

SECTION 13 1610 – WATER FEATURE ELECTRICAL ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. This section includes the following:

1. Raceways
2. Wires and Cables
3. Boxes
4. Wiring Devices
5. Supporting Devices and Hangers

B. Related Sections:

1. SECTION 13 1601 – WATER FEATURE GENERAL ELECTRICAL REQUIREMENTS
2. SECTION 13 1602 – WATER FEATURE CONTROLS
3. SECTION 13 1603 – WATER FEATURE SCADA CONTROL
4. SECTION 13 1604 – WATER FEATURE FIELD INSTRUMENTS, SWITCHES, AND ALARMS
5. SECTION 13 1605 – WATER FEATURE CONTROL PANELS
6. SECTION 13 1607 – WATER FEATURE PROGRAMMABLE LOGIC CONTROLLERS
7. SECTION 13 1608 – WATER FEATURE UNDERWATER LIGHTING CONTROLS
8. SECTION 13 1609 – WATER FEATURE DISCONNECTS, MCC, AND STARTERS
9. SECTION 13 1611 – WATER FEATURE GROUNDING
10. SECTION 26 0000 – ELECTRICAL

C. References:

1. NFPA 70 – National Electrical Code (NEC)
2. Underwriters Laboratories (UL)

1.2 SUBMITTALS FOR REVIEW

A. SECTION 01 3300 – SUBMITTAL PROCEDURES

- B. Product Data: Submit Manufacturer's literature, cut sheets indicating mounting instructions, sensor dimensions, materials, electrical requirements, and operational parameters.
- C. Warranty: Submit manufacturer's warranty and ensure forms have been completed in the owner's name and registered with the manufacturer.

PART 2 - PRODUCTS

2.1 RACEWAYS

A. Conduit

1. 1/2-inch (15mm) minimum diameter unless indicated otherwise and used strictly as indicated by product. If not indicated on the Contract Documents, size conduit for conductor type and quantity installed.
2. Galvanized Rigid Steel or Galvanized Intermediate Metallic Conduit (IMC).
 - a. May be used in all areas
3. Galvanized Electrical Metallic Tubing (EMT)
 - a. May be used in indoor dry locations where it is:
 - i. Not subject to damage
 - ii. Not in contact with earth
 - iii. Not in concrete

4. Schedule 40 Polyvinyl Chloride (PVC)
 - a. May only be used
 - i. Underground
 - ii. In or below concrete
 - b. Use Galvanized Rigid Steel elbows and risers wrapped with approved protection tape.
 5. Flexible Steel Conduit
 - a. 3/4-inch (20mm) minimum.
 - b. Required for final connections to indoor mechanical equipment, length not to exceed 36 inches (1m).
 6. Listed, Liquid-Tight Flexible Metallic Conduit
 - a. Use in outdoor final connections to mechanical equipment, not to exceed 36 inches (1m) with ground conductor.
 - B. Fittings
 1. Compression type or set-screw type with steel housing for EMT conduits.
 2. Screw-in type for flexible metal conduit.
 3. Seal-Tite type for liquid-tight flexible metal conduit.
 4. PVC Conduit
 - a. PVC fittings shall be PVC type. Use PVC adapters at all boxes.
 - b. Brush applied PVC Cement.
 - c. All PVC components (conduit, fittings, cement) shall be from the same Manufacturer.
 5. Rigid and IMC conduit fittings shall be threaded and designed for conduit use.
 - C. Prohibited Materials
 1. Aluminum Conduit
 2. Crimp-on, tap-on, indenter type fittings
 3. Malleable iron or cast set-screw fittings for EMT
 4. Spray (aerosol) PVC cement
 5. Type MC or AC Cable
 6. ENT Conduit
- 2.2 WIRES AND CABLES
- A. Conductors
 1. Feeders in conduit and ducts shall be copper-type THW, THHN, or XHHW.
 2. Branch circuits in conduit in dry locations shall be copper, minimum #12 AWG – Type THHN.
 - B. Connectors
 1. Type 512, 3M tapeless steel spring wire connectors or pressure type terminal lugs as specified in the Contract Documents.
- 2.3 BOXES
- A. Outlet Boxes
 1. Galvanized steel and correct size and shape.
 2. Provide metal supports and other accessories for installation of each box.
 3. Equip ceiling and bracket fixture boxes with fixture studs, where required.
 4. No outlet box shall be smaller than 4-inches (100mm); for 1-inch (25mm) diameter conduit, boxes shall be 4-11/16-inch (120mm) minimum.

2.4 WIRING DEVICES

A. Switches and Receptacles

1. Switches are 20 ampere. Where higher ampere devices are required they shall be of the same series as those listed. Devices of single type shall be of the same Manufacturer.
2. Approved Manufacturers
 - a. Switches
 - i. Hubbell – CS1221 Series
 - ii. Approved Equal

B. Receptacles

1. Receptacles are to be 15 amperes. Where higher ampere devices are required they shall be of the same series as those listed. Devices of single type shall be of the same Manufacturer.
2. Approve Manufacturers
 - a. Receptacles
 - i. Hubbell – CR5252 Series
 - ii. Approved Equal
 - b. Ground Fault Receptacles
 - i. Hubbell – GF5352I
 - ii. Leviton – 6899-I
 - iii. Pass & Seymour – 2091-S-I
 - iv. Approved Equal

C. Weatherproof Receptacles

1. Complete with corrosion resistant plate, spring lid cover, and weatherproof mats.
2. Approved Manufacturers.
 - a. Pass & Seymour – WP-8
 - b. Approved Equal

