SECTION 27 05 00
COMMON WORK RESULTS FOR COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes, but is not necessarily limited to, common standards and procedures for the Communications Work.

B. This Section outlines areas of responsibility between Owner, Architect, and Contractor.

C. Owner will assist with a collaborative process to determine the most cost effective and efficient means to reach the common goal of providing communications within the facility for the project, including assessing user needs and assessing required pathways. The Owner is available upon request to assist at no additional cost to the project. It is incumbent upon the construction team management to approach and engage the Owner at the appropriate times for collaboration.

D. As part of the project, the construction team must design, engineer, and provide complete, all means of support, suspension, attachment, fastening, bracing, and restraint (hereinafter “support") of the Communications Systems; and provide engineering of such support by parties licensed to perform work of this type in the project jurisdiction.

1.2 ITEMS PROVIDED BY OWNER

A. Registered Communications Distribution Designer (RCDD) support services

B. IT project management

C. Submittal approvals

D. Network equipment

E. 802.11 Wireless Access Point hardware

1. Installation by construction team when wireless access point mounting requires seismic support or a construction activity such as screwing, drilling, or welding
2. Owner will provide 802.11 design services

F. Rack and Stack

G. Plug Pack Distribution (Pre-terminated switch port cabling provided and installed by the Owner)

H. Patch Cords and Patching

I. IT UPS System (installation by construction team)

J. PDU Power distribution Equipment

K. VOIP Router, Voice Gateway, VOIP equipment

L. Camera NVR/Server

M. Overhead Paging Amplifier

N. TV Distribution Amplifier

O. Closet Cleaning postproduction

1.3 ITEMS PROVIDED BY CONSTRUCTION TEAM

A. Building Drawings and Floor Plans

B. Site Plans

C. Furniture Plans

D. As-Built Drawing Submittals
   1. As-built drawing per section 1.10
   2. Cabling Schedule
   3. Desktop Inventory Sheet
      a. Spread sheet listing cable number and location for every cable installed
         1) Cable number; room number, wall (north, south, east, west)

E. Attachments to structure

F. In wall cabling

G. In wall cabling supports

H. Wireless Access point seismic support installation where required.

I. Cabling test results

J. Patch Panels

K. Horizontal Wire Managers

L. Vertical Wire Managers (installation by construction team)

M. Racks for mounting cabling and equipment (installation by construction team).

N. Horizontal cable, jacks, faceplates, surface mount boxes, cable trays, termination hardware, and all materials needed for a complete horizontal cabling plant as defined in the Section and associated Sections and the construction documents not otherwise listed for provision by the Owner.

O. Fiber housing, cassettes, and splicing.

P. Construction Clean Closet Cleaning

1.4 RELATED SECTIONS

A. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

B. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

E. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.5 REFERENCES AND STANDARDS

A. Reference to codes, standards, specifications and recommendations of technical societies, trade organizations and governmental agencies shall mean that latest edition of such publications adopted and published prior to submittal of the bid. Consider such codes or standards a part of this Specification as though fully repeated herein.

1. UC Davis Health Telecommunications Standards
2. American National Standards Institute (ANSI)
3. Telecommunications Industry Association (TIA)
4. Building Industry Consulting Services International (BICSI)
5. American Society for Testing and Materials (ASTM)
6. Institute of Electrical and Electronic Engineers (IEEE)
7. National Electrical Manufacturers Association (NEMA)
8. Underwriters Laboratories, Inc. (UL)
9. Local Authorities Having Jurisdiction (AHJ)

B. Codes: Perform Work executed under this Section in accordance with applicable requirements of the latest edition of governing codes, rules and regulations including but not limited to the following minimum standards, whether statutory or not:

1. United States Department of Labor (DOL) Regulations (Standards - 29 CFR)
2. Part 1910, “Occupational Safety and Health Standards”
3. California Code of Regulations (CCR) Title 24, California Building Standards Code Part 2, Basic Building Regulations and Part 3, California Electrical Code (CEC).
4. 2022 California Building Code (CBC).
5. 2022 California Fire Code (CFC).
6. 2022 California Mechanical Code (CMC).
7. National, State and any other binding building and fire codes.
8. FCC Regulations:
    a. Part 15 – Radio Frequency Devices & Radiation Limits
    b. Part 68 – Connection of Terminal Equipment to the Telephone Network
9. Underwriter's Laboratories (UL): Applicable listing and ratings, including but not limited to the following standards:
    a. UL 444: Communications Cables
    b. UL 497: Protectors for Paired-Conductor Communication Circuits.
    c. UL 1651: Optical Fiber Cable
    d. UL 1690: Data-Processing Cable
    e. UL 1963: Communications-Circuit Accessories
    f. UL 2024A: Optical Fiber Cable Routing Assemblies.
10. ANSI/TIA/EIA-568.1-E Commercial Building Telecommunications Cabling Standard.
11. ANSI/TIA/EIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
12. ANSI/TIA/EIA-598-D Optical Fiber Cable Color Coding.
13. ANSI/TIA/EIA-606-C Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
14. ANSI/J-STD-607-D Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
15. ANSI/TIA/EIA-758-B Customer-Owner Outside Plant Telecommunications Cabling Standard.
16. EIA testing standards.
17. Insulated Cable Engineers Association (ICEA):
    a. ANSI/ICEA S-83-596-2016 Fiber Optic Premises Distribution Cable
    b. ANSI/ICEA S-87-640-2023 Fiber Optic Outside Plant Communications Cable
    c. ANSI/ICEA S-90-661-2021 Category 3, 5, & 5e Individually Unshielded Twisted Pair Indoor Cable for Use In General Purpose and LAN Communication Wiring Systems
    d. ICEA S-104-696-2019 Standard for Indoor-Outdoor Optical Cable
18. Telecommunications Distribution Methods Manual (TDMM)

1.6 ABBREVIATIONS

A. ADA Americans with Disabilities Act

B. AFC Above Finished Ceiling

C. AFF Above the Finished Floor

D. BDF Building Distribution Frame – See Telecommunications Room (TR)

E. BLDG Building

F. CAT Category (Related to network cable types)

G. DIV Division

H. (E) Existing

I. ER IT Equipment Room – See Telecommunications Room (TR)

J. GE Grounding Equalizer – Part of the Telecom Grounding System

K. HR Homerun

L. ID Inside Diameter

M. IDF Intermediate Distribution Frame – See Telecommunications Room (TR)

N. IT UC Davis Health IT Department (also UC, UCDH, UCD IT, IT Facilities)

O. LAN Local Area Network

P. MAX Maximum

Q. NIC Not in Contract

R. OD Outside Diameter

S. TBB Telecom Bonding Backbone – Part of the Telecom Grounding System

T. TGB Telecommunications Ground Busbar

U. TMGB Telecommunications Main Ground Busbar

V. TR Telecommunications Room, TR may also be used interchangeably with ER, IDF, MDF, or Communications Room

W. TYP Typical

X. UCD UC Davis Health IT Department (also UC, UCDH, UCD IT, IT Facilities)

Y. UFE University Furnished Equipment

Z. UON Unless Otherwise Noted

1.7 DEFINITIONS

A. Telecommunications Room (TR) – An enclosed space for housing telecommunications equipment, cable, terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and the horizontal cabling. The minimum size of a TR shall be 10’ x 16’

B. Intermediate Distribution Frame (IDF) – See Telecommunications Room (TR)

C. Entrance Facility (EF) (Telecommunications) – An entrance to the building for both private and public network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space. The minimum size of a TR shall be 10’ x 16’

D. Pathway – A physical infrastructure utilized for the placement and routing of telecommunications cable.

E. Infection Control – Clinical Environment Infection Control or ICRA

F. “Cabling”: A combination of cables, wire, cords, and connecting hardware [e.g., cables, conductor terminations, connectors, outlets, patch panels, blocks, and labeling].

G. “Identifier”: A unique code assigned to an element of the telecommunications infrastructure that links it to its corresponding record.

1.8 QUALITY ASSURANCE

A. Contractor Firm Qualifications:

1. All work for the Communications (low voltage) Infrastructure installation shall be self-performed by the Communications Contractor; subcontractors shall not be allowed under the Communications Contractor unless approved by UCDH.

B. Communications Contractor shall:

1. Be a Panduit Corp. PCI (Panduit Certified Installer) Design and Installation Contractor or approved equal.
2. Be a firm which is regularly and professionally engaged in the installation and testing of the specified communications equipment and infrastructure.
3. Be licensed to install low voltage electronic cabling systems in the State of California where applicable (C7 License).

C. Communications Contractor shall demonstrate experience in providing successful installation of data infrastructure systems:

1. Submit documentation for a minimum of three and a maximum of five successful low voltage communications infrastructure system installation projects completed within the past three years.

D. Contractor Key Personnel Qualifications:

1. Provide key personnel who are regularly and professionally engaged in the business of the application, installation and testing of the specified low voltage communications systems, equipment and infrastructure. There may be one key person or more key persons proposed for this project depending upon how many of the key roles each has successfully provided.

2. Each of the key personnel shall demonstrate experience in providing successful low voltage communications systems, equipment and infrastructure within the past three years.

E. A Registered Communications Distribution Designer (RCDD) shall be employed by the Design Builder and directly engaged in the project for all Communications Infrastructure design and installation efforts.

1. The RCDD shall be a direct employee of the Communications Contractor, within the Design Build team structure.

2. The RCDD shall be required to have oversight and supervision of the entire Communications Infrastructure installation process and quality control.

3. The RCDD shall be the Design Builder's Designer of Record for the Communications Infrastructure scope of work.

4. RCDD direct responsibilities shall include but may not be limited to: Thorough coordination with Owner regarding all design and installation efforts related to the project. A Pre-construction coordination meeting and site inspection with Owner prior to beginning any work. Oversight of Communications installation efforts, development of shop drawings and assembly of product data submittals. Quality control review and stamping of finalized Communications as-built drawings for submittal to Owner. Quality control review of Communications systems installation throughout the entire construction phase, to ensure all work is performed in compliance with approved construction drawings.

F. Critical on-site quality control installation reviews to be conducted in conjunction with Owner technical staff shall include but may not be limited to:

1. Validation of design to conform with Infection Control guidelines required as it applies with the type of structure and services to be provided in each specific area.

2. Verifying proper installation of all Communications cable tray, backbone conduits, device back boxes, conduit infrastructure and cabling pathways. Site inspection and sign-off must be performed prior to concealing conduit infrastructure and prior to the installation of any low-volt cabling.

3. Verifying proper installation of all Communications cabling. Site inspection and sign-off must be performed prior to closing-up associated accessible ceilings.

4. Verifying the layout and installation of all equipment and cabling within the Telecom Rooms, throughout the duration of the construction phase.

G. Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered cabling Installers, Technician Level. Submit documentation of current BICSI certification for each of the key personnel. Submit documentation for a minimum of three and a maximum of five successful cabling system installations for each of the key personnel in an environment resembling that which is being bid upon.

1. In lieu of BICSI certification, supervisors and installers assigned to the installation of this system or any of its components shall have a minimum of three years' experience in the installation of the specified copper and fiber optic cable and components. The personnel on site performing work pertaining to this job shall be certified on the system being installed. They shall have factory or factory approved certification from each equipment manufacturer indicating that they are qualified to install and test the provided products.

2. Submit documentation for a minimum of three and a maximum of five successful cabling system installations for each of the key personnel in an environment resembling that which is being bid upon. Documentation for each key person shall include at least two successful system installations provided that are equivalent in system size and in construction complexity to the telecommunications system proposed for this project. Include specific

experience in installing and testing telecommunications systems and provide the names and locations of at least two project installations successfully completed using optical fiber and copper telecommunications cabling systems.

3. All the existing telecommunications system installations offered by the key persons as successful experience shall have been in successful full-time service for at least 18 months prior to the issuance date for this project.

4. Provide the name and role of the key person, the title, location, and completed installation date of the referenced project, the referenced project Owner point of contact information including name, organization, title, and telephone number, and generally, the referenced project description including system size and construction complexity.

