.5).
- r. When motor for open type compressor shall have other than drip proof enclosures (see 3.6.4.1.2.1).
- s. When electromagnetic compatibility is required (see 3.6.4.5).
- t. When other than regular grade plating is required (see 3.7.4).
- u. Government approved manual number to be included on data name plate (see 3.9).
- v. Selection of applicable levels of preservation and packing (see 5.1 and 5.2).

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. The contracting officer should specify the appropriate type of first article and the number of units to be furnished. The contracting officer should include specific instructions in all acquisition instruments regarding arrangements for selection, inspection, 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 this specification.

6.5 Subject term (key word) listing.

Kitchen equipment
Refrigerator, food storage

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MILITARY INTERESTS:

Custodians

Army - GL
Navy - YD
Air Force - 99

Review Activities

Army - ME, MD
Navy - MC, SA
Air Force - 82
DLA - GS

CIVIL AGENCY COORDINATING ACTIVITY:

GSA-FSS

Preparing activity:

Army - GL

Project No. 4110-0390

INCH-POUND

AA-R-200F
 INT. AMENDMENT-1 (Army-GL)
 January 4, 1990

INTERIM AMENDMENT

TO

FEDERAL SPECIFICATION

REFRIGERATOR, MECHANICAL, FOOD: SELF-CONTAINED,
 REACH-IN AND PASS-THROUGH

This interim amendment was developed by the U.S. Army Natick Research, Development, and Engineering Center, Natick, MA 01760-5014, based upon currently available technical information. It is recommended that Federal agencies use it in procurement and forward recommendations for changes to the preparing activity at the address shown above.

The General Services Administration has authorized the use of this interim amendment as a valid exception to AA-R-200F, dated March 19, 1987.

PAGE 2

1.2, in the columns indicated: Add

Type	Outer shell	Inner liner	Door
"I	(Type A thru H)	Plastic (ABS)	Exterior same as outer shell Interior plastic (ABS)"

1.2, after Style 2: Add "Style 3 - Thru wall mounted (doors on front and rear)".

PAGE 3

2.1, under "Federal Specifications:" Add "L-P-1183 - Plastic Molding Material, Acrylonitrile-Butadiene-Styrene (ASS) Rigid"

PAGE 5

2.2, under "National Sanitation Foundation (NSF):" Add: "No. 51 - Plastic Materials and Components used in Food Equipment"

AMSC N/A

FSC 4110

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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INT. AMENDMENT-1 (Army-GL)

PAGE 6

2.2: Add new entry:

"NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

Standard No. 70 - The National Electric Code

(Copies should be obtain from the National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02269) "

PAGE 8

3.4.6.1.1, at the end of the paragraph: Add "conforming to L-P-1183."

3.5, line 9, after "rear.": Add "The style 3 refrigerator shall be a pass-through type for thru wall mounting with contents accessible from the front and provisioning from the rear (other side of wall)."

PAGE 13

3.6.3.5.1, line 3: Delete "0.0239" and substitute "0.0293"

3.6.3.5.2, line 3: Delete: "16-gage (0.050 inch nominal)" and substitute "0.050 inch nominal".

3.6.3.5.4, line 6: Delete "0.0355" and substitute "0.0359"

PAGE 14

3.6.3.6.3, line 3: Delete "0.0355" and substitute "0.0359"

Add the following new paragraph:

"3.6.3.6.4 Plastic inner liner. The molded or formed plastic inner liner for the types A thru H outer shells (see 1.2), shall conform to the plastic as specified in 3.4.6.1.1. Sealing, joining and attachment of the inner liner to the outer shell shall conform to the applicable sections of NSF 7 (3.6, 4.15, and 4.15.2)."

3.6.3.7, line 30: Delete: "0.0355" and substitute "0.0359"

PAGE 15

3.6.3.8, before the last sentence: Add "Legs are not required for the style 3 refrigerator."

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INT. AMENDMENT-1 (Army-GL)

PAGE 15

3.6.3.10, lines 5 and 6, after "supply cord": Add "in accordance with NFPA Standard No. 70."

PAGE 16

3.6.3.11.1, line 6, after "inner liner": Add "(see 1.2)."

PAGE 20

3.6.3.15.3, line 3: Delete "0.0355" and substitute "0.0359".

PAGE 47

6.2, f, after "specified": Add "or are not required."

MILITARY INTERESTS:

Custodian

Army - GL

CIVIL AGENCY COORDINATING ACTIVITY:

GSA-FSS

Preparing activity

Army - GL

(Project 4110-A439)