

SECTION 26 2726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. University IT/IS Standards for Telecommunications devices.

1.2 SUMMARY

- A. Section Includes:
 - 1. Receptacles, general purpose.
 - 2. Receptacles with integral GFCI.
 - 3. USB Charger receptacles.
 - 4. AFCI receptacles.
 - 5. Twist-locking receptacles.
 - 6. Isolated-ground receptacles.
 - 7. Tamper-resistant receptacles.
 - 8. Weather-resistant receptacles.
 - 9. Pendant cord-connector devices.
 - 10. Cord and plug sets.
 - 11. Wall box dimmers.
 - 12. Wall box dimmer/sensors.
 - 13. Wall box occupancy/vacancy sensors.
 - 14. Toggle Switches.
 - 15. Floor service outlets.
 - 16. Associated device plates.

1.3 DEFINITIONS

- A. AFCI: Arc Flash Circuit Interrupter.
- B. EMI: Electromagnetic interference.
- C. GFCI: Ground-Fault Circuit Interrupter.
- D. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- E. RFI: Radio-frequency interference.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Receptacles for University-Furnished Equipment: Match plug configurations.
2. Cord and Plug Sets: Match equipment requirements.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by UL and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with most current edition of the Northwestern University Design Standards.
- D. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

1.6 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for pre-marking wall plates.
- C. **[Samples: One for each type of device and wall plate listed below, in each color specified.]**
 1. [List of devices for which samples are desired.]

1.7 INFORMATIONAL SUBMITTALS

- A. Field quality-control test and inspection reports.
- B. Plan drawing(s) in PDF indicating location(s) of all GFCI and AFCI receptacles.

1.8 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.
- B. Plan drawing(s) in AutoCAD format mapping all locations of all GFCI and AFCI receptacles and submitted on CD-ROM.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace devices that fail in materials or workmanship within specified warranty period.
 1. Warranty Period:
 - a. **Two** years from date of Beneficial Occupancy: GFCI, AFCI devices
 - b. **Five** years from date of Beneficial Occupancy:
 - c. **Ten** years from date of Beneficial Occupancy: Receptacles

PART 2 - PRODUCTS

2.1 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: UL listed and labeled as defined in NFPA 70 and marked for intended location and application.
- B. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranded building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.2 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Heavy duty specification grade complying with NEMA WD 1, NEMA WD 6 Configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - b. Pass & Seymour; 5361 (single), 5362 (duplex).
 - c. Leviton; 5351 (single), 5352 (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. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; IG5362.
 - b. Pass & Seymour; IG5362.
 - c. Leviton; 5362-IG
 - 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.
- C. USB Charger Type Duplex Convenience Receptacles:
 - 1. Specialized Receptacles: Comply with NEMA WD 1, NEMA WD 6 for standard configurations and UL 498. Comply with USB battery charging spec USB BC1.2.
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; USB20X2.
 - b. Pass & Seymour; TR5362USB.
 - c. Leviton; T5832.
 - 3. Description:
 - a. Straight blade, 125 V, 20 A; NEMA 5-20R.
 - b. Non-feed through type.
 - c. Solid state charger device with duplex receptacle.

- d. Dual USB charging ports 3.0 A (min.), 5 VDC dual USB charging ports.
- e. Compatible with USB 2.0 devices.
- f. Tamper resistant.

D. Tamper-Resistant, Duplex, Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, ANSI C-73, and UL 498.

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Hubbell CR20 - TR
- b. Leviton; TCR – 20.
- c. Pass & Seymour; TR5362

2. Description:

- a. Built-in UL Listed, mechanical safety shutter mechanism prevents access to contacts unless a two-pronged plug is inserted to ensure that foreign objects are locked out.
- b. "TR" mold mark designation provides visual identification when installed.
- c. Self grounding clip for automatic grounding in grounded metal box.

2.3 GFCI RECEPTACLES

A. General Description:

- 1. Straight blade, non-feed through type.
- 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 943, Class A.
- 3. Include trip/reset buttons.
- 4. Include correct wiring/trip indicator LED light.