H. Indicate that all key persons are currently employed by the Communications Contractor or have a commitment to the Communications Contractor to work on this project. All key persons shall be employed by the Communications Contractor at the date of issuance of this project, or if not, have a commitment to the Communications Contractor to work on this project by the date that the bid was due to the Owner's Representative.

1. Note that only the key personnel approved by the Owner's Representative in the successful proposal shall perform work on this project's low voltage systems, equipment, and infrastructure. Key personnel shall function in the same roles in this contract, as they functioned in the offered successful experience. Any substitutions for the Communications Contractor's key personnel require approval from the Owner's Representative.

I. Designated Supervisor: Designate which key person will serve as a designated supervisor for the project. This supervisor shall be present and responsible for the project site during all phases of installation and testing of the Work in this Section. This supervisor shall be the same individual through the execution of the Work unless illness, loss of personnel, or other circumstances reasonably beyond the control of the Contractor intervene.

1.9 SUBMITTALS

A. All Submittals shall be provided electronically in PDF format. All Drawing Submittals shall be provided in PDF and AutoCAD (latest version) DWG format.

B. Submittals shall be organized in a coordinated package complete with all information specified herein. Incomplete or uncoordinated submittals will be returned with no review action.

C. Contractor shall submit the following items:

1. Contractor Key Personnel and Certifications
2. Complete Bill of Materials (BOM) List
3. Manufacturer Product Data Sheets, as defined below
4. Shop Drawings, as defined below
5. Proposed Installation Schedule
6. Cabling Certification Test Plan and proposed test equipment

D. Manufacturer Product Data Submittals shall include:

1. Submit product data sheets for all equipment being provided.
2. Collate in sequence by Section Number, and clearly mark proposed product on data sheet. Include Safety Data Sheet, where applicable.
3. Clearly identify any proposed product substitutions or known deviations.

E. Precede each submittal book with a summary TOC. per example schedule below:

1. Specification Section
2. Drawing Reference
3. Manufacturers Model No.

F. The following is a general summary list of Submittal items required to be delivered at 30-day burn-in period.

1. As part of project close-out activities, Contractor shall submit Record Documents for review and approval by the Owner.
2. All Record Documents shall be provided electronically in PDF format. All Record Document Drawings shall be provided in PDF and AutoCAD (latest version) DWG format.

1.10 CLOSEOUT SUBMITTALS

A. Contractor shall submit the following items:

1. Record As-Built Shop Drawings indicating the final, 'as-built' condition of all associated equipment, infrastructure, and work.

B. Shop Drawing Submittals shall include:

1. Drawing index/symbol/schedule sheet.
2. Clearly indicate all new work versus existing work.
3. Site Plans, Floor Plans, and Reflected Ceiling (work 7' AFF+)
4. Drawings shall be developed in AutoCAD .DWG format, utilizing most current architectural backgrounds available for the project.
5. All drawings shall be properly scaled.
6. Indicate all device locations and types. Include addressing for all network outlets.
7. Indicate all cabling routes, types and quantities.
8. Indicate all conduit routing, quantities, sizes, and wire fill. Indicate basket tray and J-hook routes.
9. Indicate fire stopping requirements for all penetrations.
10. Indicate 'cable bundle groups' no larger than:
    a. CAT6A – 74
11. When bundling low voltage cabling together the lowest common denominator determines the largest cable group allowed unless the cable is LP listed.

C. Riser Diagrams indicating:

1. Backbone cabling and termination locations. Associated cabling pathways, sizes and cable fill. Telecommunications Grounding System.

D. Enlarged Room Plans and Elevations indicating:

E. Provide dimensioned drawings for all telecommunications rooms. Complete, dimensioned rack and wall elevations of all equipment. Consideration must be given to equipment heights within. Plywood backboards and grounding equipment.

F. Racks, cabinets, cable tray, ladder rack, wire management. Termination equipment for all copper and fiber cabling. Conduit and cable entrance points and fire stopping. Electrical panels, power circuits and HVAC provisions.

G. Ensure coordinated arrangement of equipment with other trades. Typical Device Installation Details indicating: J-hooks, conduit, cable tray, and associated support systems. Network outlet faceplate layout and wiring terminations. Device back box and conduit rough-in requirements.

H. Details of other associated devices and equipment.

I. The shop drawing package must be stamped and signed by a Registered Communications Distribution Designer (RCDD). Signatures by a Professional Engineer (PE) licensed in the project jurisdiction for work of this type as required by the AHJ.

J. Cable Certification Test Results. Submit electronically in native format and include associated software license as applicable.

K. Completed punch list reports.

L. Manufacturer Operation and Maintenance (O&M) Manuals.

M. Warranty information.

N. Keys and any portable equipment.

1.11 WARRANTY SERVICE

A. Closeout Submittals, Warranties and Guarantees, provide the following.

1. Response Time: Provide a qualified technician familiar with the work at the project site within four hours after receipt of a notice of malfunction. Provide the Owner's Representative with telephone number attended 10 hours a day, five days a week, to be called in the event of a malfunction.

2. Provide all Warrantees as defined in each Communication Systems Section.

B. PanGen Structured Cabling Solutions System Warranty

1. Contractor shall provide a Panduit Certification Plus System Warranty on all installed copper and fiber permanent links. Such warranty shall provide a complete system warranty to guarantee high end-to-end performance for all applications designed to operate over the class of cabling installed. The guarantee shall include all connectivity components and cable within the permanent link and cover the system for duration of 25 years.

PART 2 - MATERIALS

2.1 COMMUNICATIONS SYSTEMS PRODUCTS SUMMARY

A. The following is a general summary list of Communications Systems equipment, components, and cabling required for the project. This is not intended to be a comprehensive list of materials. See additional Sections for complete materials requirements.

B. Racks: Seismic racks shall be RXL (# RXL-2823-BK80T). Standard racks shall be RXL (# RXL-2200-BK80T). Racks will be 8’ high for new builds and remodels where space is available. 7’ high racks will be used as an alternate where space is not available for taller racks.

C. Wire Managers: Panduit PE2V Series full height vertical cable manager.
   1. 10" Wide Front/Back unless otherwise noted on plans
   2. 96 inch or 84 inch sized to match the racks being installed.

D. Primary Bonding Busbar (PBB) & Secondary Bonding Busbar (SBB); CPI_Mfg.Part:40153-012

E. Data Patch Panels: Panduit CP48BLY

F. Fiber Terminations: LC

G. Modular Jack CAT6A
   1. Panduit Mini-Com CJ6X88TGVL
   2. Colored Icons as needed per UC service designation
   3. Icons are Panduit PAN_CID(XX) (gray for cables in ceiling)

H. Copper cabling, Category 6A (Data)
   1. High Speed, TIA Category 6A cabling, Plenum Rated
   2. General Cable GenSpeed 6A Part No. 7151855 Purple

I. Copper cabling, Category 6A Shielded (VOIP Paging)
   1. High Speed, TIA Category 6A cabling, Plenum Rated
   2. General cable GenSpeed 6A Part No. 7151855 purple

J. Telecommunications Outlets (Workstation side)
   1. Modular Furniture Surface Mount Box, Black
   2. Panduit CBX2BL-AY (2-port), CBX4BL-AY (4-port)
   3. Modular Surface Mount Box Attachment System - Mini-Com CBM-X magnetic
   4. Modular Surface Mount Box Blank Insert - Panduit CMB(BL)

K. Faceplate (Workstation side)
   1. Panduit Mini-Com Stainless Steel Faceplates Single Gang CFP {2,4,6} SY or Double Gang CFP {4,8,10} S-2GY
   2. Faceplate Blank Insert – Panduit CMB(WH)

PART 3 - EXECUTION

3.1 TELECOMMUNICATIONS SPACES

A. Telecom Room (TR) minimum size 10' x 15'.

B. UC Davis Health Telecommunications Standards do not include provisions for AV, unless otherwise indicated in the Design Criteria for the project. IT will be cooperative in assessing some parameters as they interact with IT support systems.

C. Telecommunication Spaces are to use EZ-Path Fire-Rated Pathways systems for cabling access.

D. Provide 36" of working clearance in front and back of racks and electronic equipment.

E. A positive pressure type of HVAC system using hot and cold aisles.

F. Walls shall be covered with fire-resistant treated plywood from 6” AFF to 8’6” AFF, and all surfaces sealed to mitigate airborne dust.

G. IT uses a typical three-rack configuration with a B-line seismic for equipment and a standard 19" rack for cabling. Vertical wire management for planning shall be sized at 10" unless otherwise noted on the drawings.

H. Lighting shall be provided with a minimum of 500 lux (50 foot-candles) measured at any point in the TR, including 6 inches above the finished floor. Photometrics shall consider position of racks and equipment and light fixtures shall be placed to prevent shadows between rows of equipment racks.

I. TR Floors shall be covered in VCT (Vinyl Composition Tile) or Epoxy. Sealed concrete is not acceptable.

J. Mechanical equipment of fixtures that are not directly related to the support of the TR shall not be installed of pass through the TR per California Mechanical Code 2022: 320.4.2.

K. Plumbing Equipment and fixtures that are not directly related to the support of the TR shall not be installed in or pass through the TR per California Plumbing Code 2019: 310.13

L.

3.2 RACK COMPONENTS AND ELEVATIONS

A. Owner will develop an equipment layout and rack elevation including the Telecom Room (TR) layouts. Typical components within the TR include, but not limited to:

1. Network Equipment
2. Fiber Termination Unit
3. UPS/ PDU I Power distribution
4. NM2/ NM4/ Horizontal wire management
5. VOIP Router/Voice Gateway
6. VOIP transition equipment
7. Voice cabling
8. Distribution Patch Panels
9. Clinical Engineering Equipment
10. Plug Pack Distribution
11. Camera NVR /Server
12. Nurse Call Devices
13. Overhead Paging Amplifier

B. See related Sections for materials provided by the Owner and those furnished by the Contractor.

3.3 EXAMINATION

A. Conditions: Verify conditions, provided under other sections, are acceptable for product installation in accordance with manufacturer's instructions.

B. Pathways: Verify that pathways and supporting devices, provided under other sections, are properly and permanently installed, and that temporary supports, devices, etc., have been removed.

C. Field Measurements: Verify dimensions of pathways, including length of pathways. For example, “true tape” the conduits to verify cabling distances.

3.4 FIELD QUALITY CONTROL

A. Staffing: Provide a qualified foreman who is in charge of the Work and who is present at the job site at times Work is being performed. Supervise the work force executing the Work. Perform the installation within the restraints of the construction schedule.

B. Project Management: Coordinate and attend weekly status meetings to review the overall progress and issues to be resolved throughout the course of construction. Prepare and distribute meeting agenda prior to and meeting notes after meetings in a format acceptable to the General Contractor.

C. Scheduling: Prepare an overall construction schedule based on the results of the planning meetings with the General Contractor. Issue schedule to General Contractor for approval. Prepare and issue updated schedules whenever there are modifications.

D. Inspection: Perform inspection after installation. Keep areas of work accessible and notify code authorities, or designated inspectors, of work completion released for inspection. Document completion, and inspection as required.

3.5 INSTALLATION

A. Conform to applicable federal, state and local codes, and telephone standards.

B. Attend one pre-construction meeting with the Owner to coordinate the requirements of the communications systems.

C. Coordinate the entire installation with the General Contractor, and their subcontractors, to meet the construction schedule. Include coordination meetings as required to fulfill this requirement.

D. Manufacturer's Instructions:

1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.

E. Maintain jobsite file and comply with Material Safety Data Sheets (MSDS) for each product delivered to jobsite.

3.6 REPAIR/RESTORATION

A. Replace or repair work completed by others that you deface or destroy. Pay the full cost of this repair/replacement.

B. Paint damaged areas to existing painted surfaces caused by Work.

C. Punch List:

1. Inspect installed work in conjunction with the General Contractor and develop a punch list for items needing correction.

