

SECTION 270500 – COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 GENERAL

1.1 SECTION INCLUDES

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1.2 SUMMARY

- A. This document identifies the design and specification requirements for a complete and functional communications cable plant to be performed for the Owner. The communications cable plant as specified herein will support the voice, data, AV connectivity and various other low voltage signaling and control devices.
- B. The technology infrastructure will be compliant with the latest versions of the TIA/EIA 568-B Series Commercial Building Telecommunications Cabling Standards and the Owner's IT adopted cabling standards.
- C. The Architectural Plans and Specifications, General Conditions, Supplementary General Conditions and other requirements of Division 1, the Mechanical Plans and Specifications, the Electrical Plans and Specifications, and the Communications Plans may apply to the work specified in the Division 27 Sections, and shall be complied with in every respect. The Contractor shall examine all of these documents, which make up the Contract Documents, and shall coordinate them with all communications work on the Communications plans and in the Division 27 specifications.
- D. All work associated with Telecommunication and Equipment Rooms shall comply with the National Electrical Code, state and local building codes. The guidelines developed by ANSI/TIA/EIA and BICSI shall be followed in both design and construction.
- E. Contract Documents: Drawings and specifications are to be used in conjunction with one another and to supplement one another. In general the specifications determine the nature and quality of the materials, and the drawings establish the quantities, details, and give characteristics of performance that should be adhered to in the installation of the communications system components. If there is an apparent conflict between the drawings and specifications, the items with the greater quantity or quality shall be estimated upon and installed. Clarification with the Owner, or their designated representative, about these items shall be made prior to bid response.
- F. The Architect may at any time, by written order, make changes within the general scope of any contract resulting from this proposal document. If such changes expand, reduce, change or modify the scope of work, the price for the change shall be increased or decreased at the unit prices set forth in the Unit Pricing Section, and the amount shall be deducted from, or added to, the sale price of the system to the Owner. No costs will be added to the project without prior written approval from the Architect.

1.3 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.
- B. Related Division 27 Sections include:
 - 1. 27 05 26 Grounding and Bonding
 - 2. 27 05 28 Pathways for Communications Systems
 - 3. 27 05 53 Identification for Communications Systems
 - 4. 27 11 00 Communications Equipment Room Fittings
 - 5. 27 13 00 Communications Backbone Cabling

- 6. 27 15 00 Communications Horizontal Cabling
- 7. 27 16 19 Patch Cords, Station Cords,& Cross-Connect Wire
- 8. 27 20 00 Data Communications Equipment
- 9. 27 30 00 Voice Communications Equipment

1.4 AGENCIES, REFERENCE STANDARDS AND CODES

A. Agencies

- 1. ANSI American National Standards Institute
- 2. BICSI Building Industry Consulting Service International
- 3. EIA Electronic Industries Association
- 4. FCC Federal Communications Commission
- 5. FOTP Fiber Optic Testing Procedures
- 6. IEEE Institute of Electrical and Electronic Engineers, Inc.
- 7. NBC National Building Code
- 8. NFPA National Fire Protection Agency
- 9. NEC National Electrical Code
- 10. TIA Telecommunications Industry Association
- 11. UL Underwriters Laboratories

B. Codes and Standards (Latest issue and addenda)

- 1. ADA Standards for Accessible Design 28 CFR Part 36
- 2. American Society for Testing Materials (ASTM)*
- 3. ANSI/TIA/EIA-568-B.1 - Commercial Building Telecommunications Cabling Standard*
- 4. ANSI/TIA/EIA-568-B.2 - Commercial Building Telecommunications Cabling Standard*
- 5. ANSI/TIA/EIA-568-B.3 - Optical Fiber Cabling Components Standard*
- 6. ANSI/TIA/EIA-569 - Commercial Building Standard for Telecommunications Pathways and Spaces*
- 7. ANSI/TIA/EIA-606-A - Administration Standard for Commercial Telecommunications Infrastructures, June 21, 2002*
- 8. ANSI/TIA/EIA J-STD-607-A, Commercial Building. Grounding/Bonding Requirements-Joint Standard for Commercial Building Grounding (Earthing) and Bonding Requirements

for Telecommunications, 2002*

9. ANSI/TIA/EIA-758-A - Customer-owned Outside Plant Telecommunications Infrastructure Standard, May 2005*
10. BICSI TDM, Cabling Installation, LAN Design, and Customer-Owned Outside Plant Manuals-Latest Editions
11. Chapter 208- State of Texas Communications Wiring Standard
12. International Standards Organization/International Electrotechnical Commission (ISO/IEC) IS 11801, 2000*
13. National Electric Code (NEC), Latest Issue
14. National Electrical Manufacturers Association (NEMA)*
15. OSHA - U.S. Department of Labor Occupational Safety & Health Administration
16. UL - Underwriters Laboratories (UL) Cable Certification and Follow Up Program*

