

## **27 05 28 Pathways for Communications Systems**

### **1.01 DESIGN CRITERIA FOR INSIDE PLANT CONDUIT**

- A. Telecommunications conduit must be properly designed and installed. The design and installation practices for telecommunications conduit have some unique requirements beyond those normally seen in standard electrical conduit. The following items are required to be included in the design and installation of interior telecommunications conduit:
1. Conduits must be designed and installed in the most direct route possible from the telecommunications closet to the work area.
  2. The maximum length of LAN copper horizontal distribution cable is 90 meters (295 ft) from the work station outlet to the Telecommunications Closet (TC) patch panel, no exceptions. Where this length would be exceeded the designer will add additional TCs as required.
  3. Telecommunications cabling is always installed in a home-run fashion with individual cables running from the work area all the way to the telecommunications closet. Splices in horizontal distribution cable are not allowed.
  4. Factory-manufactured sweeps which meet ANSI/TIA/EIA569-A bend radius requirements shall be used for all telecommunications conduit. The bend radius of the sweeps must be a minimum of 10-times the internal conduit diameter. Bending conduit in the field using manual or mechanical methods is not acceptable. Standard electrical elbows shall not be used. This sweep radius is necessary to insure that the conduits can accept future fiber optic cables. All horizontal conduit will be tested by the conduit installation contractor with a mandrel to prove compliance with the sweep radius requirements throughout the conduit run
  5. Each telecommunications outlet box shall have an individual conduit routing to the telecommunications closet, or to the pull box or pulling point, connecting to a major cable pathway routing to the telecommunications closet. Box shall be located in serviceable space. Looping, or “daisy-chaining,” of conduits between outlet boxes is not allowed.
  6. All conduit ends shall have plastic bushings installed before the cable is pulled into the conduit.
  7. Conduits will not be run next to hot water lines, steam pipes, or other utilities that may present a safety hazard or cause a degradation of system performance.

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8. Conduits entering the Telecommunications Closet should be designed and located allowing for the most flexibility in the routing and racking of cables.
9. Conduits or conduit sleeves entering through the floor of the Telecommunications Closet shall terminate four (4) inches above the finished floor.
10. All metallic telecommunications conduits entering the Telecommunications Closet, Equipment Room, or Entrance Facility shall be bonded together, and bonded to the Telecommunications Main Grounding Busbar with a #6 AWG ground cable.
11. All in-use and spare conduits entering the Telecommunications Closet, Equipment Room, or Entrance Facility shall be sealed to prevent the intrusion of water, gasses, and rodents throughout the construction project. Within five days of releasing the conduit for the installation of cable, the conduit installation contractor shall prove all conduits to be clean and dry.
12. All conduits and cables that penetrate fire rated walls or floors must be fire stopped.
13. All ISP conduits and innerduct, used and spare, shall be plugged with watertight plugs at both ends to prevent the intrusion of water, gasses, and rodents throughout the construction project. All ISP conduits shall have pull lines rated at a minimum of 90 kg (200 lb) pulling tension installed. The pull lines must be re-pulled each time an additional cable is installed. Prior to releasing the conduit for the installation of cables, all ISP conduits must be cleaned with a brush pulled through the conduit at least two times in the same direction and swabbed with clean rags until the rag comes out of the conduit clean and dry. All ISP conduits must be tested with a mandrel to prove compliance with the sweep radius requirements throughout the conduit run. Within five days of releasing the conduit for the installation of cable, the conduit installation contractor shall prove all conduits to be clean and dry.

**2.01 DESIGN CRITERIA FOR INSIDE PLANT PULLBOXES**

- A. Pull boxes used with telecommunications conduits in interior locations shall be rated NEMA-1. Pull boxes used in damp or wet locations such as plumbing chases or out of doors shall be rated NEMA-3R. Pull boxes shall be installed in conduits at an interval no greater than every 100 feet. A pull box shall be installed in conduit runs whenever there are two 90°sweeps, or a total of 180°of sweeps, in a conduit run. Any deviations from these criteria must have prior approval from Texas State University IT.

