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Introduction

## 1.1 Project Title

The title for this project is "Structured Communications Cabling Services."

## 1.2 Purpose of Request for Proposal

The City of Austin, hereinafter referred to as the City, seeks proposals in response to this Request for Proposal (RFP) from firms qualified and experienced in providing communications systems and services, including the following:

- **Structured Cabling** - Turn-key installation of structured cable systems for voice, data, and security systems in commercial buildings, both large and small-scale projects.
- **Move/add/change (MAC)** - cabling services for existing structured cable installations.
- **CATV Distribution** - Turn-key installation of CATV distribution systems for commercial buildings, including both home-run designs and distributed trunk-and-tap designs. CATV systems may include SD TV or HD TV, one-way analog, one-way digital, or two-way digital.
- **Abandoned Cable Demolition/Wreck-out** - and disposal services for both large and small-scale projects.
- **Audio/Video** - Turn-key installation of in-room audio/video cable systems for presentation services in conference and training rooms. Examples of audio/video systems may include A/V presentation (single room or multi-room), digital signages, A/V control systems, video conferencing systems, audio conferencing systems, satellite conferencing systems, and music systems.
- **Overhead Paging** - Turn-key installation of overhead paging/annunciation systems for both large and small-scale projects.
- **Campus Backbone Structured Cabling** - Turn-key installation of inter-campus backbone cabling required to inter-connect two or more buildings on a single campus.
- **Administration Services** - Project management and contract administration services to manage and track all of the services listed herein.

The City of Austin seeks to procure the above services from Contractors specializing in each of the services listed above. The City will consider Proposals from firms qualified to provide all the above services using in-house resources and/or from firms who choose to associate with one or more -qualified sub-contractors. In either case, the City seeks to contract with a Prime Contractor that will be entirely responsible for the delivered services listed above.

## 1.3 Business Goals

- To ensure that communications cabling installation and maintenance requirements of the City are met adequately and at a competitive cost.

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- To obtain a multi-year Price Agreement contract for use by all City Departments to procure the communications cabling services listed above in Section 1.2 above.
- To ensure that the structured communications systems installation and maintenance services provided under the Contract are of a quality sufficient to satisfy the technical specifications of the City (see Section 3.1, "City of Austin Communications Specifications"), and that work results are performed consistently and satisfactorily.
- Support the City goal of promoting economic development in Austin by encouraging Contractors to seek out partnership opportunities with local, minority-owned and woman-owned businesses.

## **1.4 Scope of Work**

### **1.4.1 General Information**

The Scope of Work for this Contract includes the following:

- **Structured Cabling** - Turn-key installations of structured cabling systems for voice, data and security networks per applicable standards, codes and specifications (see Section 3.1, "City of Austin Communications Specifications"). New installations may range from small (less than 20 drops) to large (hundreds of drops). Installations may include cable pathway installations (trays, conduits, J-supports, etc.), cable pulls, cable terminations, installation of racks and cabinets, grounding and bonding, labeling, all other components specified in each SOW (hereinafter "SOW") issued under the Contract, review and validation of system design, and certification testing and delivery of as-built documentation and test results.
- **Moves, Adds & Changes (Maintenance)** – maintenance Scopes of Work include moves, adds and changes to existing structured cable systems. Maintenance work may require the same types of deliverables as described above for new installations.
- **CATV Distribution** - Turn-key installations of distributed CATV structured cable systems, using either trunk-and-tap designs for larger installations, or home-run designs for smaller installations. Installations may include review and validation of system design, installation of cable pathway hardware, cable pulls and terminations, system balancing, performance testing, grounding and bonding, labeling, all other components specified in each SOW issued under the Contract, and delivery of as-built documentation and test results.
- **Abandoned Cable Demolition/Wreck-Out** – Cable demolition Scopes of Work may include inspection and reporting on existing abandoned cables, identification and tagging of existing cables for demolition and/or preservation, removal and disposal of cables identified for demolition, and reporting on work results.

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- **Audio-Video** – Turn-key installations of Audio-Video in-room systems, including structured cabling systems to support audio-video presentations in training rooms, conference rooms and other multi-media spaces. Installations may include review and validation of system design, installation of cable pathway hardware, cable pulls and terminations, grounding and bonding, labeling, all other components specified in each SOW issued under the Contract, testing and delivery of as-built documentation and test results. Audio Video may include purchase of equipment such as controllers, projectors, etc.
- **Overhead Paging Systems** - Turn-key installations of overhead paging/annunciation systems including cable pathway hardware, cable pulls and terminations, installation of ceiling and wall-mounted speakers and/or horns, grounding and bonding, system testing, review and validation of system design, and labeling and delivery of as-built documentation and test results. Voice paging systems may include purchase of electronic components such as amplifiers, microphones, telephone interfaces, etc. needed to support applications such as voice paging, recorded announcements and background music.
- **Campus Backbone Structured Cabling** – Some new installations may include inter-campus cabling between buildings. Campus cabling installations may include trenching for buried conduits, aerial installations, installation of buried conduits, buried vaults and/or pull points and other underground structures, building entrance wall penetrations and cabling enclosures, installation of fiber optic and copper multi-pair campus backbone cables, cable pulls, cable terminations, installation of racks and cabinets, grounding and bonding, labeling, all other components specified in each SOW issued under the Contract, and certification testing and delivery of as-built documentation and test results. Campus backbone site work may require review and approval by professional engineers, and may require permits.
- **Administration Services** - Contract administration services, including, but not limited to, quotations for individual Scopes of Work, billing and invoicing, expenditure tracking and reporting, management of sub-contractors (if applicable) to ensure timely and satisfactory work results, change order tracking and reporting, scheduling, work progress inspections and reports, and other management services required to provide satisfactory work results.

*Not included* in this contract is installation of wide area network fiber optic or copper cabling related to the Greater Austin Telecommunications Network (GAATN).

The Contractor must furnish and install a fully functional system that meets the requirements specified in each SOW issued under the Price Agreement Contract. Details regarding the City of Austin's responsibilities and the Contractor's responsibilities are detailed below. The final contract will dictate specifics of the SOW for both City of Austin and Contractor.

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**CONTRACTOR MINIMUM QUALIFICATIONS**

- a. Respondents shall be fully capable and experienced in the design and installation of the type of cabling services specified herein, including all services listed in Section 0500, 2.0. To ensure the system has continued support, the City of Austin will contract only with a Contractor having a successful history of sales, installation, service, and support. During the evaluation process, the City of Austin may, with full cooperation of the Contractor(s), visit the Contractor(s)' places of business, observe operations, and inspect records. The Contractor(s) must have a minimum of five (5) years of experience in the Voice and Data cabling construction trade.
- b. The Contractor shall have no significant performance deficiencies under City contracts, if any, in the last three (3) years, (i.e. failure to remediate punch list items, failure to comply with technical specifications, failure to complete the work per job specifications, etc.). After contract award, without notice the Contractor may be subject to inspection by the City of Austin, for verification of certified technicians working on the job.
- c. All work shall be performed and supervised by Telecommunications Technicians and Project Managers who are qualified to install voice, data and coaxial cabling systems and to perform related tests as required by the manufacturer in accordance with the manufacturer's methods.
- d. The technicians employed, whether employed under original Contract or subsequently, and regardless of whether they are employed directly or by sub-contract, shall be fully trained and qualified by the manufacturer on the installation and testing of the equipment to be installed.
- e. The Contractor shall have a permanent business facility within a 30 mile radius of the city limits of Austin, Texas. City staff may choose to perform a site visit to verify compliance with this provision.
- f. For some Work Orders issued under the Contract, the Contractor may be required to employ a Registered Communications Distribution Designer (BICSI RCDD®) that will be ultimately be responsible for the successful completion of the Work Order. The RCDD® must have a minimum of three (3) years of experience to ensure that he/she is qualified to lend adequate technical support to the field forces during installation, and during the initial and extended warranty and maintenance periods. Contractor must attach the designated RCDD®'s resume and RCDD® registration number to the RFP Response. Should the RCDD® assigned to City of Austin projects change, the new RCDD® assigned must also submit a resume for review by the City of Austin.
- g. If, in the opinion of the City of Austin, the RCDD® does not possess adequate qualifications to support the projects, in addition to other contractual rights granted to the City, the City of Austin reserves the right to require the Contractor to assign a RCDD® who, in the City of Austin's opinion, possesses the necessary skills and experience required of this project.
- h. The Contractor must also have available installers and technicians on staff who are registered and/or certified by either BICSI or by other recognized trade organizations or cable manufacturer(s) and assign them to the City of Austin's projects. The Contractor must provide proof of certifications. City of Austin's projects shall be staffed at all times

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by installers and a technician who, in the role of lead crafts persons, will be able to provide leadership and technical resources for the remaining crafts persons on the project. A minimum of 30 percent of personnel shall be registered (as defined above) telecommunications installers.

**WORK ASSIGNMENT PROCESS** - The Contractor will provide cabling and appurtenant services as described in this document at buildings/facilities planned for occupation or currently occupied by various City of Austin employees from different City departments and divisions. Subsequent to award of a Contract, each project will be defined by individual Work Orders to be issued to the Contractor against the Contract. The Contractor will review each proposed task order requirements as issued, and respond with detailed quotes and work plans. The City of Austin will evaluate Contractor's task order quotes and work plans and, if necessary, will modify or reconfigure items not pertaining cost in the task order with the Contractor's concurrence before issuing a Notice to Proceed for each task order.

The Contractor must submit in writing to the City of Austin any proposed changes with applicable pricing before a formal change to the accepted quote and work plans is approved. The City of Austin will not reimburse the Contractor for any additional work performed or materials supplied unless such additions have been specifically and formally authorized by the designated project management personnel.