C. Acronyms and Abbreviations

1. ADA Americans with Disabilities Act
2. AKA also known as
3. ANSI American National Standards Institute
4. AP access provider
5. ASTM American Society for Testing and Materials
6. AWG American Wire Gauge
7. BICSI Building Industry Consulting Services International
8. CATV community antenna television
9. CO-OSP customer owned outside plant
10. EF entrance facility
11. ER Equipment Room
12. EIA Electronic Industries Alliance
13. EMI electromagnetic interference
14. FCC Federal Communications Commission
15. HVAC heating, ventilation, and air conditioning
16. IEEE Institute of Electrical and Electronics Engineers

- 17. ITNO Information Technology Network Operations
- 18. ISO International Organization for Standardization
- 19. LAN local area network
- 20. Mb/s megabits per second
- 21. MC main cross-connect AKA Main Distribution Frame (MDF)
- 22. MDF main distribution frame AKA main cross-connect (MC)
- 23. NEMA National Electrical Manufacturers Association
- 24. NESCO National Electrical Safety Code
- 25. NFPA National Fire Protection Association
- 26. OFOI Owner Furnished Owner Installed
- 27. RCDD Registered Communications Distribution Designer
- 28. RFP Request for Proposal
- 29. RFO Request for Offer
- 30. SCS Structured Cabling System
- 31. TBB telecommunications bonding backbone
- 32. TR telecommunications room AKA Intermediate Distribution Frame (IDF)
- 33. TGB telecommunications grounding busbar
- 34. TMGB telecommunications main grounding busbar
- 35. TIA Telecommunications Industry Association
- 36. UL Underwriters Laboratories
- 37. UTP unshielded twisted-pair
- 38. WA work area
- 39. WAP wireless access points
- 40. X cross-connect

1.5 ADMINISTRATIVE REQUIREMENTS Coordination

A. Coordination

- 1. The Communications Cabling Contractor, here after referred to as "Contractor", shall provide all materials, components, tools and labor necessary for the complete installation

of all communications work required in the contract documents and specified herein.

2. The Electrical Contractor, here after referred to as "Electrical Contractor", shall provide materials, components, tools and labor to complete a communications cabling pathway, electrical power distribution and communications building grounding system as set forth in the Structured Cabling System specifications and electrical specifications and T and E drawings.
3. Work furnished and installed by the Contractor as specified in Division 27 and as shown in E and T drawings includes:
 - a. The overhead cable runway system (ladder rack) within the new ER;
 - b. Identification for Communications Systems;
 - c. Communications Equipment Room Fittings;
 - d. Communications Backbone Cabling;
 - e. Communications Horizontal Cabling;
 - f. Patch Cords, Station Cords, and Cross-Connect Wire;
 - g. Coordination with OFOI Communications Services;
 - h. Coordination with OFOI Data Communications Equipment;
 - i. Coordination with OFOI Voice Communications Equipment;
4. Work under this Division not in contract (NIC) that will be Owner Furnished/Owner Installed (OFOI) includes:
 - a. Communications services;
 - b. Voice communications equipment;
 - c. Phone cords at the work area;
5. Work furnished and installed by the Electrical Contractor as specified in Division 27 and as shown in E and T drawings includes:
 - a. The conduits and back boxes for the work area telecommunications outlets.
 - b. Installation of the TMGB in the new ER;
 - c. Installation of the TBB from the new ER to the new TRs;
 - d. Installation of the Bonding Conductor for Telecommunications (BCT) that bonds the TMGB to the electrical power ground compliant with ANSI J STD-607 A Standards;
 - e. Bonding conductors from all cable tray, sleeves and conduits;
 - f. Electrical circuits in the telecom rooms.

6. Work furnished and installed by others.
 - a. Telecommunications room(s) walls shall be covered, floor to ceiling, with rigidly fixed $\frac{3}{4}$ " fire rated plywood, void free, and capable of supporting attached connecting hardware. Plywood should be covered with two coats of fire retardant paint per Section 27 05 53.
 - b. Fire walls shall be marked for easy identification and painted with two coats of fire retardant paint.
- 1.6 WORK RESULTS - DESCRIPTION OF PROJECT
- A. Administrative Services
1. Contractor is required to provide test results and as-built documentation/record drawings prior to job acceptance.
- B. Grounding and Bonding for Telecommunications
1. Provide and install a Telecommunications Grounding Busbar (TGB) in Telecommunications Rooms (TRs).
 2. Provide and install a Telecommunications Main Grounding Busbar (TMGB) in building's Main Equipment Room (MER)/ER.
 3. Bonding conductors from the TMGB or TGB will be installed to all communications terminating to equipment cabinets, equipment racks, raceway, cable ladder rack, cable tray, sleeves and conduits. Bond all TGBs to the TMGB per Section 27 05 26.
 4. Bond TMGB to building ground per Section 27 05 26.
 5. Final design and specifications for the Grounding and Bonding system shall be coordinated with the Electrical Engineer of Record.
 6. Building entrance protection for copper cabling.
 7. Grounding and Bonding for Communications described in Section 27 05 26.
- C. Pathways for Communications Systems
1. The primary horizontal cable support system will be conduit to cablehooks. One (1-1/4") conduit servicing end users information outlets shall be "stubbed" to above the accessible ceiling, and routed to the telecommunications rack. Wall penetrations shall transition to properly firestopped sleeves, then back to cable tray.
 2. Outlets having one single cable require a single gang box that routes to the telecommunication rack via minimum one inch (1") conduit with pull string.
 3. Outlets having two or more cables require a double gang box with a single gang reducer that routes to the telecommunication rack via minimum one (1-1/4") conduit with pull string.
 4. Conduit runs may not be longer than 100ft or contain more than two 90 degree bends between pulling points, pull boxes or reverse bends without the use of a properly sized

