

SECTION 28 1000 – SECURITY ACCESS CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENT

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section

1.2 SUMMARY

- A. The Section defines the requirements for the installation of the system. As described elsewhere in these Documents the system consists of twisted pair cabling and hardware, and related hardware. In addition to the basic cable plant requirements, the testing and identification requirements are also defined. Finally, the racks, enclosures, and pathway hardware is also defined herein.

- B. Section Includes

- 1. Twisted Pair Cable
- 2. Patch Panels
- 3. Jacks
- 4. Faceplates
- 5. Patch Cords
- 6. Racks
- 7. Wire Management
- 8. Innerduct

- C. Related Sections

- 1. Section 27 05 00 – Communications Common Work Results
- 2. Section 27 05 24 – Firestopping
- 3. Section 27 05 26 – Technology Grounding System
- 4. Section 28 13 00 – Access Control System
- 5. Section 28 23 00 – Video Surveillance System

1.3 REFERENCES

- A. NFPA 70 – The National Electrical Code
- B. ANSI/TIA 568-C.0 – Generic Telecommunications Cabling for Customer Premise
- C. ANSI/TIA/EIA 568-C.1 – Commercial Buildings Telecommunications Cabling Standard
- D. ANSI/TIA/EIA 569 – Commercial Building Standard for Telecommunications Pathways and Spaces

- E. ANSI/TIA/EIA 606-A – Administration Standard for the Telecommunications Infrastructure of Commercial Building; TR-42.6 - Labeling
- F. ANSI/TIA/EIA 607A – Commercial Building Grounding and Bonding Requirements for Telecommunications
- G. ANSI/TIA – TSB 95 – Testing Standards
- H. ANSI/TIA-568-B.2-ad10 – Augmented Category 6
- I. ANSI/TIA 942 – Data Center Cabling Standard
- J. BICSI TDMM – Telecommunications Distribution Methods Manual
- K. Northwestern University Design Information Technology Building Infrastructure Requirements for Communications Systems

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Include data sheets for the following additional items:
 - 1. Twisted Pair Cable
 - 2. Patch Panels
 - 3. Jacks
 - 4. Faceplates
 - 5. Patch Cords
 - 6. Racks
 - 7. Wire Management
- C. Shop Drawings
 - 1. Drawings of any through floor fittings with details of their contents.

1.5 QUALITY ASSURANCE

- A. Qualifications
 - 1. The Contractor shall be fully qualified to perform installations as described on the Contract Drawings and within these Specifications.
 - 2. The Contractor shall have completed a minimum of three projects of like scope and complexity within the last three (3) years.
 - 3. The Contractor shall have been active in bidding, being awarded, and performing work consistent with that which is indicated on the Contract Documents for a period not less than five (5) years.
 - 4. The Contractor shall maintain an installation staff whose sole function is the installation of Structured Cabling and associated equipment and shall not utilize additional personnel obtained by means of a temporary placement or staffing agency.
 - 5. The Contractor shall have a dedicated Project Manager, who shall be the sole point of contact for the Engineer or Owner. The Project Manager shall be assigned to the project for the duration of the project.

B. Certifications

1. The Contractor shall possess current certifications by BICSI for the installation and maintenance of all Structured Cabling and associated equipment being provided under the Structured Cabling Contract.
2. The Contractor shall possess current certification for the installation of all required fire stopping to be installed under the scope of the Structured Cable Plant.

C. Samples

1. Northwestern University reserves the right to request samples of components required by these specifications.

D. Mock Ups

1. The Contractor shall provide equipment assemblies for review at the request of Northwestern University.

E. Meetings

1. The Contractor shall be attend all Pre-Construction, Pre-Installation or Progress Meetings that may be called by Northwestern University.

1.6 DELIVERY STORAGE AND HANDLING

- A. The Contractor shall responsible for the storage and handling of all Materials required by the Structured Cabling portion of this Contract.