2. Provide punch list to Owner for review prior to performing punch walk with Owner.

D. Re-Installation:

1. Make changes to adjust the system to optimum operation for final use. Make changes to the system such that any defects in workmanship are correct and cables and the associated termination hardware passes the minimum test requirements.

2. Repair defects prior to system acceptance.

E. Cleaning

1. Clean daily. Remove temporary coverings and protection of adjacent work areas. Remove unused products, debris, spills, or other excess materials. Remove installation equipment.

2. Leave finished work and adjacent surfaces in neat, clean condition with no evidence of damage.

3. Repair or replace damaged installed products.

4. Clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance. Legally dispose of debris.

3.7 DEMONSTRATION

A. On completion of the acceptance test, schedule a time convenient with the Owner or Owner’s Representative for instruction in the configuration, operation, and maintenance of the system.

B. Provide 4 hours, minimum, of on-site orientation and training by a factory-trained representative. Document dates and times of training and submit a “sign in” sheet for individuals trained, as part of the close out documentation.

3.8 CERTIFICATION

A. Provide to Owner or Owner’s Representative a written form of acceptance for signature. Corrections must be completed before Owner or Owner’s Representative and Engineer will give acceptance.

END OF SECTION

SECTION 27 05 26
GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes grounding and bonding of communications work, including but not limited to:

1. Cable shields, communications racks, cabinets and enclosures

1.2 SYSTEM DESCRIPTION

A. Provide telecommunications grounding system as described herein.

B. Except as otherwise indicated, the complete communications installation including the racks, cabinets, panels, cable tray, runway, lightning protectors cable shields and splice cases provided under the work of this project shall be completely and effectively grounded in accordance with all Code and Standards requirements, whether or not such connections are specifically shown or specified.

C. Resistance:

1. Resistance from the farthest ground bus through the ground electrode to earth shall not exceed 5 Ohms or the requirements of ANSI-J-STD-607-D-2019, whichever is more restrictive.

1.3 DEFINITIONS

A. Definitions as described in Section 27 05 00 shall apply to this section.

1.4 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

E. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.5 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements of Section 27 05 00

B. Strictly adhere to all Telecommunications Industry Association (TIA) recommended installation practices when installing Bonding and Grounding.

C. Material and work specified herein shall comply with the applicable requirements of:

1. TIA-568.1-E: Commercial Building Telecommunications Wiring Standard
2. TIA-569-E: Commercial Building Standard for Telecommunications Pathways and Spaces
3. TIA-607-D: Commercial Building Grounding and Bonding Requirements for Telecommunications
4. ANSI/TIA– 606-C Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

1.6 WARRANTY

A. Match warranty Section 27 05 00

PART 2 - PRODUCTS

2.1 PRIMARY BONDING BUSBAR (PBB) & SECONDARY GROUNDING BUSBAR (SBB)

A. The TBB and SBB provide a central ground attachment point for telecommunications bonding backbones, TR equipment, racks, cable runways, sleeves, and other system located in the Telecommunications Room. All Grounding Bus bars shall be UL listed. Hole patterns on Bus bars accommodate two-hole lugs per the recommendation of BICSI and TIA-607 standards. Insulators electrically isolate Bus bars from the wall or other mounting surfaces.

B. Manufacturer:

1. CPI Mfg. Part: 40153-12
2. Or approved equal

2.2 GROUNDING AND BONDING CONDUCTORS

A. General purpose insulated: UL listed and code sized copper conductor, with dual rated THHN/THWN, insulation color identified green.

1. Cable jacket marking:

a. Must be legible and shall contain the following information: Manufacturer's name

b. Copper conductor gauge, UL listing

c. Cable jacket shall be green with black lettering

B. Telecommunications Bonding Backbone cable:

1. 3/0 AWG THHN/THWN CU- Must be UL listed.

C. Telecommunications Bonding Conductor:

1. Sizing of the telecommunications bonding conductor per ANSIJ-STD-607-D

2. Size TBCs as the greater of 6 AWG or based on length of run using 1000CM/linear foot.

TBB/GE linear length m (ft)	**TBB/GE size (AWG)**
less than 4 (13)	6
4 - 6 (14 - 20)	4
6 - 8 (20 - 26)	3
8 - 10 (26 - 33)	2
10 - 13 (33 - 44)	1
13 - 16 (44 - 52)	1/0
16 - 20 (52 - 66)	2/0
20 - 26 (67 -84)	3/0
26 - 32 (85 - 105)	4/0
32 - 38 (106 - 125)	250 kcmil
38 - 46 (126 -150)	300 kcmil
46 - 53 (151 - 175)	350 kcmil
53 - 76 (176 - 250)	500 kcmil
76 - 91 (251 - 300)	600 kcmil
Greater than 91 (301)	750 kcmil

D. Manufacturers:

1. General Cable

2. Harger Lightning & Grounding

3. Or approved equal

2.3 COMPRESSION CONNECTOR LUG

A. Long-barrel compression lugs shall be used on all ground wire. Copper alloy body.
   1. Provide lug size to match conductor being terminated.
   2. Provide 2-hole pattern lugs.
   3. Provide each lug with silicon bronze hardware, including 2 bolts, 2 split lock washers and 2 nuts.
   4. UL listed.

B. Manufacturer:
   1. Panduit.
   2. Harger Lightning & Grounding GECLBxxx (xxx depending on cable Size).
   3. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the execution requirements of Section 27 05 00.

3.2 EXAMINATION

A. Examine existing Telecommunications Grounding Backbone system prior to the start of work within this section. The Telecommunications Contractor is solely responsible to ensure work proposed within this section is fully compatible, in the opinion of the Engineer, with the existing Telecommunications Grounding Backbone system.

3.3 CONNECTIONS TO STRUCTURAL STEEL, GROUND RODS, OR SPLICES

A. Where required by the Specifications, grounding conductors shall be spliced together, connected to ground rods, or connected to structural steel using exothermic welds or high-pressure compression type connectors.

B. Exothermic welds shall be used for cable-to-cable and cable-to-ground rod and for cable to structural steel surfaces. Exothermic weld kits shall be as manufactured by Harger Lightning & Grounding, Cadweld, Thermoweld or approved equal. Each particular type of weld shall use a kit unique to that type of weld.

C. High-pressure compression type connectors shall be used for cable-to-cable connections. Connections shall be as manufactured by Thomas & Betts #53000 series, Burndy "Hy-Ground or approved equal.

3.4 GENERAL EXECUTION

A. Provide Grounding & Bonding according to the most restrictive requirements of ANSI-J-STD-607-B, California Electrical Code Article 250 and references therein and California Electrical Code Article 800.

1. In the event of conflicting requirements, California Electrical Code requirements shall prevail.

B. Contractor shall supply all materials required to furnish and install a complete functional telecommunications grounding system.

C. The grounding system shall be installed in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.

D. Point of connection:

1. Under Work of this Section, install a complete Telecommunications Grounding System, leaving only the physical connection between the PBB and Building Service Entrance Ground for work under Division 26 Electrical.

E. Ground bar installation

1. The C-10 Contractor shall install a ground bar in each Telecom Room to which all ground wires, grounding terminal points within the room, and Telecommunications Bonding Backbone conductors will terminate.

F. Telecommunications Bonding Conductor:

1. Install TBCs in a manner that will protect them from physical and mechanical damage.
2. Routing:
    a. Route TBCs in the shortest possible path, using right-angles for turns and routed parallel to building lines.
    b. Utilize a minimum 1-foot bend radius.
3. At PBB/SBBs:
    a. Thoroughly clean non electrotin-plated busbar prior to fastening the conductors, bolts, or connectors to the busbar.
    b. Attach lugs to busbar with appropriate size cadmium bronze bolt, flat washer and Belle-ville washer.
4. Torque connections.

G. Rack Bay & Overhead Cable Support Bonding

1. Rack Bay: Bond equipment racks, frames, frame bays, cabinets, server racks, and other similar support systems located within the same room or space as the PBB/SBB to the busbar.
2. Overhead Cable Support:
    a. Bond overhead runway located within the same room or space as the PBB/SBB to the busbar.
    b. Provide “grounding kit” (straps & connectors) to bond sections of cable runway for ground continuity. This requirement shall apply to sections of cable runway within a single communication room.

H. Bonding to Building Steel

1. A bond shall be made in each TR from building steel (where available) to the PBB/SBB.

3.5 LABELING

A. General Requirements

1. Labeling, identifier assignment, and label colors shall conform to TIA/EIA-606-A Administration Standard and as approved by Owner's Representative before installation.
2. Permanently label TBCs. Affix label as close as practical to each end of the conductor.

B. Label Format

1. Labels shall be permanent with machine-generated text; handwritten labels will not be accepted.
    a. Labels shall be a minimum of 1" wide
    b. Text shall be minimum 12-point font.
2. Labels on TBCs shall fully wrap around conductors with a self-laminating feature to provide permanent marking.

C. Identifier Assignment

1. Label PBB and SBB with TR room number.
    a. Example: PBB-1900, SBB-1310
2. Separate label fields of the identifier with a hyphen.
3. TBC:
    a. First field: "TBC" (the bonding conductor type).
    b. Second field: The room identity where TBC exists; for example: "B01-TDA".
    c. Third field: A unique sequential number; for example: "01", "02", etc.
    d. Example: "TBC–B01-TDA–01"

3.6 RECORDS

A. Communication Bonding System records shall conform to TIA/EIA-606-C Administration Standards. Each component shall have as a minimum, the information as outlined in TIA/EIA-606-C.

3.7 ACCEPTANCE

A. Review bonding configuration after all cabling and equipment is installed for approval by project IOR representative.

END OF SECTION

SECTION 27 05 29
HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of communications supports and cable hook system as described in this specification, including but not limited to:

1. Strut supports
2. Cable hooks (J-hooks)
3. Beam clamps
4. Concrete fasteners
5. Touch-up materials
6. Conduit supports
7. Equipment supports
8. Fastening hardware
9. Poke-through device

1.2 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections for support of communications equipment specified for this project.

B. Provide support systems that are adequate for the weight of equipment, conduit and wiring to be supported.

1.3 SEISMIC REQUIREMENTS

A. Seismic design requirements criteria, as shown on all drawings related to the project, including architectural and structural, as defined below shall apply to all work defined within the following specification sections:

1. SECTION 27 05 00 COMMUNICATIONS HORIZONTAL CABLING
2. SECTION 27 05 26 GROUNDING AND BONDING OF COMMUNICATIONS SYSTEMS
3. SECTION 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
4. SECTION 27 11 16 COMMUNICATIONS CABINETS RACKS FRAMES AND ENCLOSURES
5. All support systems and termination apparatus associated with the telecommunications system.

B. Contractor to install seismic restraints for all telecommunications racks and UPS systems. In accordance with construction documents. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

C. Installation according to engineered drawings and anchorage calculations provided by the structural engineer in accordance with California Code of Regulations, Title 24, 2007 California Building Code.

D. Supports for such items, including racks, conduit, cable trays and similar shall provide support, bracing, and anchorage, designed by the structural engineer in accordance with CBC Chapter 16A.

E. Supports to be sized to suit load and selected to match mounting conditions

1.4 REFERENCES

A. Comply with References requirements of Section 27 05 00

B. In additional to those codes, standards, etc., listed in Section 27 05 00, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. ASTM A 510 Specifications for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel.
2. ASTM B 633 Specifications for Electrodepositing Coatings of Zinc on Iron and Steel, Sections SC2 and SC3.
3. ASTM A 653 Specifications for Steel Sheet, Zinc-Coated (Galvanized) by Hot Dip Process.
4. ASTM A 591 Specifications for Electrodepositing Coatings of Zinc on steel wire or sheets.
5. ASTM A 123 Specifications for Zinc (Hot Galvanized) Coatings on Iron and Steel.

1.5 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

E. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.6 DEFINITIONS

A. Definitions as described in Section 27 05 00 shall apply to this section.

B. “Cable Hanger”: A metal, most often steel, cable support device shaped (section view) similar to the letter J; alternately, a fabric strap. The device is available in different sizes supporting different quantities of cables and is also available with different attachment hardware to be supported by different methods (e.g., wire support, beam flange clip, etc.).

