

SECTION 271500

DATA CIRCUITS

PART 1 GENERAL

1.1 SUMMARY

Section includes premises data circuits by certified manufacturers and contract installers with certification and testing of all equipment and cabling.

1.2 RELATED SECTIONS:

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- B. Division 9 – Painting
- C. Section 260500 - General Electrical
- D. Section 260533 - Conduit
- E. Section 260534 - Boxes
- F. Section 262726 - Wiring Devices
- G. Section 260553 - Electrical Identification
- H. Section 270510 - Telecommunications Pathways

1.3 REFERENCES

- A. ANSI/TIA-568-C.0, C.1, C.2, and C.3 (herein referred to as –C) (Telecommunications Industries Association/Electronic Industries Association) - Commercial Building Telecommunication Wiring Standard.
- B. ANSI/TIA/EIA-569-B - Standard for Telecommunications Pathways and Spaces.
- C. ANSI/TIA/EIA-606A - Administrative Standard (Labeling).
- D. ANSI/J-STD-607-A - Commercial Building Grounding/Bonding Requirements.
- E. NETA ATS (International Electrical Testing Association) - Acceptance Testing Specifications for Electrical Power Distribution Equipment and Systems.
- F. NFPA 70 - National Electrical Code.
- G. UL® 969 - Standard for Marking and Labeling Systems.

- H. ISO/IEC 11801 - Information Technology, Generic cabling for customer premises.
- I. BISCI - Building Industries Consulting Services International.
- J. BISCI TDMM - Telecommunications Distribution Methods Manual.
- K. BISCI CO-OSP - Customer Outside Plant Design Manual

1.4 SYSTEM DESCRIPTION

- A. Provide, ready for operation, a complete and operational communication network infrastructure system that is a manufacturer certified Cat 6 F/UTP system. The system shall include, but not be limited to, copper and fiber optic cabling, modules, racks, patch panels, faceplates, connectors, hardware, accessories, cable supports, connections, testing, certifications and all other material, labor and operations required for a complete system.
- B. Cabling shall be installed in raceways and/or on a cable support structure as shown on the Drawings. Raceways for cabling shall be installed in compliance with Section 260553. Cable support structure shall be as specified hereinafter.
- C. The horizontal wiring shall consist of the wiring from designated telecommunication rooms to the information services outlet. The horizontal wiring includes the wiring termination components in the telecommunication room(s), the horizontal wiring itself, and the termination components at the outlet.
- D. Backbone cabling shall consist of fiber and copper cables to connect data services as required and shown on the Drawings.
- E. Horizontal Wiring for Data and Telephone: Unless indicated otherwise on the Drawings, the normal connections requirements to a standard four position telecommunication outlet are two (2) copper data cables to each outlet. The cables shall terminate in patch panels in the telecommunications rooms racks.
- F. The proposed system shall utilize a network of fiber optic (FO) and overall foil shielded twisted pair (F/UTP), riser, tie, and station cables. Fiber cables shall terminate on Fiber Distribution Centers and/or modular patch panels as shown on the Drawings. Cables and terminations shall be identified at all locations and cables shall terminate in an alphanumeric sequence at all termination locations. The complete system shall be fully standards compliant with guaranteed "Channel" performance. All F/UTP end-to-end Channel Configurations, as defined by ANSI/TIA-568-C, shall be provided by a single manufacturer.

1.5 SUBMITTALS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Product Data: Submit catalog data for each termination device, cable, rack, etc.
- C. Test Reports: Indicate procedures and results for specified field testing and inspection.

- D. Reference paragraph 1.7 B below, submit copies of all BICSI RCDD certifications together with picture identification and itemized list of technicians and installers.

1.6 CLOSEOUT SUBMITTALS

- A. Submit under provisions of relevant sections of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Project Record Documents: Record actual locations and sizes of pathways and outlets.
- C. Provide a certificate of completion of the installation with verifications that each copper cable pair has been tested to a minimum of 500 MHz and is capable of supporting 10 Gigabit Ethernet.
- D. Provide a certificate of completion of the installation with verifications that each fiber optic cable has been tested to industry standards.
- E. Provide a Certified Installation Warranty Certificate.
- F. Provide Test results for each cable and outlet.
- G. Provide marked up Drawings showing additions, deletions, and modifications also identifying cable routings.
- H. Provide electronic copies of marked up final Drawings.
- I. Provide wall mounted copies of the final system Drawings in each telecommunications room.

