

## TELECOMMUNICATION

### General

Provide Telecommunications pathways (raceways), 'Building Entrance' (BE) rooms, and Telecommunication Room (TR) rooms, as described below, and in accordance with the Program Documents. Coordinate and confirm Telecommunications systems approach for each project with the Project Coordinator.

Typically, the University (ITCom) provides all of the tele/data cabling, equipment, and terminations, from their network backbone to the telephone/data outlet (Work Area Outlet), including the faceplate at those outlets. Exceptions to this rule will be clearly stated in the program of the project

Telecommunications systems in most of the buildings, on the Ann Arbor campuses, are operated and maintained by the U of M, ITCom Department. This design guideline was drafted in cooperation with ITCom, and addresses the University's requirements. Additional information can be obtained from U of M's ITCom through the University Project Coordinator.

IT Com is usually involved with the Telecommunications systems within the University of Michigan Health System, the U of M Dearborn and Flint Campuses, and many "off-site" locations. Unless noted otherwise in the program statement, these guidelines are to be applied to any University owned building, even if the "serving utility" is not ITCom.

### Related Sections

Special Building Areas Section SBA-C - Telecommunication Rooms describes specific architectural, mechanical, and electrical features associated with Telecommunications Rooms. This section also defines Building Entrance Rooms (BE) and Telecommunication Rooms (TR) (formerly known as BDFs and LDFs respectively) and includes associated diagrams.

Refer to Section 16050 for additional conduit and cabling requirements.

Refer to Section 16110 for underground manholes and electrical duct.

### General System Description

The current cable plant provides multiple 4-pair cables of copper conductors from the user (local Work Area Outlet) to the nearest telecommunications room - either a BE or TR. These cables are used for all voice; telephone set power, and essentially all data services, including point-to-point and local area networking. Separate RG cables are installed to locations noted for closed circuit TV, and/or cable TV.

All Work Area Outlet (station) wiring is home run from the user location to the nearest TR. For transmission integrity, no intermediate splices or terminals are allowed.

For renovations, where the existing cables will be too short, new cables will need to be installed and with the associated need to modify existing conduit and cable trays.

The Building Entrance Room (BE, formerly BDF) is the main termination point in a building. Telecommunication Rooms (TR, formerly LDF) are distribution and termination rooms located on each floor of a building and serve user stations within 293 cable feet (including 6 feet of slack at TR room, and 3 feet at the Work Area Outlet). If cable lengths will exceed 293 feet, multiple TR's are be required. Also, the BE may also be the TR for that floor. TR's are interconnected to the BE via backbone cables for connection to equipment or locations external to the building. See SBA-C for additional information on BEs and TR's.

### **Telecommunication Service Entrance**

Consult with Project Coordinator and ITCOM prior to proceeding with telecommunications building service entrance design.

Refer to Technical Section 16110 for Underground Electrical Duct and Section 16050 for additional conduit and cabling requirements.

#### **Underground Service Entrance Conduits:**

Except as otherwise noted, comply with conduit requirements detailed in "Telecommunications Raceway and Cabling Requirements" noted below.

Typically, provide (a minimum of) four, 4-inch conduits extending from a location specified by ITCOM (typically a manhole), to the building.

Conduit and ducts shall include no more than 180 degrees of total bend or exceed 400 feet in length, and shall have a bending radius of at least 10 times the conduit diameter.

Encase conduit in concrete, except at poles. When terminating at a pole, clamp conduit rigidly to the pole at 90-degree separation from power.

Extend conduit 4" beyond terminating wall or floor. Plug open conduit with mechanical seal.

Pullboxes shall not be used for directional transitions or terminations of Outside Plant cable when entering a building. If the termination point (typically, the BE) of the Outside Plant cable is more than 50 feet inside the building, or if the cable is run through plenum areas, install the Outside Plant cable in rigid metallic conduit.

#### **Manholes:**

Refer to Technical Section 16110 for manhole and hand hole requirements

Manhole hand holes shall not be used for directional transitions in telecommunications service.

#### **Direct Buried Telecommunications Service Entrance: \***

\*Direct-buried service entrances are typically allowed only for off-campus structures, and when specifically noted in the program statement of the project.

Consult ITCOM for all direct-buried service entrances. Place orange warning tape in trench backfill, 18 inches above the cable.

For multi-service trenches, the minimum space requirements between Telecommunications cabling and other facilities are: 3 inches when separated by concrete, 4 inches when separated by masonry, and 12 inches where separated by well-tamped earth.

### **Telecommunication Raceway**

#### **Horizontal Pathways:**

Horizontal pathways support and protect horizontal station cables between the work area outlet and the local Telecommunications Room (or TR). Acceptable horizontal pathways include conduit, cable tray and under floor duct systems. Horizontal pathways shall be continuous and unobstructed, accessible for maintenance and installation of additional cables with minimal disruption to building occupants, and be located at a safe working height above the ceiling grid.

