SECTION 18

ELECTRICAL WORK, INTERIOR

18-01 SCOPE: The work covered by this section of the specifications consists in furnishing all labor, equipment, supplies and materials, not furnished by the government, and in performing all operations, including cutting, channeling and chasing, necessary for the installation of complete interior-wiring systems and electrical equipment, in strict accordance with this section of the specifications and the applicable drawings, and subject to the terms and conditions of the contract.

18-02 APPLICABLE SPECIFICATIONS AND STANDARDS: The following specifications and standards form a part of these specifications:

a. Federal Specifications:

J-C-103	Cable and Wire; Rubber-Insulated, Building Type (0 to 5,000-Volt Service).
J-C-129	Cable and Wire; Thermoplastic Insulated, Building Type
W-F-406	Fittings; Cable and Conduit
W-O-806	Outlet-Bodies; Iron (Cast or Malleable), Cadmium- or Zinc-Coated, with Covers and Accessories (for Shore Use)
W-O-821	Outlet-Boxes; Steel, Cadmium- or Zinc-Coated, with Covers and Accessories
W-P-131a	Panelboards; Equipped with Automatic Circuit-Breakers
W-R-1512	Receptacles, (Convenience-Outlets), Adapters, Attachment-Plug-Caps, Cord-Connector-Bodies, Current-Taps, Motor Plugs and Plug-Bodies, 250 volts
W-S-893	Switches; Snap, Multiple-Type and Combination Devices, Flush-Type with Wall Plates
WW-C-566	Conduit; Steel, Flexible
W-S-896	Switches; Snap, Single-Unit, Interchangeable Flush-Type with Wall Plates
CC-M-636a	Motors; Alternating-Current, Fractional-Horsepower, Single-Phase and Universal
HH-T-101a	Tape; Friction
HH-T-111a	Tape; Rubber (Natural and Synthetic), Insulating
WW-C-581b	Conduit; Steel, Rigid, Zinc-Coated
WW-T-806b	Tubing; Electric, Metallic
W-L-101c	Lamps; Electric, Incandescent, Large, Tungsten Filament

b. Underwriters' Laboratories, Inc:

Standard for Cabinets and Boxes

Standard for Service Equipment

Standard for Industrial Control Equipment

Standard for Thermoplastic-Insulated Wires

Standard for Rubber-Covered Wires and Cables

c. National Board of Fire Underwriters:

National Electrical Code, Standard for Electric Wiring Apparatus

d. American Standards Association:

Standards for Motors C50

e. National Electrical Manufacturers Association:

Industrial Control Standards

18-03 GENERAL: The installations shall comply with the applicable rules of the National Electrical Code except where otherwise noted on the drawings or specified herein. All electrical materials shall be new and as approved by the Underwriters' Laboratories, Inc., except as otherwise specified herein. Defective equipment or equipment damaged in the course of installation or test shall be replaced or repaired in a manner meeting with the approval of the Contracting Officer. All AC equipment shall be rated at 60 cycles unless otherwise indicated or specified. The contract drawings indicate the extent and general arrangement of the conduit and wiring systems. If any departures from the contract drawings are deemed necessary by the Contractor, details of such departures and the reasons therefor shall be submitted as soon as practicable, and within 45 days after award of the contract, to the Contracting Officer for approval. No such departure shall be made without the prior written approval of the Contracting Officer.

a. Standard Products: The materials to be furnished under this specification shall be the standard products of American manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design.

b. Materials and Equipment Schedules: Within 45 days after the date of award of contract and before any material or equipment is purchased, the Contractor shall submit to the Contracting Officer for approval a complete list, in triplicate, of materials, fixtures and equipment to be incorporated in the work. The list shall include catalog numbers, cuts, diagrams, drawings and such other descriptive data as may be required by the Contracting Officer. No consideration will be given to partial lists submitted from time to time. Approval of materials will be based in manufacturers' published rating. Any materials, fixtures, and equipment listed which are not in accordance with the specification requirements may be rejected.

c. Options of the Government: If the Contractor fails to submit for approval within the specified time or any authorized extension thereof a list of materials, fixtures and equipment in accordance with the preceding paragraph, the Contracting Officer will select a complete line of materials, fixtures and equipment. The selection thus made by the Contracting Officer shall be final and binding, and the items shall be furnished by the Contractor without change in contract price or time of completion.