B. Storage and Protection

1. Any Materials that show signs of mishandling or have been stored in a fashion so as to reduce the value of the Materials shall be replaced with new Materials at no additional cost to the Owner.

C. Waste Management and Disposal

1. All excess Materials shall be discarded in an appropriate manner.
2. Any/all hazardous materials shall be handled appropriately and shall be disposed of in a manner consistent with same, and compliant with all applicable codes and regulations.

1.7 PROJECT/SITE CONDITIONS

- A. The Contractor shall become and remain familiar with all project/site conditions that may have impact on the timing, quality and/or quantity of Materials for the project. The Contractor shall coordinate their efforts with changes in the Project/Site conditions so as to optimize the installation for the Owner.

- B. Any additional efforts by the Contractor due to a lack of awareness of project/site conditions shall not require additional compensation from the Owner.

PART 2 - PRODUCTS

2.1 GENERAL

A. Equivalent Products

1. Only products listed as approved shall be utilized. Substitutions, under normal circumstances, shall not be allowed. However, in unusual cases, substitutions may be unavoidable. ALL requests for product substitutions shall be approved by the Engineer prior to the bid submission. Loss of certification by the Contractor, or unavailability of product to the Contractor that is not of a market wide nature, shall not be construed as an unavoidable circumstance. The request for product substitution and supporting documentation, must be submitted, in writing, along with any samples requested by the Engineer. Written approval for product substitution must be submitted with the bid.

2.2 COMPONENTS

A. Connectors

B. Connectors

1. Data/Voice (Copper)
 - a. Panduit Mini-Com Category 5e
 - b. Panduit Mini-Com Category 6a
 - c. Belden Category 6a

C. Faceplates

1. All Faceplates shall be available in single, duplex, triplex, quadplex, or sixplex arrangements in a single gang configuration.
2. Faceplates shall be available in eightplex arrangements in a two gang configuration.
3. Surface mount boxes shall be available in single, dual, quad, sixplex and twelveplex configuration.
4. All faceplates shall be as manufactured by the manufacturer of the associated connectors, unless otherwise noted in the Drawings.
5. Faceplates shall wherever possible match the color of the associated electrical faceplates. Coordinate the faceplate color with the electrical contractor and drawings prior to installation.
6. Acceptable Manufacturers and Series
 - a. Belden
 - b. Panduit – Mini-com faceplates

D. Patch Panels

1. Copper
 - a. The termination block shall support the appropriate Category 5e or Category 6a applications, both current and future, designed for the associated connectivity solution.
 - b. All patch panels shall be wired to EIA/TIA 568B.

- c. The wiring block shall be able to accommodate both 22 and 24 AWG cable conductors.
- d. The block shall be Underwriter's Laboratories (UL) listed, and ETL certified.
- e. All patch panels shall be UL listed for Category 6.
- f. A 110 IDC block shall provide for the termination of horizontal, equipment, or tie cables.
- g. The signal transmission from the 110 punch down terminals to the RJ45 jack shall be by means of a printed circuit board.
- h. All patch panels shall be 48 port 2U configurations.
- i. Approved manufacturers and part numbers
 - 1) Belden
 - 2) Panduit Category 6 Patch Panel