D. Plates

1. Metal covers shall be used for all surface-mounted boxes.

2.5 SUPPORTING DEVICES AND HANGERS

A. Approved Manufacturers

1. Erico Products, Incorporated
2. Steel City
3. Minerallac
4. Approved Equal

B. Provide the appropriate supporting devices and hangers for electrical equipment from the following:

1. Beam Clamps
 - a. Set-Screw Type
 - b. Universal Clamps
 - c. Vertical Flange Clamps (Beam Clamps)
2. Clips
 - a. Conduit Clips
 - b. Combination Push-in Conduit Clips

- c. Flexible Conduit Clips
- d. Special Combination Conduit Clips
- e. "Z" Purlin Clips
- 3. Combination Conduit Hanger Clamps
- 4. One Hole Steel Strap
- 5. Minerallac Conduit Hangers
- 6. Other Hangers or Supports per the discretion of the Engineer

PART 3 - EXECUTION**3.1 RACEWAY INSTALLATION**

- A. Keep all raceway runs a minimum of 6-inches (150mm) from hot water or vent lines.
- B. Conduit in concrete slabs shall not exceed 3/4-inch (20mm) I.P. size and shall be spaced no closer than 8-inches (200mm) on center except at panel and junction boxes where they are to be spread as widely as possible; special framing may be required where conduits enter a panel board.
- C. Support conduit and boxes in an appropriate manner by:
 - 1. Expansion shields in concrete or solid masonry
 - 2. Toggle bolts on hollow masonry units
 - 3. Wood screws on wood
 - 4. Metal screw on metal
- D. Secure conduit with approved supports within 3-feet (1m) of every outlet box, junction box, gutter, panel, fitting, etc. Do not space support further apart than 10-feet (3m). Do not support conduit on suspended ceiling grid (tile or sheet rock).
- E. Cap conduit ends during construction.
- F. Clean or replace conduit in which water or foreign matter has accumulated.
- G. Install insulated bushings on each end of conduit 1-1/4-inch (32mm) in diameter and larger.
- H. Install grounding conductor in PVC conduit.
- I. Bending of PVC shall be by hot box.
- J. Route exposed conduit at right angles or parallel to walls of buildings and not "as the crow flies". Neatly rack parallel conduits together and make bends uniform to one another. Where installation is made inferior utilizing poor practice contrary to these methods as determined by the Engineer, said installation will be removed and reinstalled at the Contractor's expense.
- K. Coat buried Rigid or IMC Conduit with approved asphaltic compound or wrap with two layers of approved corrosion protection tape.
- L. Leave one (1) #10 or equivalent nylon pull wire in empty conduits.
- M. When PVC conduit is used, turn up with Rigid Galvanized elbows and risers to provide equipment grounding conductor in accordance with NEC, Article 250.
- N. Cut and thread conduit so ends will butt in couplings. Make threads no longer than necessary and ream pipe free of burrs.
- O. Prohibited Procedures
 - 1. Use of wooden plugs inserted in concrete or masonry units as base for fastening conduits, tubing, boxes, cabinets, or other equipment.
 - 2. Installation of conduit or tubing that has been crushed or deformed.
 - 3. Torches for bending PVC Conduit.

3.2 WIRES AND CABLES INSTALLATION

- A. Install Conductors in Raceway.
- B. Pulling Conductors
 - 1. Do not pull Conductors into conduit until raceway system is complete and cabinets and outlet boxes are free of foreign matter and moisture.
 - 2. Do not use heavy mechanical means for pulling conductors.
 - 3. Only wire pulling lubricant may be used.
- C. Conductors shall be continuous from outlet to outlet.
- D. Making splices for Conductors #8 AWG and smaller with steel spring wire connections. Splice larger conductors with Lock-Tite type silicon bronze type connectors. Insulated connections of #8 AWG wire and larger with 3M #33 tape.
- E. Run Conductors of different voltage systems in separate conduits.
- F. Leave sufficient slack at terminations to make proper connections.
- G. Conductor size #10 AWG and smaller shall be colored throughout. Color code Conductors as follows:
 - 1. 120/240 volts
 - a. Black – Phase A
 - b. Red – Phase B
 - c. Green – Ground
 - d. White – Neutral
 - 2. Approved color tape is acceptable for feeders only.

3.3 BOXES INSTALLATION

- A. Boxes shall be accessible and installed with appropriate cover.
- B. Sectional boxes shall not be used in concrete.
- C. Locate boxes so outlets are not obstructed by pipes, ducts, or other items.
- D. Label all circuits and source panels on exterior of each junction box.

3.4 WIRING DEVICES INSTALLATION

- A. Provide properly sized outlet boxes for all wiring devices of types specified for outlets and junction boxes in the Contract Documents.
- B. Properly wire all convenience outlets so that the hot wire, the neutral wire, and the ground wire connect to the proper terminal on all receptacles.
- C. Label source panel and circuit number on the back of all device cover plates.
- D. Provide grounding jumper from device grounding terminal to metal back box.
- E. Provide GFI receptacles in areas as required by the NEC whether indicated on the Contract Documents or not.

3.5 SUPPORTING DEVICES AND HANGERS INSTALLATION

- A. Secure conduits to within 3-feet (1m) of each outlet box, junction box, cabinet, fitting, etc and at intervals not exceeding 10-feet (3m).
- B. Install clamps secured to structure for feeder and other conduit routed against the structure. Use drop rods and hangers to support conduits run apart from the structure.

- C. Paint all supporting metal not otherwise protected, with rust inhibiting primer and then with a finish coat, if appropriate to match the surrounding metal surfaces.
- D. Use of chains, perforated iron, baling wire, rope, or tie wire for supporting conduit runs will not be permitted.

END OF SECTION