18-04 GROUNDING: The conduit systems and neutral conductor of the wiring system shall be grounded. The ground connection of the electric-system neutral and conduit system shall be made at the main service switch or circuit breaker panel. A bare copper ground conductor, sized in accordance with the National Electrical Code but in no case smaller than No. 8 AWG, shall be extended in E.M.T. from the main service equipment to the point of entrance of the water service. Connections to the water pipe shall be made by a suitable ground clamp or lug connection to a plugged tee. If flanged pipes are encountered, connection shall be made with the lug bolted to the street side of the flange connection. Where copper tubing is encountered connection to the cold water pipe shall be made with an approved clamp type connector. The grounding system shall be installed in a workmanlike manner and shall be inconspicuous.

18-05 WIRING: Branch-circuit conductors shall be of the sizes indicated on the drawings but in no case, smaller than No. 14 A.W.G. Conductors for signal and pilot control circuits may be No. 14 A.W.G. Conductors shall be continuous from outlet to outlet, and no splices shall be made except within outlet or junction boxes. Junction boxes may be utilized where required. Wire connectors of insulating material or solderless pressure connectors, properly taped, shall be utilized for all splices in wiring where possible. Soldered joints insulated with tape shall be kept to a minimum. Rubber and friction tape shall conform to the requirements of Federal Specifications HH-T-111c and HH-T-101a, respectively. Vinyl plastic tape will be acceptable in lieu of rubber and friction tape.

a. Conduit and Tubing Systems: Conduit or electric-metallic-tubing systems shall be installed in accordance with the applicable provisions of the National Electrical Code. Rigid steel conduit shall be zinc-coated and shall conform to the requirements of Federal Specification WW-C-581b. Conduit fittings shall conform to the requirements of Federal Specification W-F-406. Electric metallic tubing shall conform to Federal Specification WW-T-806b. Electric metallic tubing shall utilize compression-type threadless fittings or indenter type fittings. Where indenter type fittings are used fittings shall be installed with an indenting tool specifically designed for that purpose. Conduit and tubing shall be of 1/2-inch minimum size. Rigid steel conduit shall be used throughout except that electrical metallic tubing may be used for wiring in walls, furred spaces and exposed wiring inside the building. Electrical metallic tubing shall not be used in poured concrete slabs.

b. Flexible Metallic Conduit: Where indicated on the drawings conductors shall be installed in flexible metallic conduit. Flexible conduit may be used for equipment connections. Flexible metallic conduit shall be installed in accordance with the provisions of the National Electrical Code and shall conform to the requirements of Federal Specification WW-C-566.

(1) Installation: Conduits and tubing shall be concealed within the walls, ceilings and floors, where possible, and shall be kept at least 6 inches from parallel runs of flues, steam pipes or hot water pipes. Exposed runs of conduit or tubing shall have supports spaced not more than 8 feet apart and shall be installed with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast-metal fittings or symmetrical bends. Bends and offsets shall be avoided where possible, but where necessary shall be made with an approved hickey or conduit-bending machine. The use of a pipe tee or vise for bending conduits will not be permitted. Conduit or tubing which has been crushed or deformed in any way shall not be installed. Expansion fittings or other approved devices shall be used to provide for expansion and contraction where conduit or tubing crosses expansion joints. Wooden plugs inserted in masonry or concrete shall not be used as a base to secure conduit supports. Conduit and tubing shall be supported on approved types of galvanized wall brackets, ceiling trapeze, strap hangers or pipe straps, secured by means of toggle bolts on hollow masonry units, expansion bolts in concrete, machine screws on metal surfaces and wood screws on wood construction. Nails shall not be used as the means of fastening boxes or conduits. Conduit and tubing shall be installed in such manner as to insure against trouble from the collection of trapped condensation, and all runs of conduit shall be arranged so as to be devoid of traps wherever possible. The Contractor shall exercise the necessary precautions to prevent the lodgment of dirt, plaster or trash in conduit, fittings and boxes during the course of installation. A run of conduit or tubing which has become clogged shall be entirely freed of these accumulations or shall be replaced. Where a conduit enters a box or other fittings, a bushing shall be provided to protect

