

SECTION 16135 CABINETS, BOXES, AND FITTINGS

PART 1 GENERAL

1.1 SUMMARY:

- A. This section includes cabinets, boxes, and fittings for electrical installations and certain types of electrical fittings not covered in other sections. Types of products specified in this Section include:
 - 1. Outlet and device boxes.
 - 2. Pull and junction boxes.
 - 3. Floor boxes and service fittings.
 - 4. Cabinets.
 - 5. Hinged door enclosures.
 - 6. Boxes and fittings for hazardous locations.
- B. Conduit-body-type electrical enclosures and wiring fittings are specified in the Division 16 Section on Raceways.

1.2 DEFINITIONS:

- A. Cabinets: An enclosure designed either for surface or for flush mounting and having a frame, or trim in which a door or doors may be mounted.
- B. Device Box: An outlet box designed to house a receptacle device or a wiring box designed to house a switch.
- C. Enclosure: A box, case, cabinet, or housing for electrical wiring or components.
- D. Hinged Door Enclosure: An enclosure designed for surface mounting and having swinging doors or covers secured directly to and telescoping with the walls of the box.
- E. Outlet Box: A wiring enclosure where current is taken from a wiring system to supply utilization equipment.
- F. Wiring Box: An enclosure designed to provide access to wiring systems or for the mounting of indicating devices or of switches for controlling electrical circuits.

1.3 SUBMITTALS:

- A. Submit product data for cabinets and enclosures with classification higher than NEMA 1.
- B. Shop drawings for floor boxes and boxes, enclosures and cabinets that are to be shop fabricated, (nonstock items). For shop fabricated junction and pull boxes, show accurately scaled views and spatial relationships to adjacent equipment. Show box types, dimensions, and finishes.

PART 2 PRODUCTS

2.1 MANUFACTURERS:

- A. Manufacturers: Subject to compliance with requirements, provide products by the following:
 - 1. Floor Boxes:
 - a. American Electric.
 - b. Butler Mfg. Co.
 - c. Cooper Industries, Inc.
 - d. Raco, Inc.

- e. Thomas & Betts Corp.
2. Cabinets:
- a. Hoffman Engineering Co.
 - b. Erickson Electrical Equipment Co.
 - c. Electric Panelboard, Inc.
 - d. Parker Electrical Mfg. Co.
 - e. Spring City Electrical Mfg. Co.
 - f. Square D Co.
 - g. Circle AW
3. Boxes and Fittings for Hazardous Locations:
- a. OZ/Gedney.
 - b. Cooper Industries, Inc.
 - c. Killark Electric Mfg. Co.
 - d. Adalet-PLM.
 - e. Robroy Industries, Inc.
 - f. Spring City Electrical Mfg. Co.
 - g. Appleton
- 2.2 CABINETS, BOXES, AND FITTINGS, GENERAL:
- A. Electrical Cabinets, Boxes, and Fittings: Of indicated types, sizes, and NEMA enclosure classes. Where not indicated, provide units of types, sizes, and classes appropriate for the use and location. Provide all items complete with covers and accessories required for the intended use. Provide gaskets for units in damp or wet locations.
- 2.3 MATERIALS AND FINISHES:
- A. Sheet Steel: Flat-rolled, code-gage, galvanized steel.
 - B. Fasteners for General Use: Corrosion resistant screws and hardware including cadmium and zinc plated items.
 - C. Fasteners for Damp or Wet Locations: Stainless steel screws and hardware.
 - D. Cast Metal for Boxes, Enclosures, and Covers; Copper-free aluminum except as otherwise specified.
 - E. Exterior Finish: Gray baked enamel for items exposed in finished locations except as otherwise indicated.
 - F. Painted Interior Finish: Where indicated, white baked enamel. Emergency system cabinets and boxes shall be red.
 - G. Fittings for Boxes, Cabinets, and Enclosures: Conform to UL 514B. Malleable iron or zinc plated steel for conduit hubs, bushings and box connectors.
- 2.4 METAL OUTLET, DEVICE, AND SMALL WIRING BOXES:
- A. General: Conform to UL 514A, "Metallic Outlet Boxes, Electrical," and UL 514B, "Fittings for Conduit and Outlet Boxes." Boxes shall be of type, shape, size, and depth to suit each location and application.
 - B. Steel Boxes: Conform to NEMA OS 1, "Sheet Steel Outlet Boxes, Device Boxes, Covers, and Box Supports." Boxes shall be sheet steel with stamped knockouts, threaded screw holes and accessories suitable for each location including mounting brackets and straps, cable clamps, exterior rings and fixture studs.