E. Cabling

1. Copper

- a. Category 5e Unshielded Twisted Pair (UTP), 4 Pair
 - 1) Category 5e UTP, 4 Pair Horizontal Distribution Cables shall extend between the station location and the associated HC, shall consist of 4 pair, 24 gauge, UTP, and shall terminate all conductors onto an 8 pin modular jack provided at each outlet. Cable jacket shall comply with Article 800 of the NEC for use as a plenum or non-plenum cable as required by these Specifications and by the local authority having jurisdiction. The 4 pair UTP cable shall be UL Listed Type CMP (plenum) or CM (non-plenum).
 - 2) The Category 5e UTP cable shall be a round cable design with fluting to maintain the appropriate pair spacing relationship. The cable shall support all current future applications designed to run on Category 5e cabling.
 - 3) The Category 5e cable shall be specified to a minimum of 100 MHz.
 - 4) Approved manufacturers and part numbers
 - a) Belden
 - b) Panduit
- b. Category 6a Unshielded Twisted Pair (UTP), 4 Pair
 - 1) Category 6 UTP, 4 Pair Horizontal Distribution Cables shall extend between the station location and the associated HC, shall consist of 4 pair, 24 gauge, UTP, and shall terminate all conductors onto an 8 pin modular jack provided at each outlet. Cable jacket shall comply with Article 800 of the NEC for use as a plenum or non-plenum cable as required by these Specifications and by the local authority having jurisdiction. The 4 pair UTP cable shall be UL Listed Type CMP (plenum) or CM (non-plenum).
 - 2) The Category 6 UTP cable shall be a round cable design with fluting to maintain the appropriate pair spacing relationship. The cable shall support all current future applications designed to run on Category 6 cabling.
 - 3) The Category 6 UTP cable shall be designed to have improved balance of 10dB as compared to current Category 5e cable, which shall result in higher immunity to EMI.
 - 4) The Category 6 cable shall be specified to a minimum of 500 MHz.
 - 5) Approved manufacturers and part numbers

- a) Belden
- b) Panduit

F. Equipment Racks

1. Each MC/ER/HC shall be equipped with a 19" Aluminum Rack System to house Owner provided equipment and Contractor provided termination bays for the multiple cable types.
2. 19" Aluminum Rack System
 - a. The rack shall be able to support and organize electronic equipment, cross connection and/or termination hardware for fiber optic cabling, horizontal distribution cabling, riser cabling, or building entrance cabling as may be required by the design. The rack face shall have a conventional equipment mounting width of 19". The rack shall be designed for cable and jumper management and shall have hardware to organize and support cabling and patch cords in the vertical and horizontal planes. The rack system shall be equipped for electrical grounding to meet EIA/TIA 606 Standards, and the designed grounding system. The fastening system for the equipment shall facilitate installation with roll-formed threads in the screw holes for greater strength and durability and the mounting screws shall have pilot points. All rack components shall be charcoal black in color and made of lightweight 6061-T6 extruded aluminum. The rack shall be shipped with all necessary hardware to assemble the frame. It shall be packed in cartons with suitable shipping inserts such that no damage occurs to the rack finish. The finish shall not be scratched, chipped, or marred.
 - b. Self-Supported Rack Framework
 - 1) The self-supporting equipment rack shall be 7' tall with 3" wide channels at each side and with extruded aluminum top angles and base angles providing support. Standard grade frames shall be capable of supporting 700 lbs., with uniform distribution of weight.
 - 2) Standard frames shall provide a .19" thick channel flange and .13" web thickness.
 - 3) Standard base angles shall be .3125" thick, and top angles shall be .1815" thick.
 - 4) Racks shall be able to be mounted side by side and be secured to adjacent racks in a line-up with vertical wire management between each rack.
 - 5) The self-supporting rack shall maintain a UL listing for a telecommunications accessory.
 - 6) Approved Manufacturers and Products shall be:
 - a) Chatsworth – 7' UL Standard Rack
 - b) Equal by Homaco, Ortronics, or Panduit
 - c) All accessories and related hardware associated with a rack shall be provided by the manufacturer of the rack, unless otherwise noted in these Documents.
 - c. Horizontal Wire Management
 - 1) Units shall fit in a standard 19" rack.
 - 2) Units shall be 1U or 2U construction.
 - 3) Units shall be two sided to provide functionality on both the front and back of the rack.
 - 4) Units shall have front and back covers that have a dual hinge technology