the wire from abrasion unless the design of the box or fitting is such as to provide equivalent protection. The conduit shall be secured in each outlet box, junction box or cabinet by a locknut on the outside and a locknut on the inside unless the conduit is terminated in a screwed hub. Complete conduit system, including outlets, cabinets and stubouts shall be provided for the telephone system but wiring will be installed by others.

(2) Conductors: A complete system of conductors shall be installed in the raceway systems except for telephone. Conductors installed in ordinarily dry locations shall be rubber-insulated, type R or RU, or thermoplastic-insulated, type T. Conductors installed in wet locations such as in underground raceways installed in concrete floor slabs in direct contact with earth, or in raceways regularly subject to moisture or condensation shall be rubber-insulated type RW, or thermoplastic-insulated specifically designed for such applications, type TW. RH conductors shall be used where required for current carrying capacity. Rubber-insulated conductors, types R, RU, RH and RW shall conform to the requirements of Federal Specification J-C-103. Thermoplastic-insulated conductors, types T and TW, shall conform to the requirements of Federal Specification J-C-129. Home runs may be combined in one conduit, provided all connections are in accordance with National Electrical Code requirements and the maximum unbalanced current in the neutral does not exceed the capacity of the conductor. Neutral conductors shall be identified as required by section 2001 of the National Electrical Code.

18-06 OUTLETS: Outlets shall be installed in the locations shown on the drawings. The Contractor shall study the general building plans in relation to the spaces surrounding each outlet in order that his work may fit the other work required by these specifications. When necessary and subject to the approval of the Contracting Officer, the Contractor shall relocate outlets so that when fixtures or other fittings are installed, they will be symmetrically located according to room layout and will not interfere with other work or equipment. Only zinc-coated or cadmium-plated sheet-steel boxes conforming to the requirements of Federal Specification W-O-821, of a class to satisfy the conditions for each outlet, shall be used in concealed work. Boxes shall be installed in a rigid and satisfactory manner, either by wood screws on wood, expansion shields on masonry, or machine screws on steel work. Fixture outlet boxes shall be of a size to suit the fixture to be installed. Fixture outlet boxes on plastered walls shall be fitted with open covers set to come flush with the finished surface where applicable. Switch, telephone and receptacle outlet boxes shall be not less than 2 inches deep, fitted with appropriate plaster covers, where necessary, to set flush with the finished surface. One-piece gang boxes not less than 2 inches deep shall be utilized where necessary. Outlets in exposed work shall be of cast steel or alloy fitted with appropriate covers. Cast-metal fittings shall conform to the requirements of Federal Specification W-O-806.

a. Pull Boxes: Pull boxes shall be constructed of galvanized sheet metal, of not less than the minimum size recommended by the National Electrical Code. Boxes shall be furnished with screw-fastening covers. Where several feeders pass through a common pull box, they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation.

b. Telephone Outlets: Each telephone outlet shall be provided with a 3/8 inch hole in the center. Metal plates shall have a bushed hole.

c. Weatherproof Convenience Outlets: Weatherproof outlets shall be installed where indicated on the drawings. Each weatherproof outlet shall consist of a convenience outlet in a flush cast box with a gasketed, weatherproof, cadmium-plated, metal cover plate and cap. The cap shall be permanently attached to the cover plate by means of a hinge. Outlet box may be exposed on precast walls or columns.

d. Device Plates: A device plate shall be provided for each outlet to suit the device installed. All plates on finished walls in toilet rooms and other similarly moist locations, shall be of stainless steel, or of brass 0.040 inch thick, provided with beveled edges. Brass plates shall be chromium plated with satin finish. All plates in other rooms with finished walls shall be of brown phenolic compound having a polished stippled or polished ribbed finish with plain polished borders. Screws shall be of metal with countersunk heads, with finish to match the finish of the plate. Plates shall be installed with all four edges in continuous contact with finished wall surfaces without the use of mats or similar devices. Plaster fillings will not be permitted. Plates shall be installed vertically and with alinement tolerance of 1/16-inch. Device plates shall be of one-piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted.

