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Cabling Sy

1.0 INTRODUCTION

1.1 PURPOS

Th or all University of
This document provides the
g a complete cabling system

guidelines are provided in this written
ation details, cable routing and outlet types
vided as an attachment to this document. If
hall take precedence. The successful vendor
ystem described in this document.

Commscope Netconnect structured cabling
ment & Technology (UNC IM&T) **approved** equivalent end-to-end
by a contractor capable of providing a warranty for Commscope Netconnect,
lorado. Contractor must be within a two-hour travel distance from the University of
lorado. The Category 6 portion of the cabling sBT/F1 9.96 Tfteg

1.3 APPLICABLE DOCUMENTS:

The cabling system described in this specification is derived in part from the recommendations made in industry standard documents. The lists of documents below

3.1.1 PRODUCT SPECIFICATIONS

Category 6 Cabling Non-plenum

Horizontal cabling shall be 23 AWG, 4-pair UTP, UL/NEC/NFPA CMR rated, with a PVC jacket. Cable jacketing shall be lead-free. Cable shall be 3rd party verified to ANSI/TIA/EIA-568-B.2.1 and meet the performance requirements listed in the table below in addition to all other standard Category 6 performance requirements. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be safety listed to ANSI/UL 1666. Horizontal cable shall be:

- Commscope part number CS37R BLU (Blue) for designated data.
- Commscope part number CS37R YEL (Yellow) for designated analog voice.
- Commscope part number CS37R RED (Red) for life safety (e.g. fire alarm panels).
- Commscope part number CS37R GRN (Green) for designated Audio Video or Digital Media.

Category 6 Cabling Plenum

Horizontal cabling shall be 23 AWG, 4-pair UTP, UL/NEC/NFPA CMR rated, with a PVC jacket. Cable jacketing shall be lead-free. Cable shall be 3rd party verified to ANSI/TIA/EIA-568-B.2.1 and meet the performance requirements listed in the table below in addition to all other standard Category 6 performance requirements. Cable shall be supplied on wooden reels or in reel-in-box. Cable shall be safety listed to ANSI/UL 1666. Horizontal cable for data shall be:

- Commscope part number CS37P BLU (Blue) for designated data.
- Commscope part number CS37P YEL (Yellow) for designated analog voice.
- Commscope part number CS37P RED (Red) for life safety (e.g. fire alarm panels).
- Commscope part number CS37P GRN (Green) for designated Audio Video or Digital Media.

Modular Jacks

UNC uses category 6 SL series. All modular jacks shall be wired to the T568B wiring pattern. Modular jacks shall be constructed with a housing of polyphenylene oxide, 94V-0 rated. Modular jacks shall be terminated using a 110-style pc board connector (made of 94V-0 rated polycarbonate), color-coded for both T568A and T568B wiring. The 110 connector shall terminate 22-24 AWG solid conductors with a maximum insulation diameter of 0.060 inches. Modular jack contacts shall be plated with a minimum of 50 microinches of gold in the contact area overa 50 microinch minimum nickel underplate. Modular jacks shall be compatible with panel thicknesses of

- Modular jacks shall snap into a .790" X .582" opening. Modular jacks shall be UL Listed under file number E81956. Modular jacks shall match the appropriate color for designation of data, voice, or life safety at the office/work area.

Category 6 modular jacks shall be unkeyed 4-pair and shall meet the performance requirements listed in the table below. Modular jacks shall fit in a .790" X .582" opening. Modular jacks shall be terminated using a 110-style pc board connector, color-coded for both T568A and T568B wiring. Each jack shall be wired to **T568B**. Modular jacks shall be UL Listed under file number E81956. Modular jacks shall be:

- Commscope part number 1375055-6 (Blue) for designated data.
- Commscope part number 1375055-8 (Yellow) for designated analog voice.
- Commscope part number 1375055-7

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Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-B document, recommendations and/or best industry practices.