- 5) Access into and out of the top and bottom of the Management shall be finger type construction.
 - 6) Approved Manufacturers and Models shall be:
 - a) Chatsworth Products Universal Cable Manager, utilizing two units, in a front/back configuration.
 - b) Equal by Homoco, Panduit, or Ortronics
- d. Vertical Wire Management
- 1) Units shall have a standard bracket that shall allow for ready installation to any industry standard relay rack.
 - 2) Units shall have finger guides spaced at 1U.
 - 3) Units shall be 7' tall.
 - 4) Unit shall be double sided to provide wire management for both the front and back of the rack.
 - 5) Unless otherwise noted in these Documents, the units shall be 4" wide by 5" deep in each section, front and back.
 - 6) Approved Manufacturers and Models
 - a) Chatsworth Master Cabling Section
 - b) Equal by Panduit Standard Vertical Slotted Duct or Ortronics

2.3 ACCESSORIES

A. Patch Cords

1. Copper

- a. Patch Cords shall be manufactured and supplied by the manufacturer of the connectivity provide, and shall be rated for the same performance specifications as the cabling and connectivity being utilized.
- b. Unless otherwise indicated on the Drawings the Contractor shall supply patch cords based on 100% of the outlets at the work area, and any wall phone locations. Of the cables provided, the Contractor shall supply 25% of the cables as 1m, 50% as 3m, and 25% as 5m.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Materials shall be examined for damage on receiving the materials. Reject any materials that are damaged.
- B. Examine all materials before installation. Reject and materials that are damaged.
- C. Examine elements and surfaces to which materials will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Cable Routing

1. Provide a 36" service loop at the end of each work area stub, and a 10' service loop at the TR servicing that drop. The service loop at the TR shall be stored in the cable runway of the TR in a fashion so as to prevent the crushing of the service loop by other cable stacked on the service loop. Should no cable runway or cable tray be available for such service loops, construct a loop storage system of J-Hooks or add an additional section(s) of cable runway to accommodate the service loops.
2. Non-continuous pathways shall keep hallway crossover to a minimum. Furthermore, non-continuous pathways shall be routed so as to follow logical paths parallel and perpendicular to the building structure. Diagonal pathways are unacceptable, unless agreed to by NUIT.
3. In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the Contractor shall bundle, in bundles of 50 or less, horizontal distribution wiring with cable ties snug, but not deforming the cable geometry. Where cable bundles are to be supported by J-hooks, the J-hooks shall be attached to the building structure and framework per local codes and regulations at a maximum of five (5) foot intervals.
4. Cables shall be bundled by means of either Velcro or Milli-Ties. Zip-ties are unacceptable.
5. All horizontal cables shall not exceed 90m (295 ft) from the Telecommunications Outlets in the Work Area to the Horizontal Cross Connect.
6. The combined length of jumpers, or patch cords and equipment cables in the telecommunications room/closet and the Work Area shall not exceed 10m (33 ft) unless used in conjunction with a multi-user Telecommunications Outlet.
7. A minimum of three horizontal cables shall be routed to each Work Area, unless otherwise noted on the Drawings.
8. Horizontal pathways shall be installed such that the minimum bending radius of horizontal cables is kept within manufacturer specifications both during and after installation.
9. Telecommunications pathways, spaces and metallic raceways, which run parallel with electric power or lighting cables or conduits, which is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 50 mm (2 inches).
10. The installation of telecommunications cabling shall maintain a minimum clearance of 3 m (10 ft) from power cables or conduits in excess of 480 Vrms.
11. No telecommunications cross connects shall be physically located within 6 m (20 ft) of electrical distribution panels, or step down transformers, which carry voltages in excess of 480 Vrms.
12. Each run of UTP/ScTP cable between the horizontal portion of the cross connect in the telecommunication closet and the information outlet shall not contain splices.
13. The Contractor shall provide all devices for routing the cabling as indicated on the Drawings, and as required by the manufacturer of the Structured Cabling System, so as to maintain the long term health and operability of the Structured Cabling System.
14. In a false ceiling environment, a minimum of 75 mm (3 inches) shall be observed between the cable supports and the false ceiling.
15. Continuous conduit runs installed by the Electrical Contractor shall not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes, unless otherwise indicated in these Specifications or on the Drawings. The Technology Contractor shall verify the proper installation technique and sizing of the raceway system with the Electrical Contractor prior to installation of the cabling.
16. All horizontal pathways shall be designed, installed and grounded to meet applicable local and national codes.
17. The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not affect the geometric shape of the cables.

