

SECTION 16140

WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates
 - 2. Twist-locking receptacles
 - 3. Wall-box motion sensors
 - 4. Isolated-ground receptacles
 - 5. Snap switches and wall-box dimmers
 - 6. Wall-switch
 - 7. Communications outlets
 - 8. Pendant cord-connector devices
 - 9. Cord and plug sets
 - 10. Access Control System Devices
 - 11. Smoke Detectors
- B. Related Sections include the following:
 - 1. Section 16717 for workstation outlets

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference
- B. GFCI: Ground-fault circuit interrupter
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor
- D. RFI: Radio-frequency interference
- E. UTP: Unshielded twisted pair

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated in accordance with Section 01340

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use
- C. Comply with NFPA 70

1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations
 - 1. Cord and plug sets: Match equipment requirements

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper)
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell)
 - 3. Leviton Mfg. Company Inc. (Leviton)
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour)

2.2 STRAIGHT BLADE RECEPTACLES

- A. Industrial Grade Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498
 - 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 5361 (single), 5362 (duplex)
 - b. Hubbell; HBL5361 (single), CR5362 (duplex)
 - c. Leviton; 5361 (single), 5362 (duplex)
 - d. Pass & Seymour; 5361 (single), 5362 (duplex)
- B. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498
 - 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Hubbell; CR 5253IG
 - b. Leviton; 5362-IG
 - c. Pass & Seymour; IG6300

2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A
 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; GF20
 - b. Pass & Seymour; 2084
- C. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with UL 498 Supplement SD
 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; HGF20
 - b. Hubbell; HGF8300
 - c. Leviton; 8898-HG
 - d. Pass & Seymour; 2091-SHG

2.4 TWIST-LOCKING RECEPTACLES

- A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration L5-20R, and UL 498
 1. Products: Subject to compliance with requirements, provide one of the following
 - a. Cooper; L520R
 - b. Hubbell; HBL2310
 - c. Leviton; 2310
 - d. Pass & Seymour; L520-R

2.5 PENDANT CORD-CONNECTOR DEVICES

- A. Description: Matching, locking-type plug and receptacle body connector; NEMA WD 6 configurations L5-20P and L5-20R, heavy-duty grade
 1. Body: Nylon with screw-open cable-gripping jaws and provision for attaching external cable grip
 2. External cable grip: Woven wire-mesh type made of high-strength galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector

2.6 CORD AND PLUG SETS

- A. Description: Match voltage and current ratings and number of conductors to requirements of equipment being connected
 - 1. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and equipment-rating ampacity plus a minimum of 30 percent
 - 2. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection

2.7 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20
- B. Switches, 120/277 V, 20 A
 - 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way)
 - b. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way)
 - c. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way)
 - d. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way)
- C. Pilot Light Switches, 20 A
 - 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 2221PL for 120 V and 277 V
 - b. Hubbell; HPL1221PL for 120 V and 277 V
 - c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V
 - d. Pass & Seymour; PS20AC1-PLR for 120 V
 - 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON"
- D. Key-Operated Switches, 120/277 V, 20 A
 - 1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 2221L
 - b. Hubbell; HBL1221L
 - c. Leviton; 1221-2L
 - d. Pass & Seymour; PS20AC1-L
 - 2. Description: Single pole, with factory-supplied key in lieu of switch handle
- E. Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 1995
 - b. Hubbell; HBL1557
 - c. Leviton; 1257
 - d. Pass & Seymour; 1251
- F. Key-Operated, Single-Pole, Double-Throw, Momentary Contact, Center-Off Switches, 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle
1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 1995L
 - b. Hubbell; HBL1557L
 - c. Leviton; 1257L
 - d. Pass & Seymour; 1251L

2.8 OCCUPANCY SENSORS

A. Wall-Switch Sensors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 6111 for 120 V, 6117 for 277 V
 - b. Hubbell; WS1277
 - c. Leviton; ODS 10-ID
 - d. Pass & Seymour; WS3000
 - e. Watt Stopper (The); WS-200
2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

B. Wall-Switch Sensors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Hubbell; AT120 for 120 V, AT277 for 277 V
 - b. Leviton; ODS 15-ID
2. Description: Adaptive-technology type, 120/277 V, adjustable time delay up to 20 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft.

C. Long-Range Wall-Switch Sensors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Hubbell; ATP1600WRP
 - b. Leviton; ODWWV-IRW
 - c. Pass & Seymour; WA1001
 - d. Watt Stopper (The); CX-100

2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft.

