

SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Provide all labor, materials, and equipment for the complete installation of Work called for in the Contract Documents.
- B. This section includes the minimum requirements for the installation of horizontal cabling between Telecommunications Rooms and Work Area Outlets.
- C. Included in this section are the minimum composition requirements and installation methods for the following:
 - 1. Category 6A Cable
 - 2. Faceplates, Jacks, and Modules
 - 3. Patch Panels
 - 4. Patch Cords
 - 5. Cable Ties

1.2 DEFINITIONS AND TERMS

- A. Trade association names and communications terminology are frequently abbreviated. The following acronyms or abbreviations may be referenced within this Section:
 - 1. OWNER Owner
 - 2. ANSI American National Standards Institute
 - 3. AWG American Wire Gauge
 - 4. BICSI Building Industry Consulting Service International
 - 5. CMR Communications Riser Cable
 - 6. CMP Communications Plenum Cable
 - 7. DCM Design Criteria Manual
 - 8. EIA Electronics Industries Alliance
 - 9. FEP Fluorinated Ethylene Propylene
 - 10. IDC Insulation Displacement Connector
 - 11. IEC International Electrotechnical Commission
 - 12. IEEE Institute of Electrical and Electronics Engineers
 - 13. ISO International Standards Organization
 - 14. LBF Pound Force
 - 15. MER Main Equipment Room
 - 16. NEMA National Electric Manufacturers Association
 - 17. NEXT Near End Crosstalk
 - 18. NFPA National Fire Protection Association
 - 19. RCDD Registered Communications Distribution Designer
 - 20. RFP Request for Proposal
 - 21. RL Return Loss
 - 22. STD Standard
 - 23. STP Shielded Twisted Pair
 - 24. TIA Telecommunications Industry Association
 - 25. TR Telecommunications Room
 - 26. TSB Technical Services Bulletin
 - 27. UL Underwriters Laboratories
 - 28. UTP Unshielded Twisted Pair

1.3 QUALITY ASSURANCE

- A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the Owner.
- B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated, or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the Owner.
- C. Strictly adhere to all BICSI, EIA and TIA recommended installation practices when installing communications cabling.
- D. Contractor’s Qualifications:
 - 1. Firms regularly engaged in the installation of Data Communications cabling and that have five (5) years of installation experience with systems similar to that required for this project.
 - 2. Provide references to include client names, phone numbers and a summary of project details. These references will be checked and the clients will be asked questions relative to the performance of your company.
 - 3. Provide verification that installation personnel responsible have been properly trained to install the products described in this Section.
 - 4. Provide a BICSI RCDD certified professional for oversight on this project. This person does not have to be working on-site, but must be accessible to answer questions and provide weekly status reports. The RCDD shall be a full time employee of the contractor.
 - 5. Provide full time project manager with a minimum of ten (10) years field experience in installation of communications systems and infrastructures. Project manager shall be assigned for the duration of the project and shall not be replaced without written consent from the Owner.
- E. Manufacturer’s Qualifications:
 - 1. Firms regularly engaged in manufacture of products of the types, ratings and capacities required for this project; whose products have been in satisfactory use in similar service for not less than five (5) years, with production capabilities per applicable NEMA standards.
- F. Material and Work specified herein shall comply with the applicable requirements of:
 - 1. Texas Army Reserve: Information Technology Manual, October 10, 2024
 - 2. Department of the Army Technical Criteria for the Installation Information Infrastructure Architecture (13A), July 2008
 - 3. NECA 1 – Standard Practice of Good Workmanship in Electrical Construction, 2023
 - 4. ANSI/TIA/EIA Standards
 - 5. ANSI/NECA/BICSI-568 – Standard for Installing Commercial Building Telecommunications Cabling, 2019
 - 6. ANSI/BICSI N1-2019 – Installation practices for Telecommunications and ICT Cabling and related Cabling Infrastructure
 - 7. ANSI/TIA-568.0-E – Generic Telecommunications Cabling for Customer Premises, 2020
 - 8. ANSI/TIA-568.1-E – Commercial Building Telecommunications Cabling Standard, 2020

