

SECTION 27 00 00
COMMUNICATIONS GENERAL

PART 1 - GENERAL

Contractors shall purchase and/or provide all materials, products, services; labor and equipment specified or needed to complete all Division 27 work.

1.1 STIPULATIONS

- A. The specifications sections "General Conditions to the Construction Contract", "Special Conditions" and "Division 01 – General Requirements" form a part of the Section by this reference thereto, and shall have the same force and effect as if printed herewith in full.

1.2 SUMMARY

- A. Division 27 Specifications are established to define the standards, criteria, and assumptions to be used to bid, plan, furnish, install, test, and document information transport pathways and systems for the Owner. These Specifications shall form the basis for implementation of the design, installation, inspection, and close-out process.
- B. Within this document use of the word "shall" marks mandatory requirements. Use of the word "may" or "should" suggests optional elements. All conflicts within this document shall be resolved by the Owner, Architect and Consultant prior to application of the specification by a Contractor.
- C. The Owner, Architect and Consultant must approve any deviation from the specifications and guidelines in this document. All communications, correspondence, and approvals must be conveyed through the official project contacts of record such as the Architect and Construction Manager.
- D. Unauthorized deviations from these Specifications may result in re-design, reconstruction, or re-installation of physical communications elements at the contractor's expense. Contractors shall obtain formal written approval prior to bidding and prior to installation in order to deviate from these Specifications or from ANSI/TIA/EIA standards and BICSI methodologies. Contractors shall not deviate from NEC and NESC requirements.

1.3 REFERENCES

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to these Sections.
- B. Related Documents and Sections:
 - 1. Division 01 – General Requirements
 - 2. Division 02 – Sitework
 - 3. Division 06 – Woods and Plastics
 - 4. Division 11 – Equipment
 - 5. Division 13 – Special Construction
 - 6. Division 14 – Conveying Systems
 - 7. Division 26 – Electrical
- C. The following codes, associations, acts and agencies, as required by law:

1. American National Standards Institute/Electronic Industries Association/Telecommunication Industries Association (ANSI/EIA/TIA)
2. Americans with Disabilities Act (ADA)
3. Federal Communications Commission (FCC)
4. Institute of Electronic and Electrical Engineers (IEEE)
5. Federal, State, and Local Codes.
6. National Fire Protection Association (NFPA)
7. NFPA-70, 2011 (National Electric Code)
8. National Electrical Safety Code (NESC)
9. National Electronic Manufacturer's Association (NEMA)
10. Occupational Safety and Health Administration (OSHA)
11. Building Industry Consulting Service International (BICSI)

D. The current edition of the following standards:

1. ANSI/TIA-568, Standard for Installing Commercial Building Telecommunications Cabling
 - a. ANSI/TIA-568.0-D, Generic Telecommunications Cabling for Customer Premises
 - b. ANSI/TIA-568.1-D, Commercial Building Telecommunications Cabling Standard
 - c. ANSI/TIA-568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components Standard
 - d. ANSI/TIA-568.3-D, Optical Fiber Cabling Components Standard
 - e. ANSI/TIA-568.4-D, Broadband Coaxial Cabling and Components Standard
2. ANSI/TIA-569-D, Telecommunications Pathways and Spaces
3. ANSI/TIA-606-B, Administration Standard for Telecommunications Infrastructure
4. ANSI/TIA-607-C, Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
5. ANSI/TIA/EIA-758-B, Customer-Owned Outside Plant Telecommunications Infrastructure Standard
6. TIA TSB-162-A, Telecommunications Cabling Guidelines for Wireless Access Points
7. IEEE 802.3 Ethernet Specifications, including:
 - a. IEEE 802.3i, 10Base-T 10 Mbit/s over twisted pair
 - b. IEEE 802.3u, 100Base-TX, 100Base-T4, 100Base-FX Fast Ethernet at 100 Mbit/s with auto negotiation
 - c. IEEE 802.3ab, 1000Base-T Gbit/s Ethernet over twisted pair at 1 Gbit/s
 - d. IEEE 802.3af, Power of Ethernet
 - e. IEEE 802.3an, 10GBase-T 10 Gbit/s Ethernet over unshielded twisted pair
 - f. IEEE 802.3at, Power over Ethernet enhancements
8. IEEE 802.11 Wireless Ethernet Specifications, including:
 - a. 802.11a
 - b. 802.11b
 - c. 802.11g
 - d. 802.11n
 - e. 802.11ac
9. UL 50 Enclosures for Electrical Equipment, Non-Environmental Considerations
10. UL 294 Standard for Access Control System Units

11. UL 467 Grounding and Bonding Equipment
12. UL 1076 Standard for Proprietary Burglar Alarm Units and Systems
13. UL 1459 Standard for Safety Telephone Equipment
14. UL 1863 Standard for Communications-Circuit Accessories
15. NEMA 250 Enclosures for Electrical Equipment