D. Wide-Range Wall-Switch Sensors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Hubbell; ATP120HBRP
 - b. Leviton; ODWHB-IRW
 - c. Pass & Seymour; HS1001
 - d. Watt Stopper (The); CX-100-3
2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 150-degree field of view, with a minimum coverage area of 1200 sq. ft.

E. Exterior Occupancy Sensors

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Leviton; PS200-10
 - b. Watt Stopper (The); EW-100-120
2. Description: Passive-infrared type, 120/277 V, weatherproof, adjustable time delay up to 15 minutes, 180-degree field of view, and 110-foot detection range. Minimum switch rating: 1000-W incandescent, 500-VA fluorescent

2.9 COMMUNICATIONS OUTLETS

A. Telephone Outlet

1. Available products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following
 - a. Cooper; 3560-6
 - b. Leviton; 40649
2. Description: Single RJ-45 jack for terminating 100-ohm, balanced, four-pair UTP; TIA/EIA-568-B.1; complying with Category 5e. Comply with UL 1863

2.10 WALL PLATES

A. Single and combination types to match corresponding wiring devices

1. Plate-securing screws: Metal with head color to match plate finish
2. Material for finished spaces: 0.035-inch thick, satin-finished stainless steel
3. Material for unfinished spaces: Galvanized steel
4. Material for damp locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations"

B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant thermoplastic with lockable cover. Where indicated, provide "weatherproof while in use" covers

2.11 MULTI-OUTLET ASSEMBLIES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 - 1. Hubbell Incorporated; Wiring Device-Kellems
 - 2. Wiremold Company (The)
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles
- C. Raceway Material: Metal, with manufacturer's standard finish
- D. Wire: No. 12 AWG

2.12 INTRUSION DETECTION DEVICES

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 - 1. GE Security
 - 2. Emerson
 - 3. Hamilton Electronics
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, self-contained magnetic door switch and glass-break switch
 - 1. Magnetic door switch with surface mount magnetic contact, epoxy sealed aluminum housing, AC cable connector, contact for connection to local SCADA system input. For finished areas in Operations Building, provide flush mount magnetic contacts with concealed wiring. Coordinate installation with door frame vendor for proper openings
 - 2. Hardwired glass break sensors with adjustable sensitivity, concealed wiring, contacts for connection to local SCADA system input

2.13 SMOKE DETECTORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following
 - 1. Gentex
 - 2. Tyco / Simplex
 - 3. Siemens
- B. Components of Assemblies: Products from a single manufacturer designed for use as a complete, self-contained photoelectric smoke detector with auxiliary dry contacts for connection to facility SCADA system, test switch, and LED indicator. Smoke detectors shall be rated for environmental conditions at each location

specified. Power supply for smoke detectors shall be taken from local facility SCADA system

2.14 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color
 - 1. Wiring devices connected to normal power system, except access control and smoke detector devices: Gray, unless otherwise indicated or required by NFPA 70 or device listing
 - 2. Isolated-ground receptacles: Orange

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted
- B. Coordination with Other Trades
 - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes
 - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables
 - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall
 - 4. Install wiring devices after all wall preparation, including painting, is complete
- C. Conductors
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails
- D. Device Installation
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment

4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, $\frac{2}{3}$ to $\frac{3}{4}$ of the way around terminal screw
6. Use a torque screwdriver when a torque is recommended or required by the manufacturer
7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections
8. Tighten unused terminal screws on the device
9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact
10. Wrap device terminals with electrical tape once conductors are connected

E. Receptacle Orientation

1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right

F. Security System Device

1. Refer to project drawings for required installation requirements and associated SCADA system programming requirements

G. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening

H. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates

3.2 IDENTIFICATION

A. Comply with Section 16075

1. Receptacles: Identify panelboard and circuit number from which served. Use laser engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports

1. Test instruments: Use instruments that comply with UL 1436
2. Test instrument for convenience receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement

B. Tests for Convenience Receptacles

1. Line voltage: Acceptable range is 105 to 132 V

2. Percent voltage drop under 15-A load: A value of 6 percent or higher is not acceptable
3. Ground impedance: Values of up to 2 ohms are acceptable
4. GFCI trip: Test for tripping values specified in UL 1436 and UL 943
5. Using the test plug, verify that the device and its outlet box are securely mounted
6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above

END OF SECTION