Preparing Activity: NAVFAC Superseding
UFGS-11 41 11 (February 2016)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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REFRIGERATED AND FROZEN FOOD STORAGE EQUIPMENT

08/17

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USACE / NAVFAC / AFCEC / NASA **UFGS-11 41 11 (August 2017)**

Preparing Activity: NAVFAC **Superseding**
UFGS-11 41 11 (February 2016)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
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SECTION 11 41 11

REFRIGERATED AND FROZEN FOOD STORAGE EQUIPMENT
08/17

****
NOTE: This guide specification covers the requirements for refrigerated and frozen food and drink storage cases, walk-in coolers, and walk-in freezers.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: Coordinate this section and use in conjunction with the following:

Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT and Section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE.
****

PART 1 GENERAL

1.1 REFERENCES

****
NOTE: This paragraph is used to list the publications cited in the text of the guide

specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.
****

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

AMERICAN SOCIETY OF HEATING, REFRIGERATING AND AIR-CONDITIONING ENGINEERS (ASHRAE)

ANSI/ASHRAE 15 & 34	(2013) ANSI/ASHRAE Standard 15-Safety Standard for Refrigeration Systems and ANSI/ASHRAE Standard 34-Designation and Safety Classification of Refrigerants
ASHRAE 189.1	(2014) Standard for the Design of High-Performance Green Buildings Except Low-Rise Residential Buildings

ASTM INTERNATIONAL (ASTM)

ASTM E84	(2023) Standard Test Method for Surface Burning Characteristics of Building Materials

NSF INTERNATIONAL (NSF)

NSF Food Equipment	(2005) NSF Product Listings of Food Equipment and Related Products, Components and Materials
NSF/ANSI 2	(2021) Food Equipment
NSF/ANSI 6	(2023) Dispensing Freezers
NSF/ANSI 7	(2023) Commercial Refrigerators and Freezers

UNDERWRITERS LABORATORIES (UL)

UL 207	(2022) UL Standard for Safety Refrigerant-Containing Components and Accessories, Nonelectrical

UL 471	(2010; Reprint Sep 2019) UL Standard for Safety Commercial Refrigerators and Freezers
UL 723	(2020) UL Standard for Safety Test for Surface Burning Characteristics of Building Materials
UL 1598	(2021; Reprint Jun 2021) Luminaires

1.2 GENERAL REQUIREMENTS

****

NOTE: Indicate the configuration and layout for all refrigerated and frozen food and drink storage cases, walk-in coolers, and walk-in freezers on the floor plans, with interior elevations and equipment identified by number. Show a Food Service Equipment Schedule on the drawings using the same identification numbers[as indicated on the current US Army Quartermaster Center and School equipment schedule]. Ensure that all Contractor built-to-order items on the Food Service Equipment Schedule", are shown and coordinated with the specifications.

Designer must coordinate with other Sections, including 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT and 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE for general requirements and final connection of equipment.

NOTE: Details of particular equipment and installations are provided on Naval Food Service Division drawings. Contact Supported Command to assist with identification of kitchen equipment necessary to meet mission requirements.

****

Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for general requirements. Refer to Section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE for detailed requirements.

1.3 DESCRIPTION OF WORK

The work includes [furnishing] [and installing] [and modifying existing] [refrigerated][and frozen] food service equipment and all related work necessary to provide a complete installation. Verify existing dimensions, site conditions, and required utility connections prior to commencement of work. Coordinate delivery of components with finished openings and other vertical handling limitations within the building. Advise the Contracting Officer of discrepancies prior to [procurement and] installation of equipment. Submit Contractor's Field Verification Data prior to the preconstruction meeting.

Provide rough-in and utility connections to equipment in accord with requirements specified in other sections of this specification. Coordinate physical dimensions, capacities, manufacturer's instructions, and other requirements of the equipment furnished.