9. ANSI/TIA/EIA-568.3 -E - Optical Fiber Cabling Components Standard, 2020
10. ANSI/TIA/EIA-569-E – Commercial Building Standard for Telecommunications Pathways and Spaces, 2019
11. ANSI/TIA/EIA-606-D – Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 2021
12. ANSI-J-STD-607-E – Joint Standard for Commercial Building Grounding (Earthing)and Bonding Requirements for Telecommunications, 2024
13. ANSI/TIA-942-C – Telecommunications Infrastructure Standard for Data Centers, 2024
14. NFPA 70 – National Electric Code, 2023
15. BICSI – Telecommunications Distribution Methods Manual, 15th Edition
16. NEMA – VE 1 – Metal Cable Tray Systems, 2024
17. NEMA – VE 2 – Metal Cable Tray Installation Guidelines, 2024
18. ANSI/TIA-568.2-E, Balanced Twisted-Pair Telecommunications Cabling and Components Standard, 2024
19. UL 13 – Standard for Safety for Power-Limited Circuit Cables
20. UL 444 - Standard for Safety Communication Cables
21. IEE 802 – Local Area Network Standard
22. UFC 3-580-01 – DoD Unified Facilities Criteria, Telecommunications Interior Infrastructure Planning and Design, November 21, 2024
23. Applicable codes and directives of authorities having jurisdiction

G. Work:

1. The Work shall be performed in compliance with the applicable manufacturer's installation instructions, Standards, and certifications listed herein, the Contract Documents, and governing codes and regulations of the authorities having jurisdiction.
2. The drawing and specification requirements govern where they exceed Code and Regulation requirements.
3. Where requirements between governing Codes and Regulations vary, the more restrictive provision applies.
4. Nothing in the Contract Documents grants authority or permission to disregard or violate any legal requirements.

1.4 CONFLICTS

- A. This installation shall be made in strict accordance with the Specifications, Drawings, any applicable codes, referenced publications and standards. In case of conflicts between the aforementioned, notify the Owner in writing prior to commencement of affected work.

1.5 PERMITS

- A. The Contractor shall secure and pay for all necessary permits and fees required for the execution of this Work. Work will not start until all permit applications are approved.

1.6 SCHEDULING

- A. The Contractor shall comply with all scheduling requests established by Owner, both prior to commencing Work, and during construction. The Contractor shall provide a

detailed schedule of work to be performed. This schedule shall be submitted with the proposal and, if accepted, will be used to track work status.

- B. Work should be scheduled not to interfere with day-to-day operations within the facility. Operations vary by area and should be given careful consideration in relation to the schedule.
- C. The successful Contractor for all or any portion of the work described by this RFP package will be responsible for achieving a complete and fully functional installation on or before the contract scheduled completion date.

1.7 REQUIREMENTS

- A. All references to manufacturers, model numbers and other pertinent information herein are intended to establish standards of performance and quality of construction. The Owner must approve material submittal and substitutions in writing.
- B. Verification that all the components specified and installed meet the criteria specified by the respective component manufacturer, supplier and designer is the responsibility of the Contractor.
- C. All installation tools, special equipment and testing apparatus required to accomplish field connections and related work as described herein shall be furnished by the Contractor at no additional cost.
- D. The requirements as given in this document are to be adhered to unless revised by the Owner in writing.
- E. The Owner reserves the right to waive these requirements at any time.