#### **1.4.2 City of Austin's Responsibilities**

The City of Austin shall be responsible for the following:

- 1.4.2.1 **Provide Necessary SOW Documentation** – City of Austin will provide necessary documentation and specifications such as telecommunications drawings, specifications documents and any other drawings or documents applicable to each SOW issued under the Contract to allow the Contractor to adequately estimate, quote and install the job. City of Austin will provide to Contractor standardized document formats used for each SOW issued under this proposed Contract, such as SOW statements, Change Requests, job specification documents, etc. Scopes of Work documents will detail the desired work results, conditions of the work site, special provisions (if any), project schedules and delivery due dates, drawings, and any other related details.
- 1.4.2.2 **Single Point of Contact** – City of Austin will provide a single point of contact person for each issued SOW.
- 1.4.2.3 **Approve Project Schedules** – City of Austin will approve Contractor's submitted schedule milestones and deliverables.
- 1.4.2.4 **Walk-Throughs** – City of Austin will conduct walk-through inspections with the Contractor prior to Quotation for each SOW.
- 1.4.2.5 **Logistics and Facilities** - Make reasonable effort to provide facilities for restrooms, trash disposal, materials storage, lighting, delivery facilities and other logistical requirements. It may not be possible for the City to provide such facilities. In such cases, the Contractor may have to provide some or all of the

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facilities listed herein. In some other cases, facilities listed herein may be provided by General Contractors.

- 1.4.2.6 **Coordinate Meetings** – City of Austin will coordinate construction meetings and planning meetings (if required) between City of Austin, General Contractors, Contractor and others.
- 1.4.2.7 **Unforeseen Events** – City of Austin will not hold Contractor liable for costs or damages that occur as the result of SOW changes initiated by City of Austin, changes in construction schedules not under Contractor’s control, forces of nature, external events, Acts of War or Acts of God.

### **1.4.3 Contractor's Responsibilities**

The Contractor shall be responsible for the following: **Responsible for Sub-Contractors** - The Contractor will be responsible for all work performed by Contractor’s sub-contractors, if applicable.

- 1.4.3.1 **As-Built Documents** - Contractor will be responsible for delivery of all as-built documents for the installed system and its components. These documents shall include, at a minimum, as-built floor plans noting the locations and labeled identifiers for installed components, applicable materials Warranties and workmanship Warranties, and installed cable test result reports. The supplier shall grant the City the authorization to reproduce any provided documents for internal use.
- 1.4.3.2 **Cable Testing** - Contractor, or Contractor’s sub-contractor(s), if applicable, will be responsible for conducting cable certification testing of installed cables per project specifications for each SOW, and per Section 3.1, “City of Austin Communications Specifications”. Testing must be successfully performed before the City approves the final sign-off for the acceptance of the system. See Section 1.4.4, “Acceptance of Work.”
- 1.4.3.3 **Job Safety** - Contractor will be responsible for coordinating safety training for all personnel involved in performing work for each SOW. Contractor is wholly and ultimately responsible for ensuring the safety of all Contractor’s personnel, sub-contracted or otherwise. Contractor will provide to City of Austin a complete accident report of any serious job injury occurring to Contractor’s employee or Contractor’s sub-contracted employee within 24 hours of the occurrence. Contractor, and Contractor’s sub-contractors, shall comply with OSHA safety requirements. Contractor will provide for signaling, flagging and traffic control by competent personnel, and will provide adequate safety signage and signaling necessary to protect the public. Contractor will provide 100% tie-off fall protection when personnel are exposed to a potential fall of over six (6) feet. The same fall protection applies to situations where personnel are working close to protected edges, but where the potential for a fall over edge protection exists. Construction projects may require 10 hour OSHA training which the contractor will be responsible.
- 1.4.3.4 **Complete and Accurate Quotations** - Contractor will be responsible for delivery of timely and complete quotations based on each SOW and project

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documentation. Due dates for quotations and commencement and completion of work will be negotiated prior to Quotation for each SOW. Price quotations provided by Contractor shall be all-inclusive and shall represent all components needed for complete installation of each issued SOW. The Contractor shall be responsible for providing all parts, labor, tools, supporting hardware, safety equipment and any other associated apparatus and effort necessary to completely install, test and deliver to the City each system specified in issued SOW documents. It is the responsibility of the Contractor to inform the City prior to Quotation of discrepancies or errors in issued SOWs that may result in incomplete, incorrect or insufficient materials or labor required to complete the SOW. In case of failure by Contractor to notify the City of such deficiencies, the materials and/or labor required to satisfy acceptance of the SOW are to be supplied by the Contractor without claim for additional payment.

- 1.4.3.5 **Site Surveys/Walk-Throughs** – Site surveys and walk-throughs of job sites shall be included for each SOW issued under the Contract at no additional cost to the City.
- 1.4.3.6 **Contract Administration** - The Contractor shall be responsible for tracking and reporting all financial transactions related to issued SOWs, including, but not necessarily limited to, quotations, invoices, change orders, contract performance and any other financial data related to the Contract.
- 1.4.3.7 **Payments to Sub-Contractors** - The Contractor shall be wholly and solely responsible for timely and accurate payments made to sub-contractors for work performed, if applicable.
- 1.4.3.8 **Permits, Fees and Inspections** - The Contractor shall obtain and pay for all permits, fees and inspections required to complete each SOW.
- 1.4.3.9 **Overtime Labor** - Contractor may not make claim to City for overtime labor costs incurred unless agreement is made between Contractor and City to include such costs prior to commencement of work on each SOW.
- 1.4.3.10 **Regulatory Compliance** - The Contractor is responsible in whole, and on behalf of Contractor's sub-contractors, for complying with all local, state and Federal laws and regulations applicable to the work performed, even if said laws and regulations are not identified herein or in each issued SOW.
- 1.4.3.11 **Trash Removal** - Contractor is responsible for removal, disposal and/or recycle of all packing materials, debris and trash created by Contractor and/or Contractor's sub-contractors.
- 1.4.3.12 **Policy Compliance** – Contractor is responsible in whole, and on behalf of Contractor's sub-contractors, for complying with City of Austin's job site policies and guidelines detailed in each issued SOW.
- 1.4.3.13 **Progress Reports** – Contractor will provide weekly progress reports to City of Austin for Scopes of Work with durations of longer than one week .
- 1.4.3.14 **Storage of Materials** – Contractor will unload and store materials at the job site in locations designated by City of Austin. Contractor will be responsible for storage and safe-keeping of job materials during the job, and for preventing theft of Contractor's equipment and supplies. Deliveries of materials to the job site

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must be coordinated with City of Austin. Contractor is responsible for removing all pallets.

- 1.4.3.15 **Shipping and Handling** – Contractor will normally be responsible for paying shipping and handling fees associated with goods and supplies delivered for each SOW issued. Exceptions may be made for some orders. Contractor is responsible for identifying shipping and handling fees to be paid by the City prior to ordering the materials.
- 1.4.3.16 **Visual Identification** – For the Contractor’s protection, all Contractor employees and sub-contracted personnel must wear some form of clothing (shirts, jackets, caps, badges, etc) bearing the Contractor’s logo or trade name while working at the job site.
- 1.4.3.17 **Materials Invoices** – Contractor shall supply copies of Contractor’s invoices from Contractor’s suppliers to the City upon request for purposes of verifying Contract pricing to the City.
- 1.4.3.18 **Coordinate Meetings** – If required, the City of Austin will coordinate construction meetings and planning meetings between City of Austin, General Contractors, Contractor and others.
- 1.4.3.19 **Normal Working Hours** – Contractor, and Contractor’s sub-contractors, will be available for work Mondays through Fridays (excluding holidays) from 8:00AM to 5:00PM. The Contractor will not receive overtime labor fees for work performed during these normal working hours.
- 1.4.3.20 **Criminal Background Investigations** – Certain Scopes of Work may dictate that work be performed in City facilities requiring Contractor’s personnel and sub-contracted personnel to be subjected to an Austin Police Dept. Criminal Background Investigation (CBI). Contractor’s personnel and sub-contracted personnel may elect not to subject themselves to the CBI, but will not be allowed on job sites requiring such security measures. In such cases, Contractor is responsible for providing adequate personnel willing to subject themselves to a CBI so that the SOW may be completed on time and as specified by the SOW documents. The City will notify the Contractor in advance if an upcoming SOW requires CBIs.

#### **1.4.4 Acceptance of Work**

The City will make payments for each issued SOW upon final acceptance of the work results. The City may agree to issue progress payments to the Contractor based on agreed project milestones for larger Scopes of Work. Payments will be negotiated at the inception of each SOW.

Final acceptance of work is defined as follows:

- Cables are installed, terminated and tested per specifications, and found to be defect-free as defined by Section 3.1, “City of Austin Communications Specifications”
- Work performed by Contractor is inspected by the City and found to satisfy the requirements of each SOW.

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- Contractor has delivered to City the as-built documentation for the installation as defined in Section 1.4.3.3 of this document. As-built documents are due no later than 30 subsequent to completion of work for each SOW issued.
- City and Contractor conduct a final walk-through of each project, noting deficiencies and/or errors in installation or workmanship, creating a punch list of items to be corrected. Work will be accepted upon completion of remediation of all punch list items.

### **1.4.5 Warranties**

Applicable warranties for materials and/or workmanship for each SOW must be delivered to City, along with any associated manufacturer's warranties. In addition, materials and workmanship provided to City for each SOW must be warranted by the Contractor for a period of ten (10) years following final acceptance of each SOW, even if manufacturer's materials warranties are of shorter duration. Defects found to be caused by faulty materials or workmanship shall be corrected by the Contractor at no cost to City. An example of faulty workmanship is a mis-wired jack, or a cable that was damaged due to excessive pulling force or inadequate support.