1.7 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in installing products specified in this section with minimum five years documented experience on projects utilizing infrastructure work similar to that required for this project, and with service facilities within 100 miles of project.
 - 1. The Installer shall be an experienced firm regularly engaged in the layout and the installation of cabling infrastructure systems. Documentation shall be provided to show that the Contractor has successfully completed projects of similar size and scope within the previous twelve months.
 - 2. The Installer shall be manufacturer certified and shall have a current valid certification card.
 - 3. The Telecommunication Project Manager shall:
 - a. be certified as BICSI RCDD
 - b. be experienced in this type of project and provide technical support.
 - c. attend monthly progress meetings and additional meetings as scheduled or required.
 - d. In addition to having the appropriate manufacturer certifications, the installing work force shall wear visible identification badges at the project site showing name, current photograph and company name.

- C. Testing Agency: Company member of International Electrical Testing Association and specializing in testing products specified in this section with minimum three years documented experience.

1.8 PRE-INSTALLATION MEETING

Convene minimum one week prior to commencing Work of this section.

PART 2 PRODUCTS

2.1 DATA RACKS

- A. Product Description: Standard EIA compliant heavy duty, four post, 19" equipment and cable management rack assembly, floor mounted, steel, and having double sided wide vertical cabling section. Rack channels shall be tapped holes in universal EIA spacing. Rack shall be finished in a durable black powder coat and shall be warranted to be free from defects in materials or workmanship under normal use and conditions for the lifetime of the rack. Secure to floor and wall with manufacturer's recommended hardware and accessories. Racks shall be connected to the electrical ground system in compliance with ANSI/J-STD-607-A. Horizontal and vertical cable management panels shall be provided installed above and below each data patch panel to provide neat and orderly routing of patch cables. Cable management panels shall be sized to accommodate the maximum number of patch cables for the patch panels.
- B. Each rack shall have one 120VAC, 20A electrical power strip mounted on the rear of the rack. The power strip shall have a minimum of six outlets and shall not be equipped with an on/off switch.
- C. Ladder rack: Standard steel with durable black powder coat and manufacturer-supplied installation hardware. Securely install to the racks and building structure as shown.

2.2 DATA OUTLET JACKS, PATCH PANELS AND PATCH CABLES

- A. Category 6 F/STP Patch Cables: Provide adequate capacity for all active and 25% spare circuits. Provide gray patch cords for all patch panel ports, evenly divided between 5 and 7 foot cords, plus 15% spare of each length. Provide one gray patch cord for all telecommunications outlets throughout the facility, evenly divided into 5, 7 and 10 foot cords, plus 15% spare of each length. All patch cables shall be supplied from one manufacturer.
- B. Category 6 F/STP Modular Jack (RJ45): Wire per T568A pattern. Provide single gang 4-port faceplate configured with two (2) data jacks. Provide blanks in the unused locations on the faceplate. Each faceplate shall have designated label strips for the top and bottom at each faceplate.
- C. Outlet Faceplates shall match those specified in Section 262726 and shall provide for four jacks.

2.3 INTERIOR COPPER CABLES

- A. Cables shall be overall foil shielded, 4 pair, 23 AWG solid conductor, 100 ohm, Category 6 F/UTP compliant and installed per ANSI/EIA-568-C and NEC guidelines. Cable shall be of the traditional round design with or without flute and be 3rd party verified to comply with the manufacturer's stated performance. Cable outer jacket shall be blue.
- B. Cable shall have contiguous, 2-foot segment-length markers printed on the cable jacket. The markings shall also show the applicable performance (Cat 6).
- C. Cable shall extend between station locations and terminals as indicated. Cable shall terminate to Cat 6 shielded modular jacks at each outlet.
- D. Cable shall be capable of supporting 10 Gigabit Ethernet (10GBASE-T) to 100 meters.

