

260500 Common Work Results For Electrical

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1.1 RACEWAYS

A. GENERAL

1. Underground primary wiring raceways shall have 30" minimum cover. Underground secondary wiring raceways shall have minimum cover as required by the NEC. All underground ductbanks shall be designed, configured and installed to eliminate standing water, directing drainage to manholes, pullboxes, switchvaults, etc.
2. New building raceways and raceways added to existing buildings shall be concealed, except in areas of Mechanical Rooms, Vaults, etc. Except for mechanical rooms, the use of all surface mounted raceways and boxes shall require the use of wiremold materials with colors matching the background as closely as possible or painting.

B. SUB-TRANSMISSION & DISTRIBUTION

1. Raceways shall be galvanized rigid conduit or PVC. Raceways shall be encased in steel-reinforced concrete.
2. All electrical duct banks shall contain reinforcing steel run parallel with the conduits. The number, size, and locations of rebar incorporated into the duct bank shall be sufficient to allow a minimum ten foot span of undermined duct bank to be self supporting. The minimum individual rebar size shall be 3/8 inch in diameter. Wires to hold the rebar in place shall be incorporated into the duct bank at appropriate spacing and be of sufficient size to hold the rebar. Rebar shall be bonded to the system ground in each manhole. The use of Directional Drilling and Jack & Boring will be considered on a case-by-case basis in lieu of underground ductbanks.
3. Provide a minimum of one spare conduit, equal to or larger than the largest specified size.
4. Chairs for steel-reinforced concrete raceways shall not be spaced over 6' apart.

C. FLEXIBLE CONDUIT

1. Flexible conduit shall be steel or aluminum with a minimum diameter of 1/2", except where

supplied by a manufacturer with a lighting fixture or as part of a pre-manufactured wiring system.

2. Metalclad (MC) cable will not be used without approval from the Physical Plant Division. When used it should be limited to branches for lighting and offices. Usage for laboratories and all homeruns to panels should be avoided.
3. Separate green grounding conductors shall be installed in ANY length of flex.
4. Flex will not be used in lengths greater than 6'.
5. Flex will not be used inside walls, or as a replacement for EMT. A short vertical drop of a flex extension from emt or a junction box, into an existing wall, to a secured box, shall be allowed to avoid having to remove a section of a wall that can not be easily repaired.
6. Flex will not be looped between light fixtures, except for wiring whips provided with light fixtures.
7. Flex will not pass through walls or ceilings. A junction box is required at the point of transition.

1.2 FIBER OPTIC CABLE

- A. Refer to UF Telecomm Standards.

1.3 OVERCURRENT PROTECTION DEVICES

- A. All 600 Volt and below circuit breakers shall be bolt on type. Plug in devices are not acceptable.

1.4 WIRING METHODS

A. BOXES

1. Location: Back-to-back and through-the-wall boxes are not acceptable. When boxes share the same partition they shall be offset a minimum of 12" for sound attenuation.
 - a) Boxes below suspended ceilings shall be "readily accessible" per NEC. No removal of equipment or furnishings shall be necessary for access.
 - b) Boxes above suspended ceilings shall be "accessible" per NEC. They must be accessible from below or aside, and the access opening may not be less than 18 inches from a duct or structural component (excluding the ceiling grid). Junction boxes located above ceiling shall be installed facing down and shall be accessible after installation.
 - c) Do not recess boxes deeper than 5 inches into a wall (finished/furred out or not). Do not install multiple extension rings on one box. Do not install extension rings that will limit access to the back of the box, except for a trim ring. Boxes shall be sized so extension rings are not needed.
2. Cover plates: All cover plates shall be high abuse resistant nylon or stainless steel.
3. All device cover plates that are served by the emergency generator shall be readily

identified as an emergency circuit without removing cover. Red in color.

- B. RECEPTACLES SERVING COMPUTERS: Or any other location where the type and quantity of devices on a circuit are known to be a significant source of harmonics, neutrals for receptacles on circuits that feed offices shall not be shared by different circuits. Each receptacle serving a computer shall have it's own dedicated neutral. Neutral shall be sized according to harmonic load.

C. INSTALLATION

1. Surface mounted raceway systems shall allow for maintenance, without disassembly of the complete system. Raceway systems shall be fed from an accessible box, mounted over a recessed box in the wall. Surface raceway feeding is also permissible, provided it occurs through approved devices, fittings or knockouts supplied as part of a complete, approved raceway system.
2. All boxes in refrigerated areas should be sealed at points of entry to prevent thermal leaks and condensation.
3. Handiboxes shall NOT be used in any work.

D. DEVICES

1. All switches and receptacles to be specification grade.
2. When using stranded wire, connections are to be made to the back clamps of the specifications grade device.
3. Push-in spring type connections are not to be used.
4. Aluminum device wire must be replaced with copper within the scope of a project in existing buildings. (Note: Likely areas include HSC buildings 203, 204, and 205.)

- E. RECEPTACLES SERVING LABORATORIES: In laboratory spaces, receptacles and/or electrical equipment should not be installed within 2' from a sink. GFI's should only be installed where realistic hazards are indicated. Avoid placing equipment on outlets in these areas due to false tripping with subsequent damage to equipment and resulting loss of research information/data.