1.3.1 Design Requirements

****

NOTE: On the drawings, show:

1. A 1:50 1/4 inch scale floor plan with layout of all food service equipment and Naval Equipment Symbols.

2. A Food Service Equipment Schedule laid out in accordance with current CNIC's Galleys Department or US Army Quartermaster Center and School equipment schedules, and specified design requirements.

3. Floor, wall, and ceiling penetrations.

4. Raised bases, retainer curbs, or depressions.

5. Recessed, grated floor drains required for equipment.

6. Insulated floors where applicable, including under floor perforated drains and vent pipes.

7. Disconnect switches.

8. Electrical chases and raceways and plumbing chases.

9. Remote compressors and refrigeration systems.

10. Utility connections to building water, sanitary, electrical, and other utility systems. Convenience outlets at point of use for plug-in equipment.

11. All Contractor built-to-order items, in accordance with the Food Service Equipment Schedule, shown and coordinated with the specifications.

****

Submit detail drawings as stated in Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for[refrigerated][and frozen][food][and drink][storage cases][.][, walk-in coolers][walk-in freezers]. Provide drawings at a minimum 1:50 1/4 inch scale.

1.4 SUBMITTALS

****

NOTE: Review Submittal Description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's

Quality Control System. Only add a "G" to an item if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force, and NASA projects, or choose the second bracketed item for Army projects.
****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Contractor's Field Verification Data; G[, [_____]]

SD-02 Shop Drawings

Manufacturer's Detail Drawings; G[, [_____]]

Custom Fabricated Equipment; G[, [_____]]

Installation Instructions and Diagrams; G[, [_____]]

SD-03 Product Data

[Frozen Food and Drink Storage Cases; G[, [_____]]

][Refrigerated Food and Drink Storage Cases; G[, [_____]]

][Walk-in Refrigerators; G[, [_____]]

][Walk-in Freezers; G[, [_____]]

] SD-05 Design Data

Manufacturer's Descriptive and Technical Literature; G[, [_____]]

SD-06 Test Reports

Manufacturer's Test Data; G[, [_____]]

Field Test Reports; G[, [_____]]

SD-07 Certificates

NSF Certification

UL Certification

SD-08 Manufacturer's Instructions

Manufacturer's Instructions for Shipping, Handling, Storage, Installation, and Start-Up.

SD-11 Closeout Submittals

Manufacturer's Warranty

Contractor's Warranty for Installation

1.5 SHOP DRAWINGS

Submit manufacturer's detail drawings and custom fabricated equipment drawings for each refrigerated enclosure. Include insulation details, utility connections, and installation instructions and diagrams. Base shop drawings on verified field measurements and include contractor's field verification data.

1.6 QUALITY ASSURANCE

Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

1.6.1 Pre-Installation Conference

Thirty [_____] days prior to commencement of work, notify the Contracting Officer that the following items are prepared and ready for review:

a. Shop Drawings, product data and installation instructions

(1) Manufacturer's detail drawings

[(2) Custom fabricated equipment drawings and data

(a) Submit after approval of food service equipment drawings.

] (3) Installation instructions and diagrams

b. Product Data

[(1) Frozen food and drink storage cases

][(2) Refrigerated food and drink storage cases

][(3) Walk-in refrigerators

][(4) Walk-in freezers

] c. Design Data

(1) Manufacturer's descriptive and technical literature

(2) Manufacturer's Test Data

d. Manufacturer's Instructions

For shipping, handling, storage, installation, and start-up.

1.6.2 Factory Tests and Certifications

Submit Manufacturer's Test Data and certifications, including NSF Certification and UL Certification.

PART 2 PRODUCTS

****
NOTE: Choose one of the three bracketed options depending on whether all refrigerated components (including insulated floors) are metal faced; have automatic sprinklers within the units themselves or in the portion of the building(s) where they are located; or are non-metal faced components such as fiberglass.
****

2.1 MATERIALS

2.1.1 Insulation

Provide insulation materials for all equipment as follows:

[a. Insulated components must have a complete surface enclosure of not less than 0.8 mm 0.032 inches of aluminum or corrosion resistant steel having a base metal thickness of not less than 0.4 mm 0.0160 inches at any point.