16-07 WALL RECEPTACLES: Wall receptacles shall conform to the requirements of Federal Specification W-R-151a, type and style as specified. Heavy-duty receptacles shall be of the single type having capacity to carry the rated load continuously without damage and shall be furnished with a suitable cord-grip cap.

a. Duplex Convenience Receptacles: Duplex convenience receptacles shall be type II, style No. 102, rated 10 amperes at 250 volts and 15 amperes at 125 volts. Bases shall be constructed of brown phenolic composition. Terminals shall be mounted on the sides of the base with two screws per terminal. Duplex convenience receptacles installed in damp or wet locations and where specified shall be type II, style No. 130, 3-pole, 2-wire with the third pole grounded, rated 10 amperes at 250 volts and 15 amperes at 125 volts. Mounting straps shall have plaster ears.

b. 50 Ampere, 250 Volts Receptacles: 50 ampere, 250 volt receptacles shall be type V, style No. 322 or 324 rated as indicated and supplied complete with cap.

18-08 WALL SWITCHES: Wall switches shall be of the totally enclosed tumbler type and shall conform to the requirements of Federal Specification W-S-896 or W-S-893. In addition to the spring actuating the switch, the operating mechanism shall include a positive mechanical means to initiate motion tending to close and/or open the circuit. Enclosures shall be of phenolic composition. Not more than two switches shall be installed in a single gang position of a switch box. Single-pole, three-way switches controlling loads less than 700 watts shall be of the tumbler type, rated 10 amperes at 125 volts. Single-pole, three-way switches controlling loads of 700 watts and more shall be similar to those specified hereinbefore except rated at 20 amperes at 125-volts. All switches shall be suitable for the control of tungsten-filament lamp loads and shall carry the "T" rating of the Underwriters' Laboratories, Inc. Where switches with pilot lights are indicated on the drawings, the combinations shall consist of a switch, as specified above, with a yoke-mounted candelabra-base socket rated at 75 watts, 125-volts, and fitted with a glass or plastic jewel. A clear 6-watt lamp shall be furnished and installed in each pilot switch. Jewels for use with switches controlling motors shall be colored green and for other purposes red.

18-09 PANELBOARDS: Except where otherwise specified or indicated on the drawings, panelboards shall be of the circuit breaker dead-front safety type conforming to the requirements of Federal Specification W-P-131a, class A, and shall be suitable for operation of a 120/240 volt single-phase, 3-wire, solidly grounded neutral system. Unless otherwise indicated on the drawings, panelboards shall be provided with lugs only in the main. Panelboards shall be provided with the size and number of single-, double-, and triple-, pole branches as indicated on the drawings.

18-10 CABINETS: Cabinet boxes shall be constructed of zinc-coated sheet steel and shall conform to the requirements of Underwriters' Laboratories, Inc., Standard for Cabinets and Boxes. Trims and doors shall have a suitable primer coat and a finish coat of a color specifically designated by the Contracting Officer.

a. Panelboard Cabinets: Cabinets for panelboards shall be provided with adequate wiring gutters at the sides, top and bottom. Cabinet heights shall not exceed 72 inches unless greater heights are specifically indicated. Cabinets shall be mounted so that the distance from the floor to the center of the top switch or circuit breaker will not exceed 6 feet 6 inches. Flush cabinets shall be provided with trims having adjustable trim clamps. Trims shall be fitted with hinged doors having combination lock and latch.

b. Telephone and Signal System Cabinets: Each cabinet box shall be constructed with interior dimensions not less than those indicated on the drawings. Boxes shall be provided with a weatherproof cover.

18-11 SERVICE CONDUITS: Conduit only for underground electric-service cable, and telephone cable shall be installed as shown on the drawings, subject to relocation by the Contracting Officer. Conduits

shall terminate approximately 5 feet beyond the building wall and 2 feet below finished grade with the outside ends plugged and covered in an approved manner, unless otherwise indicated on the drawings.

