

SECTION 16400: SERVICE AND DISTRIBUTION

PART 1 - GENERAL

1.1 SCOPE:

Work of this Section shall be in accordance with the intent of the Contract Documents and shall include the following principal items:

- Electrical Distribution Equipment
- Panelboards
- Transformers
- Switchboards
- Motor Control Centers

1.2 REFERENCED STANDARDS:

- NFPA 70 - National Electrical Code
- NFPA 101 - Life Safety Code

PART 2 - PRODUCTS

2.1 ELECTRICAL DISTRIBUTION EQUIPMENT:

2.1.1 All power and lighting distribution equipment specified herein shall be by the same manufacturer.

2.1.2 All electrical distribution equipment shall be UL labeled. Model numbers indicated are based on Square D equipment.

2.1.3 Acceptable manufacturers: Square D, General Electric, Cutler-Hammer, or Siemens.

2.2 PANELBOARDS: <S>

2.2.1 Provide panelboards rated and sized as indicated in the schedule and shown on the plans.

	<u>Square D</u>	<u>Cutler-Hammer</u>	<u>General Electric</u>
Up to 240 Volts	NQOD	PRL1	AL
Up to 480 Volts	NF	PRL2	AE
Power Distribution	I-Line	PRL4	SPECTRA

2.2.2 Construction features shall include minimum 5" wide gutters, dead front construction, electroplated current carrying parts; UL listed terminals suitable for conductors specified; flush front hinged door-in-door construction with continuous piano hinge and with cylinder tumbler type locks (all keys alike); circuit directory and frame, code gauge steel, galvanized and baked enamel finished. Metal factory nameplate listing as a minimum voltage, phase, amps, wire and affixed with metal fasteners (screws or rivets) shall be required. Paper tags only are not allowed.

2.2.3 Circuit breakers shall be toggle action with quick-make, quick-break mechanism. Trip indication shall be by breaker handle taking a position between ON and OFF. All multiple breakers shall be common trip with a single handle. Minimum interrupting rating of breakers shall be 10,000 AIC. Refer to the drawings regarding higher ratings for circuit breakers. Provide Class A ground fault detection type breakers where indicated on the drawings.

	<u>Square D</u>
Up to 240 Volts Panels	QO
Up to 480 Volts Panels	EH
Power Distribution Panels	FY,FA

2.2.4 Acceptable manufacturers: Square D, General Electric, Cutler Hammer, ITE, or Siemens.

### 2.3 DRY TYPE DISTRIBUTION TRANSFORMERS: <S>

2.3.1 Transformers to be dry-type with natural draft ventilation. Units to be rated for 480 volts, 3 phase, 3 wire primary, and 120/208 volts, 3 phase, 4 wire secondary, unless otherwise indicated. Units to be designed for 60 Hertz operation, with KVA capacities as shown on drawings. Transformers to conform with applicable NEMA and ANSI standards, and be UL listed.

2.3.2 Transformers to have Class H insulation, high grade silicone steel cores, and be rated for a maximum temperature rise of 115 degrees C. Units rated 30 KVA and larger shall have four 2-1/2% taps below normal and two 2 1/2% taps above normal. Units rated less than 30 KVA to have two 5% taps below normal.

2.3.3 Sound levels generated by transformers are not to exceed the following values: 9 KVA and less -40 db, 10 to 45 KVA -42 dB, 50 to 150 KVA -45 db.

2.3.4 Acceptable manufacturers: General Electric, Square D, or Cutler Hammer.

### 2.4 MAIN POWER SWITCHBOARD: <S> <OM>

2.4.1 Switchboard shall be dead front type, with all cable and bus connections accessible from switchboard front. Sections shall be fabricated with dieformed 12 ga. steel, with rolled edges and channel iron rails. Units shall be factory assembled and tested, and shall comply with the latest ANSI, IEEE, and NEMA standards. Configurations and arrangement shall be as indicated on drawings.

2.4.2 Provide a freestanding switchboard consisting of main and distribution sections, rated for 277/480 volts, 3 phase, 4 wire. The sections shall be totally enclosed 36" deep x 90" high cubicles, containing fusible switches or circuit breakers as indicated on the plans, incoming service cable lugs, meters, current transformers, and other devices required to perform the intended functions.

A. Bussing shall be aluminum, braced for 100,000 AIC integrated equipment rating, with current ratings as indicated, suitable for continuous operation with a maximum rise of 50 degrees C above 25 degrees C ambient.

B. Instrumentation shall include the following:

1. Square D Power Logic CM-2150, Cutler-Hammer IQ DP-4000, General Electric Power Leader EPM.
2. C. T.'s, P. T.'s, sensors and other devices necessary for the intended operation of the instrumentation.