junction box. Insulated throat compression fittings must be used for communications conduit runs, with termination points having plastic or grounding bushings installed.

5. Riser sleeves in ER/TR must be properly installed with bushings and fire sealed. Initial sealing of the sleeve penetration is to be completed by the sleeve installer.
 6. Provide Shop drawings of all core drilling locations for coordination with Architect and Owner prior to drilling.
 7. All sleeves shall be reamed and grommets placed prior to cable installation to prevent cable damage.
 8. All telecommunications conduit shall be provided with a measured pull tape.
 9. Pathways for Communications described in Section 27 05 28.
- D. Identification for Communications All labeling will be compliant with TIA/EIA606-A - Administration Standard for Commercial Telecommunications Infrastructures as described in Section 27 05 53.
1. All labeling will comply with Owner administrative labeling scheme of cabling and its numerical positions on the termination hardware. Ensure compliance with Owner's preferred administrative labeling standards.
- E. Communications Equipment Room Fittings
1. The communications service entrance point is located in the Upper-level. The new service entrance pathway will consist of new (2) 4" conduit(s) from the ER through a new ductbank or existing tunnel system to existing Chemistry Building ER.
 2. Space for new outside plant fiber cable and terminating hardware will be provided in the ER.
 3. The new ER will be located on the upper level of the facility.
 4. Contractor shall provide each ER/TR with 19" floor mounted equipment racks installed per drawings. Equipment racks shall be properly bonded.
 5. Communications Equipment Room Fittings described in 27 11 00.
- F. Communications Backbone Cabling
1. Provide **6** strand, 9/125 micron single-mode fiber from Building ER to each Building TR.
 2. Provide **4** pair of vertical/horizontal copper backbone cabling consisting of 12- pair unshielded twisted pair Category 3 copper cables from the Main cross-connect field in ER to each TR rooms cross-connect field. Copper cable shall meet or exceed the mechanical and transmission performance specifications in ANSI/TIA/EIA-568-B.2 up to 16 MHz shall be installed.
 3. Copper cable shall be provided as required in NEC 2002; Listed Type CMR, CMP, MPR and/or MPP.

4. All copper backbone cables shall have a minimum 10ft service loop, and all fiber backbone cables shall have a minimum 20ft service loop.
5. Multi-mode outside plant fiber optic cable shall be provided for fire alarm connectivity only.
6. Communication Backbone Cabling requirements described in 27 13 00.

G. Communications Horizontal Cabling

1. All voice and data horizontal cables will consist of plenum rated, Category **6a**, 4 pair UTP copper cables terminated on 48 port RJ45 Category 6a, 568A patch panels in the ER/TRs. The maximum horizontal distance from the work station to the patch panel shall be 295 feet.
2. Communications Horizontal Cabling requirements described in 27 15 00.

H. Termination Hardware

1. All cable termination hardware shall be mounted in one of the Contractor provided and installed 19" racks.
2. Fiber backbone cabling shall terminate in, fully populated, rack mounted Fiber Panels using ST connectors and adapters.
3. Horizontal cabling shall terminate on rack mounted Category **6a** 48 port patch panels in the ER/TRs, and on RJ45 568A Category **6a** inserts at the outlet.

I. Patch Cords, Station Cords, and X-Connect Wire

1. Contractor shall provide two (2) Category **6a** patch cords per horizontal cable installed: 60% 5' length, 40% 7' length.
2. Contractor shall provide one (1) duplex fiber optic patch cords per fiber termination; patch cords shall be consistent with fiber type.
3. Contractor shall provide one (1) duplex fiber optic patch cords per fiber termination; patch cords shall be consistent with fiber and connector type. Lengths as required for neat and professional installation. Average length 10m. Coordinate with Owner prior to ordering.
4. All copper patch cords shall be installed in minimum one inch (1") plenum rated innerduct from cabinet to cabinet.