E. The current edition of the following guidelines:

1. ASNI X3T12 FDDI and CDDI
2. BICSI, Telecommunications Distribution Methods Manual (TDMM)
3. BICSI, Information Transport Systems Installation Methods Manual (ITSIMM)
4. BICSI, Outside Plant Design Reference Manual (OSPDRM)
5. NFPA 70 National Electrical Code (NEC) - most recent edition
6. NFPA 75, Standard for the Fire Protection of Information Technology Equipment - most recent edition
7. IEEE C2 National Electrical Safety Code (NESC) - most recent edition
8. IEEE 1100 – Recommended Practice for Powering and Grounding Electronic Equipment – most recent edition

F. When a discrepancy arises between the above-mentioned codes, standards or guidelines and the standards contained in this document, it shall be brought to the attention of the Owner immediately for resolution. The more stringent of the two guidelines shall be implemented.

1.4 PROJECT DESCRIPTION

- A. This project consists of the installation of a complete structured cabling and infrastructure pathway system for Loysville Youth Development Center.
- B. The project includes, but is not limited to the following:
1. Renovations of the Zimmerman-Bingaman (ZB) Cottage

1.5 DESCRIPTION OF REQUIRED SPACES AND COMMUNICATIONS CABLING ELEMENTS

A. Entrance Facility (EF)

1. The entrance facility of the building is located where cable (inter-building and intra-building) services interconnect. The space shall be identified on the Project Drawings.
2. The entrance facility shall house the new copper building feeder cable protection hardware. The entrance facility does not always house the main cross connect frame (MC).
3. The entrance facility may house communications electronics which shall be installed and activated by the Owner.
4. The EF shall be equipped with electrical power 110 VAC and 208 VAC L6 30 R, plywood backboard, lighting, floor covering, paint, and HVAC
5. The EF shall be connected to all MC's, TR's, and ER's via the appropriate trade size conduit or sleeve system if units are stacked. Maintaining proper fill capacity.

B. Main Cross connect (MC)

1. Copper and fiber backbone cables extend from the MC to telecommunication closets as shown on the Project Drawings. The MC also serves as a Telecommunications Room for services to the work areas.
2. The MC includes termination hardware, equipment racks, patch panels, cable management hardware, and network electronics.
3. The MC shall house the telecommunications main grounding busbar (TMGB). The bonding backbone cables shall extend from the TMGB to each of the Telecommunications Rooms as shown on the Project Drawings
4. The MC shall be connected to the EF, TR's, and ER's via the appropriate trade size conduit or sleeve system, if units are stacked. Maintaining proper fill capacity.

C. Telecommunication Room (TR)

1. The TR is the location for cross-connecting the backbone cable and horizontal station cable.
2. The space houses the new distribution frames for the horizontal cross-connect (HC). Horizontal station cables are home-run from the work area to the distribution frame. TR locations and serving boundaries are shown on the Project Drawings.
3. The TR shall be equipped with electrical power 110 VAC and 208 VAC L6-30 R, plywood backboard, lighting, floor covering, paint, and HVAC.
4. The TR will house communications electronics which shall be installed and activated by the Owner.
5. The TR shall house a telecommunications grounding busbar (TGB).
6. The TR includes equipment racks, cable management hardware, termination hardware and labeling.
7. The TR shall be connected to the EF, MC, TR's and ER's via the appropriate trade size conduit or sleeve system, if units are stacked. Maintaining proper fill capacity.

D. Intermediate Cross Connect (ICC)

1. The ICC is a remote distribution frame dedicated to a specific area within a building.
2. Communications outlets in the defined area shall be cabled back to the ICC rather than the local TR (Telecommunications Room).
3. Verify with Owner those outlets which shall be cabled from an ICC.
4. Refer to Project Drawings for construction of ICC and the service areas.

E. Backbone Riser Cable

1. Hybrid and composite cables shall not be installed under this contract.

F. Copper Entrance Cable

1. Install all the copper entrance cable, termination hardware, protection hardware, labeling and provide splice cases, and testing for the building as shown on Project Drawings.

G. Copper Riser Cable

1. New copper riser cables are home-run from the MC to each TR in a star topology.
2. Copper riser cables shall be a minimum of 25 pair.
3. Install copper riser cable, termination hardware, labeling and provide testing for the copper riser system as shown on the Project Drawings.