B. Tamper-Resistant GFCI, Duplex Convenience Receptacles, 125 V, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.
 - c. Leviton; GFTN2

2.4 AFCI RECEPTACLES

A. General Description:

- 1. Straight blade, feed through type.
- 2. Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and UL 1699.A.
- 3. Include trip/reset buttons.
- 4. Include correct wiring/trip indicator LED light.

B. Tamper-Resistant AFCI, Duplex Convenience Receptacles, 125 V, 20 A:

- 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; AFR20TR.

- b. Pass & Seymour; AF20TR.
- c. Leviton; AFTR2

2.5 **(future use)**

A.

2.6 RECEPTACLES FOR SPECIAL EQUIPMENT

- A. Specialized Receptacles: Comply with NEMA WD 1, NEMA WD 6 for standard configurations and UL 498.
- B. Products: Subject to compliance with requirements, provide one of the following:
 - 1. Hubbell.
 - 2. Pass & Seymour.
 - 3. Leviton.

2.7 HAZARDOUS (CLASSIFIED) LOCATION RECEPTACLES

- A. Wiring Devices for Hazardous (Classified) Locations: Comply with NEMA FB 11 and UL 1010.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Crouse-Hinds.
 - b. EGS/Appleton Electric.
 - c. Killark; Division of Hubbell Inc.

2.8 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. Hubbell; HBL2310.
 - b. Pass & Seymour; L520-R.
 - c. Leviton; 2310
- B. Isolated-Ground, Single Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Hubbell; IG2310.
 - b. Pass & Seymour; IG4700.
 - c. Leviton; 2310-IG.
 - 2. Description:
 - a. Comply with NEMA WD 1, NEMA WD 6, Configuration L5-20R, and UL 498.

- b. 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.

2.9 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. 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.

2.10 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.11 WALL-BOX DIMMERS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Lutron Electronics.

B. Dimmer Switches: Modular, full-wave, solid-state units with integral, quiet on-off switches, with audible frequency and EMI/RFI suppression filters, compatible with 1% LED dimming-drivers.

C. Control: Continuously adjustable slide-to-off with single-pole or three-way switching. Comply with UL 1472.

D. LED Dimmer Switches: Modular; compatible with 1% LED dimming-drivers.

1. Zero to 10 VDC for direct control of 3rd party LED drivers without use of separate power pack.

E. Finish: Color to be coordinated with the Architect from Manufacturer's standard colors.

2.12 WALL-BOX DIMMERS/SENSORS

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Lutron Electronics.

B. LED Dimmer Switches: Modular; 0 – 10 VDC Dimmer/Sensor compatible with 3rd party LED drivers; dimmer-driver combination capable of consistent dimming with low end not greater than 1% of full brightness, with integral, quiet, continuously adjustable slide-to-off with single-pole or three-way switching. Comply with UL 1472

1. Operating Environment: Operating temperature 32-104 degrees F with a relative humidity (non-condensing) of 0% to 95%.

C. Occupancy Switches:

1. Description: Line Voltage type, 120/230/277 VAC, adjustable time delay 1, 5, 15, or 30 minutes, 180-degree field of view, UL Listed.

2. Sensor: Passive infrared (PIR) with ambient light detection learning mode with a minimum PIR coverage area of 30 ft. x 30 ft.

3. Operating Environment: Operating temperature 32-104 degrees F with a relative humidity (non-condensing) of 0% to 95%.

D. Finish: Color to be coordinated with the Architect from Manufacturer's standard colors.

E. Warranty: 5 Years.

2.13 WALL BOX OCCUPANCY/VACANCY SENSORS

A. Line voltage PIR technology wall-switch sensors

1. Manufacturers: Subject to compliance with requirements, provide products by the following:

a. Lutron Electronics.

2. Description: Line Voltage PIR Technology type, 120/230/277 VAC, adjustable time delay 1, 5, 15, or 30 minutes, 180-degree field of view, UL Listed with a minimum PIR coverage area of 30 ft. x 30 ft..