The period of Contractor's warranties for any items herein are not exclusive remedies, and the City has recourse to any warranties of additional scope transmitted by the Contractor to the City and all other remedies available at law or in equity.

## **2.0 REQUIREMENTS**

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### **2.1 Minimum Functional Requirements**

Listed below are detailed minimum functional requirements of the City for this Scope of Work.

#### **2.1.1 Structured Cabling**

- 2.1.1.1 The City requires that all newly installed structured cable system permanent links (horizontal cross-connect to telecommunications outlet) consist of components from the same manufacturer or manufacturer partnership. For example, a new installation may consist of CommScope Uniprise components, Panduit Pan-Net components, or Ortronics Clarity line components, but not a mixture of these manufacturers' components. The same permanent link components shall be used throughout the entire SOW.
- 2.1.1.2 The City requires that technical personnel working on cable pulling, termination and testing be well-qualified to perform the installations, as evidenced by individual and company skills certifications and training. Personnel working on

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installation and termination of communications links must be certified by the applicable manufacturer prior to inception of work.

2.1.1.3

The City requires that new structured cable installations adhere to applicable codes and standards, including the following:

- TIA/EIA-568-B Commercial Building Telecommunications Cabling Standard
- TIA/EIA-568-B.1 General Requirements
- TIA/EIA-568-B.2 Balanced Twisted Pair Cabling Components Standard
- TIA/EIA-568-B.3 Optical Fiber Cabling Components Standard
- TIA/EIA - 942 Telecommunications Infrastructure for Data Centers
- TIA/EIA-569-A Commercial Building Standard for Telecom Pathways and Spaces
- TIA/EIA-606-A Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- J-STD-607-A Commercial Building Grounding/Bonding Requirements
- NFPA 70 National Electric Code(NEC)
- ISO/IEC, ISO 11801 Generic Cabling for Customer Premises

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- 2.1.1.4 The City may, on occasion, require installation of structured cable systems in new construction projects, requiring coordination with General Contractors, construction sub-contractors and owners.
- 2.1.1.5 The City requires as-built documents for every new structured cable system installation. Minimum requirements for as-built documents include annotated floor plans, applicable materials and workmanship warranty documents, and cable test result reports.
- 2.1.1.6 The City requires that new installations of structured cable systems are "turn-key" installations. In some cases, that may include ancillary services such as slab coring, tile cuts and cores, installation of grounding sub-systems, installation of conduits and turning boxes and/or other atypical installation services.
- 2.1.1.7 The City requires that all newly installed permanent links be certification tested (for Category rated copper and fiber optics) or performance tested (for coaxial and other special-purpose cables). Certification test results must be delivered to the City in electronic format as a spreadsheet or delimited text files.
- 2.1.1.8 The City requires the Contractor to accurately estimate the costs of labor and materials for each issued SOW. The City will not be responsible for cost over-runs unless such extra costs are the result of approved Change Requests.

**2.1.2 Moves, Adds & Changes (Maintenance)**

- 2.1.2.1 On a regular basis, the City requires maintenance of existing cable systems, including moves, adds and changes. This type of cabling work will constitute a large portion of the total proposed Contract. MAC work may range in scope from small (i.e. less than 10 moves, adds or changes) to large (i.e. relocation or re-arrangement of an entire building floor).

**2.1.3 CATV Distribution**

- 2.1.3.1 The City typically requires two types of CATV distribution installations, including home-run designs for small installations and trunk-and-tap designs for larger distributed installations.
- 2.1.3.2 The selected Contractor may be asked to review and validate CATV distribution designs as part of an issued SOW.
- 2.1.3.3 The City requires that installed CATV distribution systems be capable of supporting two-way digital subscriber services such as Time Warner's RoadRunner™.
- 2.1.3.4 The City requires that CATV distribution installations are performance tested to ensure system integrity.
- 2.1.3.5 Some larger installations may require the addition of active components such as powered amplifiers to boost signal levels.

**2.1.4 Abandoned Cable Demolition/Wreck-Out**

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- 2.1.4.1 On occasion, the City requires removal and disposal of abandoned cables from existing structures.
- 2.1.4.2 To avoid accidental damage or demolition of the wrong cables, the City requires an inspection of existing cables to identify those to be removed vs. those to remain.
- 2.1.4.3 It is the City's desire to support the concept of ecological responsibility whenever possible. Therefore, the City desires that materials removed from facilities following cable demolition/wreck-out be recycled if possible
- 2.1.4.4 The City requires that cable demolition/wreck-out be accomplished using tools, supplies, vehicles, etc. supplied wholly by the Contractor.

**2.1.5 Audio-Video**

- 2.1.5.1 The City occasionally requires purchase and installation of audio-video in-room equipment and/or cabling to support multi-media presentations in training rooms, conference rooms and other multi-media capable spaces.
- 2.1.5.2 The City may require assistance with review and validation of A/V system designs prior to installation.
- 2.1.5.3 The City requires that audio-video cable terminations and connections be made by technicians qualified to perform such work. Some audio and video cables require special skills (soldering techniques, specialty terminations, etc.).
- 2.1.5.4 The Contractor, or Contractor's sub-contractor, must possess the necessary skills and qualifications required to recommend, engineer and validate audio and video components to ensure that in-room audio-video systems will operate properly.

**2.1.6 Overhead Paging Systems**

- 2.1.6.1 The City occasionally requires purchase and installation of overhead (ceiling-mounted and/or wall-mounted) paging/annunciation systems. Such systems may be new, or may be additions to existing building systems.

**2.1.7 Campus Backbone Structured Cabling**

- 2.1.7.1 On multi-building campuses, the City may require inter-building cabling backbone installation, either trenched and buried or aerial. Trenched/buried installation may require the installation of manholes, cable vaults, pull points, etc. and may require street cuts, boring and other site work necessary to complete the designed pathway.

**2.1.8 Contract Administration and Maintenance Services**

- 2.1.8.1 The City requires a single point of contact for all delivery of services under the Proposed Contract. The proposed single point of contact should function as a dedicated account manager, and should possess at least three years of prior experience in a comparable role.

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- 2.1.8.2 The City requires that the primary Contractor be wholly responsible for all services delivered under the proposed Contract, including those delivered by sub-contractors, if applicable.
- 2.1.8.3 The City requires that the primary Contractor be responsible for handling and resolving any and all miscommunications or disagreements between the primary Contractor and Contractor's partners/sub-contractors. The City requires that the primary have a communications plan and a process for resolving disputes.
- 2.1.8.4 The City requires that the primary Contractor's single point of contact be personally involved in meetings, discussions, work planning and site visits throughout the Contract period.
- 2.1.8.5 The City requires that the selected Contractor provide a dedicated Project Manager/Project Team for the duration of the proposed Contract, and that the designated personnel remain in their roles for the duration of the Contract (barring any unforeseen turnover).
- 2.1.8.6 The City requires that the primary Contractor attend periodic performance review meetings with the City (frequency to be discussed and negotiated prior to Contract).
- 2.1.8.7 The City requires a method of collaboration between the City and the selected Contractor, administered by the Contractor, by which both parties could view Contract-related documents such as archived Quotes and Invoices, Bills of Material, reports, issues, Change Orders, etc.
- 2.1.8.8 The City requires that Contractor stores and maintains historical records regarding the Contract services provided, Quotes, Invoices and Payments made throughout the Contract term.
- 2.1.8.9 The City requires that the cabling installation and maintenance services provided under the proposed Contract are provided by well-qualified personnel and that the quality of services provided is high.
- 2.1.8.10 The City requires that the primary Contractor provides quality contract administration and contract maintenance services such as activities tracking and reporting, invoicing, payment tracking, order management, etc..
- 2.1.8.11 The City requires that the primary Contractor is experienced in administration and maintenance of large IT services contracts such as this proposed Contract.
- 2.1.8.12 The City requires that the process of scoping, estimating, quoting, installing, implementing, testing and accepting each SOW under this proposed Contract be manageable, structured and repeatable.
- 2.1.8.13 The selected Contractor may be presented with a high volume of work to be executed at the inception of this proposed Contract, and at other times, resulting in a high demand for contracted resources.
- 2.1.8.14 To reduce the possibility of miscommunications, the City requires that a qualified *technical* representative, in addition to Contractor's single point of contact, be present at initial SOW meetings and/or site walk-throughs for each issued SOW.

- 2.1.8.15 The City requires that the selected Contractor provide an account team housed permanently in the Austin metro area for the duration of the Contract.
- 2.1.8.16 The City requires that installation and/or maintenance personnel be certified, either by manufacturers or by recognized trade organizations, to perform key services under this proposed Contract.

## **3.0 TECHNICAL REQUIREMENTS**

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### **3.1 City of Austin Communications Specifications**

This section contains the City's standard technical specifications for structured cable systems. The document is titled "Division 27 – Communications Specifications for the City of Austin." This document is the City of Austin's technical specifications document, and is structured according to the Construction Specifications Institute's MasterFormat™ 2004 Edition, Div. 27 – Communications. This document is used in construction and re-modeling construction projects, and is typically issued to architects, general contractors, construction sub-contractors, and other interested parties.