18. Maximum conduit pathway capacity shall not exceed a 40% fill with the exception of perimeter and furniture fill, which is limited to 60% fill for moves, adds and changes, unless otherwise noted on Drawings.
19. Horizontal distribution cables shall not be exposed in the Work Area or other locations with public access.
20. Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 inches) above the ceiling grid supporting the tiles.
21. Cabling shall not be attached to any mechanical, electrical or technology system other than those specifically noted in the Contract Documents.
22. Cabling shall maintain clearance from Line Voltage cabling and devices at all times, and shall be spaced from these devices so as to comply with the TDMM, the NEC, and any other local codes or regulations.
23. Cables shall be bundled by means of either Velcro strap or Milli-Ties. Zip-ties are unacceptable.

B. Racks

1. All racks shall be anchored to the floor, structure below or wall as directed by the manufacturer. And shall comply with any seismic requirements as directed by any local, state or federal regulations.
2. All racks shall be assembled as directed by the manufacturer with the addition of any supplemental grounding requirements listed elsewhere in these Documents.
3. All racks shall be assembled with a vertical wire management located at each side of each row of racks, and on vertical wire management between each two adjacent racks, unless directed otherwise within these Documents.
4. All racks with active electronics mounted within, or indicated as having active electronics installed by others, or in the future shall have a vertical power distribution unit mounted on the rear.

3.3 LABELING

A. General Labeling Requirements

1. The SCC shall label, all cables, faceplates, cabling enclosures, patch panels, termination blocks, racks, equipment enclosures and related hardware.
2. All work shall be in compliance to TIA/EIA 606.
3. All labels shall be permanently attached, and shall be constructed of materials so as to assure the lifespan of the identification marker to be equal or greater than that of the device being identified.
4. The identification tag or placard shall be self adhering or attached by means of a permanent adhesive listed for the application, or other permanent mechanical means.
5. All means of identification shall be visible and clearly identifiable by personnel in charge of maintaining the cabling infrastructure.
6. All tape based products shall be manufactured for the purpose of identifying flexible communications cabling, and shall be used only on flexible materials.
7. All labels shall be machine generated onto adhesive labels or tags, or engraved on plastic laminated placards or brass tags. Use of P.Touch tape or other domestic/light duty type of label is unacceptable.
8. All laminated placards shall have a black field with white letters, unless otherwise noted.
9. The SCC shall compile all documentation required under this Section, both hard copy and electronic, and include the information in the Operating and Maintenance Manuals.

10. As previously indicated, all electronic documentation shall be recorded onto a readable CD. All files contained on the CD shall be in the native format of the software in which it was generated, as well as a plain text format.

B. Work Area Floor Plans

1. Each Horizontal Cross Connect shall contain a lexan covered copy of the floor plan(s) associated with the work area outlets serviced by the Cross Connect.
2. The size of the plans shall be equal to the size of the Contract Drawings, unless Contract Drawings exceed 30" x 42", in which case half size prints are to be utilized.
3. The plans shall be affixed by means of compression between the lexan cover and the backboard to which it is mounted. The Contractor shall make provisions to assure that the plans cannot accidentally fall from behind the lexan.
4. For cross connect locations that are smaller than TIA standard locations, half size plans shall be permitted.
5. The Contractor shall utilize the final set of Record Drawings when providing these plans.

C. Faceplate Labeling

1. All faceplates shall be labeled with the Horizontal Cross Connect and Faceplate Number.
2. The faceplate number shall be derived based on the room in which the faceplate is located, and a sequential number, e.g. TR01-138-01, where TR01 is the Telecommunications Room, 138 is the room number of the location of the faceplate and 01 indicates that this is the first faceplate in the room.
3. The label shall be permanently affixed to the faceplate in a location specifically engineered by the manufacturer to contain such information, or shall be neatly engraved directly on the faceplate and painted to facilitate easy recognition of the information.
4. The individual jack positions shall be identified with sequential letters, either by means of a pre-manufactured engraving or molding, or by installation of a machine generated label installed in a location specifically designed to hold such a label.