J. Data Communications Equipment

1. Data communications equipment will be OFOI.

K. Voice Communications Equipment

1. Voice communications equipment will be OFOI.

L. Network Connectivity for Other Trades:

1. Audio/Visual – Provide network connectivity as required for A/V elements. Refer to AV

drawings and specifications for details.

2. Electronic Safety and Security – Provide rough-in only as required facilitating voice and data network connectivity for IP cameras, Access Control Panels, etc. Refer to Security drawings and specifications for details. Security cameras and motion sensors are OFOI.
3. Fire Alarm – Provide copper/ fiber connectivity as required for Fire Alarm Panels.
4. Building Management System – Provide network connectivity as required facilitating operation of BMS/DDC.

M. Commissioning Administration

1. Contractor shall comply with General Commissioning Requirements of the technology infrastructure system.

N. Project Meetings

1. Contractor shall attend preconstruction meetings with Project Team.
2. Contractor shall provide representation on Project Team Meeting as specified in Division 1 and by the General Contractor as required.
3. Contractor will provide representation on the Commissioning Team as required for implementation of the Commissioning Plan.

O. Preconstruction Evaluation

1. Examination of buildings and site shall be the responsibility of the Contractor. Examine conditions for compliance with Communications design specifications. Validate Communications section is in accordance with related Contract Documents and the specified Owner's operational needs.

P. Construction Documentation

1. Contractor shall coordinate requirements with general provisions specified in Division 1 - Construction Progress Documentation.
2. Contractor shall provide weekly progress report including synopsis of previous week's completed tasks, list of ongoing work, and updated schedule addressing milestones. Also include items for Owner coordination.
3. Contractor shall provide weekly report of inspection by project RCDD to confirm Contractor's work is compliant with industry and manufacturer standards.

1.7 PROPOSAL SUBMITTALS

A. Contractor Certification:

1. Contractor shall be a licensed **Ortronics** Certified Integrator Design and Installation Company **or Belden CDT** capable of issuing a numbered registration certificate for the entire cable system. A copy of the Company certificate or verification by **Ortronics** or **Belden** records must accompany contractor bid, expired certificates and/or certificates issued under past certification programs will not be accepted. Proof of certification must

be included in proposal.

2. Submit written proof that the contractor is certified by the manufacturer of the products and adheres to the engineering, installation and testing procedures and utilizes the authorized manufacturer components and distribution channels in provisioning this Project.
 3. Contractor must be a member of Building Industry Consulting Services International (BICSI).
 4. 100 percent of on-site personnel shall have either **Ortronics** or **Belden** Certification in effect through, the bidding process, installation, testing, documentation, and acceptance. Documentation of all on-site personnel shall be provided post recommendation of selected contractor before final approval will be given.
 5. 100 percent of on-site installation personnel shall have BICSI certification in effect through the bidding process, installation, testing, documentation and acceptance. Documentation of all on-site personnel shall be provided post recommendation of selected contractor before final Owner's IT approval will be given.
 6. Contractor must have a minimum of one (1) Registered Communications Distribution Designer (RCDD) on staff, with Panduit approved Certification plus RCDD equivalent, submitted and approved by Panduit or Uniprise prior to project award. Submit a resume and copy of certifications for Contractor's RCDD.
 7. The RCDD shall provide approval on the design, installation, and documentation of communications system along with ensuring all Warranty documentation and requirements are met and submitted to **Ortronics** or **Belden** upon completion of the project. Documentation of all on-site personnel shall be provided before final Owner's IT approval is granted.
 8. Contractor shall not subcontract installation of voice/data/video cabling, termination or testing without the written consent of Owner and with **Ortronics** or **Belden's** review and confirmation to Owner of proposed subcontractor's current and valid certified status.
 9. Contractor shall have worked satisfactorily for a minimum of five (5) years on systems of this type and size.
 10. Design and Installation Certificates: Signed by local cable manufacturer's representative certifying that design is acceptable with cable manufacturer's Design Engineer(s) and Contractor is authorized by manufacturer to install registered (warranty) cabling system.
 11. A minimum of five (5) representative educational facilities cabling projects must be submitted as references to include the school's name, location, Architect or Engineer, cost of the cabling project and the contact person at the school district to include phone number.
 12. Upon request by the Owner, furnish a list of references with specific information regarding type of project and involvement in providing of equipment and systems.
- B. A list of technical product education (training) completed by the Contractor's project personnel.
1. All members of the installation team must be certified by the Manufacturer as having

completed the necessary training to complete their part of the installation. Submit resumes of the entire team and completed training courses and copies of BICSI Installer as well as **Ortronics** or **Belden's** training course certificates.

