

SECTION 16710

TELECOMMUNICATIONS GENERAL REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Scope of Work
- B. Codes and Specifications
- C. General Requirements and Conditions
- D. Product Requirements
- E. Structured Cabling System
- F. Submittals
- G. Record Drawings
- H. Definitions

1.2 RELATED SECTIONS

- A. Contract Terms and Conditions
- B. Section 07270 - Firestopping
- C. Section 16715 - Acceptance Testing
- D. Section 16720 - Basic Materials and Methods
- E. Section 16725 - Telecommunications Cable
- F. Section 16730 - Underground Structures - Telecommunications
- G. Section 16760 - Telecommunications Grounding and Bonding

1.3 SCOPE

- A. Scope of Work
 - 1. The scope of work includes the provision, installation, testing, and documentation of physical resources for voice and data systems required by the construction documents.
 - 2. The Contractor will provide all labor, materials, tools, equipment, and permits necessary for the satisfactory and timely completion of the project.
 - 3. The Contractor and University shall jointly coordinate the implementation of the project.

B. Statement of Work

1. The work includes, but is not limited to, the items outlined in these specifications and indicated on the drawings, as well as all incidental items required to provide complete and operable systems. The University and the Contractor shall mutually agree on the general conduct for the work prior to initiation of construction and shall each be responsible for following these general guidelines throughout the construction period unless modified in writing based upon discussions at the project coordination meetings. The major work operations include the following:
 - a. Extend the existing underground conduit system to the new building.
 - b. Furnish, install, test, and document interbuilding fiber building entrance cable from new building to MDF B.
 - c. Furnish, install, test, and document interbuilding copper building entrance cable from new building to MDF B.
 - d. Provide new BDF and IDF rooms for housing cable terminations and equipment.
 - e. Provide and install new conduit, cable tray, and support hanger (j-hook) pathway systems.
 - f. Provide, install, test, and document information outlets and associated pathways.
2. The Contractor shall provide Connectivity Design Documentation that includes, but is not limited to, the following:
 - a. Complete set of as-built drawings indicating locations and details for all telecom outlets, pathway systems, and equipment.
 - b. Cable test results.

1.4 CODES AND SPECIFICATIONS

- A. All work shall be performed in compliance with the most restrictive of Municipal, State, and/or Federal Codes which may govern this work and shall conform to the following codes and specifications:
1. National Fire Protection Association
 - a. NFPA 70-2000 National Electric Code.
 - b. NFPA 101 - Life Safety Code.
 - c. NFPA 258 - Standard Test Method for Measuring Smoke Generated by Solid Materials.
 2. ANSI Specifications:
 - a. ANSI C2-1981 National Electrical Safety Code.
 - b. ANSI C80.3 Specification for Zinc-coated Electrical Metallic Tubing.
 - c. ANSI/UL 797 Electrical Metallic Tubing.
 - d. ANSI/ICEA S-83-596-1994 - Fiber Optic Premises Distribution Cable Technical Requirements.

3. Electronics Industry Alliance/Telecommunications Industry Association (EIA/TIA):
 - a. EIA/TIA 568B - Commercial Building Telecommunications Wiring Standard.
 - b. EIA/TIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces.
 - c. EIA/TIA TSB 36 - Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables.
 - d. EIA/TIA TSB 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
 - e. EIA/TIA TSB 72 - Centralized Optical Fiber Cabling Guidelines.
 - f. EIA/TIA 75 – Additional Horizontal Cabling Practices for Open Offices.
 - g. EIA/TIA 606 - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - h. EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - i. EIA - 310-D - Cabinets, Racks, Panels, and Associated Equipment.
 - j. EIA/TIA 526-14 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant.
 - k. EIA/TIA 455-57A - Optical Fiber End Preparation and Examination.
 - l. EIA/TIA 455-59 - Measurement of Fiber Point Defects Using and OTDR.
 - m. EIA/TIA 455-60 - Measurement of Fiber Cable Length Using an OTDR.
 - n. EIA/TIA 455-61- Measurement of Fiber Cable Attenuation Using an OTDR.
 - o. EIA/TIA 455-95 - Absolute Optical Power Test for Optical Fibers and Cables.
 - p. EIA RS-458A Standard Optical Waveguide Fiber Material Classes and Preferred Sizes.
 - q. EIA-472 Generic Specification for Optical Waveguide Fibers.
 - r. EIA 232-C.
4. Federal Communications Commission (FCC) Part 15 and Part 68.
5. Title 24 - State of California Code of Regulations.
6. Uniform Building Code and UBC Specifications.
7. Occupational Safety and Health Act (OHSA) Specifications.
8. City or County Electrical Code, as applicable.
9. IEEE Specifications:
 - a. IEEE 802.2.
 - b. IEEE 802.3.
10. NEMA VE1 Cable Tray Systems.