H. Optical Fiber Riser Cable

1. The optical fiber riser cables shall extend from the MC to the TR in both a ring and a star topology.
 2. Install optical fiber riser cables from the MC to each TR. Refer to the Project Drawings.
 3. Optical fiber riser cables shall be a minimum of 12 strands.
 4. Install termination hardware, enclosures, labeling and testing for the optical fiber riser system as shown on the Project Drawings.
 5. Hybrid cables, single mode /multimode optical fiber cables are only used if specified.
- I. Coaxial Riser Cable
1. The video riser cables shall extend from the MC to the TRs in a trunk and tap topology.
 2. Provide coaxial riser cable from the MC to each TR. Refer to the Project Drawings.
- J. Horizontal Station Cable and Work Area Outlets
1. Horizontal station cable distribution follows a star topology. Each station cable is home-run from the outlet location in the work area to the distribution frame serving that area.
 2. The type of cable to be provided to each outlet varies and is indicated on the Project Drawings.
 3. Install horizontal station cables, termination hardware, labeling, provide testing and documentation.
 4. Horizontal station cable installations shall be tested.
 5. The location of outlets shall not be changed in the field without Owner's approval.
 6. The quantity of cables to each outlet and the work at each outlet location is keyed to the outlet symbol. Unless otherwise noted, each outlet location shown on the Project Drawings will receive new cable. The following description of work applies unless otherwise noted.
 7. For each new communications outlet, install new cable, jacks, faceplate, icons, blank inserts, and termination hardware at both cable ends. Label both cable ends and test the installation. In the TR, terminate cables on the appropriate frame for voice, data, or video services. Refer to Project Drawings.
 8. At each wall-mount communications outlet, install specified, wall-phone mounting plate with telephone mounting lugs and jack. Terminate first 4-pair group on wall plate jack. Coil unused 4-pair cable in outlet box. Label and test the installation. In the TR, terminate the UTP cable on the voice frame. Refer to Project Drawings. Terminate cable pairs to provide appropriate pair-pin assignments.
 9. Contractor shall route cables through built-in raceway system in modular furniture when available.
 10. Contractor shall route cables through cable management as per manufacturer's instructions.
 11. Contractor shall coordinate installation of cables for connection to specific systems such as elevator phones, HVAC controllers, security alarms, door lock controllers, etc. with Owner and Others.
- K. Primary Pathways
1. Primary pathways are major pathways for cable routed floor-to-floor, through corridors, and pathways that carry cables feeding multiple areas which are likely to be used to support growth in those areas. Primary pathways carry cable to secondary pathways.
 2. Contractor shall provide fire stopping of conduit and sleeves installed for use of telecommunications wiring.
 3. Contractor shall provide primary pathways as indicated on Project Drawings.
- L. Secondary Pathways

1. Secondary pathways extend from the primary pathway to the communication outlet box. Secondary pathways carry cable from the primary pathway to the communication outlet box.
2. Contractor shall provide fire stopping of conduits installed for use of telecommunications wiring.
3. Contractor shall provide secondary pathways as indicated on Project Drawings or as needed to support and protect cables installed under this contract.

1.6 WORK INLCUDED

- A. The Owner seeks to identify a qualified telecommunications cabling contractor capable of performing the scope of work as identified in the Contract Documents.
- B. It is the intent of these Specifications to create an ANSI/TIA-568-C compliant cabling system to support high-speed data applications up to 10 Gigabit Ethernet. System acceptance shall be judged on its ability to perform as such, the successful adherence to the installation instructions of this Specification, and compliance with parts and workmanship warranties.
- C. The work covered by this specification includes the installation of a complete cabling system, including all labor necessary to perform and complete such installation, all materials and equipment incorporated or to be incorporated in such installation, and all services, supervision, consumable items, fees, licenses, facilities, tools, and equipment necessary or used to perform and complete such installation.
- D. The Work Included is defined by the following and further defined in the drawings and Sections of Division 27.
 1. Provide project management and oversight for the installation of a complete structured cabling system.
 2. Prepare and submit component documentation shop drawings, outlet labeling drawings, cable pull/termination schedules, cable test results and record or as-built drawings, manufacturer cut sheets, and other documentation described herein.

1.7 DEFINITIONS

- A. Amplifier: A device that increases the voltage, current, or power of a signal.
- B. Angle Physical Connector (APC): An optical fiber connector that is polished at an angle of 8 to 10 degrees to reduce the back reflection of the signal.
- C. Backbone (Riser) System: The cabling and connecting hardware that provides interconnection between Telecommunications Rooms, Equipment Room, and entrance facilities.
- D. Bonding Conductor for Telecommunications (BCT): A conductor that interconnects the telecommunications bonding infrastructure to the building's service equipment (power) ground. (TIA)
- E. Building Entrance Terminal (BET): The cable termination equipment used to terminate outside plant (OSP) cables at or near the point of building entry and protect the cable pairs from lightning and foreign voltage. Sometimes referred to as protected entrance terminal (PET).