18-12 MOTORS: Motors shall be of sufficient size for the duty to be performed and shall not exceed their full rated load when the driven equipment is operating at specified capacity under the most severe conditions likely to be encountered. Unless otherwise specified, all motors shall have open frames, class A insulation, and continuous-duty classification based on a 40 degree C. ambient temperature of reference. Motors 1/6 HP or larger shall be three phase unless otherwise indicated on the drawings or specified elsewhere.

a. Fractional-Horsepower Motors: Fractional-horsepower motors of single-phase alternating current and universal types shall conform to the requirements of Federal Specification CC-M-636a.

b. Other Motors: Motors not included within the scope of paragraphs a and b above shall conform to the design, construction and performance requirements of Standard C50 of the American Standards Association.

18-13 MOTOR CONTROL: Each motor, or group of motors requiring a single control, shall be provided with a suitable controller and devices which will perform the functions as specified for the respective motors in other sections of these specifications. All controllers shall conform to the adopted standards and recommended practices of the Industrial Control Standards of the National Electrical Manufacturers Association and the Standard for Industrial Control Equipment of the Underwriters' Laboratories, Inc. Each motor, 1/8 horsepower or larger and split-phase motors having automatic switches to disconnect the starting winding shall be provided with thermal overlade protection. The overload protection device shall be provided either integral with the motor or controller, or mounted in a seperate enclosure. Unless otherwise specified the protective device shall be of the manually reset type. Single- or double-pole tumbler switches may be used as manual controllers for motors of 1/4 horsepower or less in rating. Manual controllers for motors larger than 1/4 horsepower shall be specifically designed for the purpose and shall have a horsepower rating adequate for the motor. Automatic-control devices such as thermostats or float or pressure switches may control the starting and stopping of motors directly, provided they are designed for that purpose and have an adequate horsepower rating. When the automatic-control device does not have such a rating, a magnetic starter shall be used with the automatic-control device actuating the pilot control circuit. When manual and automatic control is specified and the automatic-control device operates the motor directly, a double-throw three-position tumbler or rotary switch shall be provided for the manual control; when the automatic-control device actuates the pilot control circuit of a magnetic starter, the latter shall be provided with a three-positon selector switch. Three-position switches shall be marked "Manual-Off-Automatic".

18-14 MOTOR-DISCONNECT MEANS: Each motor shall be provided with a disconnecting means when required by the National Electric Code even though not indicated on the drawings. A circuit breaker or horsepower-

rated switch in a panelboard will be acceptable as a disconnecting means, if located within sight of the motor controller. A quick-make and quick-break general use tumbler or snap switch will be acceptable for capacities less than 30-amperes, provided the ampere rating of the switch is at least double the rating of the controlled equipment.

18-15 LIGHTING FIXTURES: Lighting fixtures shall be complete including lamps, and shall bear the label of the Underwriters' Laboratories, Inc. Lamps shall comform to Federal Specification W-L-101. All fixtures shall be wired with approved type fixture wire. The location and height of the fixtures shall be approximately as indicated on the the drawings. The exact locations and heights shall be determined by the structural and mechanical limitations of the buildings, and fixtures shall be installed in such a manner as to avoid obstructions and to give proper illuimation results. Fixtures shall conform to the requirements indicated on the drawings and the descriptions below. Minor deviations may be permitted at the discretion of the Contracting Officer in order to utilize stock fixtures but only on the basis of better efficiency, appearance, construction and photometric charcteristics. Fixtures shall be the products of manufacturers noted on the drawings or their approved equal.

a. Fixture type B - Wall mounting fixture for a maximum of 100 watt incandescent lamp with a single medium screw-base receptacle. Globe of the shape shown on the drawings shall be opal glass approximately 4 inches in diameter, with open top. Fixture body shall be cast metal with satin chrome finish and shall be suitable for installation with 3-1/4 inch outlet box.