11. Underwriters Laboratories Specifications:
 - a. UL 497 Electrical Grounding and Bonding Equipment.
 - b. UL 1479 Fire Tests of Through-Penetration Firestops.
 - c. UL Building Materials Directory; Through-Penetration Firestops Systems, and Fill, Void or Cavity Materials.
 12. The Uniform Mechanical Code.
 13. ASTM Specifications:
 - a. ASTM E 814 Methods of Fire Tests of Through-Penetration Fire Stops.
 - b. ASTM E 136 Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degrees C.
 14. Rural Utilities Services (RUS), Bulletin 345-63, RUS Specifications for Acceptance Tests and Measurements of Telephone Plant.
 15. Americans With Disabilities Act (ADA).
 16. California State University, Office of the Chancellor - Telecommunications Infrastructure Planning (TIP) Guidelines.
 17. Existing campus specifications.
- B. Where reference is made to a requirement that exceeds minimum code requirements, the specification requirement shall take precedence. The Contractor and owner's representative shall jointly resolve any work that is in apparent conflict with applicable codes.
- C. When these specifications call for materials or construction of better quality or larger sizes than required by the above-mentioned rules and regulations, the provisions of these specifications shall take precedence.
- D. In accordance with these laws, rules, and regulations, the Contractor shall provide the following:
1. Any additional material and labor that may be required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these particular specifications.
 2. All permits required by any of the legally-constituted public authorities for the installation or construction of the work.
 3. Any inspection or examinations required. Copies of certificates of all such inspections shall be delivered to the owner's representative.
 4. If any work is concealed without proper inspection and approval, the Contractor shall be responsible for all work required to open and restore the concealed areas, in addition to all required modifications.

1.5 GENERAL REQUIREMENTS AND CONDITIONS

A. Safety

1. The Contractor shall be solely and completely responsible for conditions of the job site, including safety of persons and property during performance of work.
2. The Contractor shall ensure that all personnel working in or anywhere on the site shall be provided a hard hat, safety shoes, a face shield or safety goggles, etc. for their protection.
3. If required by the campus, all personnel working in or anywhere on the site shall display a photo-ID.
4. The Contractor shall ensure that all personnel working in or anywhere on the site shall conform to the campus's regulations regarding confined space.
5. No act, service, drawing review, or construction observance by owner's representative or any other party employed by the campus is intended to include review or approval of adequacy of the Contractor's safety measures, in, on, or near the construction site.

B. Quality Assurance

1. The specifications contained herein are set forth as the minimum acceptable requirements of the Contractor's Quality Assurance program. The Contractor is responsible for executing any other Quality Assurance measures necessary to ensure complete and fully functioning systems within the scope of this project.
2. The Contractor shall ensure that all design, workmanship, materials employed, required equipment, and the manner and method of installation conforms to accepted practices. Where specific specifications do not apply, the more stringent of industry publications, CSU and campus policies, manufacturer's guidelines, or previous (similar) work at the project site shall apply.
3. The Contractor shall also ensure that each piece of equipment is in satisfactory working condition.
4. The Contractor shall certify that the cable manufacturers have carried out the quality assurance tests and procedures as specified herein. All cable must be manufactured by an ISO9001 Certified Manufacturer.
5. The Contractor is responsible for ensuring that the cable packaging for shipping/storage purposes meets or exceeds the following requirements:
 - a. One continuous length of cable per shipping reel/container.
 - b. Reels must be wooden or steel, sturdy, lagged, and shall have thermal protection jackets applied prior to lagging.
 - c. Each reel/container shall be individually identified and marked with the length of the cable it contains. Said marking shall withstand weather and shipping conditions and remain readable.
 - d. For fiber optic cable, results of the 100% Attenuation tests conducted at the factory shall accompany each reel.
 - e. Cable shall be packed in a manner that facilitates the pre-installation tests to be conducted while the cable is still on the reel (i.e., both ends of the cable must be accessible while protected from moisture).