1.8 SUBMITTALS

- A. Comply with provisions of Division 01.
- B. Comply with provisions of Section 27 05 00.
- C. Produce Shop Drawings for ALL horizontal cabling, to include but not limited to, proposed routing and its location relative to building structure (columns, floor or ceiling) and its relationship to electrical, mechanical elements as well as any horizontal cables that may exceed 295' in length (including service loops).
- D. Provide all submittal requirements under this section as a single package.
- E. Provide product data for the following:
 - 1. Product data consisting of manufacturers specifications for each type of product to be installed, all applicable certifications and elevation/plan documents supporting compliance with stated Specifications.
 - 2. Manufacturer's certificate of acceptance of the qualifications of the installing Contractor to install, test and maintain the manufacturer's equipment.
 - 3. Manufacturer's installation specifications for UTP cabling and optical fiber, indicating minimum bend radius and maximum pull tension.
 - 4. Outline of administration labeling scheme for voice and data communications cabling and termination locations per ANSI/EIA/TIA-606.
 - 5. Proposed format of as-built documentation.

1.9 CONTRACTOR CLOSE OUT SUBMITTALS

- A. Submit Closeout documentation in accordance with Division 01 of the Project Manual and any applicable supplements. The number of submittal sets required is the greater of either the requirements of Division 01 of the Project Manual, or a minimum of four (4) sets.

1. Segregate documents into separate binders containing data relevant to operational, maintenance, and warranty issues.
 2. Test reports on all copper and optical fiber cables (electronic file format and hard copy).
 3. As-built cable schedules with recorded cable routing and lengths of each designated run.
 4. As built documentation of all cabling systems.
 5. As built documentation of EF/TER/TR modifications and associated cabinet elevations.
 6. Laminated as-built drawing sheet of EF/TER/TR service area representing each level, with a scale of not less than 1/8in, mounted on the wall of each EF/TER/TR.
- B. Warranty and Maintenance:
1. Test Report Binder(s)
 2. Record Drawings
- 1.10 DELIVERY, STORAGE, AND HANDLING
- A. Deliver materials factory-packaged in containers or reels and handle in accordance with manufacturer's recommendations. Store in a clean, dry space and protect products from damaging fumes and traffic. Handle materials carefully to avoid damage.
 - B. Storage space on project site may be limited. Contractor shall coordinate delivery and arrange storage of materials and equipment with the Owner.
 - C. Components sensitive to damage in a harsh environment shall be stored off-site and delivered as needed.
 - D. Provide protective covering during construction to prevent damage or entrance of foreign matter.
 - E. Contractor is responsible for on-site security of tools, test equipment and materials.
 - F. Replace at no expense to Owner, product damaged during storage, handling or the course of construction.
- 1.11 PROJECT CONDITIONS
- A. Verify conditions on the job site are applicable to this Work. Notify Architect in writing of discrepancies, conflicts, or omissions promptly upon discovery.
 - B. The Drawings diagrammatically show cabling and arrangements of equipment fitting the space available without interference. If conditions exist which make it impossible to install Work as shown, recommend solutions and/or submit drawings to the Architect for approval, showing how the Work may be installed.
- 1.12 WARRANTY
- A. Warrant labor and product to be free of defects and deficiencies, and to conform to the drawings and specifications as to kind, quality, function, and characteristics, following Contractor Warranty requirements defined in Division 01, or for a period of 1 year from date of final completion, whichever is longer. Repair or replace defects occurring in labor or product within the Warranty period without charge.
 - B. All surplus parts and pieces to the installation shall be maintained as a spare parts inventory at the building site. Parts replaced during the warranty period shall have a warranty matching that of the original part from date of replacement.
 - C. In addition to the warranty outlined above, the Contractor shall facilitate a warranty between the Owner and the Manufacturer that provides coverage of the installed cabling system for a period of (25) twenty five years. This warranty will cover the installed

horizontal cabling system (Patch Panel to Workstation). Category 6A copper links originating from patch panels shall be warranted against the link performance minimum expected results defined in the ANSI/TIA/EIA Telecommunications Systems Bulletin (TSB-67), now incorporated into TIA/EIA 568-B, for Category 6A performance requirements. Category 6A copper links originating from wall mounted 110-style termination blocks shall be warranted against link performance minimum expected results for Category 6A performance requirements. Installation shall be performed by a Cabling System Manufacturer Certified Installer.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The products specified in this document do not necessarily constitute the exhaustive list of products required to complete the statement of work. Except where described in the SUMMARY subpart of this document, the contractor is responsible for providing any other parts and materials needed to deliver a complete and working system.