2. Submit cable tester manufacturer or a third party certification for copper and fiber cable test technicians.

C. Warranty

1. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and workmanship for a period of not less than fifteen (15) years from date of acceptance.

D. Price Quotation Information -

1. Itemized Unit Pricing for Labor and Material;
2. Itemized Add/Deduct Unit Pricing for Labor and Material for Pre-Cutover (200' average length) FOUR (4) CAT 6a Drops;
3. Itemized Add/Deduct Unit Pricing for Labor and Material for Post-Cutover (200' average length) FOUR (4) CAT 6a Drops.

1.8 SUBMITTALS FOR PROJECT RECORD

A. Follow Division 1 and this Section.

1. Drawings: As-built documentation must be submitted five (5) business days prior to obtaining approval for cutover to any portion of the new cable plant system. Furnish for review and comments, 4 complete sets of E size (30 by 42) and 4 complete sets of C size as-built drawings along with 4 CDs containing all electronic AutoCAD 2000 or newer (DWG) files.
2. Submit project record drawings at conclusion of the project to include:
 - a. Final approved Shop Drawings
 - b. Plan drawings indicating location and identification of work area outlets, nodes, plan and elevation of telecommunication rooms, cable pathway details, and backbone cable type and locations and cable ID numbers.
3. 4 sets of cable inventory data must be submitted for all copper and fiber, termination hardware (prior to cutover to new cable plant if applicable.) Submit data in binders and electronically on CDs in "Microsoft Excel" format, listing products furnished, including:
 - a. Manufacturer's name and part numbers.
 - b. Cable numbers utilizing the Owner's cable numbering standard.
 - c. Telecommunication and Equipment Room termination detail sheets
 - d. Location and riser assignments.
 - e. Cross-connect schedules including entrance point, main cross-connects, intermediate and horizontal cross-connects.

- f. Labeling and administration documentation
 - g. Warranty documents for equipment
 - h. Copper certification test result printouts and diskettes
 - i. Optical fiber power meter/light source test results.
- 4. Manufacturer Certificates: Within 10 days of completion of the project, Contractor shall deliver letter signed by local Structured Cabling Components representatives and Contractor's RCDD stating that installed cabling system complies with all requirements specified in manufacturer's installation guidelines and that there were no accidents, improper installation, mishandling, misuse, damage while in transit, unauthorized alteration, unauthorized repair, failure to follow instructions, or misuse with the structured cabling system that could adversely impact warranty.
 - 5. Test Reports: 4 sets of hard copies with 4 copies on CD in compliance with related Test Result Documentation.
 - 6. Submitted test results and other submittals that are non-compliant will be reviewed and returned to the Contractor with comments.
 - 7. Re-submitted test results and other submittals that are non-compliant will be reviewed and returned to the Contractor with comments.
 - 8. Subsequent reviews of test results and other submittals will be performed jointly by the Contractor and the Communications Consultant and Contractor will pay Communications Consultant's published hourly rate during third review and thereafter.
 - 9. Manufacturer's warranty to the Owner. This shall include, but is not limited to: Owner's name and project name and address. (Within three weeks of substantial completion).
 - 10. Within 10 days of completion of the project, Contractor shall deliver letter signed by local SCS Manufacturers representative and Contractor's RCDD stating that installed cabling system complies with all requirements specified in installation guidelines and that there were no accidents, improper installation, mishandling, misuse, damage while in transit, unauthorized alteration, unauthorized repair, failure to follow instructions, or misuse with the structured cabling system that could adversely impact warranty.
 - 11. Within 21 days of completion of a project the communications contractor and/or the manufacturer's local representative will provide owner The Structured Cabling Performance Warranty signed by the manufacturer. The warranty shall list the owner and name of the Facility including location as the holder of the warranty.

1.9 EQUIPMENT RELOCATION AND SYSTEM

- A. Upon notice of construction completion, the selected Contractor will be responsible for system startup services for the new telecommunication room. The Contractor shall be responsible for ensuring the new equipment rooms, cabinets, floors and walls are clean and ready for equipment installation. On behalf of the Owner, the Contractor shall be responsible for coordinating with the GC and other trades to keep the ER and TRs clean and dust free at all times.
- B. It shall be the responsibility of the Contractor to develop and implement a full migration

project schedule detailing the responsibilities of assigned personnel, along with contingency plans, and submit it to the Owner, or their designated representative, for approval.

- C. During the transition period, Contractor shall have the necessary supervisory, technical, and other personnel available throughout technology relocations and cutover of the telephone, networking, and video systems. This is to ensure that technicians are on site to observe the operation and maintenance of the equipment, and to resolve any cabling related issues during system start-up.
- D. Contractor shall ensure all amenities are present prior to equipment relocation. Contractor shall immediately contact the Owner, or their designated representative, if a required service such as HVAC, electrical, UPS, etc., are not present.
- E. Contractor shall accomplish a smooth and successful transition of operations and services to the new telecommunication room. The transition includes the coordination, migration, testing, and problem resolution with the system vendors.