- f. The Quality Assurance Plan employed shall include on-reel testing of fiber, and UTP, including, but not limited to, OTDR, power loss, attenuation, etc. (as applicable for given cable media).
- C. Manufacturer's Literature: Where these specifications call for an installation to be made in accordance with the manufacturer's recommendations, a copy of such recommendations shall always be kept on the job site and shall be available to owner's representative.
- D. Acceptance of Telecommunications Work
1. The Contractor must demonstrate successful completion of the following tasks for the University to accept the telecommunications work:
 - a. Before executing any performance testing, the Contractor shall present a test plan to the Engineer of Record for approval.
 - b. The Contractor has completed all testing and delivered copies of all test results to the Engineer of Record.
 - c. All test results have been examined and approved by the Contractor and Engineer of Record.
 - d. Copies of all documentation required by this section have been delivered to the Engineer of Record.
 - e. All punch list items are completed to the satisfaction of the project manager or Inspector of Record.
 - f. Structured Cabling System Certification is provided to the University.
 2. Minor failures such as incomplete resolutions to punch list items shall be responded to at the University's discretion or within one business day.
- E. Guarantee and Warranties
1. The fiber optic cable systems and the horizontal copper cable systems shall be installed by manufacturers' certified installers. Materials and labor shall be covered by extended warranties per requirements in paragraph 1.7.
 2. The Contractor shall be responsible for correcting any problems and malfunctions that are warranty-related for the entire warranty period.
 3. Copies of any extended material warranties shall be passed through to the owner's representative.
 4. During the installation and up to the date of final acceptance, the Contractor shall protect all finished and unfinished work against damage and loss. In the event of such damage or loss, the Contractor shall replace or repair such work at no cost to the University.

1.6 PRODUCT REQUIREMENTS

A. General Information

1. These specifications identify the minimum specifications for product quality acceptable on this project by designating a manufacturer's trade or brand name and catalog or model number and by describing attributes, performance, or other specifications.
2. Where applicable, the most recent manufactured product line consistent with the structured cable system supplier identified in the technical specification sections is to be the minimum standard for quality and performance of products to be used on this project.

3. For any product described only by attributes, performance, or specifications, the Contractor shall develop a Product Submittal in accordance with the requirements set forth herein. All Product Submittals must be reviewed with owner's representative prior to their use and installation on the project.
4. Such phrases as "or equal," "or equivalent," and "or acceptable substitute" indicate that an equivalent product may be proposed as a substitute for that which is specified. The proposed substitution must meet or exceed the attributes, performance, or other specifications of the specified product and must be approved by the owner's representative.
5. Failure of the Contractor to submit proposed substitutions for approval in the manner described above shall be sufficient cause for disapproval by the owner's representative of any substitutions otherwise proposed.
6. Physical samples may be required. If tests to determine equality and utility are required by the owner's representative, they shall be made by a testing laboratory with the acceptance of the test procedure first given by the owner's representative, at the expense of the Contractor.

B. Quality of Materials

1. All materials and equipment supplied by the Contractor shall be new, manufactured within one (1) year prior to installation, and meet or exceed the latest published specifications of the manufacturer. All material shall be acceptable to and approved by the University as meeting these specifications.
2. All communications materials used on this project shall conform, where applicable, to the following specifications, unless otherwise noted:
 - a. NEMA - National Electrical Manufacturers Association.
 - b. ANSI - American National Specifications Institute.
 - c. UL - Underwriters Laboratories, Inc.
 - d. The latest IEEE and EIA/TIA 568 specifications.
 - e. FCC and NCTA Coaxial Cable Television Specifications.
3. Telephone system materials and equipment shall be FCC Type-accepted and certified as such by supplier.
4. No material employed shall present environmental or toxicological hazards as defined by current industry specifications. All materials shall comply with CAL OSHA and EPA specifications or applicable federal or state laws or regulations.
5. The equipment, apparatus, and material for fiber optic equipment and apparatus shall conform to existing CAL OSHA health and safety laws. The equipment and apparatus shall have provision for application of safety labels, such as LASER identification, or warning labels as required by system considerations.