2.2 ACCEPTABLE DISTRIBUTORS

- A. Contractor shall procure all horizontal cabling components thru an approved cabling system Manufacturer product distributor.

2.3 ACCEPTABLE VENDORS AND MATERIALS

- A. Subject to compliance with requirements, install products from the following manufacturers, except where noted:
 - 1. Cable, Copper
 - a. CommScope
 - 2. Termination Components
 - a. CommScope
- B. Part numbers are provided for convenience purposes only; the contractor is responsible for complete material list and quantities. All materials listed are manufactured by CommScope unless otherwise noted. Colors shall be approved by Owner.

2.4 CATEGORY 6A PRODUCTS

- A. UTP Cable (Voice/Data)
 - 1. Provide Category 6A cabling for all voice and data work area outlet locations.
 - 2. Cable shall far exceed ANSI/TIA/EIA-568-B.2-1 and ISO/IEC 11801 Class E standards.
 - 3. The conductors shall be at minimum 24 AWG construction with FEP (CMP) insulation.
 - 4. The copper conductors shall be twisted in pairs, separated by an integrated pair divider and shall be covered by a low smoke, flame retardant (CMP) jacket.
 - 5. Provide plenum-rated cable for all.
 - 6. The jacket color for voice cables shall be white.
 - 7. The jacket color for data cables shall be green.

8. The jacket color for TOC cables shall be violet.
9. The jacket color for JSIIDs and AI phone cables will be Blue.
10. The Jacket color for Fire Alarm cables shall be Red.
11. Approved products:
 - a. CommScope 2091SDB Category 6A U/UTP Copper Cable, White, Plenum
 - b. CommScope 2091SDB Category 6A U/UTP Copper Cable, Green, Plenum
 - c. CommScope 2091SDB Category 6A U/UTP Copper Cable, Violet, Plenum
 - d. CommScope 2091SDB Category 6A U/UTP Copper Cable, Blue, Plenum
 - e. CommScope 2091SDB Category 6A U/UTP Copper Cable, Red, Plenum

B. UTP Jack Modules

1. Provide Category 6A jack modules to terminate both ends of each horizontal cable unless otherwise specified on the drawings.
2. Module shall exceed requirements of ANSI/TIA-568-C.2 Category 6A, IEEE 802.3an-2006, and ISO 11801 Class E channel standards and exceed requirements of ANSI/TIA-568-C.2 Category 6A and IEC 61156-5 Category 6A component standards.
3. Module shall meet requirements of IEEE 802.af / IEEE 802.3at and IEEE 802.3bt for Power over Ethernet (PoE) applications Type 1-4.
4. Module shall be 100% tested to ensure NEXT and RL performance and be individually serialized for traceability.
5. Voice modules at work area outlet locations shall be white in color.
6. Data modules at work area outlet locations shall be green in color.
7. Approved products:
 - a. CommScope MGS600-WH Category 6A Jack Module, White
 - b. CommScope MGS600-GN Category 6A Jack Module, Green
 - c. CommScope MGS600-BK Category 6A Jack Module, Black
 - d. CommScope MGS600-BL Category 6A Jack Module, Blue

C. Category 6A Patch Cords

1. Provide Category 6A patch cords for voice and data work area outlets.
2. Patch cord shall exceed ANSI/TIA-568-C.2 Category 6A and ISO 11801 Class E standards.
3. Shall meet requirements of IEEE 802.af / IEEE 802.3at and IEEE 802.3bt Type 1-4 for PoE applications.
4. Each patch cord shall be 100% performance tested and wired T568B.
5. Patch cord shall be constructed of Category 6A, at minimum 24 AWG UTP stranded cable Modular RJ- 45 Plugs.
6. Patch cord plugs shall meet all applicable ANSI/TIA/EIA-968-B requirements and exceeds IEC 60603-7 specifications.
7. Plugs shall use an integral pair manager to optimize performance and consistency by reducing untwisting of conductors within the plug.
8. Patch cord shall perform in center of TIA/EIA component range, ensuring interoperability and excellent performance.
9. Patch cord shall be labeled with an identification of performance level, length, and a quality control number.
10. Provide a quantity of 15' length Green patch cords for every port on every work area outlet.

