

**Western Michigan University – Office of Information Technology & Campus  
Planning, Design & Construction**

**Design Guidelines for Facilities Construction:**

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**DESIGN GUIDELINE DG17-6 UTP HORIZONTAL DISTRIBUTION**

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**I. GENERAL**

The University communications system requires a large number and variety of components to perform its mission. By far the largest quantity of individual hardware components and cable footage is used in the horizontal UTP copper cable distribution system. These cables connect the individual network user outlets and jacks to the communication distribution rooms (CDRs). Due to the quantities involved and the fact that these components directly affect the quality of each individual user connection, the horizontal distribution system is a key element in the total communications system.

While the University is committed to wireless connectivity for the University communications system, this does not remove or even significantly reduce the requirement for a quality horizontal cable system serving user outlets. Wireless connectivity is intended primarily to serve mobile needs, like students who necessarily move from area to area with no permanent position for a cable connection, or faculty and staff who must temporarily have communications connectivity in various locations for meetings, etc. Wireless connections suffer from known shortcomings, which counterbalance the advantage of mobility. They are less secure than cabled connections, though this will improve as standards evolve. In spite of the amazing technology involved, wireless is still not totally robust due to the vagaries of radio transmission systems and its susceptibility to interference. Finally, the standards for wireless speeds and hardware sharing assure that wireless links will be an order of magnitude slower than cabled connections for the foreseeable future. As a result, the horizontal

communications distribution system will remain an important part of the overall communications system for many years.

Currently, the most cost-effective means of providing cabled user connections is the use of Category 6 ("extended") copper UTP cable. These connections are certified for 1 Gigabit per second for Ethernet connections and may support greater speeds in the future. At the time of this writing, Gigabit capabilities are readily available in communications distribution equipment and are rapidly becoming standard in new individual desktop computers.

## **II. GENERAL DESIGN CONSIDERATIONS**

The horizontal cabling system connects all individual user outlets to the CDRs where communications are interfaced to the backbone system. There must be an individual cable connecting each user outlet jack to a corresponding individual jack or other access point in the CDR serving it. The horizontal cables use the horizontal cable pathways normally installed by the electrical contractor augmented as required by the communications contractor.

The UTP horizontal cable distribution system supports most individual user connections. UTP cabling will exceed EIA/TIA Category 6 quality-level with Panduit terminations at each end. No individual copper UTP connections can be longer than 295 ft. (90 meters) in order to adhere to EIA/TIA Category 6 requirements and function within design parameters of modern high-speed communications systems. All other installation specifications for Category 6 installations such as spacing from electrical objects, bend radius, etc., must also be adhered to in order to be sure the system will function properly for modern and future high-speed communications. The communications cable installer cannot meet these criteria unless the cable pathway system and a number of other building facilities are designed with them in mind.

All UTP user jacks will meet identical specifications without differentiation as voice or data use.

The horizontal distribution system defined here includes jacks intended for support of a building-wide wireless system.

## **III. SPECIFIC REQUIREMENTS**

### **A. Products**

#### *1. General*

WMU requires specific UTP communications cable jack systems to assure consistency throughout the University. These products have been certified together to assure they are capable of producing horizontal connections, which meet specifications exceeding the TIA Category 6 standards. UTP cable will be Superior Essex Category 6 enhanced quality as defined below. All jacks will be from the Panduit Mini-Com family. All horizontal distribution jacks will Panduit Category 6 plus quality as described below.

2. *Cable*

Horizontal cable will be plenum rated.

Horizontal UTP cable will be 4-pair Superior/Essex brand NextGain level.

3. *User and Communications Room Jacks*

Jacks will be Panduit brand Mini-Com series Giga-Channel Mini-Jack TX-6 Plus Modules (CJ688TPcc or better, where cc is Panduit color code). Colors will be as specified elsewhere.

4. *Jack Mounting Panels*

All horizontal system jack mounting panels will be Panduit brand Mini-Com series.

Standard work area wall outlet faceplates will be Panduit Executive Series with provision for labels:

- Default user outlet will use CBEIW or CBEIW-2G faceplate (or CFPSE4IW kit).
- Default user outlet insert will be sloped style with 2 module spaces, CHS2IX.
- Other Mini-Com series wall faceplates may be used to meet special requirements as specified or approved by owner.

Wall phone outlets will be Panduit part KWP6.

Where outlet boxes are impractical, Panduit surface-mount outlets may be used.

- Default will be model CBX4IW or CBX4IG.
- Other CBX series boxes are acceptable where appropriate.

Any outlets required in raceway systems, floor boxes, modular furniture, or other formats will accept appropriate Panduit Mini-Com series fittings. Sloped openings facing downward are preferred where they are practical. Specific parts must be approved by owner before use.

- Where special furniture or other mounting facilities cannot accommodate Mini-Com faceplates, Panduit Category 6 jacks with keystone-style mounting form may be used.

Any faceplate with an arrangement not included above or otherwise specified will be an appropriate Panduit brand part specified for use with Mini-Com modules whenever possible. Specific parts must be approved by owner before use.