Horizontal pathways shall be bonded and grounded, either at the tray, or in the TR room.

Horizontal pathways, using cable trays, should be designed to allow for future changes or additions in horizontal cabling. Cable trays shall be sized with consideration of the square footage of the area served, the number of currently planned outlets, the square inches of cable per outlet, plus 50%. Tray fill calculations shall assume, 3 4-pair Cat 5E, cables per Work Area Outlet location. These cables have a diameter of .165 inches per cable.

"J" hooks bridle rings; staples and other individual supports that inhibit cable pulling are not acceptable, *except when specifically noted in the project's program statement* for short-term leased facilities, and/or other 'temporary' facilities.

#### **Conduit (including general requirements applicable to underground service entrance):**

Conduit material, application, and installation shall comply with NEC (see SID-F) and Section 16010, and 16050.

Conduits shall be rigidly installed, and adequately supported. Conduit shall be reamed, and shall be joined and terminated with approved outlet boxes, pull boxes, fittings and bushings.

Install conduit with minimal bends and in as short a path as possible. Excessive bends, and offsets inhibit cable installation. Install adequately sized pull boxes in conduit runs every 100 feet or 180 degrees of bends. For conduit runs over 2 inches in diameter, consult ITCOM on pull box size. Bends in conduits over 2 inches shall be long sweeps and no conduit radius shall be less than 10 times the internal diameter of the conduit.

Conduit entering a BE or TR shall terminate 6" inside room unless otherwise noted.

Conduit shall not be placed above or near hot pipes and equipment, including boilers, incinerators, hot water and steam lines or through areas in which flammable or other hazardous material may be stored.

Conduit shall be provided with nylon pull strings.

All conduits are to be bonded to the TC ground with #12 copper (minimum) ground wire.

### **Cable Tray**

If cable tray is substituted for a portion of the 'home run conduit', the following items are critical to a workable installation:

- Provide adequate working space above and on 1 side of the cable tray, allowing access during the initial installation and subsequent additions.
- Place the cable tray at a safe working height above the finished floor, taking into consideration working space restrictions due to ceiling grid.
- Attach, secure, and bond station conduits to cable tray, using listed, and approved fasteners.
- The integrity of the tray shall not be compromised by the intrusion of pipes or conduits.
- Cable Tray shall not be used in place of conduit runs specified for computer room tie cables or any other riser type cable installation.

Size cable tray using the following guideline:

- A minimum of one work area outlet for every 100 square feet of useable floor space served by the cable tray.
- Standard work area outlets are served with three, four pair cables, with an average diameter of 0.165 inches each.

The maximum allowable fill for the tray is not to exceed 70% of the cross sectional area.

### **Surface Mounted Raceway:**

Surface mounted raceway is generally not preferred, but may be used to facilitate multiple outlet locations in renovations, lab settings or for surface mount applications where conduit is inappropriate. Refer to Preferred Manufacturers List.

Conduit shall run continuously between surface mounted raceway and cable tray and TR. Conduit connection at surface mounted raceway shall be a minimum of 1 1/4". Provide conduit access to both ends of surface mounted raceway for installations with high outlet density.

**Telecommunications Work Area Outlets:**

Install sufficient outlet boxes to meet current and future requirements. All outlet boxes should have continuous raceway path to TR installed. ITCOM will determine, and provide, outlet box faceplates.

Minimum conduit size for one outlet (workstation) is 3/4".

- Two workstations may be served by a 1" conduit, and up to three outlets may be served by a 1-1/4" conduit
- Please note that some clients (colleges, schools, and departments) still require a 1" minimum size conduit. The U of M Design Manager shall affirm needs of client in each project.
- In surface raceway applications up to four (single gang) outlets may be served by a 1-1/4" conduit

Outlet box shall be double gang, 2" deep minimum. The only exceptions to this requirement are wall telephone outlets, and data outlets in surface raceways. These may be single gang

**Grounding, Bonding and Electrical Protection Requirements**

All telecommunications cabling and raceway requires grounding, to protect from lightning, ground potential rises or surges, or contact with or induction from power circuits.

For each BE and TR, provide a 1/4" x 1" x 12" copper ground bus, location to be determined by ITCOM through the University Project Coordinator.

Connect telecommunications room ground bus to the ground bus bar in the nearest electrical panel on the same floor with #6 or larger stranded copper ground wire. A maximum of 1 ohm to building ground is allowed.

Bond all raceways to the ground bus bar.

Provide a continuous stranded copper ground wire, minimum #6, from each telecommunications room ground bus to the Building Entrance Room and from the Building Entrance Room to the main building ground bus.

ITCOM shall bond all telecommunications cabling shields to telecommunications room copper ground bus.