### **DIVISION 27 – COMMUNICATIONS SPECIFICATIONS FOR THE CITY OF AUSTIN**

#### **27 00 00 COMMUNICATIONS**

This document specifies requirements for installing structured telecommunications cabling systems in a physical star network topology for transporting telecommunications and CATV signals within a building. Telecommunications cabling systems include the copper and optical fiber horizontal and interior building backbone systems and cable media, patch panels, connecting blocks, fire stopping, grounding, cable support, hardware, communications outlets, connectors, and associated hardware; station wiring, work area station outlets (adapters); and distribution terminals. The structured cable system specified herein supports customer's voice, data, and video for transporting information throughout modern buildings using twisted pair, coaxial and optical fiber cables.

Coordinate electrical, grounding, and HVAC requirements with the associated disciplines.

#### **Definitions**

*Customer* – the owner (or owner's agent) of the facility in which the structured cable system is to be installed

*Vendor* – the company contracted to install the structured cable system specified herein

#### **27 01 00 Operation and Maintenance of Communications Systems**

Not applicable – the City of Austin will operate and maintain installed communications systems.

**27 05 00 Common Work Results for Communications**

**27 05 26 Grounding and Bonding for Communications Systems**

**References**

IEEE 1100, *Recommended Practice for Powering and Grounding Electronic Equipment*

ICEA P32-382, *Short Circuit Characteristics of Insulated Cable*

NFPA 70, National Electric Code

NFPA 780, *Standard for Installation of Lightning Protection Systems*

TIA ANSI J/STD-607-A in alignment with NECA/BICSI 607 and in conjunction with the most current Standards , *Commercial Building Grounding and Bonding Requirements for Telecommunications*

**Definitions**

**TGB** – Telecommunications Grounding Busbar. TGBs are the grounding connection points for systems and equipment located in ERs and TRs. TGBs must be pre-drilled copper busbars with holes for use with standard sized lugs, have minimum dimensions of .25 in. thick by 2 in. wide and may vary in length. TGBs must be listed by a Nationally Recognized Testing Laboratory (NRTL).

**TMGB** – Telecommunications Main Grounding Busbar. The TMGB is a dedicated extension of the building AC grounding electrode system for the telecommunications infrastructure. The TMGB serves as a central attachment point for the TBB. The TMGB must be pre-drilled copper busbars with holes for use with standard sized lugs, have minimum dimensions of .25 in. thick by 4 in. wide and may vary in length. TGBs must be listed by a Nationally Recognized Testing Laboratory (NRTL). The TMGB should be bonded to the AC main service entrance panel ground if located within 30 ft. of the AC main service panel.

**TBB** – Telecommunications Bonding Backbone. A TBB is a bonding conductor used to equalize potentials between TRs on multiple floors of a building, with an ultimate connection to the EF's TMGB.

**BCT** – Bonding Conductor for Telecommunications. A BCT is a copper conductor used to bond metallic components of the telecommunications system to ground. BCTs are not intended to carry AC ground fault current or lightning stroke current, but are installed to equalize voltages when such events occur. Any and all sizing of a BCT must be performed accurately.

**GE** – Grounding Equalizer. GEs are used to equalize potentials between TRs on the same floor of structure, If used, the GE would be installed on every third floor and the top of a building.

Typically, grounding protection for telecommunications systems is to be installed, labeled and tested during building construction by licensed electricians per the NEC, NFPA 780, NECA/BICSI 607, and ANSI J-STD-607-A, *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications*. The electrical sub-contractor is typically responsible for

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installing, testing and labeling the TMGB (Telecommunications Main Grounding Busbar), all TGBs (Telecommunications Grounding Busbars), all BCTs (Bonding Conductors for Telecommunications), and all TBBs (Telecommunications Bonding Backbone).

The *Vendor* may be responsible for installing additional or missing TGBs, grounding conductors between TGBs, and/or grounding equalizer conductors. All TGBs and grounding conductors installed by the *Vendor* must be installed, labeled and tested per the NEC, NFPA 780, NECA/BICSI 607, and ANSI J-STD-607-A, *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications*. TGBs must be referenced to the equipment ground terminal of the nearest AC electrical panel to equalize potentials between them. *The Vendor will not be required to make bonding connections between TGBs and electrical service panels; all such connections must be made by licensed electricians.* TGBs must also be bonded to the nearest structural steel member, whether horizontal or vertical, if applicable.

TMGBs are typically installed by licensed electricians during building construction. TMGBs should be located as near as possible to the building's cable Entrance Facility (EF), and as near as possible to primary and secondary surge protectors, cable sheaths and entrance conduits. If located within 30 ft. of the building main AC electrical panel board, a BCT should be used to bond the TMGB to the AC main panel ground. Alternatively, the TMGB may be bonded to the nearest structural steel column, provided that the bonding effectiveness of such a connection has been verified by two-point bonding tests. The TMGB may also be bonded to the nearest secondary AC electrical service panel, provided that the ground impedance of the panel board has been verified with a ground impedance tester. *All bonded connections between the TMGB and electrical service panels must be installed by licensed electricians.*

The *Vendor* is responsible for using the installed grounding system to provide protection for racks, trays, conduits and wiring circuits to comply with NEC, NFPA 780, NECA/BICSI 607 and ANSI J-STD-607-A requirements.

The *Vendor* shall provide approved materials such as listed and approved BCTs (telecommunications bonding conductors) (6 AWG or larger), listed connector lugs, listed clamps, listed pressure connectors or other listed means. BCTs may be sized at a minimum of 6 AWG if the conductor length does not exceed 100 ft. For BCTs of lengths greater than 100 ft., refer to *Soares Book on Grounding*, published by the International Association of Electrical Inspectors (IAEI). The *Vendor* shall label all installed bonding conductors of length greater than 2m (6 ft.) per labeling specifications in section **27 05 53 Identification for Communications Systems** of this document.

## **27 05 28 Pathways for Communications Systems**

### **References**

BICSI© TDMM, 12<sup>th</sup> Edition

ANSI/TIA/EIA-569-B, *Commercial Building Standard for Telecommunications Pathways and Spaces*

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Pathways for the installed structured cable system will be delivered to the *Vendor* via telecommunications drawings. The *Vendor* is responsible for installing the structured cable system in the specified pathways as shown on the drawings. If deviations from the pathways shown on the drawings are required, the *Vendor* must issue a Request for Change document to the *Customer*.

Locate telecommunications pathways away from sources of electro-magnetic interference (electrical cabling, transformers, RF sources and transmitters, large motors and generators, induction heaters, X-Ray equipment, copiers, etc.)

Pathways may consist of cable trays, conduits and/or J-Hooks. Other types of cabling pathways may be used, subject to *Customer's* approval. All fiber optic cables must be installed in innerduct (plenum-rated where required by code).

Cabling pathways must be labeled according to Section 27 05 53 of this document.

#### **Underfloor Duct Systems**

Buildings constructed with under floor duct systems will require coordination with the construction contractor, *Vendor, and Customer* prior to installation of cables.

#### **Cellular Floor Systems**

Buildings constructed with cellular floor duct systems will require coordination with the construction contractor, *Vendor, and Customer* prior to installation of cables.

#### **27 05 28.29 Hangers and Supports for Communications Systems**

Conduits, cable trays, raceways and cabling must be supported or suspended from structural members, ceilings or walls with hardware specifically designed to support their weight and the forces imposed on them from pulling and vibration. Use manufacturer's recommendations for supporting the tray or raceway system for the designed working load, including static load capacity and support span length.

Do not allow conduits, cable trays, raceways or cabling to rest directly on, or be attached to, ceiling tiles or any portion of the suspended ceiling tile system (T-bars, vertical supports, or other integral components).

Support hardware installed above ceiling tiles must be installed with at least 75mm (3 inches) of clear vertical space between the upper surface of ceiling tiles or grid and the bottom surface of the support hardware. Where space allows, install support hardware with 150mm (6 in.) of clear vertical space between the upper surface of ceiling tiles and the bottom surface of the support hardware.

Install cable trays and raceways above ceilings with a minimum of 300mm (12 in.) of clear vertical space above the tray or raceway.

If used, install J-supports (J-Hooks) on 1.2m (4 ft.) to 1.5m (5 ft.) centers, varying the distance between centers to minimize harmonic signals.

J-supports are to be loaded with no more than 75% of the J-support design capacity, leaving 25% spare capacity for growth.

**27 05 28.33 Conduits and Backboxes for Communications Systems**

Conduits installed in plenum airways must terminate in plenum-rated junction boxes.

Do not use metallic flexible conduit for telecommunications cabling. No more than two (2) 90-degree bends between pull boxes or pull points are permitted. A third bend may be acceptable for conduit runs less than 10m (33 ft.) total. No continuous conduit sections longer than 30m (100 ft.) are permitted. Locate conduits away from sources of heat and moisture. Both ends of metallic conduits must be bonded to ground. Install a pull point or pull box where conduits must change direction at an acute angle (more than 90 degrees). If a third 90-degree bend is necessary, derate the conduit capacity by 15% or increase the conduit size by one (1) trade size.

Conduit bends must be smooth, even and kink-free. For 2" diameter or less, conduit bend radii must be a minimum of six times the internal conduit diameter. For conduits larger than 2" diameter, the conduit bend radii must be a minimum of ten times the internal conduit diameter.

For conduits that serve telecommunications outlet boxes (TOs), a minimum 1" or greater diameter is required.

Terminate conduits protruding through structural floors 25mm to 75mm (1 in. to 3 in.) above the surface.

Terminate conduits protruding through vertical walls 100mm (4 in.) from the wall surface.

Conduits entering telecommunications spaces (ER and TRs) should terminate near the room corners.

Install all conduits with a minimum 90 kg. (200 lb.) test rated pull cord.

Conduits installed between TRs and telecommunications outlet (TO) boxes should not extend to more than two, and must not extend to more than three, TO boxes.

Install all pull boxes and pull points in straight sections of conduit, between bends.