C. Materials Delivery and Storage

1. Costs of all shipping to the site, inside handling, and all unusual storage requirements shall be borne by the Contractor.
2. The Contractor shall make appropriate arrangements and coordinate with authorized personnel at the site for the proper acceptance, handling, protection, and storage of materials so delivered.

3. All materials delivered to the site shall be received, handled and stored by employees of the contractor.

1.7 STRUCTURED CABLING SYSTEM

A. Systimax® Structured Cabling System

1. The installed copper station cables shall be installed by a certified Value Added Reseller (VAR) and covered by a 20 year warranty under the Systimax® Structured Cabling System.

B. Corning LANscape® Solutions

1. All fiber optic cables shall be installed by a Corning Cable certified Value Added Reseller (VAR) and covered by a 25 year warranty under the Corning LANscape® extended warranty program.

1.8 SUBMITTALS

A. Structured Cabling System Pre-Qualification Certificate: The Contractor shall submit a letter of approval from the manufacturer indicating completion of pre-qualification requirements for installation of the Systimax® Structured Cabling System and, the Corning LANscape® cabling solution. Documentation shall include training certificates for installation of the proposed products.

B. Shop Drawings and Supplemental Data

1. Copies of shop drawings and supplemental data shall be provided for the University's review. Shop drawings shall be submitted for all communications equipment, cabling, and structure pertaining to the job (distribution frames, conduit, wire, fiber optic cable, terminations, splices, etc.)
2. Design submittals (reflecting field conditions, actual cable lengths, equipment elevations, and performance expectations) shall be prepared for each system included in the project scope and reviewed with owner's representative.
3. The shop drawings and supplemental data called for shall be submitted as the instruments of the Contractor, even though they may have been prepared by a subcontractor, supplier, dealer, manufacturer, or by any other person, firm, or organization. Prior to submission, the Contractor shall undertake its own review and stamp with its acceptance, then submit to owner's representative for their review. By accepting and submitting shop drawings and supplemental data, the Contractor represents that it has determined and verified all field measurements, the physical construction, the quality of materials, the applicability of catalog numbers, and similar data, or will do so, and that it has checked and coordinated each shop drawing with the requirements of the field conditions. Conflicts between trades shall be resolved by the Contractor in the shop drawings, if possible, but in any event prior to the actual construction.
4. All shop drawings shall be drawn accurately on paper suitable for duplicate copying by black, blue line printing processes or Xerox.
5. Supplemental data shall include information as noted in the specification paragraphs requiring them.
6. Engineer of Record will review shop drawings and supplemental data submitted by the Contractor only for general design conformance with the concept of the project and compliance with the information given in the Contract Documents. A review status of "No Exceptions Taken" on a submittal does not relieve the contractor of the requirements to comply with building codes or the contract specifications."

7. Shop drawings shall be submitted for review and approval by the Engineer of Record prior to use on the job.
8. Responsibility
 - a. The shop drawings and all supporting data, catalogs, etc. shall be prepared by the Contractor or its suppliers. Therefore, the Contractor shall check the drawings of its suppliers as well as its own drawings before submission.
 - b. In particular, the Contractor shall ascertain that the drawings meet all requirements of the drawings and specifications and also confirm to the structural and space conditions.
 - c. Each shop drawing submitted for University approval shall bear a stamp certifying that it has been checked by the Contractor in accordance with the specifications. If such shop drawings show variations from Contract Documents, whether because of standard shop practice or other reasons, the Contractor shall make special mention thereof in the transmittal letter.
 - d. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation etc. that may be required by the proposed equipment, both as pertains to its own work and any work affected under other parts, headings, or divisions of Drawings and Specifications.
9. Identification: Shop drawings shall be titled with the name of the project on each sheet and shall otherwise be identified by listing the particular division, section, article or reference of the work to which they pertain. Different items shall be submitted on separate sheets, and all submittals shall be numbered serially.