11. Provide a quantity 7', 10' and 15' length Patch cords at the EF/TER/TR patch panels. Provide the corresponding QTY as per the Port Counts.
 - a. Patch cords installed in each EF/TER/TR shall be patched from the patch panel to the switch mounted inside 19" X 7" racks.
 - b. Voice cables are to be patched with White patch cords.
 - c. Data cables are to be patched with Green patch cords.
 - d. Wireless access cables are to be patched with Blue patch cords.
12. Provide plenum rated patch cords for work area outlets and patch cords installed above the ceiling for wireless access points.
13. Approved products: Wireless Access Points
 - a. CommScope:
 - 1) YYY = Feet
 - 2) CO199K2-0ZF015 Category 6A Copper Patch Cord 15' Blue - WAP
 - 3) CO199K2-0ZFYYY Category 6A Copper Patch Cord 7',10',15' Blue – EF/TER/TR
14. Approved products: WAO – EF/TER/TR
 - a. CommScope:
 - 1) YYY = Feet
 - 2) CO199K2-04F015 Category 6A Copper Patch Cord 15' Green - WAO
 - 3) CO199K2-04FYYY Category 6A Copper Patch Cord 7',10',15' Green – EF/TER/TR
15. Approved products: VOIP Wall Mounted Wall Phones – EF/TER/TR
 - a. CommScope:
 - 1) YYY = Feet
 - 2) CO199K2-08F001 Category 6A Copper Patch Cord 01' White- WAO
 - 3) CO199K2-08FYYY Category 6A Copper Patch Cord 7',10',15' White – EF/TER/TR

2.5 WORK AREA OUTLET PRODUCTS

- A. Wall Mount Faceplates
 1. Provide wall mount faceplates for voice and data work area outlets.
 2. Faceplate shall accept four (4) for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
 3. Include label/label covers for easy port identification.
 4. Raised rail design for aesthetic appeal.
 5. Faceplate shall be white in color.
 6. Approved products:
 - a. CommScope FP-LBL-4P-262 4-Port, White
- B. Wall phone Faceplates

1. Provide wall phone faceplates, as shown in the drawing set.
2. Faceplate shall be of stainless steel construction.
3. Faceplate shall accept modules for UTP cabling, which snap in and out for easy moves, adds, and changes.
4. Approved products:
 - a. Leviton WP –Plate 4108 W-SP
 - b. Owner approved equivalent.

C. Surface Mount Outlet Box

1. Provide surface mount outlet boxes for work area outlet locations where outlets cannot be recessed.
2. Shall accept CommScope Jack Modules for STP and UTP, fiber optic, and audio/video, which snap in and out for easy moves, adds, and changes.
3. Mount easily with supplied mounting screws, adhesive tape or optional magnet.
4. Cable entry from side and rear knockouts and from opening in center of base.
5. Outlet box shall be white in color.
6. Approved products:
 - a. CommScope 2-port SMB-2P-262-Plenum Surface Mount Box, White.
 - b. CommScope 1-port SMB-1P-262-Plenum Surface Mount Box, White.