- C. Cast-Aluminum Boxes: Copper free aluminum threaded raceway entries, and features and accessories suitable for each location including mounting ears, threaded screw holes for devices and closure plugs.
 - D. Malleable or Cast-Iron Boxes: Iron alloy, waterproof, with threaded raceway entries and features and accessories suitable for each location, including mounting ears, threaded screw holes for devices and closure plugs.
 - E. Malleable or Cast-Iron Floor Boxes: Fully adjustable, waterproof, with threaded raceway entrances, adjusting rings, gaskets, and brass floor plates. Where indicated, provide multi-section boxes with individual hinged section covers. Provide for power, data, and communication outlets as indicated on the drawings.
 - F. Steel Floor Boxes: Sheet steel, concrete tight, fully adjustable, with stamped knockouts, adjusting rings, and brass floor plates. Where indicated, provide multi-section boxes with concealed individual section covers under a common flush floor plate. Provide for power, data, and communication outlets as indicated on the drawings.
 - G. Service Fittings for Floor Outlet Boxes: Surface mounted horizontal, cast aluminum type 3-inches high, suitable for finished spaces and finished in satin aluminum, except as otherwise indicated. Provide duplex receptacle or 1-inch bushed opening for telephone or other communications service as indicated. Equip fitting for attaching flat to floor box cover.
 - H. Concealed Service Floor Box: Malleable, cast iron, or steel floor boxes as specified above designed to deliver power, data, and communications services from outlets concealed within the box and accessible through a single hinged cover. The cover shall fit into the top of the floor box and include a carpet or tile floor flange, a hinged steel reinforced floor plate with provision for mounting a piece of carpet or tile, and a small retractable cable exit. Provide for power, communications, and data outlets as indicated on the drawings.
- 2.5 NONMETALLIC OUTLET, DEVICE, AND SMALL WIRING BOXES:
- A. General: Conform to NEMA OS 2, "Nonmetallic Outlet Boxes, Device Boxes, Covers, and Box Supports" and UL 514C, " Nonmetallic Outlet Boxes, Flush Device Boxes and Covers." Boxes shall be molded PVC units of type, shape, size, and depth to suit location and application.
 - B. Boxes for Concealed Work: Mounting provisions and wiring entrances to suit installation conditions and wiring method used.
 - C. Boxes for Exposed Work: Ultra-violet stabilized, nonconductive, high impact-resistant boxes with integrally molded raceway entrance hubs and removable mounting flanges. Boxes shall be equipped with threaded screw holes for device and cover plate mounting. Each box shall have a molded cover of matching PVC material suitable for the application.
- 2.6 PULL AND JUNCTION BOXES:
- A. General: Comply with UL 50, "Electrical Cabinets and Boxes", for boxes over 100 cubic inches volume. Boxes shall have screwed or bolted on covers of material same as box and shall be of size and shape to suit application.
 - B. Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing.