Mini-Com faceplate opening Blank Module is Panduit CMBIW.

Closet jack panels for horizontal distribution will be CP48BL or CP48WSBL.

5. *Assorted related Products*

Rear cable support brackets will be Middle Atlantic Products **LBP-1R4** 4" offset round rod or equivalent approved by owner.

Labels will be intended for use with the Panduit Mini-Com system. See separate WMU DG.

Cable Hangers

- Cable hangers compatible with Category 6 and fiber optic cable specifications that are intended for use above false ceilings or similar spaces.

Horizontal cable management for 19" racks will be AMP/Tyco Part 558329-1 (1-u) or 558331-1 (2-u) or equivalent approved by owner.

Jumpers will be Panduit Giga-Channel TX-6 Plus patch cords (UTPSPx or better) as follows:

- Closet jumpers: one per jack, length 1, 2, or 3ft, as appropriate, color purple.
- Office jumpers: one per jack, length 9 or 14 ft for small office, as appropriate, 14 or 20 ft for large office, as appropriate; color black.
- Classroom connections: one per jack, length appropriate to suit final intended use, color black.
- Public areas: one per jack, consult owner for lengths, color black.
- Other outlets: consult owner.
- RJ mounting panels, faceplates, and other hardware as detailed in **17161**.

**B. Execution**

1. *General*

Install all horizontal cabling using cable path system.

Entire system will be installed in a manner, which meets Panduit Warranty requirements. See appropriate UMU DG.

## 2. *Cabling*

Horizontal user cables will be routed to the nearest TC (by cable length). If two TCs are close in distance, the connection will be routed to the one that is most logical for the outlet (consult with owner if questionable).

Individual cables are not color-coded. White is the default color.

Cables will be directly terminated to jacks at TC and user ends with no intervening splices, junctions, or connectors.

- At each closet jack, cable will be dressed so sufficient slack is available to allow re-termination, if necessary, without requiring unbundling and significant adjustments.
- At each user outlet, a service loop of approximately 8" will be left for future re-terminations. This slack will be neatly coiled in the box in a manner adhering to Category 6 bend requirements.

All cabling will be neatly and appropriately dressed and retained within cable pathway.

Bend radius, tensions, and other physical parameters for all cables will adhere to manufacturer specifications and Category 6 standards at all times during installation and after completion.

Cables will be dressed and secured to cable trays in accordance with manufacturer-approved practices and accepted standards.

At CDRs, each group of cables connected to an individual 48-jack panel will be bundled and dressed into a service excess of approximately 5 feet near the panel to allow re-location of panel if required at a later date. The excess will be placed so it will not interfere with installation of electronics in the rack.

## 3. *All Jacks*

Jacks will be attached to cables using the T568 wiring pattern.

Quantity and arrangement of RJ jacks at specific user outlets will be as detailed on drawings and/or supplemental specifications. If any individual outlets are not clear, consult owner.

At the TC end, jacks will be installed in racks in groups of up to 48 using Panduit Mini Com 48-jack metal panels.

- RJ jack panels will have cables dressed and routed neatly. Cables and pairs will be retained to rear support brackets to assure full strain relief support and proper bend radius.
- Cables will be supported either by individually securing them to integral strain relief bars on Panduit RJ patch panels or by securing

them to rear support bar spaced from patch panels to assure proper bend radius, or both.

Jacks at each end of each cable will have matching colors and labeled identifications per separate WMU DG.

- If detailed specifications are not provided for jack arrangements in specific types of outlets, jacks in outlets will be arranged as specified below.
- Default colors for UTP jacks at the user outlet end will be:
  - Upper left (position 1) - Off White (Panduit code IW)
  - Lower left (position 2) - Blue (Panduit code BU)
  - Upper right (position 3) - Yellow (Panduit code YL)
  - Lower right (position 4) - Orange (Panduit code OR)
- When fewer than 4 UTP jacks are installed, they will be placed according to the following:
  - Single jack:
    - If unspecified, IW in position 1.
    - If specified as “data-only” or intended for computer use, BU in position 2.
  - Two jacks: IW in position 1(UL) and BU in position 2 (LL).
  - Three Jacks: IW in position 1, BU in position 2, YL in position 3.
- Jacks from each outlet will be arranged in the panel in the TC in the order of placement within the outlet (1-UL, 2-LL, 3-UR, 4-LR).

Jacks at both ends will be labeled and system will be documented as specified in separate DG.

#### 4. *User Outlets*

User jacks will be installed in sloped panels with openings facing down whenever practical.

All openings not filled by jacks or connectors will be filled with a Blank Module (Panduit CMBIW).

Outlets designated with no faceplate required (if any) will have 2 feet of available cable and will be terminated with a standard TX-6 jack for testing purposes.

- Finished termination will be neatly coiled and left in outlet box on completion to avoid damage.

Other non-standard outlets will be finished per specifications provided in drawings.

5. *Closet Jack Panels*

Unused closet mini-mod openings do not need to be filled.

**END OF SECTION**