2.4 FIBER OPTIC CABLE AND TERMINATIONS

- A. Cable: Multi-fiber, single mode, OM3 50/125 μ m cable with 900 μ m tight buffered fibers, with central dielectric members, surrounding by dielectric strength members, protected by a flame-retardant outer jacket.
- B. Terminations: Type LC, multimode, OM3 50 μ m, ceramic, installed in strict compliance with manufacturer's recommendations.
- C. Fiber Enclosure: Standard 19" rack mounted with top and side covers, polycarbonate tinted front door, strain reliefs. Provide with sufficient ports for 50% more than required by cable.

2.5 CHANNEL PERFORMANCE SPECIFICATIONS

Copper and Fiber Optic Systems shall meet the performance requirements as defined in the ANSI/TIA-568-C standards.

2.6 TELECOMMUNICATION ROOM (TR)

- A. The TRs shall provide for a transition between the horizontal and backbone pathways, and provide space for telecommunications components including cable terminations (horizontal and backbone), active and passive equipment, cross-connections cabling, and hardware, and any other materials or equipment associated with the building telecommunications, data and technology systems.
- B. Provide $\frac{3}{4}$ inch fire rated plywood void free and finished on one side, mounted vertically 4 inches AFF as shown in each TR. The fire rated plywood shall be painted, on all 5 sides, with at least two coats of fire resistant white paint. The final paint finish shall be clear of footprints, markings, etc and shall be a smooth finished product.
- C. All TRs shall be equipped with a grounding bus bar. A solid copper grounding bus bar with compression fittings and stand off brackets with insulators will be required on the Telecommunications backboard. Bus bars will be connected as shown on the Drawings.
- D. Data cables shall be routed into the TRs through overhead ladder racking. The ladder racking shall be 18" minimum width. The data cables shall be terminated to 48-port Category 6 F/UTP patch panels mounted in 7' x 19" aluminum racks. A doubled-sided vertical cable

management unit with cover shall separate each rack. Category 6 F/UTP patch cords shall be used to connect communications equipment. Category 6 cross connect is not permitted. Racks and ladder racking shall be properly anchored to the floor and structure and grounded.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The project manager and crew shall be consistent through out the project. The project manager shall be present when any work is being performed. The project manager shall contact the Owner designated contact at the beginning and end of each day that work is to be performed.
- B. Cable shall be installed and terminated per manufacturer's specifications. The installer will observe the cabling practices described in ANSI/TIA-568-A standards. Standard industry practices guided by ANSI/TIA cabling standards and BICSI installation manuals shall be employed for cable installation, handling, grooming, etc. All cabling will be installed in a manner that will protect the cable from damage during installation, facilitate cable management and identification, and provide a neat and groomed appearance.
- C. Install wire and cable in accordance with ANSI/TIA-568-A and ANSI/TIA/EIA-569-B.
- D. The maximum bends between pull points shall be 180 degrees.
- E. The maximum distance between pull boxes shall be 100 feet.
- F. If a continuous raceway system is not shown on the Drawings, all cabling not shown in raceway shall be supported with a cable support structure.
 - 1. Cabling shall be installed in straight paths and exit pathways at ninety-degree angles. Diagonal, beeline and or non-supported cabling are unacceptable. Cabling shall be routed as high as possible and above other building facilities in the path with the least obstructions in the ceiling space while maintaining the separation requirements of ANSI/TIA-568-A, ANSI/TIA/EIA-569-B, and NFPA 70 (NEC). There shall be a minimum distance of 3 inches between the cable and ceiling grid and cable pathways shall be clear of all possible EMF and RFI interference. Specifically cables shall be at least **2 feet** away from all lighting fixtures and other potential EMF sources. Any violations of this shall be corrected at the contractor's expense. Cables shall not be run parallel with electrical conduits or strapped to them. The placing of cable ties shall not deform the cables.
 - 2. The cable support structure shall utilize Cat 6 and fiber approved cable supports and be sized to accommodate change. J hook type cable supports shall be securely fastened to the building structure and be spaced at a maximum distance of four (4) feet so that sag between supports does not exceed 12 inches. J hooks shall be sized as follows: two inch J hooks rated for 75 cables and shall be used to support cable paths of 50 or less cables, four inch J hooks rated for 150 cables and shall be used to support cable paths of 51 to 100 cables. All cable paths shall be sized with 20% spare capacity. All attachment hardware shall be approved for the type of installation and maximum load rating of the products to be installed.
- G. All penetrations through walls and floors shall be sleeved. All sleeves shall have permanently