2.4.3 Labels shall include engraved laminated bakelite plates at each main and distribution switch which indicates services. See Identification and Nameplates for additional requirements.

2.4.4 Acceptable Manufacturers: Square D "Power Style" QED, Cutler-Hammer PRLC, or General Electric Class 1 and 2 Spectra Switchboards.

#### 2.5 MOTOR CONTROL CENTER: <S> <OM>

2.5.1 Provide a freestanding motor control center, rated for 480 volts, 3 phase, 3 wire. Construction shall match adjacent switchboard. Control center shall consist of individually enclosed plug-in type combination circuit breaker - starter units, equipped with hinged doors.

2.5.2 Circuit breakers shall be molded case type with plug-on connections, quick-make/quick-break operation, 22,000 AIC rating and common trip. Breaker's enclosure shall be interlocked to prevent opening with breakers in "ON" position, except by means of a screwdriver release. Breaker shall be equipped with an external handle with provision for padlocking. Circuit breakers shall disconnect all control power when in "Tripped" or "OFF" position.

2.5.3 Starters shall be magnetic, line voltage type with overload relays in each phase. Each starter will be provided with pilot light on H-O-A switch. Interlocks as required, plus one spare, shall be provided for each starter. Holding coils shall be 120 VAC, fed from an individual control power transformer.

2.5.4 Terminal strips shall be numbered to match temperature control wiring diagrams. Provide grounding busses for terminating grounding conductors and engraved label for each device as specified under Identification and Nameplates.

2.5.5 Acceptable Manufacturers: Square D Model 6, Cutler-Hammer Freedom, or General Electric Spectra MCC.

#### 2.6 GROUND FAULT PROTECTION SYSTEM: <S> <OM>

2.6.1 Provide completely wired, UL listed, zone selective, ground fault protection system consisting of sense coils, ground fault relays and monitor test system. The system shall be capable of 2 level operation.

2.6.2 Equipment is based on Square D type GC system. Equal equipment by General Electric or Westinghouse is acceptable.

2.6.3 Sense Coil shall be laminated iron case with dual winding. Provide test winding for simulation of ground fault condition.

2.6.4 Ground Fault Relay shall continuously monitor the output of the sensor and shall initiate the opening of the circuit under ground fault conditions. Current pickup shall be field adjustable from 100 to 1200 amperes. Time delay shall be field adjustable for 0.1, 0.2, 0.3 or 0.5 seconds.

2.6.5 Monitor-test System feature shall simulate a ground fault and shall reset each relay. Ground fault simulation and reset shall be actuated by illuminated pushbutton.

### PART 3 - EXECUTION

#### 3.1 ELECTRICAL SERVICE AND METERING PROVISIONS:

3.1.1 Provide electrical service and metering provisions as indicated on the drawings. This contractor shall verify the electrical service with the serving power company prior to rough-in and coordinate the installation, notifying the Architect of discrepancies and/or requirements unique to this job that are not indicated on the plans.

3.1.2 The contractor shall provide all materials and labor shown on the drawings and/or required for the complete installation except as specifically indicated to be by the serving utility.

3.1.3 Where there is a charge for utility furnished items, it shall be paid by the contractor.

#### 3.2 ELECTRICAL LOAD BALANCING:

3.2.1 Contractor shall be responsible for balancing electrical loads at each panel so that neutral current flow is reduced to the lowest possible level and all phase legs are as equally balanced as possible. Contractor shall relocate circuit breakers or individual branch circuits as required to accomplish electrical load balance. After load balancing is complete, it shall be verified with the facility fully powered and operating in its intended manner.

#### 3.3 GROUNDING:

3.3.1 Electrical grounding shall conform to Article 250 of the N.E.C. Neutral conductors, cable shields and sheaths, metallic conduits, junction boxes enclosures and all conductive non-current carrying parts of equipment shall be grounded.

3.3.2 Ground rods shall be copper clad steel minimum 5/8" diameter by 8 feet long driven into the ground at least 8 feet, 6 inches.

#### 3.4 DRY TYPE DISTRIBUTION TRANSFORMERS:

3.4.1 Mount transformers 75 KVA and smaller with wall-mounted brackets from wall and structure above, unless otherwise indicated. Transformers larger than 75 KVA to be floor mounted on 4 inch thick reinforced concrete pads, unless otherwise indicated.

3.4.2 The transformer is to be isolated from its supports with 3/8" neoprene pads.

3.4.3 Final conduit connections to the transformer shall be flexible metal conduit for a minimum distance of 10 conduit diameters.

3.5 TERMINATION LUGS:

Contractor shall coordinate size of termination lugs in all equipment with conductor sizes indicated on plan. Contractor shall notify equipment vendor of special lug requirements.

END OF SECTION