C. Cable Runway or Ladder Rack: Overhead means to get cabling from point to point whether it be vertical or horizontal within Telecommunications Spaces such as TR’s and the TER.

D. “J-Hook”: Another name for cable hangers.

PART 2 - PRODUCTS

2.1 FASTENERS, STRAPS, AND BEAM CLAMPS

A. Equal products by the following manufacturers will be considered providing that all features of the specified product are provided:

1. Concrete fasteners
    a. Hilti.
    b. Phillips "Red-Head."
    c. Remington.
    d. Ramset.
    e. Simpson Strong-Tie.
    f. Or approved equal.
2. Concrete inserts and construction channel:
    a. Unistrut Corp.
    b. GS Metals "Globe Strut."
    c. Thomas & Betts.
    d. "Kindorf" Corp.
    e. Or approved equal.

3. Conduit straps:
    a. 0-Z/Gedney.
    b. Erico "caddy" Fastening Products.
    c. Thomas & Betts.
    d. "Kindorf" Corp.
    e. Or approved equal.
4. Beam Clamps
    a. Cooper B-line.
    b. SuperStrut.
    c. Unistrut.
    d. Or approved equal.

2.2 CABLE HANGERS

A. Ceiling Hung J-Hooks

1. Specifically intended to carry the load of up to 74 communications cables without applying excess forces to cables at bottom of bundle.
2. Integral broad bottom edge to spread cable load with flat bottom and provide a minimum of 1-5/8" cable bearing surface.
3. Integral hanger rod attachment hardware at top. Load rated for application.
4. Incorporates smooth 90-degree radius edges to prevent snagging cable jackets on installation.
5. Designed so the mounting hardware is recessed to prevent cable damage.
6. Integral mechanical cable latch retainer to provide containment of cables within the hook. The retainer shall be removable and reusable.
7. Suitable for direct attachment to walls, hanger rods, beam flanges, purlins, strut, floor posts, etc.to meet job conditions.
8. Multi-tiered cable hooks to be used where required to provide separate cabling compartments, or where additional capacity is needed.
9. Finishes: cable hooks for non-corrosive areas shall be pre-galvanized steel, ASTM A653. Where additional strength is required, cable hooks shall be spring steel with a zinc-plated finish, ASTM B633, SC3.
10. Cable hooks for corrosive areas shall be stainless steel, AISI Type 304.
11. Manufacturer:
    a. Cooper B-Line series BCH21 (max 32 CAT-6A cables), BCH32 (max 50 CAT-6A cables), BCH64 (max 72 CAT-6A cables).
    b. Caddy/Erico cablecat.
    c. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Comply with the Executive requirements of Section 27 05 00.

3.2 EXAMINATION

A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances. Notify the University's Representative of conditions that would adversely affect the installation or subsequent utilization of the system. Do not proceed with installation until unsatisfactory conditions are corrected.

B. Installer is responsible for the integrity of the structures to which the system is attached, including their capability of safely accepting the loads imposed as evaluated by a qualified engineer.

C. The University's Representative reserves the right to request additional supports where in their sole opinion said supports are required. Any additional supports shall be installed at no additional cost to the University.

3.3 PREPARATION

A. Prepare and maintain the following clearances from EMI sources (per BICSI Standards).

1. Power cable (in grounded conduit) = 6 inches
2. Power cable (unshielded) = 24 inches
3. Fluorescent lights = 5 inches
4. Transformers = 48 inches

B. Provide all low voltage Communications Systems Pathways and Electronic Security and Safety System Pathways.

3.4 DISTRIBUTION PATHWAY VIA CEILING HUNG CABLE HOOKS (J-HOOKS)

A. The cabling support system shall be installed in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.

B. Provide dedicated supports at sixty inches (60") separation, maximum, per a given route. Suspend wire or rod using components appropriate for the structure – e.g., powder-actuated clip fastener for wire, beam flange clip or angled flange clip for either wire or rod, or an embedded anchor for the threaded rod. Do not share support (wire/rod) with other trades. Do not support the hanger on ceiling grid support wires. Do not support the hanger from ductwork, piping, or other equipment hangers.

C. Provide independent pathways for each low voltage system (network, 800MHZ Radio, access control, DAS, BMS, etc.).

D. Maintain minimum 6" clearance above suspended ceilings.

E. Cable Tray cables are not to exceed a 25% fill when the project is complete. 25% fill is a visual fill of 50% of the cable tray.

3.5 CONDUIT

A. Conduit used for pathway is to be designed with a maximum 40% visual fill.

B. EZ path retrofit EZDR-400 or EZDR-200 will be provided on all conduits when required for compliance.

3.6 FLOOR BOXES AND POKE THROUGH DEVICES

A. All Floor boxes shall be sized and approved by UCD IT and FD&C's furniture group.

1. Wiremold RC9AM2TCBK flush poke -thru with accessories as required.
2. One 1-1/4" trade standard, data.
3. One 1-1/2" trade standard, av or other.
4. Floor poke through assembly, dual service feed-through fitting. Commonly used wire mold RC9AM2TCBK flush poke -thru with accessories as required. One 3/4" trade standard and one 1-1/4" trade standard.
5. Wiremold 4ffatcbs flush furniture feed poke -thru with accessories as required.
6. Or approved equal.

END OF SECTION

SECTION 27 05 33
CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide telecommunications pathways in accordance with ANSI TIA-569-E, as shown on the plans or as designed by an RCDD.

B. Provide conduits as required by fire code and where wall cavities are obstructed.

C. Provide Ring and String where allowed in wall cavities and locations are accessible.

D. Provide a minimum of a 1 ¼" conduit for wall drops as needed.

E. All junction boxes shall be sized and designed by a registered RCDD communications designer

F. Conduit for communications is NOT to adhere to the parallel of the exterior wall configuration required by the electrical specification. Cable Distance is priority for communications cabling and dictates path taken.

1.2 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

E. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.3 SUBMITTALS

A. Product Data: For each product indicated.

B. Submittals are to be approved by IT Facilities Department and consultant.

1. Obtain written approval from the Consultant for the product data submittal prior to materials and equipment purchase order and prior to installation.
2. Format: Submit each product data as an electronic (PDF) document.
3. Labeling: For each submittal, provide a cover page including the following information:
   a. Client Name
   b. Project Name and Address
   c. Submittal Name (e.g., “Product Data Submittal for LCD Panel Backbox.”)
   d. Specification Section Number (e.g., “Section 27 05 33).
   e. Date of Submittal
   f. Contractor Name

C. Submit conduit shop drawings for cable path other than wall drops.

D. Confirm low voltage pathway quantity and fill ratio expected.

E. Include junction box locations and sizes.

PART 2 - PRODUCTS

2.1 WORK AREA OUTLET BOX

A. Work area outlet box

1. 4 11/16” x 2 1/8” deep boxes on wall drops where required

2.2 JUNCTION BOXES

A. Junction Boxes

1. Sized to accommodate bend radius of cabling being installed.

2.3 FLOOR BOXES, POKE-THROUGHS AND MONUMENTS

A. Floor Box, Flush Devices

1. All Floor boxes shall be sized and approved by IT facilities and FD&C’s furniture group.

2. Manufacturers

a. Wiremold RC9AM2TCBK Flush Poke -Thru with accessories as required.

B. Floor Poke Through Assembly, dual service feed-through fitting.

1. Commonly used

a. Wiremold RC9AM2TCBK Flush Poke -Thru with accessories as required.
   1) One 3/4" trade standard
   2) One 1-1/4" trade standard

b. Wiremold 4FFATCBS Flush Furniture Feed Poke -Thru with accessories as required.

2.4 WIRELESS, SECURITY AND OTHER PERIPHERAL CABLING INSTALLATIONS

A. Conduit and/or electrical outlet box shall not be installed for wireless access point installations unless required by AHJ or physical conditions of the area.

B. Consider the device being installed when calling out conduit and housings for security and peripheral devices due to differing requirements.

2.5 FIRE PENETRATIONS

A. EZ path retrofit EZDR-400 shall be provided where applicable as fire stop materials on all conduits.

PART 3 - EXECUTION

3.1 GENERAL REQUIREMENTS

A. Distribution Pathway via EMT Raceway:

1. Structured cabling installation is to meet BICSI cable distance limitations. Remaining parallel to the building structure is not a requirement.

2. All ends of conduits shall be cut square, reamed and fitted with insulated bushing.

3. All conduit which passes through firewalls shall adhere to applicable fire code.

3.2 PREPARATION

A. Fill ratios are to be calculated by the designer and installer during their respective design and installation phases of the project.

B. Cable Tray cables are not to exceed a 25% fill when the project is complete. 25% fill is a visual fill of 50% of the cable tray.

C. Conduit used for pathway is to be designed with a maximum 40% visual fill.

D. EZ path retrofit EZDR-400 or EZDR-200 will be provided on all conduits when required for compliance.

3.3 MOUNTING AND INSTALLATION – WORK AREA OUTLET BOX

A. Provide back boxes at all wall phones and employee time clocks.

B. The distance between pull boxes shall not exceed 100 feet.

C. Conduits exceeding two 90-degree bends shall be upsized to the next trade size and never exceed 240 degrees.

D. Support and fasten pathway and pull boxes as defined in the electrical specifications.

E. Conduit purposed for floor box(es) must have the respective conduit turn up in an adjacent or nearby wall or column that is stubbed to nearest accessible ceiling.

F. Manufacturer's instructions:

1. Comply with manufacturer's product data, including product technical bulletins, product catalog installation instructions, and product carton instructions for installation.
2. Maintain jobsite file of Material Safety Data Sheets (MSDS) for each product delivered to jobsite packaged with an MSDS.

3.4 PENETRATIONS

A. Provide EZ path fire penetrations where applicable.

B. Provide conduit penetrations per electrical Specifications.

3.5 STATION CABLE PATHWAY INSTALLATION

A. Work Area Outlet Boxes:

1. Unless otherwise noted on the plans, all cut in boxes and surface station outlet boxes are to be installed at a height of 18" A.F.F. (above finished floor) to center, except for those otherwise called out.
2. Those plates or boxes that are to be used for telephone wall jacks shall be installed according to ADA requirements.
3. All cabling outlets shall be installed so that their edges are parallel to the vertical and horizontal edges of the surface on which they are mounted.

3.6 FINAL INSPECTION AND CERTIFICATION

A. Punch Walks and Punch Lists

1. Punching the Work of individual Sections of Division 27 may be combined.
2. Execute a punch walk with the Consultant to observe work.
3. Develop a punch list for items needing correction. Issue this punch list to Consultant.
4. Correct the Work as noted on punch list.
5. Execute follow up punch walk with the Engineer and the Owner or Owner's Representative to verify punch list items have been corrected.

END OF SECTION

SECTION 27 05 36
CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This section included cable trays in corridors and telecom spaces.

1.2 SUBMITTALS

A. Submittal requirements:
   1. Submittals are to be approved by UCD IT and consultant.
   2. Provide shop drawings indicating cable tray does not to exceed 25% visually full when the project is complete. 25% full is a visual fill of 50%.
   3. Provide product data for the following:
      a. Manufacturer's data/cut sheets, product drawing/specifications and installation instructions for all products (submit with bid).
         1) Clearly mark the provided documentation to denote which part number/specific product is being submitted.

1.3 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.4 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the owner or owner representative.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where “approved equal” is stated or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the owner or the owner representative.

C. Strictly adhere to all BICSI, Telecommunications Industry Association (TIA) recommended installation practices when installing communications and data cabling.