CI. Blank Modules

1. Populate any unused faceplate module openings with blank modules.
2. Blank module color shall match the faceplate color.
3. Populate any unused patch panel module openings with blank modules.
4. Blank module color shall match the patch panel color.
5. Approved products:
 - a. CommScope M20AP-262 Blank Module, White

CII. Patch Panels

1. Provide patch panels in TER/TR locations for all horizontal cabling.
2. Can be clearly identified with Hand-Held Thermal Transfer Printers.
3. Use 24-port / 48-port patch panels in TER/TR locations.
4. Approved products:
 - a. CommScope 760162800 UNP-6A-DM-1U-24 Patch Panel, 24 Port
 - b. CommScope 760162818UNP-6A-DM-2U-48 Patch Panel, 48 Port

2.6 MISCELLANEOUS PRODUCTS

A. Cable Ties

1. Provide “hook & loop” cable ties for bundling cables.
2. The material shall consist of nylon loops with polypropylene hooks.
3. Use plenum-rated ties in plenum spaces.
4. Approved products:
 - a. CommScope
 - b. Panduit
 - c. Owner approved equivalent.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify conduit, raceways, boxes, fittings and bodies are properly installed as described in Division 26.
- B. Verify grounding and bonding following Section 27 05 26.
- C. Verify supporting devices are properly installed following Section 27 05 28.
- D. Verify conduit has a minimum 1-inch diameter for UTP home runs.
- E. All protected telecommunication terminations require bonding, grounding and a busbar.

3.2 INSTALLATION

- A. General
 - 1. Cables shall be pulled in accordance with the manufacturers recommended practices and in compliance with the NEC and the BICSI Telecommunications Distribution Methods Manual. Planning and care shall be taken to prevent abuse and damage during the handling or installation phase. Specified minimum cable bend radius shall be met without deviation.
 - 2. Pull cables simultaneously where more than one is being installed in same raceway. Use pulling compound or lubricant where necessary. Compound used must not deteriorate conductor or insulation. Use pulling means including fish tape, cable, rope, and basket weave wire/cable grips that will not damage media or raceway.
 - 3. Protect cable from tension, compression, torsion, bending, squeezing and vibration. Do not pull cables improperly or exceed the Manufacturer's tensile rating. This value shall be not more than thirty-two (32) lbf (provide breakable link for all cable pulling). There shall be no coils of excess cable left in the ceilings, cable trays, or raised floor areas unless specified otherwise. A trailer pull string shall be left in all conduits before and after cables have been installed. The cabling within the wiring closets/cabinets shall be routed and dressed neatly to their termination points such that no excess cable is present. As cables are pulled into the cabinet, bundle them in groups with Velcro type straps according to their terminating row position. Strap exposed cables for strain relief at the termination in the communications rooms.
 - 4. All strapping and lashing of cable within the TER(s) and TR(s) shall be made with "Velcro" type straps for easy access to cable bundles to facilitate future "adds and changes". No plastic tie-wraps will be allowed for support of cable.
 - 5. All cabling will be rated for a minimum operation range of -20°C to 75°C
 - 6. All floor and wall penetrations shall be fire-stopped in accordance with local codes and restrictions.
 - 7. New cabling will be installed in cable tray, conduit, and/or J-hooks throughout entirety of cable path.
- B. Horizontal Cable
 - 1. Install voice and data cable locations and configurations as depicted on drawings.
 - 2. Test all cable prior to installation. Upon failure to perform testing, the installer shall accept the cable as good and assume all liability for the replacement of the cable should it be found defective at a later date.