attached bushings. Sleeves shall be sized to accept 50% growth. All sleeves shall be fire-stopped using UL® approved methods and shall maintain assembly fire ratings. All sleeves between floors shall be supported with a conduit riser clamp installed per the manufacturer direction and shall be installed tight to the ceiling with enough sleeve to attach the bushing and rise up three inches above the floor on the opposite end.

- H. The horizontal cables shall be bundled using hook and loop cable ties. Plastic cable ties are not permitted. All cable shall be installed according to ANSI/TIA-568-C and ANSI/TIA/EIA-569-B standards.
- I. Horizontal station cable shall have 12 inches spare cable at the station outlet and 10 feet of spare at each rack. Provide 25 feet of spare cable at each WAP termination. Cables and fiber riser cable shall have 10 feet spare at each rack. Cables from building protector blocks shall have 10 feet spare at protector blocks. Fiber cables terminating into the building shall have a 20-foot service loop at the data rack.
- J. All cable shall be installed in a complete, neat, and orderly fashion. Install cable with sufficient bending radius as not to kink, shear, or damage binders. Bend radius shall meet manufacturer's specifications for horizontal cable, fiber-optic inter- and intra- building cable, and copper inter- and intra- building cable. Cables shall be groomed, such that cables to be terminated on the left side of the patch panels are routed down the left side of the rack, and cables to be terminated on the right side of the patch panels are to be routed down the right side of the rack.
- K. Terminate cables at outlet devices. Terminate cables at specified rack.
- L. Install pull wire in each empty data conduit.
- M. Ground and bond pathways, cable shields, racks and equipment under the provisions of ANSI/J-STD-607-A - Commercial Building Grounding/Bonding Requirements.
- N. Each end of all cable shall be labeled at approximately 3 to 6 inches from the Network Data jack with a printed cable label. Labeling for the faceplate and block terminations shall be provided as specified below. All labeling shall comply with the ANSI/TIA/EIA-606-A standard.
- O. All labels for the labeling shall be printed using a computer, printer or Brother P-Touch labeler with TZ tape or equivalent. Labels shall not be hand written. Labels shall be different colors as detailed for identification per the 606-A standard. The contractor shall meet with the Owner and verify the numbering schemes and label coloring.
- P. The numbering scheme shall be agreed upon between the contractor and the Owner prior to the start of the physical installation.
- Q. Each piece of termination hardware such as a patch panel shall have a unique named and label. For each element in the route, identification labels shall be completed and attached. Labels shall meet the requirements of UL® 969 Standard for Marking and Labeling Systems. A final report shall record system configuration, unique identifier, fiber labels, pathways and as-built details and as-built drawings. Loss Measurements and shall also be included with the records. Color coding to match UL® 606 requirements.

- R. All cables shall be installed according to ANSI/TIA-568-C and ANSI/TIA/EIA-569-B standards. Care shall be taken during the installation to prevent nicks, abrasions, burning and scuffing of the cable. Cables found to be damaged will be replaced at the contractor's expense regardless of whether the cable passes Cat 6 testing standards.

3.2 TESTING

A. Horizontal Cable Testing:

1. Each equipment telecommunications room patch cord, patch panel, horizontal cable, RJ 45 jack, station patch cord shall be tested end-to-end for compliance with Cat 6 parameters as stated in the ANSI/TIA-568-C standards. Only certified Cat 6 cable testing shall be used. The Test equipment used for horizontal Cat 6 cable tests shall be in compliance with the industry standard Cat 6 cable testers level IV, and comply with ANSI/TIA test procedures. Each link shall be tested to ANSI/TIA-568-C.
2. Testing of all copper wiring shall be performed prior to system cutover. 100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and presence of AC voltage. Horizontal wiring pairs shall be tested from the information outlet to the TR.
3. The contractor, at no charge to the Owner, shall bring any pairs not meeting the requirements of the standard into compliance.
4. Complete, end-to-end test results shall be submitted to the Architect/Engineer and the Owner.