D. Material and work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA-569-E Commercial Building Standard for Telecommunications Pathways and Spaces.
2. ANSI/TIA/EIA-606-C Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
3. ANSI/J-STD-607-D Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
4. BICSI – Telecommunications Distribution Methods Manual
5. NEMA – VE-1 – Metal Cable Tray Systems
6. NEMA – VE-2 – Metal Cable Tray Installation Guidelines

PART 2 - PRODUCTS

2.1 BASKET TRAY

A. Basket Tray

1. Open Wire Frame Construction.
2. Welded wire mesh with continuous safety edge wire lip.
3. Mesh forms grid at nominally 2" by 4"
4. Electroplated zinc galvanized carbon steel.
5. Accessories: Provide a complete system of accessories, including bonding and grounding connections, conduit connectors, to terminate conduits extended to basket edge, radius

shields to protect cabling at inside corners, and waterfall drop-outs at each end of cabling racks and cabinets or where needed to terminate open wiring systems.

6. Manufacturers:
   a. Cablofil.
   b. PW Industries.
   c. Or approved equal.

2.2 CABLE TRAY WATERFALL (CONTRACTOR FURNISHED AND INSTALLED)

A. Provide cable tray waterfall or drop out at ends of all runs.
   1. Cooper B-line 9A-1104.
   2. Cooper B-line 99-1124.
   3. Or approved equal.

2.3 CABLE TRAY TRANSITIONS (CONTRACTOR FURNISHED AND INSTALLED)

A. All turns, bends, and direction changes shall use manufacturer's pre-manufactured materials.

PART 3 - EXECUTION

3.1 CABLE TRAY APPLICATION

A. Communications cable tray installations shall conform to the following:
   1. Basket Tray- Horizontal station cabling outside of the communications rooms where more than 100 cables are within the pathway.

B. Size and Fill Ratio:
   1. Basket Tray is not to exceed 50% visually full when the project is complete. 25% full is a visual fill of 50%. Size as shown on the drawings.

3.2 INSTALLATION

A. Each of the cable tray systems shall be installed and supported in accordance with the manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.

B. Installation shall be performed and accomplished in a professional manner, by qualified personnel.

C. Installation to maintain at least 12" vertical clearance over the top of each tray for use by University’s personnel.

D. Provide access 24" wide along one side of each tray unless conditions will not allow such clearances. Deviation must be cleared by IT before installing tray. Conditions of installation not approved by IT shall be replaced at no cost to the University.

E. A minimum of 6 inches of clearance from the top of the finished ceiling to the bottom of the cable tray shall be provided.

F. Cable distance limitation of 275 ft shall be adhered to when laying out cable support infrastructure.

G. Cable fill ratio is not to be exceeded during the initial installation of cabling.

H. Separation of systems other than IT are the responsibility of the contractor. IT requires a separation of all non-Ethernet protocol systems from all Ethernet protocol systems installed.

I. Basket Tray shall not penetrate any firewall. EZ Path products shall be used as the solution with the cable or basket tray stopping short of the wall by 1 to 2 feet.

J. Where basket tray becomes inaccessible, transition to an equivalent size conduit pathway shall be provided. If fire stopping is required at either end of the conduit(s), an EZ Path retrofit EZDR-400 shall be provided on all conduits.

K. Center mount “T” style cable tray supports shall not be permitted.

END OF SECTION

SECTION 27 05 41
FIRE-STOPPING SYSTEMS

PART 1 – GENERAL

1.1 DESCRIPTION

A. Section includes: Firestopping for the following.

1. Penetrations through fire-resistance-rated floor and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

2. Penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.

3. Penetrations through smoke barriers and construction enclosing compartmentalized areas involving both empty openings and openings containing penetrating items.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

A. Comply with California Code of Regulations - Title 24, CBC - Chapter 7, Fire Resistance Ratings and Fire Tests.

B. Test Requirements:

1. ANSI/UL 2079 Tests for Fire Resistance of Building Joint Systems, 2020

2. ASTM E-814 Standard Test Method for Fire Tests of Penetration Firestop Systems, 2017

3. ANSI/UL 1479 Standard for Fire Tests of Penetration Firestops, 2015

1.3 RELATED SECTIONS

A. Division 27 Communications Sections

1.4 SUBMITTALS

A. Procedure: In accordance with Division 01 and the following:

B. Data: Manufacturer product data, including UL Listing, for all materials and prefabricated devices and manufacturer's installation instructions. Submitted material must be approved by Campus Fire Marshal prior to installation.

C. Shop drawings detailing location of installed through penetration devices.

1.5 QUALITY ASSURANCE

A. Compatibility: Provide firestop systems compatible with one another and with substrates under conditions of application and service.

B. Firestop system installation, must meet requirements of ASTM E-814, UL 1479, or UL 2079 tested assemblies that provide a fire rating equal to that of construction being penetrated.

C. All materials shall be new.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following, as required by condition of use:

1. Specified Technologies, Inc.
Somerville, NJ, telephone 800-992-1180

2.2 MATERIALS

A. All through penetrations shall be labeled on both sides of the wall to indicate the appropriate UL system number, product used, installation date, hour rating installer, location number and telephone contact for the corresponding manufacturer. Material installed shall be as required for installation conditions and to achieve the required fire resistance.

B. Use only firestop products that have been UL 1479, ASTM E-814, or UL 2079 tested for specific fire rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire rating involved for each separate instance.

C. For penetrations by non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following materials are acceptable:

1. EZ-Path retrofit device sized for the conduit being installed.

D. For penetrations by combustible items (penetrants consumed by high heat aflame) including insulated metal pipe, PVC jacketed, flexible cable or cable bundles and plastic pipe (closed piping systems) the following materials are acceptable:

1. EZ-Path Fire Rated Pathway

E. For large size/complex penetrations made to accommodate cable trays, multiple steel and copper pipes, electrical busways in raceways the following materials are acceptable:

1. EZ-Path Fire Rated Pathway

F. Provide a firestop system with a "F" Rating as determined by UL 1479 or ASTM E-814 which is equal to the time rating of construction being penetrated.

G. Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction being penetrated.

H. For work station conduits from accessible ceiling to outlet.

1. STI SpecSeal putty.

I. For pipe penetrations of cast in place concrete floors and concrete over metal decking the following material is acceptable:

a. EZ-path

J. STI Radius Control module.

1. Radius Control Modules snap into the ends of EZ-path pathways and provide a minimum bend radius for IT cabling.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify conditions and measurements affecting the work of this Section at site. Make sure that detrimental conditions are corrected before proceeding with installation.

3.2 INSTALLATION

A. Install materials in compliance with their manufacturer's instructions and the printed instructions of UL Fire Resistance Directory.

B. Install re-enterable, non-hardening, intumescent putty in work station conduits where required. Do not use fire caulk.

C. EZ-path fire rated pathways shall be installed with Radius Control Modules.

3.3 IDENTIFICATION

A. Identify firestopping with pressure sensitive, self adhesive preprinted labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestopping installation where the labels will be visible to anyone seeking to remove penetrating items or firestopping. Include the following information on the labels:

1. The words: "WARNING—FIRESTOPPING—DO NOT DISTURB. NOTIFY BUILDING MANAGEMENT OF ANY DAMAGE”

2. Contractor's name, address and phone number

3. Firestopping system designation of applicable testing and inspecting agency

4. Date of installation

5. Firestopping manufacturer's name

6. Installer's name

END OF SECTION

SECTION 27 05 43
UNDERGROUND DUCTS AND RACEWAY FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of exterior telecommunications pathways as called for in these specifications and related drawings, including but not limited to:

1. Cutting and Patching Asphalt and Concrete
2. Trenching and Excavation
3. Underground Conduit Systems
4. Cable Routing Hardware
5. Horizontal Directional Drilling – Also commonly referred to as Directional Boring or Guided Horizontal Boring

1.2 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections for support of communications equipment specified for this project.

B. Feeder Duct-bank: Each building shall be fed via redundant diverse pathways from the nearest telecommunications maintenance hole via two (2) 4" PVC Schedule 40 conduits. Each PVC conduit shall include pull- rope. (Refer to the Telecom Site Plan for details).

C. Innerduct: Install two (2) – 4” 3-cell flexible innerduct into each of the 4” conduits. All pull cords shall be secured at each end to prevent accidental removal.

1.3 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS OR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

I. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

J. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

K. 27 13 00 COMMUNICATIONS BACKBONE CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.4 SUBMITTALS

A. See Section 27 05 00 – Common Work Results for Communications, for submittal procedures.

1.5 QUALITY ASSURANCE

A. All installation work for the new exterior telecommunications pathways shall be performed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated shall be subject to the control of Owner.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based on the acceptable manufacturers listed. Where “approved equal” is stated, equipment shall be equivalent in every way to that of the equipment specified and subject to approval based on submittals provided.

C. Materials and work specified herein shall comply with the applicable requirements of:

1. California Electrical Code (CEC).
2. IEEE/NESC – National Electrical Safety Code
3. NEMA Standards including, but not limited to:
    a. NEMA, RN1, PVC Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
    b. NEMA, TC3, PVC Fittings for use with Rigid PVC Conduit and Tubing.
    c. NEMA, TC6, PVC and ABS Plastic Utilities Duct for Underground Installation.
    d. NEMA, TC8, Extra Strength PVC Plastic Utilities Duct for Underground Installation.
    e. NEMA, TC9, Fitting for ABS and OVC Plastic Utilities Duct and Fittings for Underground Installation.
    f. NEMA, TC10, PVC and ABS Plastic Communications Duct and Fittings for Underground Installation.
4. UL Standards including, but not limited to:
    a. UL 6, Rigid Metal Electrical Conduit

b. UL 651 Schedule 40 and 80 PVC Conduit

5. ANSI-C80.2, Specification for Rigid Steel Conduit, Enameled
6. ANSI/TIA/EIA-569-E – Commercial Building Standard for Telecommunications Pathways and Spaces.
7. ANSI/TIA/EIA-607-D – Commercial Building Grounding and Bonding Requirements for Telecommunications
8. ANSI/TIA/EIA-758-B – Customer Owned Outside Plant Telecommunications Cabling Standard (including all applicable addenda)
9. BICSI Telecommunications Distribution Methods Manual
10. BICSI Customer-Owned Outside Plant Manual

D. For horizontal directional drilling, the Contractor shall follow all procedural precautions necessary to ensure that the essential aspects of proper directional bore installation are adequately controlled.

E. Personnel for horizontal directional drilling shall be fully trained in safety and their respective duties as part of the directional drilling crew.

1.6 WARRANTY

A. See Section 27 05 00 – Common Work Results for Communications, for additional warranty requirements.

PART 2 - PRODUCTS

2.1 CONDUIT SYSTEM

A. Non-Metallic Conduit:
1. PVC plastic pipe, ASTM D1785, Schedule 40, Type PVC 1120.
2. Tone Tape, Arnco DL WP12LC Tone Tape, or equivalent.

B. Conduit Joint Couplings:
1. PVC non-metallic fittings must be installed with solvent applied couplings.
2. An approved transition coupling shall be used to connect metal to plastic (PVC) conduits.
3. Couplings may be threaded and / or glued to provide watertight seal at conduit junctions.

C. Electrical Metallic Tubing (EMT): Electro-galvanized steel tubing 3/4” and larger diameter per project requirements.
1. Conduit joint couplings and connectors: steel double set screw indenter fittings.
2. Metal bushings for 3/4” and 1” conduit.
3. Insulated metallic bushings for 1-1/4” and larger conduit.
4. Insulated metallic bushings with grounding lugs as required.
5. Conduit sweeps: minimum 10 times the conduit inside diameter.
6. Include required conduit straps, and hangers, heavy-duty malleable iron or steel. Perforated pipe strap or wire hangers are not permitted.

D. Outside Pull-Box: Minimum 14 gauge galvanized steel with weatherproof locking cover and hardware for surface mounting as required for project. Dimensions as required for project.

E. Test mandrel shall be ¼" smaller than inside conduit diameter and not less than 12 inches long.

F. Pull-rope: 1/4" Nylon pull rope.

G. Core Drill Seals for Outside Building Walls: Link-Seal waterproof assembly or equal. Manufactured by PSI/Thunderline/Link-Seal.

