**27 15 00 Communications Horizontal Cabling**

(Revision date: 4/17/14)

**1.0 Purpose**

1. These guidelines provide requirements for designers to incorporate into bid documents. They are part of the University Wiring Standard (UWS), version 3.0.
2. **General Requirements**
3. Horizontal Cabling. Horizontal cables will be installed throughout all spaces in campus buildings. These cables will originate at a BDF/IDF room and terminate at telecom outlets (faceplates). The cable type used for the vast majority of locations will be Category 6A UTP cable. For special applications, fiber optic cables and coax video cables will be installed.

**3.0 Materials and Standards**

1. Materials. The materials used for this system are to be manufacturer and part number specific with no substitutions, unless specified as accepting “or equal.” See Section 27 06 00 Schedules for Communications Systems for a list of materials acceptable for use in NC State University projects.
2. Construction details. A detail drawing describing the various outlet configurations is available for download by designers at the NCSU ComTech website.
3. Standards. All work shall be in accordance with the latest versions of the BICSI TDMM manual and TIA-568 standard, and with manufacturer’s recommendations.
4. Installer qualifications. All installation work (including pulling of cables) shall be performed by a contractor who is currently certified by Leviton Network Solutions as a Leviton Premier Installer (LPI) or Leviton Authorized Installer (LAI). Proof of that certification must be provided to NCSU (by either the contractor or by Leviton Network Solutions) prior to commencement of work. All work shall be completed in accordance with the Leviton Network Solutions warranty process for Category 6A horizontal cabling systems. See Section 27 08 00 Commissioning of Communications Systems for additional information.
5. Outlet types. The telecom outlet types accepted for use at NCSU are the following:
	1. University Wiring Standard (UWS) outlets. Three Category 6A cables.
	2. UWS single outlets. One Category 6A cable.
	3. Single-mode fiber outlet. One 4-strand single-mode fiber optic cable.
	4. Multi-mode fiber outlet. One 4-strand OM3 multi-mode fiber optic cable.
	5. UWS with video. Three Category 6A cables and one RG6 coax video cable.
6. Tools/equipment. All installation should be performed using tools and equipment designed for the specific cables. UTP cables may be terminated with standard punchdown tools or with Fluke Network JackRapid punchdown tool for Leviton jacks (JR-LEV2).
7. UWS outlets. These outlets will typically be installed for all occupied work area spaces within a building. Additionally, any locations requiring the potential of more than one telephone and/or network connection should be provisioned with UWS outlets. Each cable may be used to connect a telephone or data network device. Terminations shall be completed per manufacturer specifications, using TIA-568A pinouts, and as follows:
8. Station end. Outlets shall be terminated with any campus standard two-gang or modular furniture faceplates. For two-gang faceplates, the default finish is stainless steel. For specific projects, other custom finishes are available (almond, white, and black). Modular furniture faceplates are white finish. The upper left position shall be terminated with a Category 6A jack (crimson color). The upper right position shall be terminated with a Category 6A jack (white color) and lower right position with a Category 6A jack (black color). A blank insert (gray color) shall be installed in the lower left position.
9. BDF/IDF end. Beginning in the upper-most patch panel in the first horizontal cross-connect rack, terminate each outlet started from the left end of the panel. Terminate each cable with a Category 6A jack with its color corresponding to the jack color on the station end. For each outlet terminated, install the crimson jack in the upper position of the patch panel, white jack in the middle position, and black jack in the lower position. Install jacks only in patch panel positions where outlets exist.
10. UWS singles. For certain locations and applications, it may be determined that it is highly unlikely that more than one telephone or network device will ever be required. Examples include a: wireless access point, wall telephone at a loading dock, CCTV camera in an exit corridor, controller for a break room vending machine, etc. In these locations, a single Category 6A cable may be installed. All outlets can be easily upgraded to UWS outlets later with the addition of two Category 6A cables. These outlets should not be specified for typical occupied spaces (offices, labs, classrooms, etc.), but limited to the specialized situations as described above. Terminations shall be completed per manufacturer specifications and as follows:
11. Station end. Outlets shall be terminated with any campus standard two-gang or modular furniture faceplates. The upper left position shall be terminated with a Category 6A jack (crimson color). Blank inserts shall be installed in the other three positions (gray color).