- C. Hot-Dipped Galvanized Steel Boxes: Sheet steel with welded seams. Where necessary to provide a rigid assembly, construct with internal structural steel bracing. Hot-dip galvanized after fabrication. Cover shall be gasketed.
 - D. Stainless-Steel Boxes: Fabricate of stainless steel conforming to Type 302 of ASTM A 167, "Specification for Stainless and Heat Resisting Chromium-Nickel Steel Plate, Sheet, and Strip." Where necessary to provide a rigid assembly, construct with internal structural stainless steel bracing. Cover shall be gasketed.
 - E. Cast-Aluminum Boxes: Molded of copper free aluminum, with gasketed cover and integral threaded conduit entrances.
 - F. Malleable or Cast-Iron Boxes: Molded of iron alloy with gasketed cover and integral threaded conduit entrances.
 - G. Boxes Approved for Classified Locations: Cast metal boxes conforming to UL 886, "Outlet Boxes and Fittings for Use in Hazardous (Classified) Locations," listed and labeled for use in the specific location classification, and with the specific hazardous material encountered. Conduit entrances shall be integral threaded type.
- 2.7 CABINETS:
- A. Comply with UL 50, "Electrical Cabinets and Boxes."
 - B. Construction: Sheet steel, NEMA 1 class except as otherwise indicated. Cabinet shall consist of a box and a front consisting of a one piece frame and a hinged door. Arrange door to close against a rabbet placed all around the inside edge of the frame, with a uniformly close fit between door and frame. Provide concealed fasteners, not over 24 inches apart, to hold fronts to cabinet boxes and provide for adjustment. Provide flush or concealed door hinges not over 24 inches apart and not over 6 inches from top and bottom of door. For flush cabinets, make the front approximately 3/4 inch larger than the box all around. For surface mounted cabinets make front same height and width as box.
 - C. Doors: Double doors for cabinets wider than 24 inches. Telephone cabinets wider than 48 inches may have sliding or removable doors.
 - D. Locks: Combination spring catch and key lock, with all locks for cabinets of the same system keyed alike. Locks may be omitted on signal, power, and lighting cabinets located within wire closets and mechanical-electrical rooms. Locks shall be of a type to permit doors to latch closed without locking.
- 2.8 STEEL ENCLOSURES WITH HINGED DOORS:
- A. Comply with UL 50, "Cabinets and Enclosures" and NEMA ICS 6, "Enclosures for Industrial Controls and Systems."
 - B. Construction: Sheet steel, 16 gage, minimum, with continuous welded seams. NEMA class as indicated; arranged for surface mounting.
 - C. Doors: Hinged directly to cabinet and removable, with approximately 3/4 inch flange around all edges, shaped to cover edge of box. Provide handle operated, key locking latch. Individual door width shall be no greater than 24 inches. Provide multiple doors where required.
 - D. Mounting Panel: Provide painted removable internal mounting panel for component installation.

- E. Enclosure: NEMA 1 except as indicated. Where door gasketing is required, provide neoprene gasket attached with oil-resistant adhesive, and held in place with steel retaining strips. For all enclosures of class higher than NEMA 1, use hubbed raceway entrances.
- 2.9 CAST METAL ENCLOSURES WITH HINGED DOORS:
- A. Copper free aluminum with bolted, hinged doors. Where used at hazardous (classified) locations, enclosures shall conform to UL and shall be listed and labeled for the classification of hazard involved.
- 2.10 MOLDED NONMETALLIC ENCLOSURES WITH HINGED DOOR:
- A. General: Molded, glass fiber reinforced high impact strength polyester with bolt or screw secured doors and solid neoprene gaskets.

PART 3 EXECUTION

- 3.1 INSTALLATION, GENERAL:
- A. Locations: Install items where indicated and where required to suit code requirements and installation conditions.
 - B. Cap unused knockout holes where blanks have been removed and plug unused conduit hubs.
 - C. Support and fasten items securely in accordance with Division 16 Section on Supporting Devices.
 - D. Sizes shall be adequate to meet NEC volume requirements, but in no case smaller than sizes indicated.
 - E. Remove sharp edges where they may come in contact with wiring or personnel.
- 3.2 APPLICATIONS:
- A. Cabinets: Flush mounted, NEMA enclosure type 1 except as otherwise indicated.
 - B. Hinged Door Enclosures Indoor: NEMA type 1 enclosure except as indicated.
 - C. Hinged Door Enclosures Outdoors: NEMA Type 4. Install drip hood, factory tailored to individual units.
 - D. Hinged Door Enclosures in Corrosive Locations: NEMA type 4X nonmetallic enclosure.
 - E. Outlet Boxes and Fittings: Install outlet and device boxes and associated covers and fittings of materials and NEMA types suitable for each location and in conformance with the following requirements:
 1. Interior Dry Locations: NEMA Type 1, sheet steel or nonmetallic as permitted by local code.
 2. Locations Exposed to Weather or Dampness: Cast metal, NEMA type 3R.
 3. Wet Locations: NEMA Type 4 enclosures.
 4. Corrosive Locations: NEMA Type 4X enclosures.
 5. Hazardous (Classified) Locations: NEMA type listed and labeled for the location and class of hazard indicated.
 - F. Pull and Junction Boxes: Install pull and junction boxes of materials and NEMA types suitable for each location except as otherwise indicated.
 - G. Floor Boxes: In slabs on grade and wet locations use NEMA type 4 boxes. At other locations in slabs, use concrete-tight NEMA 1 boxes.