b. Fixture type CA-1 - Incandescent lighting fixture for ceiling mounting with plain opal glass globe. Overall diameter shall be 9 inches. Globe shall accomodate a maximum of one 75 watt lamp. Fixture shall have an overall depth of approximately 10 inches and shall be suitable for mounting on fixture stud or extension of fixture stud, in the outlet box. Fitters shall be as noted on the drawings. Fixture finish shall be polished chrome.

c. Fixture type CA-2 - Fixture shall be as specified for CA-1 except that it shall accomodate a maximum of one 150 watt lamp and shall have approximately 12 inches overall diameter, 13 inches overall depth.

d. Fixture type CL-1 - Fixture shall be general diffusing, one piece, shallow bank ceiling fixture with drum type, white opal glasss globe for a maximum of two 100 watt lamps. Shallow bend and back plate shall be one piece, 22 gage metal with exposed portions to have polished chromium finish. Reflector with baked synthetic white enamel finish shall be provides drum globe shall be supported by means of center or side fastenings as required. If center supported a suitable felt washer shall be provided under the cap nut.

e. Fixture type R-2 - Wall bracket consisting of a glazed white porcelain base, medium base, keyless socket, single receptacle and a glass shade. Shade shall be white or opal glass. Height of base shall be not less than 5 inches. When used shade holder screws shall be of brass with polished chromium finish. Fixture shall be furnished with removable receptacle and shall be suitable for mounting on either 3-1/4 or 4 inch outlet box, as required.

f. Fixture type R-3 - Fixture shall be same as R-2 except that it shall be without receptacle and that socket shall be provided with pull chain or toggle switch. Pull chain, if used shall have one insulated link.

j. Fixture type R-7 - Fixture shall be weatherproof, glazed black porcelain bracket with medium base, keyless porcelain socket and opal glass cylinder with open bottom and shall fit 3-1/4 inch outlet or box.

k. Fixture type LR - Fixture shall be keyless porcelain receptacle for mounting on 4 inch box. Receptacle shall be rated not less than 660 watts and shall be provided with shade holder groove.

l. Fixture type LRP - Fixture shall be the same as type LR except that it shall be provided with pull chain switch with three foot insulated chain.

m. Fixture type WB-24 - Fixture shall be weatherproof surface fixture suitable for wall mounting and shall have die cast aluminum body suitable for outdoor installation. Fixture shall be provided with screw-in type, flat bottom cylindrical, white opal glass globe complete with cork gasket between body and globe. Receptacle shall be keyless, medium screw base. Fixture shall be suitable for mounting on 3-1/4 inch box and shall have satin chrome finish. Dimensions and general appearance of the fixture shall be similar to type WB-2 Prescolite.

n. Fixture type WB-2-2S - Fixture shall conform to the applicable requirements for fixture type WB-24, except that it shall have two horizontal lamp and globe units on common base and shall be provided with pull chain switch. Dimensions and general appearance shall be similar to type WB-2-2 Prescolite.

o. Closet Heaters: Closet heaters shall be of the resistor type, rated as indicated on the drawings and suitable for operation at 120 volts. The heating element shall be completely enclosed by a perforated metal guard and the maximum surface temperature of the assembly shall not exceed 150°F. The closet heater may consist of a unit type assembly for mounting on an outlet box or screw base receptacle. Or, the closet heater may consist of a resistor and separate perforated metal guard in which case the guard shall be secured to wall or outlet box and provision shall be made for replacing the resistor unit without removing the guard assembly. Fixture to be supplied with one medium porcelain receptacle and shall be suitable for a maximum of one 100 watt lamp. Trim to be chrome finish with overall dimensions approximately 8½ x 8½ inches. Depth of fixture to be 4 inches.

18-16 KITCHEN EXHAUST FAN: Kitchen exhaust fan of the type and ratings indicated on the drawings shall be provided where indicated and in accordance with details shown therein. Ducts and grilles shall be provided as shown on the drawings and in accordance with the applicable requirements of the section on Forced Warm Air Heating System. Equipment shall be installed in accordance with the manufacturers recommendations and drawings as approved by the Contracting Officer.