All conduit open ends must be reamed and fitted with insulated bushings to eliminate sharp edges.

Length of pull boxes must be a minimum of twelve (12) times the diameter of the largest conduit. See the project telecommunications and/or electrical drawings for specifications of pull boxes to be installed.

Normal installation height for telecommunications backboxes installed on vertical walls is 15" AFF unless otherwise noted on project drawings.

See project telecommunications drawings for locations and specifications of conduits and backboxes.

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**27 05 28.36 Cable Trays for Communications Systems**

Cable trays and raceways installed above ceilings must be installed with at least 300mm (12 inches) of clear vertical space above the top surface of the tray or raceway.

Use ladder-style cable trays or welded-wire (basket) trays as specified in project drawings. Cable trays must be sized and supported according to manufacturer's specifications to adequately support the designed cable load and the tare weight of the cable tray system. All cable tray sections are to be bonded and cable tray runs to be grounded according to NEC, NFPA 780, NECA/BICSI 607 and ANSI J-STD-607-A requirements.

**27 05 28.39 Surface Raceways for Communications Systems**

Surface raceways (if installed) are to have removable front panels, and must have separate compartments for communications cables and electrical cables whenever electrical service is installed in the raceway. If the raceway has a metallic barrier between compartments, it must be bonded to ground.

See project telecommunications, electrical drawings or scope of work for locations and specifications of surface raceways.

**27 05 53 Identification for Communications Systems**

References

BICSI© TDMM, 12<sup>th</sup> Edition

ANSI/TIA/EIA-606-A, *Administration Standard for Commercial Telecommunications Infrastructure*

Structured cable systems installed in City of Austin facilities are to be considered Class 3 premises, according to ANSI/TIA/EIA-606-A, *Administration Standard for the Telecommunications Infrastructure of Commercial Buildings*. The **Vendor** is responsible for documenting and labeling all components according the table below. The Vendor is to provide installation documentation and cable plant test results using the identification scheme shown here. See "Labeling Application Notes" following the table for specific instructions regarding labeling.

Identifier	Format	Example
Telecommunications Spaces (EF, ER, TRs)	BldgID.FloorID.SpaceID	CC4.1.TR2 (Central Campus, Bldg #4.Floor #1.TR #2)
Labeling applies to drawings and record-keeping	These identifiers will be provided to <i>Vendor</i> by <i>Customer</i> .	
Horizontal	SpaceID.Rack.Panel.PortNumb	TR2.1A.PP1.32 (TR #2,

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Identifier	Format	Example
<p>Links/Telecomm Outlets</p> <p>Apply labels to both ends of the links (TR patch panels and TOs and MUTOAs, if used)</p>	<p>er</p> <p>-Alternate-</p> <p>YYYY</p> <p>Where X designates building floor #, and YYY is a sequential number</p>	<p>Rack 1A, Patch Panel #1, port number 32)</p> <p><b>CC1.1.TAP4.3</b> (CATV Tap #4 located in Central Campus, building one, floor one, port #3)</p>
<p><b>TMGB</b> (Telecommunications Main Grounding Busbar)</p> <p>Should be labeled by electrical contractor</p>	<p>BldgID.SpaceID.TMGB</p>	<p><b>CC4.ER.TMGB</b> (Central Campus, Bldg. #4, Equipment Room, TMGB)</p>
<p>TGB (Telecommunications Grounding Busbars)</p> <p>Should be labeled by electrical contractor</p>	<p>BldgID.SpaceID.TGB#</p>	<p><b>CC4.1.TR2.TGB1</b> (Central Campus Bldg. #4, Floor #1, TR #2, TGB #1)</p>
<p>Backbone and Riser Cables</p> <p>Label both ends of backbone cables. Apply permanent labels to cable sheaths.</p>	<p>BldgID.FromSpaceID.ToSpaceID.CableTypeCable#</p> <p><i>Cable Types are from the NEC, Table 770.113</i></p> <p>OFNP=Optical Fiber Non-conductive Plenum</p> <p>OFNR= Optical Fiber Non-conductive Riser</p>	<p><b>CC4.1.ER.CRC2.2.TR2.OFNR3</b> (Central Campus Bldg. #4, from the ER to the TR on the 1st floor, to Cameron Road Campus, Building #2, Floor #2, TR #2, Optical Fiber Non-conductive Riser, cable #3)</p>
<p>Backbone Cable Pair or Optical Fiber</p> <p>Label both ends at termination points</p>	<p>BldgID.FromSpaceID.ToSpaceID.CableTypeCable#.Pair#</p> <p><i>Cable Types are from the NEC, Table 770.113</i></p> <p>OFNP=Optical Fiber Non-conductive Plenum</p> <p>OFNR= Optical Fiber Non-conductive Riser</p>	<p><b>CC4.1.ER.CRC2.2.TR2.OFNR 3.120</b> (Central Campus Bldg. #4, from the ER to the TR on the 1st floor, to Cameron Road Campus, Floor #2, TR #2, cable #3, pair #120)</p>

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<b>Identifier</b>	<b>Format</b>	<b>Example</b>
<b>Firestopping Locations</b>  Apply permanent label on or near firestop	BldgID.SpaceID.CompassLocation.Firestop#	<b>CC4.RM242.W.FS1</b> (Central Campus Bldg. #4, Room 242, west wall, firestop #1)
<b>Building</b>  Used for record-keeping and drawings	CampusIDBldgID	<b>CC4</b> (Central Campus Building 4)  <b>SPTECH</b> (South Park campus, Technical Bldg.)
<b>Racks, Cabinets and Termination Hardware</b>	BldgID.SpaceID.HardwareID  Racks and cabinets – specified by Row-Rack# (i.e. 2-9)  Termination Hardware – “PNL”=patch panel, “PB”=punch block, “FPP”=fiber patch panel, “FSD”=fiber splice drawer or enclosure	<b>CC4.1.ER.1-4</b> (Central Campus Bldg. #4, Floor #1, Equipment Room, Row 1-Rack or Cabinet 4)  <b>CC4.1.ER.1-4.PNL3</b> (Central Campus Bldg. #4, Floor #1, Equipment Room, Row 1-Rack or Cabinet 4, Panel 3)  <b>CC4.1.ER.Wall.PB14</b> (Central Campus Bldg. #4, Floor #1, Equipment Room, wall-mounted Punch Block #14)
<b>Pathway Components (Cable Trays, Conduits, Raceways)</b>	BldgID.FromSpaceID.ToSpaceID.HardwareID  “CT”=cable tray, “CN”=conduit, “RW”=raceway, “CH”=chase, “DCT”=duct	<b>CC4.2.TR2E.RM145.CT1</b> (Central Campus Bldg. #4, Floor #2, from TR on the 2 <sup>nd</sup> floor east side, to Room 145, Cable Tray #1)  <b>CC4.1.ER.TRIW.CN4</b> (Central Campus Bldg. #4, Floor #1, from ER, to TR on the 1 <sup>st</sup> floor west side, Conduit #4)

In addition to the identifiers listed above, the Class 3 administration premise will also use the following identifiers. The *Vendor* is not responsible for labeling these components unless installing outside cable plant:

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- Campus Backbone Cable Identifier – in Entrance Facility (EF) and/or ER
- Campus Backbone Cable Pair or Optical Fiber Identifier
- Campus Pathway or Element Identifier

Labeling Application Notes:

**Horizontal Links**

Horizontal cable links may be labeled at the Telecommunications Outlet (TO) by labeling the top or bottom of the TO faceplate with the TR or TE identifier (i.e. "TR2") and applying individual labels to each TO receptacle with the assigned TO number (i.e. "1001", "2032"). Alternately, the TO faceplate may be labeled at each receptacle with the fully qualified identifier (i.e. "TR2.1001A", "TR2.1001B", etc.).

At the other end of the cable, typically in a TR or TE, each cable termination point (jack or punch) must be labeled with the partially qualified identifier (i.e. "1001A")

**Backbone and Riser Cables**

Backbone and riser distribution cables are identified by building ID, the "from" space ID, the "to" space ID, the cable type and the cable number (i.e. CRC4.1.ER.CRC1.1.TR2.OFNR3). The "Cable Type" portion of the identifier is derived from tables 770.113, *Optical Fiber Cable Markings*, and 800.113, *Balanced Twisted-Pair Cable Markings* of the NEC. For reference, these tables are summarized below:

**NEC Table 770.113**

Optical Fiber Cable Marking	Cable Type
OFNP	Optical Fiber Non-conductive Plenum
OFCP	Optical Fiber Conductive Plenum
OFNR	Optical Fiber Non-conductive Riser
OFCR	Optical Fiber Conductive Riser
OFNG	Optical Fiber Non-conductive General Purpose
OF CG	Optical Fiber Conductive General Purpose
OFN	Optical Fiber Non-conductive General Purpose
OFC	Optical Fiber Conductive General Purpose

**NEC Table 800.113**

Balanced Twisted-Pair Cable Marking	Cable Type

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CMP	Communications Plenum
CMR	Communications Riser
CM, CMG	Communications General Purpose
CMX	Communications Limited Use
CMUC	Communications Under Carpet

NEC Coaxial Cable Markings

Balanced Twisted- Cable Type Pair Cable Marking	
CATVP	CATV Plenum
CATVR	CATV Riser
CATV	CATV Cable
CATVX	CATV Limited Use

Label both ends of backbone and riser cables with permanent labels specifically designed for use on cable sheaths.

**Pathway Components (Cable Trays, Conduits and Raceways)**

Label both ends of cable trays conduits and raceways with the fully qualified identifier. Exception: exposed raceways used for horizontal distribution to work areas may be left unlabeled for appearance.