H. Conduit Caulking Compound: Compounds for sealing conduit ducts shall have putty-like consistency workable with the hands at temperatures as low as 35 degrees Fahrenheit, shall not slump at a temperature of 300 degrees Fahrenheit, and shall not harden materially when exposed to the air. Compounds shall readily caulk or adhere to clean surfaces of plastic conduit, metallic conduits, or conduit coatings; concrete, masonry; any cable sheaths, jackets, covers, or insulation material, and the common metals. Compounds shall form a seal without dissolving, noticeable changing characteristics, or removing any of the ingredients. Compounds shall have no injurious effect on the hands of workers or upon materials.

I. Underground Plastic Line marker: Manufacturer's standard permanent, continuous-printed polyethylene film tape with metallic core, intended for direct burial service; not less than 3" wide x 4 mils thick. Provide orange tape with black printing reading, "CAUTION TELEPHONE/DATA CABLE BELOW," or similar.

J. Ground Wire: Bare Copper # 6

K. Tracer Box: NEMA-3 4" x 4" weatherproof box

L. Spacers for 4" Conduit: Carlon S289NJN Intermediate Spacer and S288NJN Base Spacer

M. Precast Concrete Vault:

1. General: Provide precast concrete communications vault as detailed on the Drawings and as required for installation of new duct-bank systems and connection to existing duct-bank systems at locations shown on the Drawings. Provide 4'W x 6'L x 4'D precast.

    a. Design: Vaults shall be steel reinforced, and the complete vault assembly shall be designed for H-20-44 bridge loading. Submittals shall clearly indicate all dimensions and reinforcing steel.

2. Concrete: Vaults shall be constructed using concrete with a 4500 psi 28-day strength. Concrete mix shall be designed in accordance with ASTM standards.

    a. Reinforcing Steel: Steel shall be intermediate or hard grade billet steel conforming to ASTM A15, deformed in accordance with ASTM A305.

3. Vaults: Vault and pull box covers for all non-traffic areas shall be made of ductile iron cover, covers in parking and traffic areas shall be cast iron and rated for heavy vehicular traffic. Mount covers in a 30" Type "B" or "WRM" frame. The frame and neck shall be doweled into the vault to prevent movement away from the opening. Voice and Data communications vaults and pull box covers shall be marked "TELECOMMUNICATIONS".

4. Conduit Entry: Plastic conduits shall include a bell end inside the vault or pull box, mounted flush and grouted to seal openings. Precast fiber type terminators shall be provided for each duct-bank entry.

    a. Grounding: A #4/0 bare copper ground wire shall penetrate the side wall in the bottom section of each vault and pull box and extend 48" inside and outside of the vault pull box.

5. Accessories: Knockouts, cable racks, sumps, steps, joint seals and other accessories shown on the Drawings or required for a complete installation shall be provided.

N. Duct Plug 4": General Machine Products (GMP) 6668R16

O. End Bell 4": Carlon E297N

P. Squeegee is moistened pea-sized gravel and sand mixture.

Q. Multi-cell Fabric Mesh Duct:

1. All fabric mesh duct shall be installed per manufacturer's requirements.
2. Only manufacturer's fittings, transition adapters, terminators, accessories and installation kits shall be used.
3. All fabric mesh duct shall be populated with a measured pull tape.
4. Manufacturer: MaxCell.

2.2 CABLE ROUTING HARDWARE

A. Cable Rack with Support Hardware as Required (or comparable):

1. 18 Hole: Condux 08380200, Chance C203-1126
2. Other Sizes as Required: Condux, Chance

B. Cable Rack Steps/Hooks:

1. 4": Condux 08380600, Chance C203-1131
2. Other Sizes as Required: Condux, Chance

C. "S" Rack Supports: Condux, Chance

D. Step Lock Wedge: Panduit CHW-C20

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and conditions under which the new exterior telecommunications pathways are to be installed. Provide notification, in writing, of conditions detrimental to proper completion of the work.

B. Verify field measurements and pathway routing conditions are as shown on drawings. Provide notification, in writing, of conditions deviating from drawings.

C. Beginning of telecommunications pathway installation indicates Contractor acceptance of existing conditions.

3.2 EXCAVATING, TRENCHING AND BACKFILLING

A. General: The work hereunder includes whatever excavating and backfilling is necessary to install the voice and data communications work. Coordinate the voice and data communications work with other work in the same area, including excavating and backfilling, dewatering, floor protection

provisions, other temporary facilities, other underground services (existing and new), landscape development, paving, structural foundations, and floor slabs on grade. Coordinate with weather conditions and provide temporary facilities needed for protection and proper performance of excavating and backfilling.

B. Standards: Except as otherwise indicated, comply with the applicable provisions for voice and data communications work excavating and backfilling. Refer instances of uncertainty to the Architect/ Engineer for resolution before proceeding with the Work.

C. Coordinate excavating, trenching and backfilling with Landscaping, Civil, Mechanical, Plumbing and Electrical drawings. Voice and Data Communications duct-banks shall be independent of any other systems.

D. Refer to Civil contract documents for information regarding required depths, slope and grade and additional information regarding trenches. Where these documents and the civil documents differ, bring any such differences to the attention of the engineer prior to construction. The bottom of the trench shall be accurately excavated to provide firm, uniform bearing for the bottom of the raceways and duct-banks. Where mud or unstable soil is encountered in bottom of trench, it shall be removed to firm bearing and the trench shall be backfilled with bedding sand to proper grade and tamped to provide uniform firm support.

E. The bottom of trenches shall be accurately graded to provide proper fall and uniform bearing and support for each section of the conduit on undisturbed soil or 2" of sand fill at every point along its entire length. In general, grading for voice and data communications duct-banks and conduits shall be from building to vault, and from a high point between vaults to each vault.

F. Exercise care not to excavate below required depth, leaving a flat bed of undisturbed earth, firm and secure, before laying conduit. In the event rock is encountered, excavate 6" below required depth and backfill to required depth with bedding sand, and compact to minimum 95% compaction.

G. All grading in the vicinity of excavation shall be controlled to prevent surface ground water from flowing into the excavations. Any water accumulated in the excavations shall be removed by pumping or other acceptable method. During excavation, material suitable for backfilling shall be stacked in an orderly manner a sufficient distance back from edges of trenches to avoid overloading and prevent slides or cave-ins. Material unsuitable for backfilling shall be wasted and removed from the site and properly disposed of.

H. The Contractor shall be fully responsible for the safety of persons, materials and equipment in or near trenches or other excavations and provide all required sloping, shoring, railings and other protective provisions. The Contractor shall provide a trench shoring plan and design which is sealed by a registered professional engineer. Refer to Divisions 1 and 2 for additional requirements.

I. If any unknown and/or uncharted utilities are encountered during excavation, promptly notify Architect/ Engineer and wait for his instructions before proceeding.

J. If such unknown utilities are encountered and work is continued without contacting the Architect/ Engineer for instructions, and damage is caused to said utilities, the Contractor shall repair at his own expense, such damage to the satisfaction of the owner or utility company concerned.

K. Trenches shall not be backfilled until all required tests have been made by the Contractor and approved by the Architect/Engineer and any local authorities having jurisdiction.

L. Backfill shall be cement stabilized sand up to 6" above the top of conduit or duct-bank as required by code. Backfill up to grade shall be in maximum 6" lifts with minimum 95% compaction of lifts. Refer to Division 2 or elsewhere in Contract Documents for additional trenching and backfill requirements.

M. Opening and Re-closing Pavement, Landscape Areas and Lawns: Where excavation requires the opening of existing walks, street, drives, other existing pavement or lawns, such surfaces shall be cut as required to install new conduit and to make new connections to existing conduits. The sizes of the cut shall be held to a minimum, consistent with the work to be accomplished. After the installation of the new work is completed and the excavation has been backfilled and flooded, the area shall be patched or replaced, using materials to match those cut out or removed. Patches shall thoroughly bond with the original surfaces, shall be level with them, and shall meet all the requirements established by the authorities having jurisdiction over such areas. All removed work shall be replaced by craftsman who regularly installs the types of work being replaced.

N. Excavation in Vicinity of Trees: All trees including low hanging limbs within the immediate area of construction shall be adequately protected to a height of at least 5’ to prevent damage from the construction operations and/or equipment. All excavation within the outermost limb radius of all trees shall be accomplished with extreme care. All roots located within this outermost limb radius shall be brought to the attention of the Architect before they are cut or damaged in any way. The Architect will give immediate instructions for the disposition of same. All stumps and roots encountered in the excavation, which are not within the outermost limb radius of existing trees, shall be cut back to a distance of not less than 18" from the outside of any concrete structure or pipeline. No chips, parts of stumps, or loose rock shall be left in the excavation. Where stumps and roots have been cut out of the excavation, clean compacted dry bank sand shall be backfilled and tamped.

O. Perform all trenching and backfill for new underground conduit system placement as shown on the project drawings.

P. Perform pavement marking as required. All utilities to be located by contractor and exposed, if necessary, prior to construction.

3.3 CONDUIT SYSTEM PLACEMENT

A. Place new conduit system including maintenance holes as shown on the project drawings.

B. Twelve-inch (12”) clearance from all utilities to be maintained. If not possible, conduit to be encased in concrete slurry (flow fill) where proper distance cannot be obtained.

C. Cross telecommunications conduit ducts below gas piping.

D. All conduits shall be thoroughly cleaned before laying or using.

E. During construction, the ends of the conduits shall be plugged to prevent water washing mud into the conduits, vaults, or buildings. Specific conduit care shall be taken to keep the conduits clean of concrete, dirt or any other substance during the course of construction.

F. New and reopened trenches under asphalt roadways and parking lots must have concrete cap or be encased in concrete as required.

G. Support multiple conduits on preformed nonmetallic separators to provide not less than 1” spacing between exterior surfaces of conduit (Type 5). Spacing between separators shall be close enough to prevent sagging of conduits or breaking of couplings and watertight seals.

H. Squeegee is to be placed in the trench for 20’ on each side of the vaults (Type 4).

I. Conduits shall be securely anchored in place with nylon tie-downs to prevent movement during the placement of concrete slurry (flow fill), squeegee, and other backfill materials. Wire tie- downs are prohibited.

J. Seal all conduit junctions and fittings watertight prior to pour of concrete slurry (flow fill). Conduit couplings shall be made in accordance with the manufacturer’s recommendation for the particular type of conduit and coupling selected and as approved.

K. Unless otherwise noted on drawings, a minimum two-foot (24”) depth of cover is required above the top of all conduits.

L. Provide communication drain box in conduit six feet (6’) from building outside wall penetrations as shown in project drawings. Conduit inside drain box shall be perforated to allow water and gas to escape.

M. Transition to PVC coated GRC conduit five feet (5’) from building outside wall penetrations.

N. For all offsets and sweep bends, provide fiberglass or PVC coated GRC.

O. All conduit bends are to be minimum 3’ radius or larger as noted on drawings.

P. Bury underground plastic line marker one foot (12”) above the telecommunications conduit.

Q. Cast into concrete a #6 bare copper ground wire directly above the telecommunications conduit and extend 4” into each vault space. Extend 6” of tracer wire into tracer box on outside wall of building directly above conduit entry point.

R. Provide plastic conduit bell ends at each PVC conduit termination and for all conduit entering vaults.

S. Do not bore under concrete sidewalks, remove and replace sidewalks as necessary.

T. The new conduit shall extend through the wall into the building, tunnel, or crawl space a minimum of 4 inches.

U. Building, tunnel, and vault core drills must be sealed around conduits with approved waterproof plugging compound.

1. Seal openings around conduits that pass through inside building wall core drills with UL listed foamed silicone elastomeric compound.
2. Seal openings around conduits that pass through outside building walls with a complete Link-Seal assembly or equal for a waterproof seal. Slope conduit away from building.
3. Seal openings around conduits that pass through vault walls with foundation foam on the interior of the core and silicone sealer on the inside and outside of the core for a waterproof seal.

V. Maintenance Holes (MH) shall be placed with the long dimension in line with the main conduit run. The conduit shall enter opposite ends of the MH on the short sides so that the MH shall not be used as a 90 degree bend in cable installations.