1.9 RECORD DRAWINGS

- A. The Contractor shall keep one set of drawings on site to continually maintain an accurate record of the as-constructed work.
- B. The marked-up drawings shall accurately indicate location of equipment, pull-boxes, conduits, cable types and labeling.
- C. Within 30 days of completing work, the Contractor shall submit five (5) copies of as-built drawings to the owner's representative. In addition, the Contractor shall provide an electronic copy of the as-built drawings in a format specified by the owner's representative.

1.10 DEFINITIONS

- A. Backboard: Backboard generally refers to the A-C, fire-retardant, plywood sheeting lining the walls of the telecommunications facilities. Backboards may also refer to the entire wall-mounted assembly, including wire management and termination frames.
- B. Building Distribution Frame (BDF): The BDF is the location within a building where the entire inside cable and fiber optic plant originates. The entire cable and fiber optic entrance facilities also terminate here. Part of the Horizontal Distribution System may originate here as well. It may include: the physical location, enclosure, wire and copper cable management hardware, fiber and management hardware, termination hardware, distribution hardware, protection hardware, active electronic components, and equipment racks. EIA/TIA-569 "Commercial Building Standard for Telecommunications Pathways and Spaces" refers to the room housing the BDF as the Equipment Room. Throughout this specification, BDF and Telecommunications Equipment Room are equivalent.
- C. CATV: Cable Antenna Television system.

- D. Cable Plant: Cable, conduit raceways, vaults, junction/pull boxes, rooms, racks, equipment, patch bays/blocks, and other infrastructure required to provide physical, electrical, optical connectivity between buildings on the Campus.
- E. Cable Rack: Hardware designed and manufactured for horizontal pathway distribution of cable and inside wiring inside the MDF, BDF, or IDF rooms.
- F. Cable Tray: Hardware designed and manufactured for horizontal pathway distribution of cable and inside wire from the MDF, BDF, or IDF to the Information Outlet access point.
- G. Copper Entrance Cable: Copper Cable that joins the University's backbone infrastructure at its connecting point to the buildings BDF.
- H. Designation Strips: Paper or plastic strips, usually contained in a clear or color tinted plastic carrier, designated for insertion into a termination frame. Designation strips are usually imprinted with the adjacent terminal number and are used to aid in locating a specific pair, group of pairs, or information outlet inserted into the termination frame, or for the purpose of delineating a termination field.
- I. Entrance Conduit: Conduit that connects the University's underground infrastructure with the building's BDF.
- J. Fiber Entrance Cable: Fiber Optic cable that joins the University's backbone infrastructure at its connecting point to the buildings BDF.
- K. Information Outlet: An integral assembly containing one of the following:
 - 1. The standard voice/data outlet consists of three, 4 pair category 6 jacks that can be used for various services (voice, data, network, etc.); One gray colored jack for voice, and two orange colored jacks for data.
 - 2. The standard voice/data/fiber outlet consists of two, 4 pair category 6 jacks (one gray for voice and one orange for data) and LC type, duplex, fiber optic connector.
 - 3. The standard voice-only outlet consists of one, 4 pair category 6 wall jack.
 - 4. The standard data-only outlet consists of one or more, 4 pair category 6 jacks (orange) in color.
 - 5. The category 6 jacks and LC type fiber cable connector shall be mounted in faceplates that are secured to standard, quad, metal electrical outlet boxes. Blank dust cover(s) shall be provided in the unused faceplate positions. A single gang faceplate and box shall be used for the installation of a single voice or data category 6 cable. A dual gang faceplate and outlet box shall be used for the installation of a total of two to eight copper and fiber cables.
- L. Inside Plant (ISP): Communications system inside a building (wire, fiber, coaxial cable, equipment and racks, information outlets, etc.).
- M. Intermediate Distribution Frame (IDF): The IDF is the location in a building where a transition between the Riser System and the Horizontal Distribution System occurs. It may include: the physical location, enclosure, wire and cable management hardware, fiber and management hardware, active electronic components, termination hardware, and equipment racks. EIA/TIA-569, "Commercial Building Specifications for Telecommunications Pathways and Spaces" refers to the IDF as the Telecommunications Closet. Throughout this specification IDF and Telecommunications Room are equivalent.
- N. LAN: Local Area Network.