Example: "CC2.1.ER.CC1.1.TR1.CT2" denotes a cable tray routed from the Central Campus Building 2 (CRC2) Equipment Room (ER) to Central Campus Building 1 Telecomm Room #1 (CRC1.TR1) as Cable Tray #2 (CT2).

**27 06 00 Schedules for Communications**

Schedules for Communications systems are dependent on each Scope of Work, and will be provided to *Vendor* by the *Customer* at the onset of each Scope of Work.

**27 08 00 Commissioning of Communications**

The installed Structured Cable System will be considered commissioned upon delivery of complete cable test results to the *Customer*, and upon final acceptance of the installation by the *Customer*. Commissioning of Communications Systems is to include the following:

**27 08 10 Commissioning of Copper Backbone Cabling**

**27 08 10.11 Inspection**

*Customer* and *Vendor* shall inspect copper backbone cable terminations and labeling, and if necessary, create a punch-list of changes/corrections needed to bring the installation into specification. *Vendor* shall complete punch list items before final commissioning is considered complete.

**27 08 10.13 Testing**

All cable pairs shall be link tested using approved test instruments set up to the appropriate test configuration for the category of cabling to be tested. Complete test results are to be delivered to *Customer* before final commissioning is considered complete. Multi-pair copper backbone and riser cables are allowed a maximum pair failure rate of 1%, or 1 pair per 100. Multi-pair cables of less than 100 pairs must be 100% failure-free.

**27 08 20 Commissioning of Optical Fiber Backbone Cabling**

**27 08 20.11 Inspection**

*Customer* and *Vendor* shall inspect fiber optic backbone cable terminations and labeling, and if necessary, create a punch-list of changes/corrections needed to bring the installation into specification. *Vendor* shall complete punch list items before final commissioning is considered complete.

**27 08 20.13 Testing**

All fiber optic strands shall be link tested using approved test instruments set up to the appropriate test configuration for the category of cabling to be tested. Complete test results are to be delivered to *Customer* before final commissioning is considered complete. Multi-strand backbone and riser cables are allowed a maximum failure rate of 1%, or 1 strand per 100. Multi-strand fiber optic cables of less than 100 strands must be 100% failure-free.

Multi-mode optical fiber testing shall be performed in accordance with TIA/EIA-455-54B, using surface-emitting LED light sources in an overfilled launch condition. Testing shall be Category 2 or 3 compliant as defined by TIA/EIA-455-54B.

**27 08 30 Commissioning of Coaxial Backbone Cabling**

**27 08 30.11 Inspection**

*Customer* and *Vendor* shall inspect coaxial backbone cable terminations and labeling, and if necessary, create a punch-list of changes/corrections needed to bring the installation into specification. *Vendor* shall complete punch list items before final commissioning is considered complete.

**27 08 30.13 Testing**

All coaxial backbone cables shall be link tested using approved test instruments set up to the appropriate test configuration for the category of cabling to be tested. Complete test results are to be delivered to *Customer* before final commissioning is considered complete.

**27 08 40 Commissioning of Horizontal Communications Cabling**

**27 08 40.11 Inspection**

*Customer* and *Vendor* shall inspect horizontal cable terminations and labeling, and if necessary, create a punch-list of changes/corrections needed to bring the installation into specification. *Vendor* shall complete punch list items before final commissioning is considered complete.

**27 08 40.13 Testing**

All horizontal shall be permanent link tested using approved test instruments set up to the appropriate test configuration for the category of cabling to be tested. Complete test results are to be delivered to *Customer* before final commissioning is considered complete.

**27 08 50 Commissioning of Horizontal Coaxial Cabling**

**27 08 50.11 Inspection**

*Customer* and *Vendor* shall inspect horizontal cable terminations and labeling, and if necessary, create a punch-list of changes/corrections needed to bring the installation into specification. *Vendor* shall complete punch list items before final commissioning is considered complete.

**27 08 50.13 Testing**

All installed coaxial horizontal cables shall be proof-of-performance tested, including aligning and balancing the system and testing the system and components. Tests should be performed using signal level meters to confirm that the installed channels meet specifications for distortion, signal uniformity, signal-to-noise ratio, signal ingress and hum modulation.

**27 10 00 STRUCTURED CABLING**

**27 11 00 Communications Equipment Room and Telecommunications Room Fittings**

The following sections specifically list the acceptable equipment types and items for this project. Proposed equivalent items must meet or exceed these specifications and the specifications of the listed item. In the event a specified manufacturer's part number has changed or is no longer valid, *Vendor* shall substitute the appropriate equivalent manufacturer's part number. *Customer* or *Customer's* designee will have final determination of acceptability of all proposed equipment and must approve submitted equipment prior to installation. Where quantities are not noted, they may be derived from the drawings. In the event of a discrepancy between the specifications and the drawings, the greater quantity and/or better quality will be furnished.

Any *Customer* -furnished materials or equipment not installed in the project shall be returned to the *Customer*. *Vendor* shall store all materials and equipment in accordance with manufacturers' instructions in a weather-tight, secure enclosure. *Vendor* shall be responsible for safety and security of all *Customer*-furnished materials until project is complete and accepted by *Customer*.

All equipment and materials, unless otherwise specified, shall be new, free from any defects, and of the best quality of their respective kinds. All like materials used shall be of the same manufacture, model, and quality, unless otherwise specified.

**27 11 13 Communications Entrance Protection**

Per NEC 800, III, circuits exposed to electrical power faults and lightning must be protected with primary circuit protectors, and circuits exposed to sneak currents must additionally be provided with secondary protectors. Inter-building copper cables installed on a campus between buildings are considered by the

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NEC definition to be “exposed to lightning”, even if buried and installed in conduits, and therefore, must be installed with primary protectors on both ends of the cables.

Other types of cables (fiber optic) containing electrically conductive wires must be grounded on both ends of cable.

**27 11 16 Cabinets, Racks, Frames and Enclosures**

Equipment cabinets, racks, frames and enclosures must be designed to adequately support the hardware and equipment to be installed in each. Mounting rails are to be standard 19” with clearly marked Rack Unit (RU) identifiers. In some cases, 23” racks may be specified. All metallic cabinets, racks, frames and enclosures are to be bonded and grounded. Equipment cabinets must be supplied with leveling feet. Open-frame racks must have bases designed for permanent attachment to solid floors, and are to be installed with supporting members at the tops to prevent tipping. Frames and enclosures are to be mounted to permanent building structure according to manufacturer’s instructions. Acceptable manufacturers are:

- 1) Panduit.
- 2) Chatsworth
- 3) SMC
- 4) Wrightline

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer’s* approval prior to procurement and installation.

See project drawings or scope of work for sizes, types and other specifications. Cabinets, racks, frames and enclosures will be specified on project telecommunications drawings by *Customer*, and may not be substituted without prior written consent by *Customer*.

**27 11 19 Communications Termination Blocks and Patch Panels**

Termination blocks (where used) for voice cables are to be 66-style displacement connector type or 110-style, and may be wall-mounted or mounted in 19” equipment cabinets or racks. See drawings for placement and quantities. In some cases, 110-style blocks will be specified. Some projects will specify that terminations be made on RJ-45 patch panels with 8 pin modular inserts. See the project telecommunications drawings or project scope of work for specifications on each project.

Patch panels are to be (24) or (48) port, 19” rack-mount, TIA/EIA 568-B Category 6 compliant.

Acceptable manufacturers are:

- 1) Panduit Angled Modular Patch Panels p/n CPPLA24WBL and CPPLA48WBL
- 2) Panduit Flat Modular Patch Panels p/n CPPL24WBL and CPPL48WBL

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- 3) Uniprise UNP600 series, angled or flat as specified
- 4) Uniprise UNPMM series
- 5) Ortronics Clarity line

**Modular Connectors**

Modular connectors mounted in patch panels are to be TIA/EIA 568-B Category 6 compliant.

Acceptable manufacturers are:

- 1) Panduit Mini Com Jack Modules (example, CJ688TG)
- 2) Uniprise UNJ600 Series
- 3) Ortronics Clarity line

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

**Color Coding:**

All horizontal distribution cables shall be terminated on BLUE RJ-45 modular connectors in rack-mounted patch panels.

All backbone/riser copper cables shall be terminated on GREY RJ-45 modular connectors in rack-mounted patch panels.

See project telecommunications drawings or Scope of Work for locations, types and other specifications regarding additional color coding for patch panels and TOs.

**Color Coding for Cross-Connect Fields**

The following table specifies color assignments for identifying only cross-connect fields or panels. Accepted methods for color coding are colored backboards, colored connectors, colored covers, colored tape, paint or labels.

<b>COLOR</b>	<b>IDENTIFIES:</b>
Orange	Service provider demarcation point
Green	Network connections by service provider to service provider network equipment
Purple	Connections to common enterprise equipment such as PBX's, mainframes, MUXes, etc.
White	First-level backbone (e.g. termination of building backbone cables connecting Main Cross-Connect/Campus Distribution to Intermediate Cross-Connects/Building

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	Distribution)
Gray	Second-level backbone cross connect (e.g. termination of building backbone cables connecting Intermediate Cross-connects/Building Distribution to Horizontal Cross-Connects/Floor Distribution
Blue	Horizontal connections/Floor Distribution to telecomm outlets/connectors
Brown	Campus backbone connections  NOTE: Brown takes precedence over White or Gray for inter-campus runs
Yellow	Connections to miscellaneous equipment
Red	Reserved for future use or used for connections to Key Telephone systems

**27 11 23 Communications Cable Management and Cable Trays/Ladder Rack**

***Cable Management***

Horizontal rack-mounted cable managers are to be installed below each flat patch panel, and below each data switch. See project drawings or Scope of Work for exact placements.