18-17 SIGNAL SYSTEM: A signal system consisting of a chime, controlled by a push button, with necessary control transformer, conduit and wiring shall be installed as indicated on the drawings. Chime shall be two note bar type for one entrance "Edwards" #1405 or equal. Control transformer shall be mounted on outlet box with suitable adapter plate. Push button to be "Edwards" #632 or equal.

18-18 SECONDARY JUNCTION BOXES: Secondary junction boxes shall be installed where indicated on the drawings for the purpose of tapping secondary service cables. A suitable gasket shall be installed between the cover and the box. A sufficient number of cover screws shall be provided to hold the cover firmly in place and tight along it's entire contact surface. The size of the boxes shall be as indicated on the drawings, and the required number and size of stubout conduits shall be provided to 5 feet from the building unless otherwise indicated. Box shall receive two coats of zinc-chromate primer before installation and shall receive a finish coat as directed by the Contracting Officer. Boxes shall be raintight cast metal conforming to Underwriters' Laboratories Standards for Cabinets and Boxes.

18-19 EQUIPMENT CONNECTIONS: Equipment connections shall be made with flexible or rigid conduit as applicable. Controllers for motors, disconnect switches, and all control, protective and signal devices for motor circuits, except where such apparatus is furnished mounted and connected integral with the motor-driven equipment, shall be installed, connected, and left in operating condition. The number and size of conductors between motors and control or protective apparatus shall be as recommended by the manufacturer of the apparatus or as required by the National Electrical Code. Control wiring shall be color-coded as directed by the Contracting Officer.

18-20 REPAIR OF EXISTING WORK: The work shall be carefully laid out in advance, and where cutting, channeling, chasing or drilling of floors, walls, partitions, ceilings or other surfaces is necessary for the proper installation, support or anchorage of the conduit, raceways, or other electrical work, this work shall be carefully done, and any damage to buildings, piping or equipment shall be repaired by skilled mechanics of the trades involved, at no additional cost to the Government.

16-21 GOVERNMENT-FURNISHED EQUIPMENT: The Government will furnish the equipment listed in the Appendix A of these specifications. The Contractor shall uncrate and install the equipment in accordance with the manufacturer's recommendations, as directed by the Contracting Officer and as specified herein.

a. Ranges: The ranges shall be of the 4-burner, electric, domestic, cabinet type conforming to the applicable requirements of Federal Specification W-R-101, with top dimensions approximately 38 inches by 25 inches and approximately 36 inches high. The ranges shall be installed in the kitchen where indicated on the drawings and as directed by the Contracting Officer.

(1) Range Receptacle: The Contractor shall furnish and install a flush, molded-plastic, 50 ampere, 250 volts, 3-pole, 3-wire range receptacle type V, style No. 322 or 324. The receptacle shall be furnished with a flexible cord set for connection to the electric range. The cord shall consist of 50 ampere, 250 volt, 3 pole angle type, molded plastic cap with sufficient length of rubber-jacketed cable consisting of two No. 6 and one No. 8 AWG conductors. The range shall be completely connected and grounded.

b. Refrigerators: Refrigerators shall be electric, self-contained, 8 cu. ft., conforming to the applicable requirements of Federal Specification A-R-211b. Refrigerators to be installed shall be either left-hand or right to suit the kitchen layout as directed by the Contracting Officer and shall be connected to the outlets indicated on the drawings.

c. Hot Water Heaters: The hot water heaters shall be of the capacity indicated on the drawings and shall be vertical tank, electric heaters conforming to the applicable requirements of Federal Specification W-H-196. The heaters shall be installed where shown on the drawings or directed by the Contracting Officer and shall be completely connected to existing wiring and junction box. Wire sizes shall be the same as existing line to the heater and shall be made by means of rigid or flexible conduit with suitable fittings as applicable and approved by the Contracting Officer.

16-22 TESTS: After the interior-wiring-system installation is completed, and at such time as the Contracting Officer may direct, the Contractor shall conduct an operating test for approval. The equipment shall be demonstrated to operate in accordance with the requirements of this specification. The test shall be performed in the presence of the Contracting Officer or his authorized representative. The Contractor shall furnish all instruments and personnel required for the tests, and the Government will furnish the necessary electric power.