Pair untwist at the termination shall not exceed .24 inch for Category 6 connecting hardware.

Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.

Cables shall be neatly bundl 90.024 651.7 Tm0 g0 663.22 Tm0 g0 G -0.00888 Tc[(the)] TJETQq0.00000912 0 612 792

Acceptable Hardware -		
LC-Style 6-Fiber Single mode Plate (SM)		
Blank Plate	Commscope	760147736
1U Rack Mount Patch Enclosure, Black	Commscope	760231449
2U Rack Mount Patch Enclosure, Black	Commscope	760231456
4U Rack Mount Patch Enclosure, Black	Commscope	760231464

4.0 BACKBONE CABLE

A minimum of two six strand single mode fiber optic cables shall be utilized to connect buildings Main Distribution Frame (MDF) to the Core Data Center in a dual home fashion. The Core Data Center (CDC) for Central Campus is located in Carter Hall and Gray Hall. The Core Data Center (CDC) for West Campus is located in McKee Hall and Ross Hall. A minimum of six strand fiber optic cable shall be utilized to provide backbone connectivity between the MDF and each Intermediate Distribution Frame (IDF). Inter-building fiber optic cabling shall be single mode Indoor/Outdoor Loose Tube. Intra-building fiber optic cabling shall be single mode Indoor/Outdoor Interlocking Armored Plenum. The cable shall provide a maximum attenuation of 3.5 dB/km @ 850 nm and 1.5 dB/km @ 1300 nm. The bandwidth of the cable shall be 500 MHz/km @ 850 nm and 500 MHz/km @ 1300 nm. The optical fiber cable shall be Commscope or Corning.

4.1 BACKBONE CABLE INSTALLATION

All backbone cables shall be installed in the following manner:

Fiber Optic cables installed within UNC tunnel system, shall be separated by a minimum of three feet when applicable.

All Fiber Optic cables installed outside the UNC tunnel system shall be installed in separate conduit, separate innerduct or as indicated on prints/drawings.

Backbone cables shall be installed separately from horizontal distribution cables.

Where cables are housed in conduits, the backbone and horizontal cables shall be installed in separate conduits or in separate innerducts within conduits.

Where cables are installed in an air return plenum, the cable shall be installed in conduit, or plenum cable shall be installed in a plenum innerduct to provide protection to the cable

Where horizontal backbone cables and distribution cables [NRR1]are installed in a cable tray or wireway, backbone cables shall be installed first and bundled separately from the horizontal distribution cables.

Support brackets with cable tie slots for fasten TJJETQq0.000009.3.05 Tm0 G[(0 G)792 reW* nBT/F2 9.96 7326 T

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Horizontal distribution multimode optical fiber attenuation shall be measured in one direction at either 850 nanometers (nm) or 1300 nm using an LED light source and power meter. Backbone multimode fiber shall be tested at both 850 nm and 1300 nm in one direction. Test set-up and performance shall be conducted in accordance with ANSI/TIA/EIA-526-14 Standard, Method B. The MT-RJ system shall be tested in accordance with the industry testing procedures established in -RJ Optical Fiber Systems literature# 1307540. This measurement is consistent with the loss which network equipment will see under normal installation and use. Test evaluation for the panel to panel (backbone) or panel to outlet (horizontal) shall bebased on the values set forth in ANSI/TIA/EIA-568-B.1.

Where concatenated links are installed to complete a circuit between devices, the Contractor shall test each link from end to end to ensure the performance of the system. After the link performance test has been successfully completed, each link shall be concatenated and tested. The test method shall be the same used for the test described above. The evaluation criteria shall be established between the Owner and the Contractor prior to the start of the test.