3. All conformance standards must be certified for multipair and individual cable runs.
4. Jacketing and insulation must satisfy the Underwriter's Laboratories (UL) listed fire rated cable insulation requirements in plenum areas.
5. Any pulling compound or lubricant used in cable installation must not deteriorate the conductor or the insulation. Provide 3M type WLC or an approved equal.
6. Copper cable runs shall not exceed 295 feet. All runs shall be continuous. No splicing is allowed.
7. The Contractor shall install copper cable with a minimum bend radius of six times the diameter of the cable.
8. Provide a 15-foot, patch cable with RJ45 connectors for 100% of each work area outlet insert installed. Provide a mix of 7', 10', 15' Patch cords for each termination in the EF/TER/TR rooms, as required on the contract drawings. The patch cable rating and connector shall match the horizontal cable/connector rating.
9. Install minimum 12-inches of spare copper cable in ceiling plenum prior to dropping down wall to outlet. Support slack to structure with J-Hook and Velcro ties. If there is no plenum, loop shall be located in the box prior to termination. Provide box of sufficient size to accommodate spare cable, termination equipment if applicable and maintain bending radius.
10. Install 10-feet of spare copper cable (service loop) at each above ceiling outlet prior to termination. Provide Velcro type tie wrap for cable support and organization.
11. All horizontal cable shall be rated for plenum use.
12. The maximum pulling tension for 4-pair at minimum 24 AWG horizontal UTP cables shall not exceed 32 lbf. The Contractor shall provide a tension meter during the pulling of all cables. If the meter shows that the tension has exceeded 32 lbf, the Contractor shall discard the cable and pull new cable.

3.3 WORKSTATION TERMINATION

- A. At the workstation termination point, cables shall be routed and dressed to provide a service loop in case re-termination is necessary. Leave 12 inches of slack at the junction box. Provide strapping of voice and data cable to provide strain relief of cable in relation to outlet termination.
- B. Each horizontal workstation cable shall terminate on a modular jack connector and attached to the outlet faceplate. All unused faceplate ports will have a blank insert.
- C. The Contractor shall adhere to the latest termination procedures as specified by manufacturer's instructions.
- D. Follow TIA/EIA 568-B termination procedures.

3.4 PATCH SYSTEM

- A. Each horizontal data cable will terminate on a loaded patch panel.
- B. Mount the distribution panels starting at the upper most position of the racks/rails beginning with contractor provided fiber patch panels. Allow for sufficient space between the distribution panels to allow for horizontal wire managers and cross connect component installation. Provide a detail of your elevation plan to the OWNER or Owner's Representative before proceeding.

- C. Provide and install Category 6A patch cables (as described in parts list) for channel testing. Two (2) patch cables will be provided for each data link. 15' cables used for WAO and 7', 10' or 15' cable patch cables used for TER/TR space patching.

3.5 TESTING

- A. Copper Media Testing:
 - 1. Contractor shall utilize personnel trained in the operation of the following Level II rated test equipment:
 - a. Fluke DSX Series
 - b. Ideal LanTEK II
 - c. Viavi Certifier40G
 - d. Approved equal
- B. All cables and termination hardware shall be 100% tested for defects in installation and to verify cable channel performance under installed conditions. The Contractor prior to system acceptance shall verify all conductors of each cable useable. Any defect in the cable system installation, including but not limited to cable, connectors, patch panels and connector blocks, shall be repaired or replaced in order to ensure 100% useable conductors in all cables installed.
- C. Perform end to end link testing of all cabling and connections with specified equipment and certify as meeting the criteria as defined in Category 6A UTP cabling systems within the most current publication of TIA/EIA 568-B.
- D. Provide equipment calibration reports with test results.
- E. Provide 72 hours' notice to the Owner prior to testing.

3.6 CLEANING

- A. Upon completion of the installation, make all components free of any oil, grease, dust and debris.
- B. Work areas will be cleaned at the end of each workday and a final cleanup will occur at project completion.

3.7 DOCUMENTATION

- A. Electronic submittal, via CD ROM, of required cable test results, As-Built drawings, and warranty information will be submitted to the Owner or Owner's representative at least ten (10) working days before Certificate of Occupancy is awarded. CAD files shall be submitted in AutoCAD (.dwg) format. When proprietary software is needed to view cable test results, the contractor will provide a licensed copy for OWNER IT Department.

3.8 ACCEPTANCE

- A. Review test results and conduct a final inspection and punch list walk-thru with Owner and/or Owner, to inspect installation and obtain concurrence. Concurrence does not waive the responsibility of the Contractor to correct deficiencies.

END OF SECTION