B. Fiber Optic Testing:

1. Each OM3 50/125 μ m fiber link shall be attenuation tested, patch panel to patch panel, using an OTDR at the 850 and 1300 nm wavelength in at least one direction using the two jumper method. Each single-mode fiber link shall be attenuation tested, patch panel to patch panel, at the 1310 and 1550 nm wavelength in at least one direction using a light meter. Link attenuation shall be measured using the one reference cord method as specified in TIA-526-14-A for multimode and TIA-526-7 for single-mode. Field test instruments shall meet the requirements of ANSI/TIA-568-C.0. Link attenuation and length shall meet the performance and application requirements of ANSI/TIA-568-C.0 and 10 Gigabit Ethernet.
2. Power meter tests for building risers shall be accomplished for length and attenuation for each individual fiber. Test results shall be provided for each individual fiber and maintained for inclusion into the documentation package.
3. Link attenuation does not include any active devices or passive devices other than cable connectors and splices.
4. A final report shall be compiled that records system configuration, fiber labels, cable routes, and as-built details and as-built drawings.

- C. A Certified Cat 6 cable tester, Level IV, shall perform the certification test on all Cat 6 links and adhere to ANSI/TIA-568-C.

- D. All test equipment shall be consistent throughout the installation. All test equipment shall be available for inspection by the Owner at any time. A valid and current calibration certificate traceable to the National Institute of Standards and Technology for any test equipment to be used shall be provided to the Owner.

- E. Two printed copies of the computer generated reports of the test results (in 8.5" by 11" hard cover binders) are required plus two compact disc copies.

3.3 FIELD QUALITY CONTROL

- A. Field inspection and testing shall be performed under provisions of the General and Supplemental General Conditions and Division 1 Specifications Sections.
- B. Inspect, test and certify all cabling and equipment and terminations as specified and in accordance with ANSI/TIA-568-C.

3.4 MANUFACTURER WARRANTY

- A. Contractor shall provide a Twenty-Five Year System Warranty and Application Assurance.
- B. A Warranty Statement shall be provided by the Manufacturer stating the period of the Warranty for all the products specified for the project, the name and address of the authorized manufacturer's agent and also state who shall honor any and all Warranty claims.
- C. Extended Product Warranty shall cover product defects for all passive manufactured channel components. Passive components are defined as those exhibiting no gain or contributing no energy. As from the date of a Registration Certificate the Manufacturer shall Warrant:
 - 1. That the passive products that comprise the registered Channel solution shall be free from manufacturing defects in material or workmanship under normal and proper use;
 - 2. That all channel approved passive cabling products that comprise the registered Channel solution exceed the specification of ANSI/TIA-568-C and exceed ISO/IEC 11801 standards and shall be equal to or exceed the performance specifications of the associated Communication product data sheet in effect at the time the Registration Certificate is issued;
 - 3. Each channel shall be comprised exclusively of a single manufacturer's solution.
 - 4. This extended Product Warranty is applicable to the channel cabling solution products only on the original site of installation. Under the Extended Product Warranty, Manufacturer shall either repair or replace the defective product itself at Manufacturer's cost and, pay an Authorized Cable Installation Reseller for the cost of labor to repair or replace any such defective product on behalf of the Manufacturer;
- D. Application Assurance shall cover the failure of the channel structured cabling solution to operate the applications, which the Solution was designed to support, as well as additional application(s) defined below. Manufacturer shall warrant that the registered channel structured cabling solution shall be free from failures which prevent operation of the specific applications for which the original channel structured cabling solution was designed. The Application Assurance Program shall also cover the following additional applications:
 - 1. Those identified in the current (at the time of installation) channel structured cabling solution performance specifications; and
 - 2. In accordance with application standards specifications, any application introduced in the future by recognized standards or user forums that use ANSI/TIA-568-C or ISO/IEC 11801 components and link/channel specifications for cabling.
- E. Other Warranties

1. Additional Warranty: The Contractor shall state any additional Contractor supplied warranty.

END OF SECTION