][b. Insulated components must be protected by an automatic sprinkler system located within the refrigerated unit(s) themselves as well as in the portions(s) of the building(s) in which they are located.

] c. Insulation must comply with flame spread index limits of not more than 75 and smoke developed index of not more than 450 when tested, in the maximum thickness intended for use, in accordance with ASTM E84 or UL 723.

2.1.2 Other materials

Provide in accordance with Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.2 LIST OF EQUIPMENT

****
NOTE: Carefully edit the master Foodservice Equipment Schedule in Section 11 06 40.13

FOODSERVICE EQUIPMENT SCHEDULE; retain items used for the project. Edit the Equipment List and include in the project Specification. List the information contained on the Equipment List on the Contract Drawings.
****

Submit detailed Food Service Equipment List as specified in Section 11 06 40.13 FOODSERVICE EQUIPMENT SCHEDULE.

2.3 CONSTRUCTION OF FABRICATED EQUIPMENT

Construct and finish fabricated equipment in accordance with Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT.

2.4 PREFABRICATED WALK-IN REFRIGERATORS AND FREEZERS

****
NOTE: Provide floor panel walk-in refrigerators and freezers, or floorless walk-in refrigerators and freezers installed over insulated floors, as directed. For floorless units, provide insulated floors under each walk-in refrigerator and freezer as if each unit were a freezer. Material for floors and surrounding areas should be quarry tile or other suitable material.

NOTE: Use floorless design where possible. When refrigerators are provided in existing buildings or over crawl spaces, floors must be prefabricated insulated floor panels. Note on the drawings that the exterior panel surfaces of prefabricated assemblies in contact with concrete must be treated to prevent deterioration caused by corrosion or chemical reaction of dissimilar materials. Indicate type and size of units on drawings and schedule.

NOTE: All insulated components, including insulated floor panels, must comply with IBC Chapter 26 Plastics in that assemblies must either: limit flame spread index to not more than 75 and smoke developed index to not more than 450 where tested in the maximum thickness intended for use in accordance with ASTM E84 or UL 723; or have a complete surface covering of not less than 0.8 mm 0.032 inches of aluminum or corrosion-resistant steel having a base metal thickness not less than 0.4 mm 0.0160 inches at any point; or the refrigerated unit(s) themselves, and the part(s) of the building(s) in which they are located, must be protected by automatic sprinklers. See Chapter 26 for provisions for non-sprinklered buildings.
****

Provide walk-in units manufactured for food service use in accordance with NSF/ANSI 7 UL 207, and UL 471. Provide [floorless assemblies with insulated floor screeds, installed over insulated floors.][floor panel walk-in refrigerators and freezers with appropriate insulated floor assemblies and [polished aluminum][galvanized][_____] finish floor.]

Provide prefabricated dispensing freezers in accordance with the requirements of NSF/ANSI 6.

2.4.1 Panel Construction

Interchangeable, 1200 mm 4 feet maximum width, 100 mm 4 inch thick, filled with insulation. Provide preformed corner panels extending not less than 300 mm 12 inches in each direction. Panels to have tongue and groove edges or flush joints with double seal serrated neoprene rubber gaskets to assure air and vapor tight joints. [Provide panels for separating sections.]

a. Insulation: 100 mm 4 inch minimum foamed-in-place polyurethane with manufacturer's rated "K" factor of not more than 0.15, free rise density of not less than 27 kilograms (kg) per cubic (cu) meter 1.7 pounds per cubic foot, or in-place density of not less than 32 kg per cu meter 2 pounds per cubic foot. Provide floor screeds with minimum of 63 mm 2 1/2 inches of foamed insulation.

b. Closures: Close the exposed exterior of the walk-in unit adjacent to walls and ceiling with panels of same material as used for exterior of walk-in unit panels.