**3.01 CABLE PATHWAYS AND SUPPORT STRUCTURES**

- A. The Inside Plant (ISP) telecommunications substructure are the cable pathways and support structures necessary for routing telecommunications cabling between telecommunications closets, and from the telecommunications closet to the work area. There are numerous products and methods that can be employed to build the substructure. Some of these methods include: Enclosed conduit system, Open or enclosed cable trays, Routing above a false ceiling using cable supports, and in-slab floor ducts.
- B. The conduit system shall be routed inside ceilings, floors, and walls to the greatest extent possible. Surface mounted conduit shall be used only when there is no other route to provide service to the desired location.
- C. For the main floor in slab on grade constructed buildings, conduit will route in walls and ceilings not in or under the slab. If this design is not possible, an alternate must be presented and approved following the “Approval for Alternate Design Solutions” process detailed in section 27 01 00. If an under slab route solution is approved, the conduit must be installed with at least 1” of concrete encasement around all sides of the conduit. Exceptions occur in cases of modular furniture installation; in which in slab conduit routing is sometimes necessary; design should work in conjunction with modular furniture.
- D. Telecommunications outlets shall be located to minimize the length of patch cord required to connect the computer or telephone to the outlet.
- E. All outlets shall have a minimum one-inch conduit. Increase the conduit size as necessary for the quantity of cables to be installed. Cable fill shall not exceed 40%.
- F. All wall outlets shall be mounted in a minimum four (4)-inch by four (4)-inch by two and one-half (2 ½)-inch deep double gang outlet box.
- G. An electrical outlet shall always be located within three (3) feet of a telecommunications outlet.
- H. Telecommunications cable and conduit shall maintain the minimum separation distance from power as listed below.
- I. For power systems operating at 480V or greater, including electrical distribution panels, step down devices or transformers, maintain a minimum separation distance of 6 m (20 ft) from all telecommunications cross-connects.
- J. For power systems operating at 480V or greater, maintain a minimum separation distance of 3 m (10 ft) from all telecommunications cabling. Pathways should cross perpendicular to electrical power cables or conduits.

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- K. For large electrical motors or transformers, maintain a minimum separation distance of 1.2 m (4 ft) from all telecommunications cabling
- L. For lightning protection system conductors (NEC 800-13), maintain a minimum separation distance of 1.8 m (6 ft) from all telecommunications cabling
- M. For power systems operating at less than 480V, including all conduit and cables used for electrical power distribution, maintain a minimum separation distance of 0.6 m (2 ft) from all telecommunications cabling. Pathways should cross perpendicular to electrical power cables or conduits.
- N. For fluorescent lighting, maintain a minimum separation distance of 12 cm (5 in) from all telecommunications cabling. Pathways should cross perpendicular to fluorescent lighting.
- O. For branch circuits (secondary) power (120/240V, 20A) where electric light or power circuits coexist with telecommunications cabling, maintain a minimum separation distance of 0.50 m (2 in).

**4.01 Cable Routing in Non-Traditional Locations/ Modular Furniture**

- A. Cable routing and outlet placement in non-traditional locations (locations other than wall outlets), such as modular furniture, classroom desks, and floor outlets require close coordination in the design process. This coordination must consider all trades and manufacturers; including but not limited to: electrical, telecommunications, structural, and furniture manufacturer/ installer in order to provide a cohesive final product.
  - 1. Cable ingress point into location must meet all acceptable cable routing standards; including specified manufacture's recommended space for outlet and associated cabling, fill ratios and power separation.
  - 2. Cable pathway within modular furniture must meet all acceptable cable routing standards; including fill ratios and power separation.
  - 3. Outlet locations must be designed to accommodate knock out/ bezel size for standard Ortronics Series II connector and or faceplate.
  - 4. Alternative design solutions, such as MUTOA's and Consolidation Points may be considered for these spaces. But must be approved by Texas State University Network Operations.
  - 5. Transition Points and under carpet cabling shall never be an approved design alternative.

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- B. Engineers, Designers and Consultants must coordinate with Texas State University Network Operations for approval on design solutions for these pathways and spaces.

END OF SECTION 27 05 28