

DIVISION 16 - ELECTRICAL WORK
Section 16130 - Boxes

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Contractor provide:
 - 1. Outlet, junction and pull boxes.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16140 - Wiring Devices.
- E. Section 16160 - Panels and Enclosures.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. National Electrical Code (NEC).
 - 2. Underwriter's Laboratories, Inc. (UL).

2. PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Appleton.
- B. Crouse-Hinds.
- C. Raco.
- D. Steel City.
- E. Substitutions in accordance with Section 01640.

2.02 MATERIALS

- A. Outlet Boxes.

SECTION 16130-2

1. Outlet boxes shall be galvanized, pressed steel having depth and shape best suited to the intended use.
2. Outlet Boxes for Mounting Fixtures.
 - a. Equip outlet boxes for mounting fixtures with slip-in or boltless fixture studs.
 - b. Hickey studs will **not** be acceptable.
 - c. Install large fixtures with hangers to support fixtures independently of outlet boxes.
3. Outlet Boxes not Mounting Fixture.
 - a. Outlet boxes not mounting fixtures and at which no connections are made shall be equipped with steel cover plates.
 - b. Although no connections are made in such outlets, sufficient wire shall be provided in each for making future connections.
4. Ceiling Outlet Boxes.
 - a. Galvanized, octagon, 4 inches, 1 ½ inches deep without fixture stud, 2-1/8 inches deep with fixture stud.
5. Surface-mounted Outlet Boxes for exterior convenience receptacles or local light switches in areas with exposed conduit shall be "FS" or "FD" cast boxes.
 - a. Surface-mounted outlet boxes shall have hubs of number and quantity appropriate to the number of conduits connected thereto.

B. Junction and Pull Boxes.

1. All boxes shall be made of code gauge steel, hot dipped galvanized after fabrication with galvanized steel covers secured to boxes with machine screws spaced on not more than twelve (12) inch centers. In no case shall material be less than #14 gauge.
2. Pull or junction boxes with maximum side over sixty (60) inches and a maximum area greater than 1,400 square inches shall be made of 1-1/2 inch by 1-1/2 inch by 1/4 inch galvanized angle frame covered with #10 gauge galvanized sheet steel riveted or welded to framework. Cover plate shall be #11 gauge galvanized steel.
3. All boxes shall be ample size to allow the conductors to be installed in them without bending, either before or after installation, to radii less than that recommended by the conductor manufacturer.
4. Boxes installed in raceway systems 1-1/4 inch trade size or larger containing #6 or larger conductors for straight or angle pulls shall be based on the largest raceway size in accordance with the National Electrical Code.

SECTION 16130-3

5. Wires or splices in boxes shall not exceed the quantity allowed by the National Electrical Code for junction, outlet and pull boxes.

3. EXECUTION

3.01 INSTALLATION

- A. Provide junction and pull boxes wherever necessary regardless of whether or not they are indicated on the drawings.
- B. In all boxes having a dimension over 6'-0" in any direction, conductors shall be racked in a neat manner. Outlet, pull or junction boxes shall be rigidly secured in place and shall in no way depend upon conduits for support.
- C. The Architect/Engineer shall have the option to relocate within ten (10) feet and prior to rough-in, any box without additional cost to the Owner.

DIVISION 16 - ELECTRICAL WORK
Section 16140 - Wiring Devices

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Contractor provide:
 - 1. Wall switches, receptacles and wall plates.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16130 - Boxes.
- E. Section 16160 - Panels and Enclosures.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. National Electrical Code (NEC).
 - 2. Underwriter's Laboratories, Inc. (UL).
 - 3. National Electrical Manufacturer's Association (NEMA).

1.04 SUBMITTALS

- A. Product Data.
 - 1. Wall switches, receptacles and wall plates.

2. PRODUCTS

2.01 MATERIALS

- A. Local and Miscellaneous Switches.
 - 1. All local switches: Rated 20 amperes, 120/77 volts, AC (not for DC). Equip each with an ivory toggle.

SECTION 16140-2

2. All switches shall be quiet type.

B. Schedule for Local Switches.

<u>Type of Switch</u>	<u>Bryant Cat. #</u>	<u>Arrow/Hart Cat. #</u>	<u>Hubbell Cat. #</u>	<u>P & S Cat. #</u>
1 pole	4901	1992	1221	20AC1
3 way	4903	1993	1223	20AC3
4 way	4904	1994	1224	20AC4

C. Switch Plates.

- Switch plates shall be provided for all switches with number of gangs and openings necessary.
- Plates for flush mounted devices in finished areas shall be smooth plastic, "Nylon" or "Noryl". Color to be ivory.

D. Convenience Receptacles.

- Flush, grounding type 20 ampere, 125 volt. Equip each receptacle with an ivory face.