W. The ends of the metallic conduit shall be reamed and bushed using:

1. Insulated metallic bushings for 1-1/4" conduit and larger
2. Insulated metallic bushings with grounding lugs for conduit entering TRs and ERs

X. After conduit duct installation has been completed and concrete has set, pull "D" test mandrel through all new conduit ducts to verify duct integrity and ensure smooth interior surfaces free from burrs or obstructions that might damage cable sheaths.

Y. Following mandrel testing, draw cylindrical wire brush with stiff bristles through each conduit to clean the conduit and remove any concrete, dirt or other obstructions.

Z. Stub out conduits into ERs, TRs, and cabinets only enough to attach connector and bushings with grounding lugs except conduits shall rise a minimum of 6 inches above the finished floor.

AA. Install new pull rope in all new conduit and extending three feet into each building space.

BB. Plug ends of the new conduit with watertight rubber conduit plugs, conduit caulking compound, or conduit caps to ensure foreign matter does not enter the buildings.

CC. Refer to Owner prior to cutting or drilling any surface.

3.4 CABLE ROUTING HARDWARE

A. Place new cable routing hardware in the tunnels and in crawl spaces beneath the building as required for the project and as shown on the drawings.

B. Perform installation of routing hardware as specified in Section 270526 including anchoring and supports, grounding and bonding, etc.

C. Place new ladder, pulling-in irons, cable racks, "S" rack supports, steps in new and existing vaults as required for backbone cable routing.

3.5 HORIZONTAL DIRECTIONAL DRILLING

A. Owner shall be notified 48 hours in advance of starting horizontal directional drilling work. The directional drilling shall not begin until Owner is present at the job site and agrees that proper preparations for the operation have been made.

B. No work shall commence until Traffic Control and Construction Permits from Owner and/or the City are in place as applicable for the specific project.

C. Site Preparation

1. Prior to any alterations to work site, the entry and exit points shall be marked.
2. No alterations to the work site beyond what is required for operations shall be made.
3. All activities shall be confined to designated work areas.

D. Drill Path Survey

1. The entire drill path shall be accurately surveyed with entry and exit stakes placed in the appropriate locations within the areas indicated on drawings.
2. If a magnetic guidance system is being used, the drill path will be surveyed for any surface geomagnetic variations or anomalies.

E. All applicable environmental regulations shall be adhered to.

F. Following drilling operations, the equipment will be de-mobilized and the worksite restored to its original condition. All excavations will be backfilled and compacted to 95% of original density. Landscaping will be restored to original site conditions.

3.6 SAFETY

A. The contractor must comply with Owner regulations for asbestos, lead, and confined spaces.

B. All applicable state, federal and local safety regulations shall be adhered to and all operations shall be conducted in a safe manner.

C. Guard vault openings per NESC C-2-2017, 423.A:
1. When covers of maintenance holes are removed, the opening shall be promptly protected with a barrier, temporary cover, or other suitable guard.

D. Test for gas in vaults and unventilated vaults per NESC C2-2017, 423.B and C, including, but not limited to:
1. The atmosphere shall be tested for combustible or flammable gases before entry.
2. Where combustible or flammable gases are detected, the work area shall be ventilated and made safe before entry.
3. Unless forced continuous ventilation is provided, a test shall also be made for oxygen deficiency.
4. Provision shall be made for adequate continuous supply of air. Note: The term adequate includes evaluation of both the quantity and quality of the air.
5. Employees shall not smoke in vaults.
6. Where open flames must be used in maintenance holes or vaults, extra precautions shall be taken to ensure adequate ventilation.

3.7 AS-BUILT DRAWINGS

A. Mark the project drawings with notations reflecting any variations from the base specifications and drawings including as-built conduit routing.

END OF SECTION

SECTION 27 05 53
IDENTIFICATION AND LABELING OF COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Provide all labor, materials, tools, and equipment required for permanent intelligible labeling for items including but not limited to communications cabling (structured and non-structured) innerduct, connectors, faceplates, jacks, receptacles, patch panels, and racks.

B. All labels will be preprinted, or computer printed type. Handwritten labels are not acceptable.

C. This section includes minimum labeling requirements for the following:

1. Room designations
2. Communications cabling
3. Closet Hardware including patch panels, terminal blocks, protectors, and racks.
4. Work Area Outlets
5. Wireless Access Points
6. Pathways and Spaces
7. Grounding and Bonding

1.2 VISUAL APPEARANCE

A. Clear plastic covers over faceplate labels are not permitted.

B. Shall be preprinted or computer printed type, minimum 12pt. font.

C. Black SMBs are to be labeled with white on black.

D. Stainless will be labeled with black on white.

E. White (if required) will be labeled with black on white.

1.3 LABELING STANDARDS AND REQUIREMENTS

A. All new labeling is to reflect UCD labeling standards.

B. Contact the University's Representative for a copy of the current standards prior to proceeding.

C. Bring to the University Representative’s attention any project conditions not described in these specifications and the University's current standards and conform to the direction received.

D. Identification and administration work specified herein shall comply with the applicable requirements of:

1. ANSI/TIA/EIA-606-C Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

1.4 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

PART 2 - PRODUCTS

2.1 COMMUNICATION CABLING LABELS, GENERAL

A. Shall meet the legibility, defacement, exposure and adhesion requirements of UL 969.

B. Shall be preprinted or computer printed type, minimum 12pt. font. Handwritten labels are not acceptable.

2.2 COMMUNICATION CABLING LABELS, INTERIOR

A. Provide vinyl substrate with a white printing area and black print.

B. If cable jacket is white, provide cable label with printing area which is either orange or yellow, such that the labels are easily distinguishable.

C. Shall be flexible vinyl or other substrates to apply easy and flex as cables are bent.

D. Shall use aggressive adhesives that stay attached even to the most difficult to adhere to jacketing.

E. Manufacturers:

1. Cable Type- 4 pair UTP /4 pair UTP Zero Skew - Panduit S100X150VAC or approved equal.
2. Cable Type- 4 pair STP - Panduit S100X150VAC or approved equal.
3. Cable Type- 25 to 100 pair copper - Panduit S100X650VAC or approved equal.
4. Cable Type- 2 strand fiber - Panduit F100X300AJT or approved equal.
5. Cable Type- 4-12 strand fiber - Panduit S100X150VAC or approved equal.
6. Cable Type- RG-6 and RG-59 Coax - Panduit S100X150VAC or approved equal.
7. Cable Bundles - Panduit UIHL12-XO or approved equal.
8. Other Interior Cabling - Panduit S100X650VAC or approved equal.

2.3 GROUNDING AND BONDING, PATHWAY, AND SPACE LABELS

A. Panduit C200X100FJC or approved equal.

2.4 WORKSTATION LABELS

A. Panduit - White C061X030FJC

B. Panduit - White C750X050YIJ or approved equal.

2.5 LOCATION NAMEPLATES

A. Provide laminated plastic nameplates for each equipment enclosure, rack, switch, and device, as specified.

B. Comply with ASTM D 709.

C. Each nameplate inscription shall identify the function and, when applicable, the position.

D. Nameplates shall be melamine plastic, 0.125-inch thick, black with white center core.

E. Surface shall be matte finish. Corners shall be square.

F. Accurately align lettering and engrave into the core. Minimum size of nameplates shall be one by three inches.

G. Lettering shall be a minimum of 0.25-inch-high normal block style for location nameplates or a minimum of 1-inch-high normal block style for rack nameplates.

H. Panduit C300X100APT or approved equal.

2.6 COMMUNICATION CABLING LABELS, OUTSIDE PLANT

A. Cable Tags in Manholes, Handholes, and Vaults

1. Provide tags for communications cable or wire located in manholes, handholes, and vaults.

a. The tags shall be polyethylene.

b. Machine printed - Do not provide handwritten letters.

2. Polyethylene Cable Tags

a. Provide tags of polyethylene that have an average tensile strength of 22.4 MPa (3250 pounds per square inch) 3250 pounds per square inch; and that are two millimeter (0.08 inch) 0.08 inch thick (minimum), non-corrosive non-conductive; resistive to acids, alkalis, organic solvents, and salt water; and distortion resistant to 77 degrees C 170 degrees F. For fiber optic cables provide Panduit PST-FO or equal. For Copper cables provide Panduit PST-1028 or equal.

b. Provide a one-piece nylon, self-locking tie for cable tags.

c. Ties shall have a minimum loop tensile strength of 778.75 N (175 pounds) 175 pounds. The cable tags shall have black block letters, numbers, and symbols 25 mm (one inch) one inch high on a yellow background.

d. Letters, numbers, and symbols shall not fall off or change positions regardless of the cable tags' orientation.

3. Manufacturers:

a. Panduit

b. Brady

c. Or equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Verify all room numbers, racks, conduits, cable tray, cables, equipment housing, vaults and items within this document have been labeled.

B. Contractor applied labeling shall reflect final space and Telecommunications structure designations.

C. Accurate labeling shall be provided on the as-built shop drawing submittals.

3.2 IDENTIFICATION AND LABELING

A. Telecommunications Rooms

1. Labels shall be affixed at the entry to all telecommunications rooms and spaces (Includes entrance facilities, telecommunications equipment rooms, communication equipment spaces and work areas).

2. All IT rooms are numbered but not designated “equipment” due to security concerns.

B. Cable Tray and Conduits

1. Cable tray structured versus AV or analog systems pathway labeling and designations are the responsibility of the installer to designate the services that are to use the pathway or what portion of the pathway.
2. Any permanent label that is clearly visible is acceptable.

C. Rack and Cabinet Labeling

1. Provide laminated plastic nameplates for each equipment enclosure, row and rack designations as shown on elevations provided by UCD IT.

D. Copper Patch Panels – Horizontal

1. Label with Jack numbers.

E. Tie Cable Patch Panels

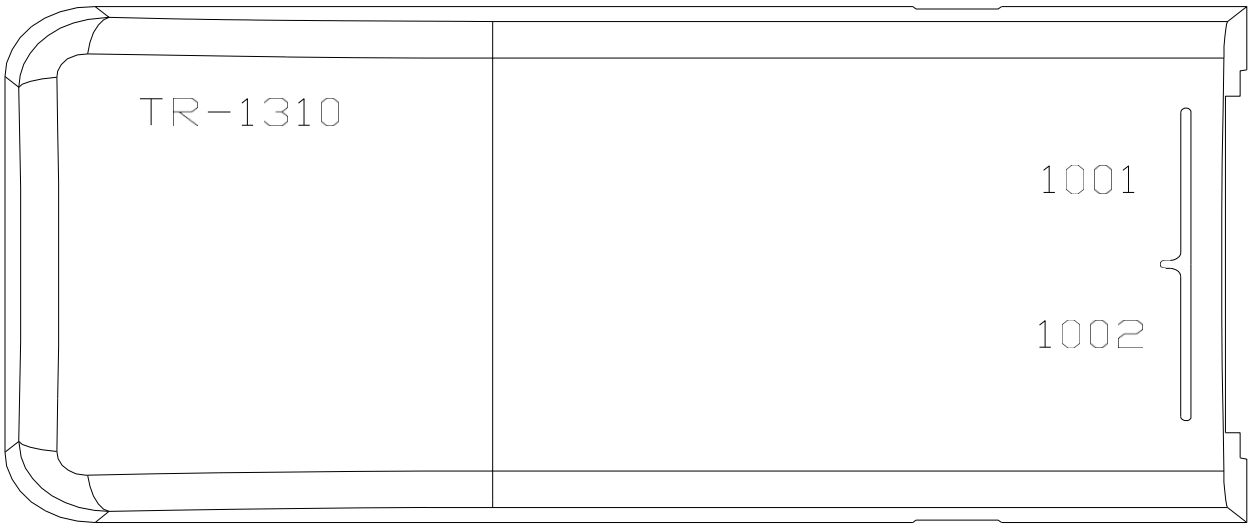
1. Label the pair count at the top of the patch panel, separated from all others.
2. Place the cable's identification text centered on the top label strip. (example:18CA75, TIE 1672A).