1.10 SEQUENCING AND SCHEDULING

- A. An initial planning meeting will be held with the successful bidder to clarify all requirements (systems, services, distribution methods, etc.), identify responsibilities, and schedule the events that will transpire during the implementation of the project. Within two (2) weeks of the initial meeting, the Contractor shall provide a written report and project schedule to clearly document the events and responsibilities associated with the project.
- B. Contractor shall be responsible for the development and implementation of a complete project schedule detailing the responsibilities of assigned personnel and submit it to the GC and Owner for approval.

1.11 QUALITY ASSURANCE - CONTRACTOR QUALIFICATIONS

- A. Follow Division 1 and this Section.
- B. Voice/Data
 - 1. The installation company shall have a full-time RCDD on staff during all phases of the installation including testing and documentation. RCDD documentation shall be included in all responses to RFP/RFO.
 - 2. The Installer shall have either **Ortronics** or **Belden** Certification in effect throughout installation, testing, documentation and acceptance.
 - 3. One hundred percent (100%) percent of on-site personnel shall be certified. The contractor's project manager or lead technician shall be BICSI certified to facilitate on-site installation practices and to provide inspections of on-going work.
 - 4. Untrained, undocumented, or otherwise unqualified personnel are not allowed to perform any portion of the communications infrastructure installation.
 - 5. All personnel must be permanent employees of the telecommunications contractor, or approved sub-contractors.

PART 2 PRODUCTS

2.1 PRODUCT SCHEDULE

A. Refer to Division 27 sections for approved product and schedules.

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| 1. | 27 05 26 | Bonding and Grounding For Communications System |
| 2. | 27 05 28 | Pathways For Communications Systems |
| 3. | 27 05 43 | Underground Duct And Raceways |
| 4. | 27 05 53 | Identification For Communications Systems |
| 5. | 27 11 00 | Communications Equipment Room Fittings |
| 6. | 27 13 00 | Communications Backbone Cabling |
| 7. | 27 15 00 | Communications Horizontal Cabling |
| 8. | 27 16 19 | Patch Cords, Station Cords And Cross-Contact Wire |
| 9. | 27 20 00 | Data Communications Equipment |
| 10. | 27 30 00 | Voice Communications Equipment |

2.2 WARRANTY

- A. A **25-year *Ortronics or Belden*** Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided.
- B. The warranty covers all cables installed, tested and registered in a structured cabling system for a period of 20 years. A structured cabling system is defined as a cabling infrastructure, designed and installed to current ANSI/TIA/EIA-568-B series standards.
- C. The Extended Product Warranty shall ensure against product defects, that all approved cabling components exceed the specifications of ANSI/TIA/EIA 568B and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of ANSI/TIA/EIA 568B and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of ANSI/TIA/EIA 568B and ISO/IEC IS 11801 for fiber links/channels, for a twenty year period. The warranty shall apply to all passive SCS components.
- D. Unless otherwise specified, unconditionally guarantee in writing the materials, equipment, and workmanship for a period of not less than twenty (20) years from date of acceptance by Information Technology Network Operations.
- E. Warrant installation against all product defects, and that all approved cabling components meet or exceed the requirements of TIA/EIA-568B and ISO/IEC 11801 for a period of 20 years.
- F. The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective products and labor for the replacement or repair of such defective products.
- G. Within 10 days of completion of the project, Contractor shall deliver letter signed by local SCS Manufacturers representative and Contractor's RCDD stating that installed cabling system

complies with all requirements specified in installation guidelines and that there were no accidents, improper installation, mishandling, misuse, damage while in transit, unauthorized alteration, unauthorized repair, failure to follow instructions, or misuse with the structured cabling system that could adversely impact warranty.

- H. Within 21 days of completion of a project the communications contractor and/or the manufacturer's local representative will provide owner The Structured Cabling Performance Warranty signed by the manufacturer. The warranty shall list the owner, name of the facility including location as the holder of the warranty.
- I. The Owner shall not be responsible for any aspect of ensuring the warranty is issued or updated. It shall be the Contractor's responsibility in conjunction with the Manufacturer.
- J. During the warranty period, Owner may engage any (manufacturer approved) communication contractor to perform future moves, adds and changes to the system. Owner approved contractors shall be responsible for updating any required documentation. Owner shall not be responsible for any aspect of updating and maintaining the warranty.
- K. The Labor, Material and Performance Warranty shall cover the testing and replacement of all structured cabling components. The structured cabling system shall be a complete certified system. The system and all components shall be performance matched and guaranteed by the manufacturer.
- L. Person / Entity Covered
 - 1. This warranty is for the sole benefit of Owner and any successor in interest to the site in which such Registered SCS was originally installed.
 - 2. All communications work and materials not included in the SCS components shall be warranted by the contractor that performed the work for a minimum of three years from the date of substantial completion.