- F. GFI RECEPTACLES: All receptacles in toilet rooms, outside, and within 6 feet of a sink shall be a ground fault interrupter (GFI) receptacle. Ground fault breakers and feed through Ground fault interrupter receptacles are not permitted.

G. CONDUCTORS

1. All conductors shall be copper.
2. Provide an insulated grounding conductor in all feeder and branch circuits.
3. Crimp type connectors shall only be used on stranded wire.
4. Conductors for 120/208 volt shall be black/red/blue and white. Conductors for 277/480 volt shall be brown/orange/yellow/gray.

5. All neutral conductors shall be considered current carrying when considering pipe fill.

1.5 **ELECTRICAL IDENTIFICATION**

A. LABELING

1. Switches: Each light switch shall be marked by circuit number using numbered vinyl cloth adhesive markers, 1/4" minimum height. Locate marker behind device cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.
2. Receptacles: Each receptacle shall be marked by circuit number using numbered vinyl cloth adhesive markers, 1/4" minimum height. Locate marker behind device cover plate so it can be readily identified by removal of the cover plate. Thomas and Betts E-Z Code Markers are acceptable.
3. Boxes: All junction box covers shall be marked by circuit number using indelible ink, 3/4" minimum height. Locate marker so it can be readily identified (without) removal of the cover plate.
4. Floors: Areas that pertain to section 110-26 of NEC shall have yellow striping installed diagonally with stripes being three inches wide and three inches apart. The center of the area shall have the words "Safety Zone" installed with letters at least four inches high.
5. Standard electrical coding shall be observed as follows:
For 120/208: black, red, blue, white, green;
For 277/480: brown, orange, yellow, gray, green with yellow stripe
6. Control and alarm wiring shall be identified by tags at every enclosure.
7. Projects should specify that junction boxes be labeled with circuit and panel numbers.
8. All emergency switches and outlets should be identified by red plates or a permanent marking "emergency". Red color switches and receptacles may also be used.

1.6 **DESIGN LOADS**

- A. For offices, 110/120 VAC 20 AMP circuits shall be designed on the basis of a maximum of four (4) desk locations per circuit or two (2) offices per circuit. (i.e.: 5 or more desk locations on a circuit or 3 or more offices on a circuit are not acceptable)
- B. Lighting: No more than 5 offices will be powered by one circuit.

1.7 **TRENCHING**

- A. All trenching shall be done by hand or directional boring unless approved by PPD.

1.8 **SWITCHES & RECEPTACLES**

- A. All switches and receptacles to be specification grade.

1.9 IDENTIFICATION OF UNDERGROUND WIRING AND/OR DUCTBANKS

- A. **WARNING TAPE:** All underground wiring and ductbanks shall have metalized warning tape installed above a conduit, ductbank or electrical line that identifies the specific system buried below. Tape shall consist of a minimum 3.5 mil solid foil core encased in a protective plastic jacket (total thickness 5.5 mils) and be 6" wide with black lettering imprinted on a color coded background that conforms to APWA color code specifications. Tape shall be installed from 18" to 30" above a conduit, ductbank or electrical line and in no case less than 6" below grade.
- B. **TRACER WIRE:** Tracer wire is not required for underground electrical lines.
- C. **ID TAGS:** ID tags shall be installed on all splices and terminations in manholes with: Name of the Splicer; Name of the Electrical Contractor performing the work; and Date of Installation of the Splice.

1.10 DEMONSTRATION OF ELECTRICAL EQUIPMENT

The following is guide to the amount of contact hours of instruction the Builder shall provide to train University maintenance personnel in the operation of new systems. The complexity of each system shall be taken into account.

- A. **ELECTRICAL:** 8 hours divided into two sessions.
- B. **FIRE ALARM SYSTEMS:** 16 hours divided into four sessions.
- C. **EMERGENCY GENERATOR:** 4 hours, one session.
- D. **VIDEO TAPING:** Provide video taping of any Builder or Manufacturer demonstrating the features for operation of generators, main switchgears, switchboard, fire alarm systems etc. during Substantial, Final Inspection, or any other training session.

1.11 CABLE TRAY

- A. Cable trays shall be adequately sized for 10% future additions (minimum). Cable trays shall be installed as high as possible, but beneath ductwork. Installed cable trays shall be accessible at all locations. Trays shall be installed with a cover only where physical protection of the installed cables is required, and where accessible. See UF Telecommunications Construction Standards for further requirements on telecommunications cable tray.
- B. Separators between different types of services shall be provided.

1.12 SAFETY SWITCHES / DISCONNECTS

- A. Switches and disconnects shall be appropriate for the location and application.
- B. Provide 10% spare fusing with a minimum of three sets spare (including new fusing for each of the three phases) of the amount installed, based on the different voltages, amperage ratings, and types of fusing installed. Spare fusing shall be provided within weatherproof containers for long-term storage (such as in ammo cans). Spray paint container with the wording 'Spare Fuses' on the side.

END OF SECTION