- F. Cable Tray: A support mechanism used to route and support telecommunications and other optical fiber cable. Cable trays may be equipped with side walls or barriers to constrain a cable's horizontal placement or movement.
- G. Category: A rating that defines the performance of optical fiber cabling components and systems. A category describes mechanical properties and transmission characteristics of balanced twisted-pair and optical fiber cabling and provides a numbered designation. Categories are defined in many regional standards (e.g. ANSI/TIA, ISO, AS/NZS, JIS)
- H. Category 3: The balanced twisted-pair cabling specifications characterized by, among other requirements, a frequency range from 1 to 16 megahertz (MHz).
- I. Category 5e: The balanced twisted-pair cabling specifications characterized by, among other requirements, a frequency range from 1 to 100 megahertz (MHz). This category specifies transmission parameters that were not characterized by TIA category 5 (e.g., power sum near-end crosstalk [PSNEXT], return loss, equal level far-end crosstalk [ELFEXT], power sum equal level far-end crosstalk [PSELFEXT]) and features more stringent near-end crosstalk (NEXT) than TIA category 5.
- J. Category 6: The balanced twisted-pair specifications characterized by, among other requirements, a frequency range from 1 to 250 megahertz (MHz).
- K. Category 6A: The balanced twisted-pair cabling specifications characterized by, among other requirements, a frequency range from 1 to 500 megahertz (MHz). The augmentation from category 6, typically expressed as category 6A, features extended frequency range and alien crosstalk transmission parameters.
- L. Coaxial Cable: A cable composed of an insulated central conducting wire wrapped in another cylindrical conducting wire and then wrapped in another insulating layer and an outer protecting layer.
- M. Conduit Chase Pipe: Short section of bushed EMT conduit with sufficient size and capacity to support horizontal cabling bundles from ceiling space, through ceiling tile, onto the cable runway system connecting wall to rack or cabinet.
- N. Communications Outlet (Work Area Outlet): Any point of connectivity for voice, data, or video services at the user's end. (i.e. work area, desk, etc.)
- O. Communications Pathways: Conduits, cable trays or other supports with the sole purpose of carrying communications cabling. Communications pathways shall not be used by other low-voltage systems, including but not limited to: fire alarm, security systems, and or building automation wiring or air/vacuum tubes.
- P. Construction Area: Those areas identified on drawings, specifications, and contract documents as well as areas affected by the work including all areas of the building.
- Q. Entrance Facility (telecommunications, EF): An entrance to a building for both public and private network service cables, including wireless, and the entrance point of the building and continuing to the entrance room or space. The location where the main telecommunications service enters a building from the outside; where the demarcation between the inter-building and intra-building cabling system occurs.

- R. Equipment Room (telecommunications, ER): An environmentally controlled centralized space for telecommunications equipment that usually houses a main or intermediate cross- connect. The location which provides space and maintains a suitable operating environment for large telecommunications equipment. This space may be co-located with the Entrance Facility and/or Telecommunications Room, provided the room is sized for all functions.
- S. Horizontal Cabling: The cabling between the Telecommunications Room and the Work Area that carries voice, data and/or video signals.
- T. Horizontal Cross-connect (HC): A group of connectors (e.g., patch panels, punch-down blocks) that allow horizontal, backbone, and equipment cabling to be cross-connected with patch cords or jumpers. Floor distributor (FD) is the international equivalent term for horizontal cross-connect.
- U. Horizontal System: The cabling between, and including, the TO (Telecommunications Outlet) connector and the HC (Horizontal Cross-connect) in the Telecommunications Room.
- V. Horizontal Distribution Area (HDA): A space within the Data Center where a Horizontal Cross-Connect is located that may include LAN switches, SAN switches and KVM switches for the end equipment located in the EDA (Equipment Distribution Area).
- W. Inside Plant (ISP) Cabling: Communications cabling and terminations primarily located inside the building footprint including, but not limited to copper and optical fiber cabling, splicing and terminations, and work related to their construction.
- X. Inside Plant (ISP) Pathways: Communications pathways primarily located inside the building footprint including but not limited to conduits, j-hooks, cable trays, enclosures, equipment racks and cabinets, and work related to their construction.
- Y. Intermediate Cross-connect (IC): An intermediate connection facility that is cabled to the Main Cross-connect. An intermediate cross-connect typically services as the Telecommunications Equipment Room for a building.
- Z. Intermediate Distribution Frame (IDF): An enclosed space designed for housing telecommunications equipment, cable terminations, and cross-connections. The room is the recognized cross-connect between the Backbone and Horizontal Systems. Also frequently referred to as TR.
- AA. J-Hook: A non-continuous supporting device for horizontal cables that is shaped like a "J". It is attached to some building structure using a beam clamp, bracket, or other mounting type devices and either a wire or threaded rod. Horizontal cables are laid in the opening formed by the "J" to provide support for cables.
- BB. Main Cross-Connect (MC): The Cross-Connect normally located in the EF, MDF, or ER for cross- connection and interconnection of entrance cables, first-level backbone cables, and equipment cables. Campus distributor is the international term for MC. Also frequently referred to as MDF.
- CC. Main Distribution Area (MDA): The space in the Data Center where the Main Cross-Connect is located.
- DD. Multimode Optical Fiber: Optical fiber with a core diameter of 50 or 62.5 micron (micrometer) and a cladding diameter of 125 micron; lightwave propagation allows many modes within multimode fiber. Also abbreviated as MM or FOMM.