3. Programmable as a Vacancy (manual ON/auto OFF) or Occupancy sensor (auto ON/auto OFF).

4. Operating Environment: Operating temperature 32-104 degrees F with a relative humidity (non-condensing) of 0% to 95%.

B. Finish: Color to be coordinated with the Architect from Manufacturer's standard colors.

C. Warranty: 5 Years.

2.14 *(Future use)*

2.15 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Single Pole:

- 1) Hubbell; HBL1221.
- 2) Pass & Seymour; CSB20AC1.
- 3) Leviton; 1221

b. Two Pole:

- 1) Hubbell; HBL1222.
- 2) Pass & Seymour; CSB20AC2.
- 3) Leviton; 1222

c. Three Way:

- 1) Hubbell; HBL1223.
- 2) Pass & Seymour; CSB20AC3.
- 3) Leviton; 1223

d. Four Way:

- 1) Hubbell; HBL1224.
- 2) Pass & Seymour; CSB20AC4.
- 3) Leviton; 1224

C. Pilot-Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Hubbell; HBL1201PL for 120 and 277 V.
- b. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
- c. Leviton; 1201-PL

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following :

- a. Hubbell; HBL1221L.
- b. Pass & Seymour; PS20AC1-L.
- c. Leviton; 1221-2L

2. Description: Single pole, with factory-supplied key in lieu of switch handle. Provide six (6) spare keys.

2.16 WALL PLATES

A. Single and combination types shall match corresponding wiring devices.

1. Plate-Securing Screws: Metal with head color to match plate finish.
2. Material for Finished Spaces:

- a. Shall be same manufacturer as device
 - b. Offices and administrative areas: Painted steel, color selected by Architect from specified selections.
 - c. Laboratories, kitchens, food preparation: 0.035-inch- (1-mm-) thick, satin-finished, Type 302 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 and damp locations.
 5. Receptacles dedicated for use with computers: Use engraved white plastic, self adhesive label with 0.188" high black-filled lettering on face of plate to read "COMPUTER ONLY".
- B. Wet-Location, Weatherproof-in-use Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.17 FLOOR SERVICE FITTINGS

- A. Coordinate fittings with floor boxes as described in Section 26 0533.
- B. Type: Modular, flush-type, dual-service units suitable for wiring method used.
- C. Compartments: Barrier separates power from voice and data communication cabling.
- D. Service Plate: Rectangular die-cast aluminum with satin finish.
- E. Power Receptacle: NEMA WD 6 Configuration 5-20R, unless otherwise indicated.
- F. Voice and Data Communication Outlet: Comply with University IT/IS Department Standards.

2.18 FINISHES

- A. Device Color:
 1. Wiring Devices Connected to Normal Power System: Ivory, White, Blue, Gray, and Brown as selected by Architect or required by NFPA 70 or device listing.
 2. Dedicated outlets: Grey.
 3. Wiring Devices Connected to Essential Power System: Red.
 4. Isolated-Ground Receptacles: Ivory with Orange triangle.
 5. UPS: Blue.
 6. Switched devices: Green.
 7. Temporary devices: Black.
- B. Wall Plate Color: Match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. 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 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 right 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 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.
4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pig-tailing existing conductors are permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that 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 extend not less than 6 inches (152 mm) from wall.
5. "Daisy-chaining" of receptacles is not permitted.
6. Use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.
7. Use a torque screwdriver when a torque is recommended or required by manufacturer.
8. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
9. Tighten unused terminal screws on the device.
10. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.

E. Receptacle Orientation:

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

F. 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.

- G. Arrangement of Devices: mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multi-gang wall plates.
- H. Adjust locations of floor service outlets to suit arrangement of partitions and furnishings.

3.2 IDENTIFICATION

- A. Comply with Division 26 Section "Identification for Electrical Systems."
- B. Identify each receptacle with panelboard identification and circuit number. Receptacles rated more than 120V shall have voltage identified. Use hot, stamped or engraved machine printing with black-filled lettering on white field for normal circuits, red-filled lettering on white field for essential circuits, self adhesive nameplate attached to face of plate, and durable wire markers or tags inside outlet boxes.

3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
 - 1. Test Instruments: Use instruments that comply with UL 1436.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated digital-display indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 20-A Load: A value of 6 percent or higher is unacceptable.
 - 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. 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.
- C. Wiring device will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports, and plan drawing(s) map indicating locations of all GFCI and AFCI receptacles.

END OF SECTION 26 2726

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