Single-mode optical fiber attenuation shall be measured at 1310 nm and 1500 nm using a laser light source and power meter. Tests shall be performed at both wavelengths in one direction on each strand of fiber. The set-up and test shall be performed in accordance with ANSI/TIA/EIA-526-7 Standard, Method 1A. Two-meter patch cords shall be used as test references and for the actual test. This test method utilizes a one jumper reference, two jumper test to estimate the actual link loss of the install cable plus two patch cords. The MT-RJ system shall be tested in accordance with the industry -RJ Optical This measurement is consistent with the loss which network equipment will see under normal installation and use.

Test evaluation for the panel to panel (backbone) shall be based on the values set forth in ANSI/TIA/EIA-568-B.1. Attenuation testing shall be performed with a stable launch condition using two-meter jumpers to attach the test equipment to the cable plant. The light source shall be left in place after calibration and the power meter moved to the far end to take measurements. Maximum attenuation for installed cables shall be

1000 and then multiplied by the installed cable length in meters*. The adjusted cable attenuation value shall be added to the manufacturers mean loss per mated pair of connectors multiplied by the number of mated pairs under test**.

The expected results for each cable (or group of cables of the same nominal length) shall be calculated

fiber in the respective cable shall be evaluated against this target number. Any fibers that exceed this value by more than (?dB) shall be repaired or replaced at no cost to the Owner.

*For this application, the length based on cable length measurements marked on the jacket, will be suitable. If OTDR testing is performed in accordance with 8.2.2, then the actual measured length shall be used. Conversion from metric to US Standard measurement shall use 3.2808 as a constant with the result rounded to the next highest whole number.

**The testing for this project is measuring the loss over the installed cable plus two jumpers which accounts for

Each cable shall be tested with an Optical Time Domain Reflectometer (OTDR) to verify installed cable length and splice losses. The OTDR measurements for length shall be performed in accordance with ANSI/TIA/EIA-455-60. The measurements to determine splice loss shall be performed in accordance with

more of the following

set will be designated for as the central location to document all as-built information as it occurs throughout

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- If entry is above grade, transition to Rigid Metal Conduit with long-sweep elbows. Provide weathertight seal at entry to building using all weather polyurethane sealant, color to match surrounding finishes.
- If entry is through slab on grade, handhole may be eliminated, and HDPE Communication Duct may be swept up to grade (near vertical) and cut off approximately above slab.

- Contractor is responsible for calling for all utility locates and shall pothole all critical crossings prior to boring.
- Contractor shall protect all open trenches.
- Site Restoration
  - Repair all damage to existing systems prior to closing trench.
  - Backfill all trenches and borehole openings using jumping / Plate Compactor type compaction equipment. Add water to achieve adequate compaction to prevent future settling.
  - SOD AREAS

    Scrape / Retain topsoil (+/-
    over well compacted soil. Grade to match existing.
    Place new sod (New sod shall be equivalent of a ninety-nine percent improved variety blue grass sod).
    Coordinate sod placement / maintenance with UNC Facilities.
  - PAVED AREAS

    Replace pavement (concrete / asphalt) to match existing thickness
    - Minimum of thick

    Protect new pavement from damage until cured

12.0 WARRANTY AND SERVICES

The contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and follow-on support after project completion. Contract warranty must be a minimum of five years including materials and labor.

12.1 INSTALLATION WARRANTY

The contractor shall warrant the cabling system against defects in workmanship for a period of five years from the date of system acceptance. The warranty shall cover all labor and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. This warranty shall be provided at no additional cost to the Owner.

12.2 CABLING SYSTEM WARRANTY

The contractor shall facilitate a 25-year system performance warranty between the manufacturer and the Owner. An extended component warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of acceptance. The performance warranty shall warrant the installed 250 MHz horizontal copper, and both the horizontal and the backbone optical fiber portions of the cabling system. Copper links shall be warranted against the link performance minimum expected results defined in ANSI/TIA/EIA-568-B.2-1 (latest draft). Fiber optic links shall be warranted against the link and segment performance minimum expected results defined in ANSI/TIA/EIA-568-B.1.