Acceptable Manufacturers are:

- 1) Panduit
- 2) Commscope Uniprise
- 3) Ortronics
- 4) Other

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

***Cable Trays***

Cable trays used for overhead cable support and distribution must of ladder type construction or welded wire (basket) construction and must be designed to adequately support and protect the designed cable installation and weight loads. Trays and ladder racks must be installed according to manufacturer's instructions regarding maximum spans for the designed load, electrical bonding and grounding, and attachment to permanent building structure. Trays and ladder racks must be selected to be of adequate size for the designed cable capacities, plus 30% growth.

Acceptable manufacturers are:

- 1) CPI (Chatsworth)

- 2) Snake tray
- 3) B-Line
- 4) Other

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

See project drawings or Scope of Work for locations, sizes, types and other specifications regarding communications cable management support hardware.

#### **27 11 26 Communications Rack Mounted Power Protection and Power Strips**

Power distribution Units and Power Strips are specific to each installation, depending on the type of building power provided to the telecommunications space. See project drawings or Scope of Work for specifications.

Acceptable manufacturers are:

- 1) APC
- 2) Server Technologies
- 3) Baytech
- 4) Other

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

See project telecommunications drawings or Scope of Work for locations, sizes, types and other specifications regarding power protection and power strips.

#### **27 13 00 Communications Backbone Cabling**

##### **27 13 13 Communications Copper Backbone Cabling**

Communications Copper Backbone and Riser cabling will be CAT 3, CAT 5e or greater multi-pair rated plenum cable. See project drawings or Scope of Work for cable types and pair counts. Acceptable manufacturers are:

- 1) Panduit
- 2) Belden/CDT
- 3) General Cable
- 4) Commscope

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

See project drawings or Scope of Work for locations and specifications of backbone cables. *Vendor* is required to use the same brand and model number of copper backbone cable throughout the entire project.

##### **27 13 13.13 Communications Copper Cable Splicing and Terminations**

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Communications copper cables must be installed and left with a minimum of six (6) feet of service loop at each end (after termination), coiled and secured. No communications copper cables may be spliced. Terminations for voice cables may be on 66 style punch blocks, 110-style punch blocks or on patch panels as specified in the project drawings or Scope of Work.

See project drawings or Scope of Work for locations, types and counts of copper cable terminations.

**27 13 23 Communications Optical Fiber Backbone Cabling**

Communications Fiber Optic Backbone and Riser cabling used for voice services will be multi-strand 50/125 micron laser-grade multimode, 62.5/125 micron multimode, and/or 9/125 micron singlemode as specified in the project drawings

Multimode fiber cables shall comply with the following performance characteristics:

- Maximum insertion loss of 3.0 dB/km at 850nm wavelength and 1.0dB/km at 1300nm wavelength for 50/125 micron multimode cable.
- Maximum insertion loss of 3.5 dB/km at 850nm wavelength and 1.5dB/km at 1300nm wavelength for 62.5/125 micron multimode cable.
- Maximum insertion loss of .3dB/km loose tube construction and .9dB/km tight buffer construction for single mode fiber.
- Bandwidth of 200 MHz/km at 850 nm and 500MHz/km at 1300 nm wavelength for 62.5/125 micron multimode cable
- Bandwidth of 500 MHz/km at 850 nm and 500MHz/km at 1300 nm wavelength for 50/125 micron multimode cable

All fiber optic backbone and riser cabling shall be installed in fiber optic innerduct, sized appropriately and plenum-rated where required by code. Riser cables must be adequately and safely supported by securing to vertical ladder tray or other hardware designed for the purpose of securing and supporting cables.

See project drawings or scope of work for designated cable types and strand counts.

Acceptable manufacturers are:

- 1) Panduit
- 2) Belden/CDT
- 3) General Cable

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation. Specific fiber optic cable manufacturer and part numbers will be specified on project drawings or scope of work.

Installation, testing and verification of the installed optical fiber backbone cabling must comply with ANSI/TIA/EIA-568-B.1, *Commercial Building Telecommunications Cabling Standard, Part 1: General Requirements*, and

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ANSI/TIA/EIA-568-B.3, *Optical Fiber Cabling Components Standard* and with optical fiber cable manufacturer's instructions and specifications.

**27 13 23.13 Communications Optical Fiber Splicing and Terminations**

In-line splices are not permitted in optical fiber backbone cables. If a repair splice is made due to damage, maximum allowable splice loss is .3 dB per splice for multi-mode cables and .05 dB for single mode cables. If repair splices are made, the optical fiber cable plant loss budget and performance margins must be recalculated and verified by the *Customer* before approval for the repair splice is given.

All fiber optic cables are to be terminated according to the following (project specifications may vary depending on existing conditions. See project telecommunications drawings or scope of work for specific requirements):

50/125 micron multi-mode – LC style connectors

62.5/125 micron multi-mode – ST style connectors

9/125 micron single mode – SC style connectors

Maximum insertion loss for any mechanical connector pair is as follows:

LC connectors - .6dB maximum

ST connectors - .75 dB maximum

SC connectors - .5 dB maximum

Optical fiber cables must be installed and left with a minimum of six (6) feet of service loop at each end (after termination), coiled and secured. No fiber optic cables are to be spliced, unless special circumstances dictate and permission to do so is granted by the *Customer*. See drawings for fiber termination types, locations and counts.

Optical fiber splices and terminations must comply with ANSI/TIA/EIA-568-B.3, *Optical Fiber Cabling Components Standard* and with optical fiber components manufacturers' instructions and specifications.

**27 13 33 Communications Coaxial Backbone Cabling**

Installed CATV systems shall be designed to utilize a two-way sub-split RF broadband spectrum with a forward bandpass of 50MHz – 750MHz and a reverse bandpass of 5 MHz – 30 MHz to accommodate two-way digital broadband data services. Amplifiers and other CATV active equipment must support two-way digital broadband services that may be added at a later date.

Large CATV Communications distribution systems may be a trunk and tap design, utilizing PIII .500 plenum CATVP backbone trunk cables that meet or exceed SCTE attenuation requirements for analog video distribution, and 1GHz rated RG-6U cables for subscriber drops.

Smaller CATV distribution systems may be home-run design, using taps and/or splitters with 1GHz rated RG-6U coaxial cable for subscriber drops.

No reverses are permitted in the backbone cable path; use adapters and fittings as needed to avoid reverses.

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All taps, amplifiers, splitters or other CATV active or passive devices installed above ceilings or in other hidden locations must be marked with permanent labels indicating the position of such devices. Such markings must be visible from building spaces easily accessible by humans (i.e. labels on suspended ceiling grid, labels affixed to finished drywall, suspended placards, etc.). Such locations must also be shown on as-built drawings.

Exposed coaxial backbone cables must be strapped or semi-permanently affixed to building structure (walls, decks, columns, etc.) via J-Hooks or other approved methods, or to cable trays. If affixed to cable trays, the cables must be attached either outboard or underneath the trays for identification, maintenance and accessibility. Coaxial cables must be kept separate from UTP cables.

### **AUDIO/VIDEO SERVICES**

Some installed Audio/Video distribution systems may use coaxial cable such as RG-59 or other coaxial cable.

All active or passive devices installed above ceilings or in other hidden locations must be marked with permanent labels indicating the position of such devices. Such markings must be visible from building spaces easily accessible by humans (i.e. labels on suspended ceiling grid, labels affixed to finished drywall, suspended placards, etc.). Such locations must also be shown on as-built drawings.

Exposed coaxial backbone cables must be strapped or semi-permanently affixed to building structure (walls, decks, columns, etc.) via J-Hooks or other approved methods, or to cable trays. If affixed to cable trays, the cables must be attached either outboard or underneath the trays for identification, maintenance and accessibility. Coaxial cables must be kept separate from UTP cables.

### **27 13 33.13 Communications Coaxial Splicing and Terminations**

All splices of PIII .500 CATVP cables shall use integral mandrel steel sleeve connectors. All end-of-line taps, line extenders, amplifiers, power supplies, etc. shall be grounded. RG11 cable shall not be used as backbone/distribution cable. Use appropriate coring tools for all splices. All connectors must use integral mandrel steel sleeves. Center conductors must be clean and free of any foreign matter prior to connecting.

Seal all connections exposed to moisture using approved sealants.

Install 75 Ohm terminators on all unused tap and splitter ports.

Taps and splitters may be located inside TRs, TEs or ERs as needed, or may be installed above ceilings or under access floors. If taps and splitters are installed above ceilings or under access floors, they must be strapped or semi-permanently affixed to building structure (walls, decks, columns, etc.) or to cable trays. If

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affixed to cable trays, taps and splitters must be affixed outboard or underneath the cable tray for ease of maintenance.

All active CATV Outlets must be supplied with pre-terminated station coaxial cables with screw-on F-Type connectors on both ends. See drawings, scope of work and/or job specifications for specific quantities and lengths

**27 13 43 Communications Services Cabling**

**27 13 43.13 Dialtone Services Cabling**

See Section 27 15 00

**27 13 43.23 T1 Services Cabling**

T1 cables will be specified by *Customer* prior to installation. See project drawings or scope of work for specifications.

**27 13 43.33 DSL Services Cabling**

See Section 27 15 00

**27 13 43.43 Cable Services Cabling**

See 27 13 33

**27 13 43.53 Satellite Services Cabling**

Refer to project telecommunications drawings for satellite and antenna cable specifications.