c. I-Beam Supports: Wherever compartment dimension exceeds the clear-span ability of ceiling panels, provide I-beam supports on the exterior of the ceiling or supported by spline-hangers. Install 13 mm 1/2 inch diameter steel rods through beam/hangers and secure to the structure above. Beams or posts within compartments are not be acceptable.

d. Finish:

(1) Exterior:[Stainless steel on all exposed surfaces and doors, aluminum on unexposed surfaces.][Aluminum with two coats of white, baked-on enamel paint.][High impact reinforced fiberglass panels, must comply with flame spread and smoke index limits when tested in accordance with ASTM E84 or UL 723 or protected by an automatic sprinkler system within the refrigeration unit and the location of the building in which the unit occurs. Color of panels as selected by Contracting Officer from manufacturer's complete range of choices.]

(2) Interior:[Stainless steel][Aluminum with two coats of white, baked-on enamel paint][High impact reinforced fiberglass panels must comply with flame spread and smoke index limits when tested in accordance with ASTM E84 or UL 723 or protected by an automatic sprinkler system within the refrigeration unit and the location of the building in which the unit occurs. Color of panels as selected by Contracting Officer from manufacturer's complete range of choices].

2.4.2 Prefabricated Floor Panels

Provide prefabricated floor panels of the same construction as wall/ceiling except with 1.9 mm 14 gauge galvanized skin, sealed watertight.[Field apply one hard alloy aluminum tread plate, 5 mm 3/16 inch thick, with all joints caulked.][Provide nonskid floor strips 100 by 900 mm 4 by 36 inch and field apply at 300 mm 12 inch spacing in all

aisles.] Provide prefabricated floor panels [laid on] [recessed], with[sloping interior floor ramps at exterior entrance doors][panels flush with surrounding building floor]. Furnish two sets of erection tools, compatible with fasteners, with each unit.

2.4.3 Floorless Refrigerator Floors

****
NOTE: Designer must determine appropriate insulation thickness, subfloor thickness subject to existing geographical and soil conditions.
****

Make floorless refrigerator floors flush with the surrounding building floor. Provide built-in floor with [two][three][four][_____] layers of [50 mm2 inch][_____ mm_____ inch] thick polyurethane board insulation with staggered joints set in mastic or other thickness of insulation as recommended in writing by the floor manufacturer and appropriate for the specific geographic, climate and soil conditions. Provide a watertight seal formed by [0.152 mm6 mil][_____ mm_____ mil] polyethylene sheets with all joints lapped 150 mm 6 inch and sealed, on the surface of the subfloor that will support the insulation and the refrigeration floor. Assembly must comply with flame spread and smoke index limits when tested in accordance with ASTM E84 or UL 723 or when protected throughout by an automatic sprinkler system within the refrigeration unit(s) and the location(s) of the building in which the unit(s) occur(s). Provide a 6.8 kg 15 pound felt slip sheet over insulation with 150 mm 6 inch lapped joints flashed up the height of finished floor base. The subfloor and [walk-in refrigerator][walk-in freezer] floor to each be a minimum 100 mm 4 inch thick reinforced concrete with insulation sandwiched between. Provide drain holes in subfloor to drain water seepage. Make insulation continuous by extending insulation at refrigerator walls and partitions, down to the insulation sandwiched between the subfloor and the refrigerator floor. Insulate the area beneath the door as recommended by the floor manufacturer. Support the subfloor on a fill of 50 mm 2 inch clean rock aggregate having a minimum depth of 375 mm 15 inch. Embed the perimeter within the gravel fill to allow for air circulation.