- EE. Outside Plant (OSP) Cabling: Communications cabling and terminations primarily located outside the building footprint including, but not limited to copper and optical fiber cabling, splicing and terminations, lightning and electrical protection, and work related to their construction.
- FF. Outside Plant (OSP) Pathways: Communications pathways primarily located outside the building footprint including but not limited to conduits, maintenance holes, hand-holes and work related to their construction.
- GG. Plenum: A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system. Assume all spaces above suspended or accessible ceilings are a plenum.
- HH. Plenum-rated: Listed by the Underwriters Laboratory as being suitable for installation into a plenum space. Communications cabling routed through plenum-rated space shall be plenum-rated and identified as Type CMP.
- II. Single Mode Optical Fiber: Optical fiber with a relatively small core diameter of 8–9 micron (micrometer) and a cladding diameter of 125 micron; lightwave propagation is restricted to a single path, or mode, in single mode optical fiber. Also abbreviated as SM or FOSM.
- JJ. Splice: A joining of conductors meant to be permanent. 2. A device that joins conducting or transmitting media.
- KK. Splice Case: A metal or plastic housing with a semi-cylindrical cavity used to clamp around a cable splice, providing a closure.
- LL. Telecommunications Bonding Backbone (TBB): A conductor that interconnects the telecommunications main grounding busbar (TMGB) to the telecommunications grounding busbar (TGB). (TIA)
- MM. Telecommunications Enclosure (TE): A case or housing for telecommunications cable terminations and cross-connect cabling.
- NN. Telecommunications Grounding Busbar (TGB): A common point of connection for telecommunications systems and equipment bonding to ground, and located in the telecommunications room (TR) or equipment room (ER). (TIA)
- OO. Telecommunications Main Grounding Busbar (TMGB): A busbar placed in a convenient and accessible location and bonded, by means of the bonding conductor for telecommunications (BCT), to the building service equipment (power) ground. (TIA)
- PP. Telecommunications Outlet (TO): A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as WAO (Work Area Outlet).
- QQ. Telecommunications Room (TR): An enclosed space designed for housing telecommunications equipment, cable terminations, and cross-connects. The room is the recognized cross-connect between the Backbone and Horizontal Systems. Also frequently referred to as IDF (legacy term).
- RR. Telecommunications Space: An area or room dedicated for use for the telecommunications infrastructure and equipment (e.g. Entrance Facility, Equipment Room, Telecommunications Room, Maintenance Hole, Handhole).

- SS. Work Area Outlet (WAO): A device placed at the user workstation for termination of horizontal media and for connectivity of network equipment. Also referred to as TO (Telecommunications Outlet).
- TT. Zone Distribution Area (ZDA): A space in the Data Center where a zone outlet or consolidation point is located.

1.8 ABBREVIATIONS AND ACRONYMS

A. Table Below

A/E:	Architect/Engineer (designer)
ADA:	Americans with Disabilities Act
AFC:	Above Finished Ceiling
AFF:	Above Finished Floor
AHJ:	Authority Having Jurisdiction
ANSI:	American National Standards Institute
APC:	Angled Physical Connector
ASTM:	American Society for Testing and Materials (ASTM International)
AWG:	American Wire Gauge
BCT:	Bonding Conductor for Telecommunications
BDF:	Building Distribution Frame
BER:	Building Entrance Room
BET:	Building Entrance Terminal
BISCI:	Building Industry Consulting Service International
BTU:	British Thermal Unit
CATV:	Community Antenna Television (Cable Television)
CBN:	Common Building Network
CD:	Campus Distributor
CMP:	Communications Plenum Cable
CMR:	Communications Riser Cable
DAS:	Distributed Antenna System
dB:	Decibel
dBmV:	Decibel MilliVolt
EDA:	Equipment Distribution Area
EF:	Entrance Facility
EIA:	Electronic Industries Association
ELFEXT:	Equal Level Far-End Crosstalk
EMC:	Electromagnetic Compatibility
EMI:	Electromagnetic Interference
EMT	Electrical Metallic Tubing
ER:	Equipment Room