D. Patch Panel Labeling

1. All patch panels shall be labeled as to the identity of the patch panel.
2. The patch panel identification shall be derived based on the rack in which it is mounted and a sequential letter, e.g. TR01A-PP03, where TR01A is the rack ID, and PP03 indicates that this is the third patch panel in the rack.
3. The label shall be installed in the space provided by the manufacturer for this purpose. If no space is provisioned, the Contractor shall provide a laminated placard that shall be engraved with the identification of the patch panel, and shall be mounted in the upper right corner of the patch panel, but shall not block the proper installation of the patch panel.
4. All ports shall be labeled with the ID of the faceplate terminated at that port, and the associated jack letter from the faceplate.

E. Rack Labeling

1. All racks shall be labeled as to the identity of the device indicated on the Drawings. The label shall be made of plastic laminate and attached at the center of the front top rail of the rack and shall be visible from eye level.

F. UTP Cable Labeling

1. All UTP cables shall be marked at both ends of the cable jacket, at approximately 2" from the end of the sheath, with a self adhesive label.
2. The label shall have the exact location of the point of service, i.e. the TR, rack or block

3.4 FIELD QUALITY CONTROL

A. Site Test, Inspection

1. The Engineer retains the right to be present at any or all cable certification. The Contractor shall provide written notice 48 hours prior to the beginning of the certification process.
2. The Contractor shall provide a copy of the unaltered certification test reports to the Engineer in both hardcopy and electronic format. The Contractor shall also provide a copy of the associated Cable Tester's Database Management Software with unedited soft copy.
3. Independent System Certified testing may be required, at the discretion of the Engineer, provided at the expense of the Contractor, in the event of non-performance of the specified testing procedures, submittals and/or installation procedures.
4. The extent and logistics of the independent testing shall be arranged by the Engineer.
5. Copper Cabling
 - a. Upon completion of the cable installation, the Contractor shall perform complete copper cable certification tests on every cable, included but not limited to:
 - 1) For Category 3 Cabling and higher:
 - a) Wire Map
 - b) Length
 - c) Attenuation
 - d) Near End Cross Talk (NEXT)
 - 2) For Category 6a Cabling, additional tests shall be:
 - a) Equal Level Far End Cross Talk (ELFEXT)
 - b) Propagation Delay and Delay Skew
 - c) Return Loss
 - d) Power Sum Near End Cross Talk (PSNEXT)
 - e) Power Sum Equal Level Far End Cross Talk (PSELFEXT)
 - f) Insertion Loss
 - b. Test shall be performed to published standards, including but not limited to, the latest revisions of EIA/TIA 568, ISO/IEC 11802 and other applicable standards at the time of installation.
 - c. All tests shall be performed with a certified Level III UTP test device.
 - d. All UTP field tester shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided to the Engineer for review prior to the start of testing.
 - e. New test leads and/or calibration of testing instruments shall be provided at the beginning of each project.
 - f. Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters.
 - g. Test settings from options provided in the field testers shall be compatible with

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FOR: _____
ISSUED: 03/29/2017

3.5 CLEANING

- A. All equipment and Materials furnish, installed or provided shall be cleaned of all debris construction or otherwise prior to Owner final Acceptance.

3.6 DEMONSTRATION

- A. Upon completion of all installation, termination and testing, the Contractor shall review the entire installation with NUIT. At the time of this review, the Contractor shall present the hard copies of all unadulterated test results.

3.7 PROTECTION

- A. The Contractor shall protect all aspects of the cabling system from damage during the time period from the notice to proceed through the point of Owner Acceptance

END OF SECTION 28 1000