2.4.4 Doors

****
NOTE: Designer should configure refrigerator and freezer to allow access to freezer directly from refrigerator unit where possible for energy conservation measures.
****

Provide [one] [two] per [unit] [section], with 100 mm 4 inch thickness, filled with insulation. Provide each door panel with an outside pilot light, a light switch and a remote bulb sensor with exterior flush-mounted, waterproof thermometer for registering temperature inside box. Provide anti-condensing strip heaters around the perimeter of door panel jambs. Provide top and each side of door with a resilient, non-magnetic, or thermoplastic with magnetic steel core gasket. On bottom edge of door, provide a replaceable, adjustable rubber or vinyl wiper gasket.

a. Hardware [Polished Stainless Steel][_____]: Provide two self-closing, spring-loaded hinges for each door. Include plated steel pin and

cam-lift type bearing. Provide door latch with cylinder lock and with provisions for padlock. Include safety-release handle to permit opening from inside when locked.

b. Door Stops: Provide door stops where necessary, to prevent walk-in refrigerator and freezer doors from striking adjacent walls, plumbing fixtures or food service equipment when door is open.

c. Protective Bumpers: Equip the exterior sides of refrigerator that are not installed against each other or against a wall with protective bumpers.[Fabricate bumpers from either 1.5 mm 0.059 inch thick galvanized steel or stainless steel channel or from solid rubber or rubber-like materials having a durometer hardness of 75plus 5.]

d. Gasket: Provide either natural or synthetic rubber gaskets and in accordance with NSF/ANSI 2. Where frames are used, the panels must fit together with gaskets that are designed for 50 percent compression.

2.4.5 Air flow Inhibiting Strip Curtains

Provide transparent flexible vinyl reinforced strip curtains anchored at top and able to be replaced individually. Provide strips a minimum of 200 mm 8 inch wide and 2 mm 0.08 inch thick.

2.4.6 Lights

Provide high efficiency rated two-tube fluorescent lamps in vaporproof fixtures with safety shields. Provide lighting in accordance with UL 1598. Provide diffuser and ballast capable of operating in minus 23 degrees C 10 degrees F temperature. Run lights the full length of walk-in units starting 600 mm 2 feet from front panel and extending within 600 mm 2 feet of back panel. [Run between shelf rows].

2.4.7 Identification Signs

Mount engraved phenolic plastic compartment identification signs 300 by 50 mm 12 by 2 inch high in selected color with 25 mm one inch high letters on door above view window.

2.4.8 Pressure Relief Port

Provide electrically heated, insulated pressure relief port[in each section].

2.5 REFRIGERATION UNIT SYSTEMS

****

NOTE: Refrigeration units may be located inside or outside, but if units are located outside in a cold climate they should have winter controls, heaters, and enclosed compressor housings.

****

****

NOTE: Indicate, on the drawings, the location and heights of the refrigerator coil and condensate drain lines. Locate all coils and drain lines so as not to restrict the full utilization of the food storage racks. Indicate on drawings and in

specifications that the condensate drain lines are must be insulated. Locate on the drawings the funnel floor drain for the condensate drain. Floor drains and drain lines must not protrude into the walking surface or produce a tripping hazard.

Locate thermometer on the drawings, mounted outside the refrigerator, in a location that will preclude vibration, not interfere with the operation of the door, provide protection from damage, and allow easy reading. Locate the sensor to measure the air temperature in the warmest part of the refrigerator. Do not locate thermometer on the door panel.

****

Provide in accordance with ANSI/ASHRAE 15 & 34 and ASHRAE 189.1. Provide preassembled remote condensing unit assembly with all necessary components factory installed and wired including electrical box, time clock, drier, sight glass,[winter control and crankcase heater][enclosed compressor housing,] and compressor rack.[Set meat chiller to operate at minus one degree C 30 degrees F and other refrigerators to operate at one degree C 33 degrees F. Set freezers to operate at minus 18 degrees C 0 degrees F.] Mercury is prohibited for use in thermometers. Chlorofluorocarbon (CFC) based refrigerants are prohibited.

Provide refrigerant compressors, packaged compressors and condenser units, and refrigerant condensers as specified in Division 23 of these specifications.

****

NOTE: Select the first statement for NAVFAC projects, or the second statement for USACE.

****

[Provide refrigeration system equipment for cold storage in accordance with Section 23 69 00.00 20 REFRIGERATION EQUIPMENT FOR COLD STORAGE.]
[Provide refrigeration system equipment for cold storage in accordance with Section 23 63 00.00 COLD STORAGE REFRIGERATION SYSTEMS.]