FCC:	Federal Communications Commission
FD:	Floor Distributor
FEXT:	Far-End Crosstalk
FOMM:	Fiber Optic Multimode
FOSM:	Fiber Optic Single Mode
F/UTP:	Foil Screened Unshielded Twisted Pair
FOTP:	Fiber Optic Test Procedure
FREQ:	Frequency
GE:	Grounding Equalizer (replacing TBBIBC)
GND:	Ground
GHz:	Gigahertz
Hz:	Hertz
IDC:	Insulation Displacement Connector
IDF:	Intermediate Distribution Frame
IEEE:	Institute of Electrical and Electronics Engineers
ISO:	International Standards Organization
ISP:	Inside Cable Plant
IT:	Information Technology
LAN:	Local Area Network
LC:	Lucent Connector
Mbps:	Megabits per second
MDA:	Main Distribution Area
MDF:	Main Distribution Frame
MHz:	Megahertz
MM:	Multimode
MMF:	Multimode Fiber
MPO:	Multi-fiber Push On connector
NEC:	National Electrical Code, NFPA 70
NESC:	National Electric Safety Code
NEXT:	Near End Cross Talk
NFPA:	National Fire Protection Association
NRTL:	Nationally Recognized Testing Laboratory
OFNP:	Optical Fiber Nonconductive Plenum Cable
OFNR:	Optical Fiber Nonconductive Riser Cable
OSHA:	Occupational Safety and Health Administration
OSP:	Outside Plant
OTDR:	Optical Time Domain Reflectometer
PoE:	Power-over-Ethernet
PSELFEXT:	Power Sum Equal Level Far-End Cross Talk
PSNEXT:	Power Sum Near End Cross Talk
RCDD:	Registered Communications Distribution Designer
RFI:	Radio Frequency Interference

RH:	Relative Humidity
RMU:	Rack Mount Unit
SC:	Subscriber Connector
ScTP:	Screened Twisted Pair
STP:	Shielded Twisted Pair
SM:	Single Mode
SMF:	Single Mode Fiber
TBB:	Telecommunication Bonding Backbone
TBBIBC:	Telecommunications Bonding Backbone Interconnecting Bonding
TCIM:	Telecommunication Cabling Installation Manual
TDMM:	Telecommunications Distribution Methods Manual
TGB:	Telecommunications Grounding Bus Bar
TIA:	Telecommunications Industry Association
TMGB:	Telecommunications Main Grounding Bus Bar
TO:	Telecommunications Outlet
TR:	Telecommunications Room
TSER:	Telecommunications Service Entry Room
UL:	Underwriters Laboratory
UPS:	Uninterruptible Power Supply
UTP:	Unshielded Twisted Pair
VLAN:	Virtual LAN
WAN:	Wide Area Network
WAO:	Work Area Outlet
WAP:	Wireless Access Point
Wi-Fi:	Wireless Fidelity
WLAN:	Wireless LAN
ZDA:	Zone Distribution Area

1.9 QUALITY ASSURANCE

A. Telecommunications Design Engineer / Consultant / Contractor Qualifications

1. All Division 27 design services shall be directly performed by a BICSI (Building Industry Consulting Service) RCDD (Registered Communications Distribution Designer) having a minimum of five (5) years active design experience under this credential. Specific duties assigned to the RCDD shall include, but not be limited to, the following: all aspects of structured cabling, rack elevations, pathways, entrances, grounding and bonding, etc. The Architect/Designer shall be responsible to assure that other MEP functions do not interfere with, or otherwise infringe upon, critical elements of the design.
2. All materials furnished shall be new, unused, clean and free from damage, defects or corrosion.
3. Equipment and materials of the same type shall be a product of the same manufacturer throughout unless specifically exempted in advance. A specific example is all products comprising the Permanent Link (station cable, patch panels, jacks, faceplates, etc...)

4. Component manufacturer shall be ISO 9001:2008 and offer products that are RoHS compliant.
5. The contractor shall accept complete responsibility for installation, certification, and support of cabling system. Contractor must show proof the vendor has the certifying manufacturer's support on all of these issues with shop drawing submittals
6. Contractor shall provide with bid an RCDD and Installer-level BICSI Certification. A minimum of one (1) permanent crew member shall be BICSI Installer Level II as well as manufacturer certified. Twenty-five percent (25%) of installation force shall be BICSI Installer or manufacturer certified. Work crew, not involved in installing cable elements (e.g. laborers delivering/moving materials, installing grounding by an electrician, or workers installing pathway elements) do not require BICSI or manufacturer certification.
7. Contractor shall provide with bid a Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed.
8. Contractor shall provide with bid a Manufacturer Certification for the system solution bid, issued directly in the bidder's company name, valid for the time frame in which the installation will be completed.
9. Contractor shall provide with bid a minimum of five (5) reference accounts at which similar work, both in scope and design, have been completed by this Contractor within the last three (3) years. Three (3) of the provided references shall relate directly to the correctional institution environment.
10. Contractor shall provide with bid the experience profile of the RCDD responsible to manage the contract. Should the RCDD assigned to this project change during the installation, the replacement RCDD profile shall be re-submitted to the Architect, Technology Consultant, General Contractor or Construction Manager, and the Owner for review and approval.
11. The contractor shall be knowledgeable in local, state, regional, and national codes and regulations. All work shall comply with the latest revision of codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall apply.
12. Only installers trained and certified by the proposed manufacturer shall be allowed to install products. Installers must possess the highest level of certification available by the manufacturer for the specific copper cabling solution being installed.
13. Only installers trained and certified by the proposed manufacturer shall be allowed to install firestop products.
14. Only installers trained and certified by the proposed manufacturer shall be allowed to terminate and test optical fiber. Others specified above may pull/place optical fiber cable under the supervision of an installer trained and certified by the manufacturer.