E. Schedule of Convenience Receptacles.

<u>Type Receptacle</u>	<u>Bryant Cat. #</u>	<u>Arrow/Hart Cat. #</u>	<u>Hubbell Cat. #</u>	<u>P & S Cat. #</u>
duplex	5362	5739S	5362	6300

F. Ground Fault Interrupt Duplex Receptacles.

- Flush, grounding type, 20 amperes, 125 volt. Equip each receptacle with test and reset switch and an ivory face. Receptacle to be Pass & Seymour 159-F1 or approved equal.

G. Receptacle Cover Plates for Flush-Mounted Receptacles.

- Same finish as switch plates.

H. Substitutions shall be in accordance with Section 01640.

3. EXECUTION

3.01 INSTALLATION APPLICATION

A. Gang plates shall be used for all multiple device locations.

DIVISION 16- ELECTRICAL
Section 16150 - Motors

1. GENERAL

1.01. WORK INCLUDES:

A. Base Bid:

1. Electrical Contractor:

- a. Provide branch circuits for all motors complete with control wiring for automatic or remote control where required or as indicated.
- b. Make all electrical connections and install in place all starting equipment which is furnished by each Mechanical Contractor with his equipment.
- c. Install all motors not shipped integral with equipment.

1.02. RELATED WORK:

A. Specified Elsewhere:

- 1. 16010 - General Provisions
- 2. 16110 - Conduits
- 3. 16120 - Wires & Cables
- 4. 16130 - Boxes
- 5. 16140 - Wiring Devices
- 6. 16160 - Panelboards
- 7. 16170 - Motor & Circuit Disconnects
- 8. 16450 - Grounding
- 9. 16500 - Lighting
- 10. 16721 - Fire Alarm & Detection

B. Work Furnished but Installed by Others:

1. Each Contractor:

- a. Furnish magnetic starters for his equipment.
- b. Overload heaters for magnetic starters.
- c. Furnish all motors for his equipment.

1.03. SYSTEM DESCRIPTION:

A. Definitions:

- 1. "Each Contractor" refers to the General or Mechanical Contractor.

2. PRODUCTS

2.01. MATERIALS:

- A. Make in accordance with respective Sections of Division 16.

3. EXECUTION

3.01. INSTALLATION/APPLICATION:

- A. All magnetic starters and remote controls shall be rigidly secured in place.
- B. While overload heaters will be furnished with combination motor starters that are being furnished by others, check all heaters and the associated motors nameplate data for the proper application and ratings of these heater units for the motor being protected.

END 16150

DIVISION 16 - ELECTRICAL WORK
Section 16160 - Panels and Enclosures

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Contractor provide:
1. Panel boards, cabinets and circuit breakers.

1.02 RELATED SECTIONS

- A. Section 01340 - Shop Drawings, Product Data and Samples.
- B. Section 16010 - General Provisions.
- C. Section 16110 - Conduit.
- D. Section 16130 - Boxes.
- E. Section 16140 - Wiring Devices.
- F. Section 16450 - Grounding.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
1. National Electrical Code (NEC).
 2. Underwriter's Laboratories, Inc. (UL).
 3. National Electrical Manufacturer's Association (NEMA).

1.04 SUBMITTALS

- A. Provide product data for panelboards and circuit breakers under provisions of Section 01340.

2. PRODUCTS

2.01 ACCEPTABLE MANUFACTURERS

- A. Square D.
- B. Substitutions in accordance with Section 01640.

2.02 MATERIALS

SECTION 16160-2

- A. Lighting and Power Panels, Cabinets and Breakers.
1. Provide panels and cabinets where indicated.
 2. Refer to drawings for Panel Information.
 3. Lighting panels shall be arranged with circuit breaker branches or capacities as shown and with lugs or circuit breakers in the mains as indicated.
 4. Breakers shall have minimum interrupting capacities as follows (amperes, symmetrical RMS, NEMA Rating).
 - a. Main breaker - 50,000 amperes.
 - b. Branch circuit breakers - 10,000 amperes @ 240V.
 5. 120/208 volt branch circuit breakers shall be plug-in type, of ratings shown, shall be quick-make, quick-break with inverse time tripping characteristics with automatic release secured through a combination thermal-magnetic trip element.
 6. 277/480 volt branch circuit breakers shall be bolt-on, heavy duty type with frame size as required or indicated.
 7. Panels shall have ground bus bars, and neutral bus bars with neutral main lugs and as many taps as there are branch circuits.
 - a. Bus bars shall be copper at 1,000 amperes per square inch cross sectional area.
 - b. Each panel section shall receive spare circuits as indicated, shall include circuit breaker.
 8. Where blank spaces are indicated, they shall be for future breakers.
 - a. Include all connections and mounting breakers at these blank spaces for the installation of future breakers.
 9. Panels shall be mounted in code gauge cabinets of galvanized steel with wiring gutter on four (4) sides.
 - a. Fronts shall be of one (1) piece of code gauge steel with trim. Doors shall be provided for panels, complete with key lock and circuit directory frame and typed card.