1. BDF/IDF end. Beginning in the upper-most patch panel in the first horizontal cross-connect rack, terminate each outlet starting from the left end of the panel. Terminate each cable with a Category 6A jack (crimson color) in the upper position of the patch panel with blank inserts in the middle and lower positions. Install jacks only in patch panel positions where outlets exist.
2. Fiber outlets. There may be locations where fiber optic cable (instead of UTP cabling) is required to meet high-bandwidth connectivity needs. This typically occurs in specialized places like server rooms or video production studios. The type of fiber to be installed (single or multi-mode) is determined by specific equipment requirements. Terminations shall be completed per manufacturer specifications and as follows:
3. Station end. Outlets shall be terminated on a two-gang faceplate. Strands shall be terminated (using mechanical termination) with LC type connectors suited for the cable type (single or multi-mode). Strands F1 and F2 will be terminated in the lower left position of the faceplate. Strands F3 and F4 will be terminated in the lower right position, and blanks will be installed in both upper positions.
4. BDF/IDF end. In multi-rack rooms, one 2RU fiber housing will be installed solely for horizontal cable terminations. This housing will contain a maximum of four connector panels installed with colored square icons facing down. Beginning in the upper left connector panel, strand F1 will be terminated (using mechanical termination) on the bottom half of the left-most duplex adapter. Strand F2 will be terminated in the top half of that same adapter. Strands F3 and F4 will be terminated in second adapter similarly. For additional horizontal fiber cables, the above pattern will be repeated until the upper left connector panel is filled. Subsequent terminations will be made in the lower left connector panel, followed by the upper right and lower right connector panels, as required.
5. UWS outlets with video. Although CATV and other video services are increasingly moving to data network delivered mechanisms, there may occasionally be a need for installation of coax video cable. This will be an RG6 video cable terminated in the same outlet faceplate with the three Category 6A cables that constitute typical UWS outlets. Terminations shall be completed per manufacturer specifications and as follows:
6. Station end. The three Category 6A cables shall be terminated per above. In the lower left position, a video (F-type) jack shall be installed. The RG6 cable shall be terminated as follows:
	1. Prep cable with a fixed blade, prep tool drop trimmer designed for RG6 cable. Insert cable into outer opening of tool until cable touches stop. Use edge of tool if no stop. Proper tool should have two blades not three. Close tool and rotate clockwise around cable 4 to 5 times or until cutting action can no longer be heard. Holding tool firmly closed, pull tool away from cable end to expose the braid and center conductor. Cable should be prepped to ¼” x ¼” dimensions.
	2. Fold back braid. For Quad Shield cable remove layer of foil between the two braids.
	3. Inspect center conductor to make sure there isn’t a thin layer of dielectric remaining on conductor or a piece of the braid wrapped around the center conducter.
	4. Guide center conductor and dielectric into post. Insert cable into connector until dielectric is flush with post. Center conductor should extend approximately 1/16” past edge of connector(no more than 2/16”).
	5. Insert the F connector into compression tool and properly seat. Compress fully. When properly connected, no braided shield will be visible from under the bottom portion of the connector, and the dielectric insulation will be flush with the top of the inner ring of the connector.
	6. Twist the cable connector onto the jack hand tight plus ¼ revolution with wrench. When properly tightened the portion threaded onto the jack and the body should not move.
	7. Tools. Use a commercial grade stripper (Belden Snap-N-Seal CST596596 or equal) and compression tool (Skywalker Lock and Seal Big Blue - LNS 5000 or equal).
7. BDF/IDF end. The RG6 cable will be terminated as described above. Beginning in the upper left position of the video F-panel in the first cross-connect rack, a video jack (F-type, gray color) will be installed. The cable connector will be installed onto the rear of the jack (twisted hand tight plus ¼ revolution with wrench). Subsequent jacks will be installed in the panel, left to right, filling in all empty slots.
8. Patch cords. The provision and installation of patch cords will not fall within the scope of work for contractors constructing or renovating campus buildings. Patch cords are installed by ComTech. However, the designer should specify outlet locations in order to facilitate easy patch cord installation (even after furniture is installed) using standard length patch cords.
9. Cable installation/routing. All horizontal cabling will be non-plenum type and shall be installed inside an enclosed raceway/conduit system. Cabling shall be installed end-to-end (no splices) according to standard industry practices.

Cables shall be routed at the BDF/IDF end as follows: Route horizontal cables from entry points into BDF/IDF to nearest ladder rack. Fasten cables to overhead ladder racks to reach equipment racks where cables are to be terminated. Install an additional 10ft. (minimum) cable slack loop in the cable runs, and fasten to overhead ladder racks. Route cables neatly, parallel to each other, and secure with velcro-type cable wraps to the ladder rack system. Install cables down from ladder racks via dropouts into the rear channel of vertical managers. Cables to be terminated on the left half of patch panels should be routed down the left vertical manager and those to be terminated on the right half of patch panels down the right vertical manager. Dress cables to the rear of each patch panel by fanning out and attaching to the cable management bar installed behind each patch panel.

1. Firestopping. Firestopping material shall be installed inside all wireways which enter each BDF/IDF after installation of the horizontal cabling is completed to form smokes barriers. Malleable foam-type bricks that can be cut to fit shall be used. Putty or mineral wool shall not be used. Slots should be cut to allow the bricks to form tightly around cables. Firestopping is not required inside 1” homerun conduits serving single outlets.

End of Section