**27 15 00 Communications Horizontal Cabling**

**27 15 00.16 Communications Horizontal Cabling**

There will be no distinction between horizontal cables installed for voice communications use and those installed for data communications. Therefore, horizontal communications cables must be CAT6e or greater. All installed horizontal cables shall be limited to 90m (295 ft.) maximum length, including minimum slack. Cable channels may not include more than one CP (Consolidation Point) or TP (Transition Point).

All horizontal cables must be installed so that a minimum of 3m (10 ft.) of slack is left at the TR, and 1m (3.28 ft.) of slack in the hung ceiling above the Telecommunications Outlet (TO). At the TO, cables must be installed with a minimum of 200mm (8 in.) of slack.

All installed cable channels shall be tested and verified to meet applicable ANSI/TIA/EIA 568-B.1 requirements.

All horizontal cabling channels installed as part of the same Scope of Work are to be comprised of components from the same manufacturer, or from an approved cable/hardware manufacturer partnership (i.e. an installation may NOT consist of some cable channels installed with Manufacturer "A" products and some with Manufacturer "B" products).

Acceptable manufacturers of horizontal cabling are:

- 1) Panduit CAT6e

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- 2) General Cable CAT6e
- 3) Belden/CDT CAT6e
- 4) Commscope Uniprise CAT6e
- 5) Berk-Tek Lan-Mark 1000 CAT6e

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

**NOTE:** In some cases, Customer may require installation of CAT5e or CAT3 horizontal cables to match existing cable installations.

**27 15 00.23 Audio-Video Communications Horizontal Cabling**

Audio-video cable specifications will vary from project to project, depending on type of installation. The *Customer* will select and specify audio-video cables prior to installation.

See project drawings or Scope of Work for specifications on other audio/video cables.

**27 15 00.46 Paging Communications Horizontal Cabling**

Distributed amplified systems are designed to utilize 2-pair 24AWG or 22AWG cables designed to carry both audio and low-voltage signals. The *Customer* will select and specify horizontal cables prior to installation.

**27 15 00.49 Intermediate Frequency/Radio Frequency Communications Horizontal Cabling**

Not applicable to this project. See Section 27 13 33 above and 27 15 33 below for CATV distribution specifications.

**27 15 00.53 Antennas Communications Horizontal Cabling**

Antenna cabling and connectorization will be specified by *Customer* prior to installation. See project telecommunications drawings or Scope of Work for specific requirements.

**27 15 13 Communications Copper Horizontal Cabling**

See 27 15 00.16

**27 15 23 Communications Optical Fiber Horizontal Cabling**

See 27.13.23

**27 15 33 Communications Coaxial Horizontal Cabling**

All CATV subscriber drops shall be 1 GHz rated RG-6 cables that meet or exceed SCTE attenuation requirements for analog video distribution. All RG-6 terminations shall be F-Type connectors that meet or exceed SCTE standards.

Coaxial cables must be plenum-rated where required by Code.

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Subscriber drops must be installed such that the maximum dB level variance between any two service outlets fed from the same tap is 8 dB. PADs may be used to correct service outlets exceeding this requirement.

**27 15 43 Communications Faceplates and Connectors**

Telecommunications Outlets (TOs) will be installed in-wall and in modular furniture applications. TOs will consist of faceplates with modular RJ-45 receptacle connectors and/or other types of connectors for flush and recessed in-wall mounting and mounting to modular office systems.

All TO faceplates will be colored stainless steel, off-white or ivory. See project Scope of Work for details.

Acceptable manufacturers are:

- 1) Panduit Pan-Net
- 2) Commscope Uniprise
- 3) Ortronics Clarity

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

**AUDIO/VIDEO SERVICES**

Some jobs may required off-the-shelf or customer faceplates and/or panels for Audio/Video use. Such plates and panels may require specialized connectors such as VGA, D-SUB, XLR microphone connectors, S-Video, Component video and/or audio, Composite video and/or audio, DVI, HDMI, fiber optic.

**27 16 00 Communications Connecting Cords, Devices and Adapters**

**27 16 13 Communications Custom Cable Assemblies**

If required, see scope of work for details.

**27 16 16 Communications Media Converters, Adapters, and Transceivers**

Media converters, adapters and transceivers will be considered OFE (Owner-Furnished Equipment) unless specified in the project Scope of Work.

**27 16 19 Communications Patch Cords, Station Cords, and Cross Connect Wire**

All connecting hardware used in the premise distribution cabling system must meet the requirements for reliability, safety and transmission performance specified in ANSI/TIA/EIA-568-B series and the NEC. All connectors used to provide connections between 100 ohm balanced twisted-pair cables must meet or exceed the requirements of ANSI/TIA/EIA-568-B.2.

All eight-position jacks shall be wired with the T568B pin/pair assignments.

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The combined length of cables and cords used to connect the cable channel to work area equipment and to equipment located in the TR shall not exceed 10m (33 ft.)

Patch cables used for cross-connecting horizontal distribution cables to data switches in the TRs will be specified on project scope of work. Patch cables used for cross-connecting horizontal distribution cables to voice riser cables in the TRs will be colored GREY

Data station cords used to connect customer devices in work areas will be CAT6 certified or better..

Cable colors will be specified in the project Scope of Work.

Acceptable manufacturers are:

- 1) Panduit TX6 Plus CAT6 Patch Cords
- 2) Commscope Uniprise CAT6 Patch Cords
- 3) Berk-Tek Lan-Mark 1000 Patch Cords
- 4) General Cable CAT6 Patch Cords

*Customer* reserves the right to procure and furnish patch cords and station cords.

All active CATV Outlets must be supplied with pre-terminated station coaxial cables with screw-on F-Type connectors on both ends. See project drawings or Scope of Work for specific quantities and lengths

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

## **27 20 00 DATA COMMUNICATIONS**

All data communications active equipment and software for this project is considered to be OFE (Owner-Furnished Equipment) however the customer may require 27.24.23 Audio-Video Devices.

### **27 24 23 Audio-Video Devices**

## **27 30 00 VOICE COMMUNICATIONS**

All voice communications active equipment and software for this project is considered to be OFE (Owner-Furnished Equipment), and is not included in this specification.

## **27 40 00 AUDIO-VIDEO COMMUNICATIONS**

### **27 41 00 Audio-Video Systems**

*Vendor* may be required to provide and/or install audio-video systems. *Vendor* may also be required to provide Audio/Video equipment that may include controllers, projectors, audio, etc. See project telecommunications drawings or Scope of Work for specific requirements.

### **27 41 13 Architecturally Integrated Audio-Video Equipment**

**27 41 16 Integrated Audio-Video Systems and Equipment**

**27 41 16.28 Integrated Audio-Video Systems and Equipment for Conference Rooms**

*Vendor* may be required to provide and install audio and video communications cabling, equipment and connectors required per project or Scope of Work.

**27 41 16.29 Integrated Audio-Video Systems and Equipment for Board Rooms**

*Vendor* may be required to provide and install audio and video communications cabling, equipment and connectors required per project drawings or Scope of Work.

**27 41 16.51 Integrated Audio-Video Systems and Equipment for Classrooms**

*Vendor* may be required to provide and install audio and video communications cabling and connectors required per project drawings or Scope of Work.

**27 41 16.61 Integrated Audio-Video Systems and Equipment for Theaters**

*Vendor* may be required to provide and install audio and video communications cabling, equipment and connectors required per project drawings or Scope of Work

**27 41 16.62 Integrated Audio-Video Systems and Equipment for Auditoriums**

*Vendor* may be required to provide and install audio and video communications cabling, equipment and connectors required per project drawings or Scope of Work.

**27 50 00 DISTRIBUTED COMMUNICATIONS AND MONITORING SYSTEMS**

**27 51 00 Distributed Audio-Video Communications Systems**

**27 51 13 Paging Systems**

**27 51 13.13 Overhead Paging Systems**

Distributed amplified systems are designed to utilize 2-pair 24 AWG or 22 AWG cables designed to carry both audio and low-voltage signals. The *Customer* will select and specify horizontal cables prior to installation. The *Vendor* will install paging equipment and horizontal cables and connectors per project drawings or Scope of Work.

**DIVISION 28 – ELECTRONIC SAFETY AND SECURITY FOR THE CITY OF AUSTIN**

**DIVISION 28 05 00**

This document specifies requirements for installing structured security cabling and cabling pathway systems within a building.

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Coordinate data, telecom, electrical, grounding, and HVAC requirements with the associated disciplines

**Definitions**

**Customer** - the owner (or owner's agent) of the facility in the structured security cable system is to be installed

**Vendor** - the company contracted to install the structured security cable system herein.

Vendor may be required to provide and install security cabling, equipment and connectors required per project drawings or Scope of Work.

**28 05 00 Common Work Results for Electronic Safety and Security**

**References**

NFPA-70, *National Electrical Code*

NEC-760-21, *Complies with Section of Standards for Non Power Limited Cables*

NEC-760-23, *Complies with Section of Standards for Non Power Limited Cables*

NEC-760-41, *Complies with Section of Standards for Power Limited Cables*

TIA ANSI J/STD-607-A, *Commercial Building Grounding and Bonding Requirements for Telecommunications*

**28 05 13 Conductors and Cables for Electronic Safety and Security**

**28 05 26 Grounding and Bonding for Electronic Safety and Security**

**28 05 28 Pathways for Electronic Safety and Security**

Acceptable manufacturers are:

- 1) Belden
- 2) Remeec

Other manufacturers may be proposed by the *Vendor*, but will be subject to *Customer's* approval prior to procurement and installation.

See drawings or scope of work for sizes, types and other specifications. Cables and cabling hardware will be specified on project telecommunications drawings or scope of work by *Customer*, and may not be substituted without prior written consent by *Customer*.