3. EXECUTION

3.01 INSTALLATION

- A. All panelboards shall be rigidly secured in place.

SECTION 16160-3

- B. Wiring in panelboards shall be neat and tied with cable ties as specified in Section 16120.

END 16160.

16160-3

DIVISION 16 - ELECTRICAL WORK
Division 16170 - Motor and Circuit Disconnects

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Electrical Contractor provide:
 - 1. Safety switches (disconnect switches).
 - 2. TT switches.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16130 - Boxes.
- E. Section 16140 - Wiring Devices.
- F. Section 16150 - Motors.
- G. Section 16450 - Grounding.
- H. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
 - 1. National Electrical Code (NEC).
 - 2. Underwriter's Laboratories, Inc. (UL).
 - 3. National Electrical Manufacturer's Association (NEMA).

1.04 SUBMITTALS

- A. Provide product data for safety switches and TT switches under provisions of Section 01340.

2. PRODUCTS

2.01 SWITCHES

- A. Safety Switches.
 - 1. All safety switches shall be heavy duty industrial type, 600 volt AC, 2 pole, fused unless noted otherwise.
 - 2. In general, mount all fusible and non-fusible safety switches in NEMA 1 enclosures.
 - 3. Where indicated to be weatherproof, mount in NEMA 3R enclosures.
- B. TT switches.

<u>Item</u>	<u>Square D</u>	<u>G. E.</u>	<u>ITE</u>
1P TT switch	FG-1	CR101H1	C11T11
2P TT switch	FG-2	CR101H2	C11T21

SECTION 16170-2

C. Substitutions in accordance with Section 01640.

3. EXECUTION

3.01 INSTALLATION

- A. Provide all safety switches for motor disconnects, appliance or equipment disconnects and similar items.
- B. Safety switches shall be rigidly attached to wall and shall in no way depend on conduits for support.

END

16170-2

DIVISION 16 - ELECTRICAL WORK
Section 16450 - Grounding

1. GENERAL

1.01 SECTION INCLUDES

A. Base Bid, Contractor provide:

1. Provide a station grounding system to ground distribution panels.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16130 - Boxes.
- E. Section 16140 - Wiring Devices.
- F. Section 16160 - Panels and Enclosures.
- G. Section 16500 - Lighting.

1.03 QUALITY ASSURANCE

A. Regulatory Requirements.

1. Article 250, National Electrical Code (NEC).

2. PRODUCTS

2.01 MATERIALS

- A. Copper grounding conductor in accordance with Article 250, National Electrical Code.

3. EXECUTION

3.01 INSTALLATION

- A. In accordance with Article 250, National Electrical Code.

DIVISION 16 - ELECTRICAL WORK
Section 16500 - Lighting

1. GENERAL

1.01 SECTION INCLUDES

- A. Base Bid, Contractor provide:
1. Lighting fixtures, lamps and accessories.

1.02 RELATED SECTIONS

- A. Section 16010 - General Provisions.
- B. Section 16110 - Conduit.
- C. Section 16120 - Wire and Cable.
- D. Section 16130 - Boxes.
- E. Section 16140 - Wiring Devices.
- F. Section 16160 - Panels and Enclosures.
- G. Section 16450 - Grounding.

1.03 QUALITY ASSURANCE

- A. Regulatory Requirements.
1. National Electrical Code (NEC).
 2. Underwriter's Laboratories, Inc. (UL).
 3. Certified Ballast Manufacturer's (CBM).
 4. Electrical Testing Laboratories (ETL).

1.04 SUBMITTALS

- A. Provide product data for all light fixtures and accessories under the provisions of Section 01340.

2. PRODUCTS

2.01 MATERIALS

- A. Refer to Plans for Light Fixture Schedule.
- B. All light fixtures on 115 volt circuits shall have 125 volt lamps.

SECTION 16500-2

- C. Fluorescent type lamps to be cool white color unless noted otherwise on Drawings.

3. EXECUTION

3.01 INSTALLATION

- A. Fixtures shall be wired with white wire for the neutral and colored wire for phase wires.
- B. Housing of all fixtures must be grounded.
- C. Each fixture to be complete with holders, screws, sockets, wires, and lamps as are necessary for a complete installation.
- D. Each fixture to be tested after installation for ground and/or shorts.
- E. Fixtures shall be installed and supported in accordance with the manufacturer's recommendations.