2.3 DELIVERY, STORAGE, AND HANDLING

- A. Delivery Requirements: Follow Division 1 Requirements.
- B. Packing, Shipping, Handling, and Unloading
 - 1. Protect equipment during transit, storage, and handling to prevent damage, theft, soiling and misalignment.
 - 2. Coordinate with IT for temporary secure storage of equipment and materials during project timeframes.
 - 3. Do not store equipment where conditions fall outside manufacturer's recommendations for environmental conditions.
 - 4. Do not install damaged equipment; remove from site and replace damaged equipment with new equipment.
- C. Acceptance at Site
 - 1. All risk of damage or loss will remain with the Contractor until project completion and acceptance of the installation by the Project Manager. Upon acceptance, risk of loss will

pass to the Owner. Prior to that time, the Contractor shall be solely responsible for security of all Contractor provided project materials.

D. Storage and Protection

1. All materials and equipment delivered and placed in storage shall be stored with protection from the weather, humidity, and temperature variation, dirt, and dust, or other contaminants.
2. Material will be properly packaged in original factory-fabricated type containers and protected from damaging fumes, construction debris, and traffic until installation or job completion.
3. Any flammable materials or hazardous materials shall be kept and/or stored in suitable places approved by the General Contractor and outside the buildings at all times.

2.4 PRODUCT QUALITY ASSURANCE

- A. All materials and equipment provided shall be the standard Commercial-Off-The-Shelf (COTS) products of a manufacturer engaged in the manufactures of such products. All materials shall be typical commercial designs that comply with the requirements specified. All materials and equipment shall be readily available through manufacturers and/or distributors. All equipment shall be supplied complete with any optional items required for proper installation.
- B. In the event of a breach of the representations and warranties contained herein, the Contractor, at their own expense, shall take all measures necessary to correct and make the cabling system work in compliance with the applicable manufacturer written technical recommendations and standards.

PART 3 EXECUTION

3.1 SITE CONDITIONS

A. Existing Site Conditions

1. Cable pathways and runs to individual outlets are not shown in their entirety but shall be provided as if shown in their entirety. The Contractor shall coordinate with other trades to determine exact routing.

B. Environmental Limitations

1. Due to the critical nature of the environment, the Contractor shall use extra effort to provide a clean work environment, free from trash/rubbish accumulated during and after cabling installation. Contractor shall remove all rubbish from job site daily at his or her own expense.

C. Use of Site

1. Proceed with work without interfering with ordinary use of streets, aisles, passages, exits, and operations of the including Information Technology Network Operations.
2. Contractors will adhere to the Contractor Badge program and will wear assigned

contractor's badge on person in a clearly visible location following the Contractor Badge program standards as administered and provided by Facilities Planning & Construction.

3. Access to buildings where work is to be performed shall be directed by Information Technology Network Operations.
4. Contractors shall provide proper safeguards with personnel or appropriate safety barricades when pulling cables in any Owner's building or related off-site areas.

D. Continuity of Services

1. Previous arrangements must be made with the University representative to avoid interference with, or interruption of, existing building services. The work shall be arranged to minimize down time.

3.2 EXAMINATION

- A. Examination of buildings and site shall be the responsibility of the Contractor. Examine conditions for compliance with requirements of other sections in which related work is specified and determine if conditions affecting performance of the work of this Section are satisfactory. Do not proceed with work of this Section until unsatisfactory conditions have been corrected in an acceptable manner.
- B. Verify liquid-carrying pipes are not installed in or above voice and data system equipment rooms.
- C. Verify fire-rated backboards are properly installed and painted following Section 06105. Notify the Project Manager immediately and prior to installation in the event that the backboards are not installed or painted properly.
- D. Verify conduit, raceways, and boxes are properly installed.
- E. Prior to starting the installation, the assigned installation supervisor shall participate in a walk-through of the project site with the Project Manager to review the installation documentation, verify that all construction necessary for the installation has been completed, and verify all installation methods and cable routes.
- F. The Contractor shall provide a complete cabling infrastructure according to the written specifications and drawings. If the scope of work to be performed by the Contractor changes, it shall be in writing. Contractor shall respond to these changes with a complete material list, including pricing, labor, and taxes in writing per Division 1 requirements. Contractor shall not proceed with additional scope of work without signed approval by the General Contractor.

3.3 PREPARATION

- A. Protection of Surroundings
 1. Repair: Patching and repair of facilities, finishes, and equipment. Any damage to building or site caused by Contractor, including grass, paving, curbs etc., shall be restored at Contractor's expense to match condition prior to damage. If necessary and requested by the General Contractor, Contractor shall provide professional services to clean or repair scratched/soiled finishes at their own expense.
 2. Contractor shall keep all foods and liquids (water, drinks, etc.) in designated break areas.