3.3 INSTALLATION OF OUTLET BOXES:

- A. Outlets at Windows and Doors: Locate close to window trim. For outlets indicated above doors center outlets above the door opening except as otherwise indicated.
- B. Column and Pilaster Locations: Locate outlet boxes for switches and receptacles on columns or pilasters so the centers of the columns are clear for future installation of partitions.
- C. Locations in Special Finish Materials: For outlet boxes for receptacles and switches mounted in desks or furniture cabinets or in glazed tile, concrete block, marble, brick, stone or wood walls, use rectangular shaped boxes with square corners and straight sides. Install such boxes without plaster rings. Saw cut all recesses for outlet boxes in exposed masonry walls.
- D. Gasketed Boxes: At the following locations use malleable or cast metal, threaded hub type boxes with gasketed weatherproof covers:
 - 1. Exterior locations.
 - 2. Where surface mounted on unfinished walls, columns or pilasters. (Cover gaskets may be omitted in dry locations).
 - 3. Where exposed to moisture laden atmosphere.
 - 4. At food preparation equipment within four ft. of steam connections.
 - 5. Where indicated.
- E. Mounting: Mount outlet boxes for switches with the long axis vertical or as indicated. Mount boxes for receptacles vertically, except above counter receptacles to be mounted horizontally. Three or more gang boxes shall be mounted with the long axis horizontal. Locate box covers or device plates so they will not span different types of building finishes either vertically or horizontally. Locate boxes for switches near doors on the side opposite the hinges and close to door trim, even though electrical floor plans may show them on hinge side. Provide far side box supports, for electrical switch boxes installed on metal studs and provide stud to stud support for electrical receptacle boxes installed on metal studs.
- F. Ceiling Outlets: For fixtures, where wiring is concealed, use outlet boxes 4 inches square by 1-1/2 inches deep, minimum.
- G. Cover Plates for Surface Boxes: Use plates sized to box front without overlap.
- H. Protect outlet boxes to prevent entrance of plaster, and debris. Thoroughly clean foreign material from boxes before conductors are installed.
- I. Concrete Boxes: Use extra deep boxes to permit side conduit entrance without interfering with reinforcing, but do not use such boxes with over 6 inch depth.
- J. Floor Boxes: Install in concrete floor slabs so they are completely enveloped in concrete except for the top. Where normal slab thickness will not envelop box as specified above, provide increased thickness of the slab. Provide each compartment of each floor box with grounding terminal consisting of a washer-in-head machine screw, not smaller than no. 10-32, screwed into a tapped hole in the box. Adjust covers of floor boxes flush with finished floor.
- K. Existing Outlet Boxes: Where extension rings are required to be installed, drill new mounting holes in the rings to align with the mounting holes on the existing boxes where existing holes are not aligned.

- L. Back to back outlet boxes are not permitted. Separate boxes a minimum of 6 inches in standard walls and 24 inches in acoustical walls.

3.4 INSTALLATION OF PULL AND JUNCTION BOXES:

- A. Box Selection: For boxes in main feeder conduit runs, use sizes not smaller than 8 inches square by 4 inches deep. Do not exceed 6 entering and 6 leaving raceways in a single box. Quantities of conductors (including equipment grounding conductors) in pull or junction box shall not exceed the following:

Size of Largest Conductors in <u>Box</u>	Maximum no. of Conductors in <u>Box</u>
No. 4/0 AWG	30
250 MCM	20
500 MCM	15
Over 500 MCM	10

- B. Cable Supports: Install clamps, grids, or devices to which cables may be secured. Arrange cables so they may be readily identified. Support cable at least every 30 inches inside boxes.
- C. Mount pull boxes in inaccessible ceilings with the covers flush with the finished ceiling.
- D. Size: Provide pull and junction boxes for telephone, signal, and other systems at least 50 percent larger than would be required by Article 370 of NEC, or as indicated. Locate boxes strategically and provide shapes to permit easy pulling of future wires or cables of types normal for such systems.

3.5 INSTALLATION OF CABINETS AND HINGED DOOR ENCLOSURES:

- A. Mount with fronts straight and plumb.
- B. Install with tops 78 inches above floor.
- C. Set cabinets in finished spaces flush with walls.

3.6 GROUNDING:

- A. Electrically ground metallic cabinets, boxes, and enclosures. Where wiring to item includes a grounding conductor, provide a grounding terminal in the interior of the cabinet, box or enclosure.

3.7 CLEANING AND FINISH REPAIR:

- A. Upon completion of installation, inspect components. Remove burrs, dirt, and construction debris and repair damaged finish including chips, scratches, abrasions and weld marks.
- B. Galvanized Finish: Repair damage using a zinc-rich paint recommended by the manufacturer.
- C. Painted Finish: Repair damage using matching corrosion inhibiting touch-up coating.

END OF SECTION 16135