15. The Contractor may provide proof of registration/certification of planned installers in bid documents. If not included in the bid documents, the Contractor shall provide a narrative on the levels of registration/certification of their installers within the bid documents. The Contractor shall provide proof of registration/certification for the final list of installers prior to the start of work.
16. The Owner reserves the right to reject any unregistered or uncertified installers performing work for which they are not registered/certified. The Contractor shall be responsible for any loss of work, delays in schedules, or extra cost as a result of the use of unregistered/uncertified workers. Additional effort on the part of the Contractor to maintain the installation schedule as a result of the above-mentioned loss time shall be the Contractor's responsibility and at the Contractor's additional expense.
17. The Contractor shall provide to the Owner, architect and consultant the above required documentation for any worker on this project brought in after the submittal of initial documentation on installers. Owner may periodically check installer identification and registrations/certifications during the installation.

1.10 COORDINATION OF WORK

- A. When articles, materials, operations or methods related to execution of communications work are noted, specified, or described in the specification or are indicated or reasonably implied on drawings and schedules, execute work as required or appropriate to provide complete and proper function, operation and installation.
- B. The drawings utilize symbols and schematic diagrams to indicate items of work. These symbols and diagrams will not typically identify dimensions, nor will they identify inclusion of specific accessories, appurtenances and related items necessary and appropriate for a complete and proper installation and operation. The Telecommunications Subcontractor shall install work complete and ready for proper operation, including related items not specifically identified, shown, indicated or expressed on the drawings, and in conformity with the dimensions indicated on architectural drawings and on shop drawings approved by the Design Engineers.
- C. The drawings include details for various items, which are specific with regard to the dimensions and positioning of work. These details are intended only for the purpose of establishing general feasibility. They do not obviate field coordination for the indicated work. Work shall not proceed until actual field conditions and requirements are verified by the Telecommunications Subcontractor.
- D. The drawings are diagrammatic and indicate the general arrangement of systems and equipment unless indicated otherwise by dimensions.
- E. Coordinate with Owner to identify the location where existing facilities can be accessed to provide interconnection between new and existing cables. These spaces shall be identified on the Project Drawings.
- F. All Division 27 Contractor Project Managers shall schedule and conduct a coordination meeting with the Owner, architect and consultant to confirm and coordinate scope of work requirements prior to commencement of work whether project is new construction, renovation, or retrofit. Project meetings shall be scheduled through the General Contractor or Construction Manager, depending upon how the project management process is structured in each instance.
- G. The Contractor shall submit a work schedule before any work begins. This schedule shall identify the major phases of the installation. The Architect or Construction Manager shall review the schedule with the Owner, identify inspection requirements based on phasing and request any required modifications to the installation schedule. When the installation plan is finalized and approved, work may begin.

1.11 WARRANTY REQUIREMENTS

- A. The contractors shall adhere to all warranty requirements for all installations.
- B. The contractor shall submit, in the bid documents, any additional contractor-specific warranties or guarantees to be offered on the project.
- C. The contractor shall supply any and all necessary documentation needed to process and record the warranty(s) and to verify the installation solution.
- D. Manufacturer's Warranty
 - 1. Equipment and materials required for installation under these standards shall be the current model and new (less than one (1) year from date of manufacture), unused and without blemish or defect, and are to be guaranteed to be free from defect for a minimum of one (1) year from the date of project's substantial completion.
 - 2. When a defect or problem is observed within the first year after substantial completion, the Owner's IT will notify the governing subcontractor through the proper channels. The appropriate subcontractor then will have 48 hours to fix the defect or furnish and install a replacement part/system, all at no cost to the project or the Owner.
- E. Manufacturer's Extended Warranty
 - 1. All manufacturer extended product warranties shall be afforded to The Owner. A copy of certification by the manufacturer for all products listed in this specification is to be provided.
 - 2. Prior to commencement of the work, the successful bidder shall contact an authorized manufacturer's representative to inform them that this job is being registered under the warranty program.
 - 3. Upon completion of the work, the contractor shall coordinate with the manufacturer the issuance of a full warranty on the entire copper cable plant including the horizontal cabling for both parts and labor. The cabling contractor at his sole expense will correct any deficiencies determined by the manufacturer