3. The Contractor shall obtain the Architect's and Engineer's written permission via the General Contractor before proceeding with any work necessitating cutting into or through any part of building structures such as girders, beams, concrete or tile floors, partition and/or ceilings.
4. If it becomes necessary to cut through any wall, floor, or ceiling to install any work under this Section of the Contract or to repair any defects that may appear up to the expiration of the guarantee period, such cutting shall be done by the Contractor under the supervision of the General Contractor.
5. Patching of all openings cut by the Contractor, or repairing of any damage to the work of other trades caused by cutting or by the failure of any part of the work installed under this Contract, shall be performed by the appropriate trade but shall be paid for by the Contractor.
6. Openings cut through concrete and masonry shall be made with masonry saws and/or core drills and at such locations acceptable to the Architect/Engineer. Impact-type equipment shall not be used except where specifically approved by the Architect/Engineer.
7. All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or finishes.
8. Refer to Division 1 for additional information.

3.4 DEMOLITION/REMOVAL

- A. Unless indicated otherwise, all items that must be removed due to interference with work of this contract remain the property of the Owner, and are to be salvaged at the Owner's discretion. Any material to be salvaged, other than Contractor's waste material, must be approved in writing by the General Contractor.

3.5 FIRESTOPPING

- A. The Contractor is required to properly fire-stop any penetrations through fire barriers utilized for the placement of telecom cabling. Provide fire resistant intumescent materials to restore fire ratings to wall, floor, or ceiling penetrations according to local and national codes.
- B. Verify the hourly rating of the barrier.
- C. Select the UL Listing to match or exceed the barrier.
- D. Adhere to cable loads and fill procedure in the Listing.
- E. Seek pre-approval from the Authority Having Jurisdiction (Inspector).
- F. When installing the System, be sure not to exceed the listing limitations.
- G. After installation, place information labels and take digital photographs of both sides of each firestopped penetration in the System for future reference.
- H. All openings shall be restored to "as-new" condition under the appropriate Specification Section for the materials involved, and shall match remaining surrounding materials and/or

finishes.

- I. Provide fire resistant materials to restore fire ratings to all wall, floor, or ceiling penetrations used in the distribution and installation for communications cabling system. Coordinate fire stopping procedures and materials with General Contractor and Div.7.
- J. Solutions and shop drawings/submittals for fire stop materials and systems shall be presented to the General Contractor for written approval of materials prior to purchase and installation.
- K. Materials shall be installed per manufacturer instructions, be UL listed for intended use, and meet NEC codes for fire stopping measures.
- L. The material chosen shall be distinctively colored to be clearly distinguishable from other materials, adhere to itself, and remain resilient and pliable to allow for the removal and/or addition of communication cables without the necessity of drilling holes in the material.
- M. The fire stopping material shall maintain/establish the fire rated integrity of the wall/barrier that has been penetrated.
- N. Contractor shall coordinate with electrical contractor and ensure Communications Pathway firestopping is properly identified and labeled. Contractor shall laminate and permanently affix to each side of a fire wall/floor penetration, the following information:
 - 1. Installing Contractor's name, address and phone number.
 - 2. Alpha-numeric unique identifier (floor/penetration - A1)
 - 3. Name of manufacturer of fire stop system.
 - 4. Part & model numbers of system and all components.
 - 5. Phone numbers of manufacturer's corporate headquarters in U.S. and local distributor's name and phone number.

3.6 CONSTRUCTION WASTE MANAGEMENT

- A. Contractor shall remove all excess material and debris from the site upon completion of work each day and in a manner approved by the General Contractor's Project Manager. See Division 1.

3.7 LABELING

- A. Confirm administrative labeling scheme of cabling and its numerical positions on the termination hardware. Ensure compliance with Owner's preferred administrative labeling standards.

3.8 CLOSEOUT ACTIVITIES

- A. Acceptance shall be subject to substantial completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation as described herein.
 - 1. All Proposal Submittals and Project Record Submittals.

2. Training to Owner's representative on methods to add and remove fire stop barriers, add and remove isolation conduit seals and, when necessary, add and remove IP 67 rated outlets.
3. Maintenance manuals specified in Div. 1 to GC and Owner regarding structured cabling system, firestopping and conduit sealing methods and manufacturer's recommended maintenance instructions.
4. Contractor shall complete all punch list items within five (5) days of notification by GC.
5. Contractor shall wipe down all equipment, racks, cabinets, and sweep and mop ER/TR floors prior to Substantial Completion. Project will not be considered complete until cleaning has been done.
6. Contractor shall complete Closeout Checklist listing status of all submittals, maintenance manuals, Owner training, and punch list items and deliver per Division 1.

END OF SECTION 270500