2.5.1 Monitoring Alarm System

Provide an electronic monitoring and alarm system for[each section of] each unit. Alarm is to warn of abnormally low and high temperatures.

a. System components: Detecting thermostat, master control panel, interconnecting wiring,[remote, labeled, and audible alarm,] and defrost compensator. Provide dials showing temperatures and pilot lights, warning lights, switches, transformer, and buzzer, all as a part of the master control panel. Provide master control panel [and remote audible alarm]. Provide power fuse to protect system components.

b. System operation: Set alarms at 5 degrees C 10 degrees F above and below specified operating temperatures.

2.5.2 Personnel Alarm

For each unit, provide separate audible alarm system operable from inside

unit, for use of personnel unable to exit unit. Locate remote audible alarm where indicated.

PART 3 EXECUTION

3.1 INSTALLATION

Do not install items that show visual evidence of biological growth.

Prior to commencement of installation, perform a complete walk through of the facility with the Contracting Officer to verify readiness for installation.

Provide adequate protection of all finished surfaces, fixtures,[furnishings] and other equipment to prevent any damage during the installation work.

Conduct installation procedures in accordance with ANSI/ASHRAE 15 & 34, ASHRAE 189.1, NSF Food Equipment and UL standards stated herein, and with the manufacturer's instructions.[Set floor mounted equipment on 150 mm 6 inch thick concrete housekeeping pads, complete with anchor bolts and grouting. Finish housekeeping pads with two coats of oil-resistant epoxy polyamide coating.]

3.1.1 Equipment Connections

Complete equipment connections for all utilities. Unless otherwise specified, provide [chromium-plated copper alloy] [stainless steel] exposed piping.

3.1.2 Plumbing Work

Tag all plumbing final connection points of equipment, indicating item number, name of devices or components, and type of utility (water, gas, steam, drain). Provide extensions of indirect waste fitting to open-sight hub drain, floor sink, or floor drains from food service equipment.

3.2 TESTS

Perform the tests as specified. Notify the Contracting Officer in writing, [10][_____] days prior to performing tests. Perform tests in the presence of[the manufacturer's representative][and the Contracting Officer].

3.2.1 Initial Start-Up and Operational Test

Provide all lubricants and accessories before initial start-up. Start and operate all equipment. Follow the manufacturer's procedures and place the systems in all modes of operation. Supplement initial charges of lubricating oil to ensure maximum operating capacity. Adjust all safety and automatic control instruments. Record manufacturer's recommended readings hourly. Operational tests must cover a period of not less than [3][5][_____] days. Refer to Section 11 05 40 COMMON WORK RESULTS FOR FOODSERVICE EQUIPMENT for detailed Operation and Maintenance Manuals requirements.

Upon completion of start-up and operational tests submit a list of authorized local service and repair entities.

3.2.2 Test Reports

Submit final field test reports for each system tested, describing test apparatus, instrumentation calculations, and equipment data based on industry standard forms or reasonable facsimiles thereof. Include in data: compressor suction and discharge pressure; refrigerant charge pump, compressor and air moving device ampere readings; power supply characteristics, including phase imbalance, with 1/2 percent accuracy; thermostatic expansion valve superheat-value as determined by field test; subcooling; high and low refrigerant temperature switch set points; low oil pressure switch set point; [defrost system timer and thermostat set points;] moisture content; ambient, condensing and coolant temperatures; capacity control set points; field data and adjustments which affect unit performance and energy consumption. Where final adjustments and settings cannot be permanently marked as an integral part of device, include adjustment and setting data in test report.

3.3 MANUFACTURER'S WARRANTY

Submit all manufacturers' signed warranties to Contracting Officer prior to final commissioning and acceptance.

3.4 CONTRACTOR'S WARRANTY for INSTALLATION

Submit contractor's warranty for installation to the Contracting Officer prior to final commissioning and acceptance.

-- End of Section --