PART 2 - PRODUCTS

2.1 GENERAL

- A. Refer to the specific sections of the specifications for equipment requirements.
- B. Materials and equipment furnished shall be of current production by manufacturers regularly engaged in the manufacture of such items, for which replacement parts are available.
- C. When more than one unit of the same class of equipment or material is required, such units shall be the products of a single manufacturer and part number.
- D. All products and materials shall be new and unused prior to their installation as part of this project. Refurbished items are not allowed.
- E. All products and materials shall be selected to allow for future growth. Examples: Conduits and cable trays shall be sized to allow for a minimum of 25% growth. Patch Panels shall be sized to allow for a minimum of 25% growth.
- F. Alternates may be proposed but shall meet or exceed specifications for the items listed. Acceptance shall be at the sole discretion of the Owner, architect and consultant.

PART 3 - EXECUTION

3.1 GENERAL

- A. Contractor shall provide conversion and integration of existing in-service communications infrastructure into new and existing spaces in close coordination with the Owner, architect and consultant. Accommodate all Owner requirements for after-hours scheduling and planned service outages.
- B. The Owner shall not be responsible for delays in work because of shutdowns due to unsafe working practices by Contractors. Delays enforced by the Safety Office caused by unforeseen environmental conditions in the work area may be out of Contractor's control. Contractors shall contact the Owner's primary project manager immediately if delays are incurred for safety reasons.
- C. It shall be the responsibility of the Contractor to secure any parking permits prior to the first day of work on-site.
- D. Work outside of normal operating hours and days shall be coordinated with the Construction Manager and Owner's Facilities Management office.

3.2 DIMENSIONS AND DEFINITE LOCATIONS

- A. The Project Drawings depicting work show approximate locations. The exact location of equipment and devices shall be established in the field in accordance with instructions from the owner. Consideration shall be given to construction features, equipment of other trades, and requirements of the equipment proper
- B. The Contractor shall refer to shop drawings and submittal drawings for equipment requiring electrical connections to verify rough-in and connection locations.
- C. Unless specifically stated to the contrary, no drawings by scale shall be used as a dimension to work by. Dimensions noted on the drawings are subject, in each case, to measurements of adjacent or previously completed work and all such measurements necessary shall be taken before undertaking any work dependent upon them.

3.3 PROGRESSIVE AND FINAL CLEANING OF PROJECT SITE

- A. During construction, and prior to the Owners acceptance of the building, remove from the premises and dispose of packing material and debris cause by communications work.
- B. Remove dust and debris from interior and exterior of telecommunications equipment. Clean accessible current carrying equipment prior to being energized.
- C. Contractor shall clean work areas each day and remove debris properly and legally from the Owner's property. Where communications equipment and related materials are installed or stored for use in the project shall be neatly stacked and remain free of debris, cable scraps and accumulated dust from the floor and surfaces of installed communication equipment, and materials. All exits, and paths shall be cleaned so as to prevent dirt from being tracked throughout the facility.
- D. Upon completion of the work, remove excess debris, materials, equipment, tools and similar items. Leave the premises clean, neat and orderly.

3.4 TESTING AND VERIFICATION

- A. Refer to individual sections for additional testing and verification requirements.
- B. The Contractor shall verify that requirements of the Standard are met. Verification shall be through a combination of analyses, inspections, demonstrations and test, as described below.
- C. Verification by inspection includes examination of items and comparison of pertinent characteristics against the qualitative or quantitative standard set forth in the specifications. Inspection may require moving or partially disassembling the item to accomplish the verification, included as part of the work at no additional cost to the owner.
- D. The Contractor shall verify by formal demonstrations or tests that the requirements of this Standard and the specifications have been met. The Contractor shall demonstrate that the communications systems components and subsystems meet specification requirements in the "as-installed" operating environment during the "System Operation Test". Even though no formal environmental testing is required, the communications Contractor shall measure and record temperature, humidity and other environmental parameters and the environmental conditions, which were encountered during the "System Operation Test".
- E. Perform commissioning and pretest prior to enclosure of walls.
- F. Perform system operation tests after full enclosure of walls.

3.5 COMPLETION

- A. Systems shall be complete and operational, and controls shall be set and calibrated.
- B. Testing, start-up and cleaning work shall be complete.
- C. Special tools for proper operation and maintenance of the equipment provided under Division 27 shall be delivered to the Owner's IT.

END OF SECTION