- O. Main Distribution Frame (MDF): The MDF is the location, within a building, where the entire outside cable and fiber optic plant originates. It may include the physical location, enclosure, wire, fiber, and copper cable hardware, protection, active electronic components, equipment frames and racks. EIA/TIA – 569 “Commercial Building Standard for Telecommunications Pathways and Spaces”: refers to the room housing the MDF as the Equipment Room. This space could be the Telecommunications Switching Center and/or the Computer Center and may vary by campus.
- P. MPOE: Minimum Point of Entry, Utility Partnerships/Alternate Carrier, located within the MDF.
- Q. Management Hardware
 - 1. Fiber Management: Hardware designed and manufactured for the purpose of keeping fiber patch cords neat and orderly. Most termination frame manufacturers provide fiber management components designed to work in conjunction with their termination frames. Fiber management may also refer to other types of hardware for the purpose of securing fiber optic cable to the building.
 - 2. Wire Management (Copper, Data, Network): Hardware designed and manufactured for the purpose of keeping cross-connect wire and patch cables neat and orderly. Most termination frame manufacturers provide wire management components designed to work in conjunction with their termination frames. Wire management may also refer to other types of hardware for the purpose of securing wire and cable to the building.
- R. Outside Plant (OSP): Communications system outside of the buildings (typically underground conduit and vaults, exterior/underground, aerial, and buried rated wire and cable, etc.).
- S. Riser Cable: High volume cable (copper) that connects the BDF with the IDF or backboards located on the same or different floors.
- T. Riser Conduit: Conduit that connects the BDF to the IDF or backboards located on the same or different floors.
- U. Riser Fiber Cable: Fiber Optic Cables that connects the BDF with IDF or backboards located on the same or different floors.
- V. SPOE: Secondary Point of Entry, Utility/Alternate Carrier Partnership in buildings other than the MDF.
- W. Station Wire: 4 pair, unshielded, twisted pair, category 6 wire that connects the information outlet to the BDF or IDF.
- X. Telecommunications Ground: An electrical ground (as defined by local codes), usually the main building ground electrode extended by a continuous #3/0 AWG wire to ground bus bars in the BDF, IDF, and roof telecommunications terminal point.
- Y. Termination Fields
 - 1. Copper, Data, Network Termination Fields: A group of termination frames clustered together to provide terminations for specific cable or inside wiring groups, where all of the cable or wiring in the group is used for a single purpose, constitutes a copper, data, or network termination field. The extent of a specific field, located in a group of fields, may be distinguished by a physical separation between the frames forming the field, by uniquely colored designation strips, or by a series of terminal numbers.
 - 2. Fiber Optic Termination Fields: A group of termination frames clustered together to provide terminations for fiber optic cable fibers, where all of the cable fibers are used for a single purpose, constitutes a fiber termination field.
- Z. Termination Frames

1. Copper Termination Frame: Device designed and manufactured for the purpose of terminating large numbers of copper cable or station wire pairs. These devices generally utilize insulation displacement connections and usually require special tools to make the terminations. Throughout this specification, the terms Copper Termination Frame and Wiring Block are equivalent.
2. Data Termination Frame: Device designed and manufactured for the purpose of terminating copper cable pairs from the active data electronic hardware. These devices generally utilize insulation displacement connections and usually require special tools to make the terminations. Throughout this specification, the terms Data Termination Frame and/or Data Patch Panel are equivalent.
3. Fiber Termination Frame: Device designed and manufactured for the purpose of terminating fiber optic cable fibers into "LC" connector field.
4. Network Termination Frame: Device designed and manufactured for the purpose of terminating copper cable pairs from the active data electronic hardware. These devices generally utilize insulation displacement connections and usually require special tools to make the terminations. Throughout this specification, the terms Network Termination Frame and Network Jack Panel are equivalent.

PART 2 - MATERIALS

Not used

PART 3 - EXECUTION

Not used

END OF SECTION