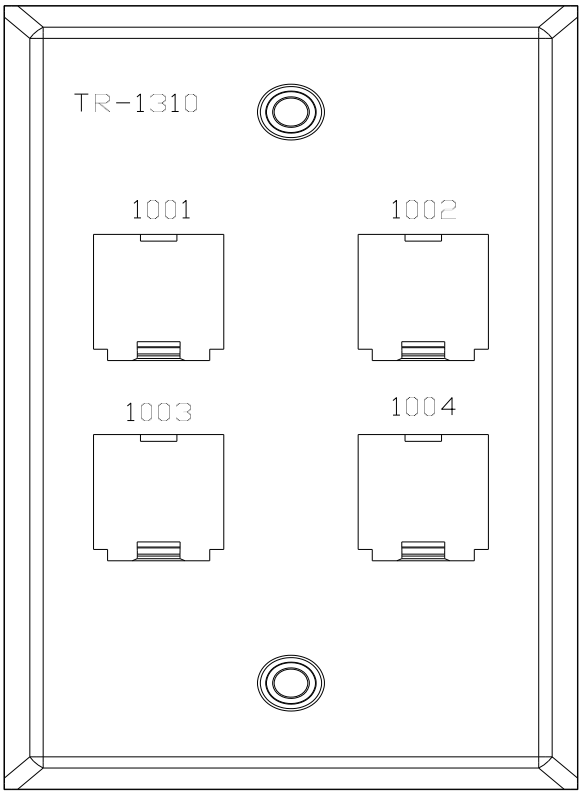
F. 110 Blocks

1. Not used other than MPOE, OSP installation.
2. Label with University provided designation.

G. Workstations

1. Use adhesive type labels and affix labels to faceplate per diagram provided.
2. Provide sequential 4 or (Occasionally 5 digit) jack number (starting dependent on the floor designation) beginning with an X such as X056, X being floor# followed by the closet sequenced cable number.All faceplate labels shall contain the following items:
    a. Building and Closet Designation such as 34-1100 (building#, IT closet#)
    b. TR Designation such as TR1.1 or TR 1A (University established designation)
3. Under no circumstances are jacks to be installed with a drop/name or location number as a label or a matrix identifier.
4. See diagrams below:





H. Wireless Access Point (WAP) Labeling

1. The University's Representative will provide locations for Wireless Access Point installations with the University's assigned designated identifiers adhered to the Access Point itself.
2. Building Designation / room or area designation – AP / a,b,c (if multiple AP's within room).
3. WAP labeling consists of the Icon being a designated color at the device, Icon being a designated color in the patch panel, and a band being installed on both ends of the patch cord that connects the cable in the TR room.

I. Grounding and Bonding

1. Label the TMGB (telecommunications main ground busbar) with an adhesive label.
2. Label the TGB(s) (telecommunications ground busbar) with an adhesive type label(s).

J. Other Cable Numbering

1. Other cabling types, such as Coax installed in a TR shall be numbered uniquely, such as C=Coax.
2. Cameras and AP's are Data Cabling, which falls into the Data Cabling labeling scheme.
3. Point to point Data Cables require independent numbering such as A1001 for items such as in room video distribution such as N-stream equipment.

K. Fiber Patch Panels

1. Fiber patch panels shall be marked using adhesive labels indicating the range of circuits installed to it. All fiber optic cable patch panels shall be labeled with the pair count of every fiber pair, the cable's assigned identifier, and the patch panel's assigned identifier.
2. All labels shall consist of the following:
    a. Provide the respective FTU # next in sequence in the data room.
    b. Provide and label each bulkhead in the fiber panel per the following: Fiber Cable #, "FROM" Building / "FROM" Room / "FROM" Rack#Row# / "FROM" FTU / Fiber Type / Strand # / To Location / Fiber Cable # / "TO" Building / "TO" Room /"TO" Rack#Row# / "TO" FTU / Fiber Type / Strand # /.
    c. Coordinate with IT before applying any labels.

L. Fire stopping
1. Each fire stopping location shall be labeled at each location where fire stopping is installed, on each side of the penetrated fire barrier, within 12 in. of the fire stopping material.
2. Labels shall adhere to the requirements set forth by the authority having jurisdiction (AHJ).

M. Indoor Communications Cables
1. Horizontal and Indoor Backbone cables shall be marked within 12 inches of each endpoint or to innerduct in which the cable is installed.
2. Label each end of each riser cable where the cable terminates.
3. Backbone cables shall be marked at each endpoint and at all intermediate locations, pull/access point or junction boxes through which the cable passes, as well as on each floor and in each room the cable is openly visible in.

N. Copper Riser Cabling.
1. Label all copper backbone cables of at least 25 pair construction to contain the following information:
    a. Installation Date
    b. University Assigned Cable ID: (Example: 70 Tie 0P609).

O. Fiber Riser cabling.
1. Label all fiber backbone cables to contain the following information:
    a. Installation Date
    b. University Assigned cable ID:(Example: IFA134)

END OF SECTION

SECTION 27 11 16
COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

PART 1 - GENERAL

1.1 SUMMARY

A. Equipment racks shall be Contractor furnished; Contractor installed.

B. The Owner standard is to provide 3 feet clearance from all rack and rack hardware to other hard surfaces in addition to allowing for code requirements for electrical power in the room. Some instances may require deviations due to room sizes and architectural features. Install racks according to construction documents. Report conflicts to IT before installation.

1.2 PREPARATION

A. Verify that no mechanical, electrical or other systems and piping systems, (e.g. water sources) run through the TR Rooms or IT spaces

B. Receive approved layout from Owner IT.

C. Validate the package for the IT installation, e.g. power for equipment, pathway for cabling air conditioning and incidentals for proper operation of each TR.

1.3 EQUIPMENT MOUNTING

A. All floor supported equipment racks shall be bolted to the structure in accordance with the requirements of the CBC.

B. Contractor shall install per approved structural engineering design illustrating the materials approved that conform to these requirements.

1.4 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

PART 2 - PRODUCTS

2.1 PRODUCTS

A. Seismic Racks

1. RXL-2823-BK8019 heavy duty double sided seismic 2-post rack, or equal.
    a. Eight-foot for new builds and remodels where space is permits.
    b. Seven-foot racks will be used as an alternate where space is not available for taller racks. Coordinate rack requirements with the owner.

B. Standard Racks

1. RXL-2200-BK80T, RXL-2020-BK80T two post rack, or equal.
    a. Eight-foot for new builds and remodels where space permits.
    b. Seven-foot racks will be used as an alternate where space is not available for taller racks. Coordinate rack requirements with the owner.

PART 3 - EXECUTION

3.1 GENERAL

A. Free-standing Universal Racks

1. Assemble relay racks according to manufacturer’s instructions. Verify that equipment mounting rails are sized properly for rack-mount equipment before attaching the rack to the floor.
2. Racks and cabinets must be attached to the floor in four places using appropriate floor mounting anchors. When placed over a raised floor, threaded rods should pass through the raised floor tile and be secured in the structural floor below.

3. Racks and cabinets shall be grounded to the TGB and or TMGB using appropriate hardware provided by the contractor. The ground will meet local code requirements and will be approved by the Authority Having Jurisdiction (AHJ).
4. In seismic areas, the rack should have additional bracing as required by building codes and the recommendations of a licensed structural engineer.
5. Ladder rack may be attached to the top of the rack to deliver cables to the rack. The rack should not be drilled to attach ladder rack. Use appropriate hardware from the ladder rack manufacturer.
6. The equipment load should be evenly distributed and uniform on the rack. Place large and heavy equipment towards the bottom of the rack. Secure all equipment to the rack with equipment mounting screws.
7. Install per approved structural requirements as defined by the project structural review.

END OF SECTION

SECTION 27 11 19
COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

PART 1 - GENERAL

1.1 SUMMARY

A. Furnish and install copper termination assemblies, including rack and cabinet mounted copper patch panels.

B. Furnish and install fiber termination assemblies, including:

1. Fiber connectors
2. Rack and cabinet mounted fiber patch panels

1.2 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.3 SUBMITTALS

A. Provide product data for the following:

1. Manufacturer's data/cut sheets, product drawing/specifications and installation instructions for all products (submit with bid).

1.4 QUALITY ASSURANCE

A. All cable and equipment shall be installed in a neat and workmanlike manner. All methods of construction that are not specifically described or indicated in the contract documents shall be subject to the control and approval of the owner or owner representative.

B. Equipment and materials shall be of the quality and manufacture indicated. The equipment specified is based upon the acceptable manufacturers listed. Where "approved equal" is stated or a substitution is requested, equipment shall be equivalent in every way to that of the equipment specified. All substitutions are subject to the control and approval of the owner or the owner representative.

C. Strictly adhere to all BICSI, and Telecommunications Industry Association (TIA) recommended installation practices when installing communications/data cabling.

1.5 WARRANTY

A. The horizontal communications cabling system installed shall be eligible for coverage by a Limited Lifetime Warranty to the end user.

B. Authorized Installer/Authorized Integrator shall provide labor, materials, and documentation in accordance with Panduit requirements necessary to ensure that the Owner will be furnished with a Limited Lifetime Warranty.

C. Necessary documentation for warranty registration shall be provided to the manufacturer by the installer (within 10 days) following 100 percent testing of cables.

PART 2 - PRODUCTS

2.1 COPPER CABLE TERMINATION DEVICES AND RELATED

A. Copper patch panels

1. Rack mount category 6A 8P8C
2. Panduit CP48WSBLY
3. Or approved equal.

2.2 FIBER CABLE TERMINATION

A. Fiber Optic Connectors

1. Provide fusion splice to factory terminated and pigtailed splice cassette.
2. Insertion loss for multi-mode ≤ 0.15 dB - manufacturer's rating for typical splice.

3. Insertion loss for single mode ≤ 0.06 dB - manufacturer's rating for typical splice.
4. LC at rack mounted patch panels as noted or scheduled,
5. Use Corning Cable Systems model X77 Micro Fusion Splicer, Fujikura fusion splicer, or equal.

B.

C. Utilize a precision zirconia ceramic ferrule.

D. Shall have a radial-ramped coupling nut, which facilitates mating/de-mating.

E. Connector performance per TIA-568.C.3 and the following:
1. Insertion Loss, multimode: Less than or equal to 0.75 dB per mated pair.
2. Insertion Loss, single mode: Less than or equal to 0.50 dB per mated pair
3. Insertion Loss: single mode, angle polish: Less than or equal to 0.30 dB per mated pair
4. Return Loss: single mode, Ultra Polish, greater than or equal to 55 dB
5. Return Loss: single mode, Angle Polish, greater than or equal to 65 dB

F. Fusion Spliced LC Multimode matching to the fiber type being terminated.

G. Fusion Spliced LC Single Mode matching the fiber type being terminated.

2.3 FIBER DISTRIBUTION PANELS

A. Fiber Termination Unit
1. AFL Ascend high density rack mounted fiber housing with LC cassettes sized accordingly.
2. Provide manufacturer's blank cover inserts at unused openings.

PART 3 - EXECUTION

3.1 GENERAL

A. The contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein.

B. Contractor shall have a minimum of five (5) years of recent experience on structured cabling systems of similar type, size and quantities.

C. Cable termination:
1. Route cables in Telecom Rooms to patch panels in racks by routing across cable runway to top of rack and then down vertical cable management sections to back of patch panels or termination locations.
2. Route cables in Telecom Rooms to wall mount cabinets and down through openings of top and/or bottom of cabinets to patch panels. Cabinet standoffs may be used to create additional and necessary pathway.
3. Cables and Termination Hardware: Test 100 percent for defects in installation and verify cabling system performance under installed conditions.

a. Verify all pairs of each installed cable before system acceptance.

b. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.

4. Cables, Jacks, Connecting Blocks, and Patch Panels:

a. Verify all pairs of each installed cable before system acceptance.

b. Defects in cabling system installation, including but not limited to cables, connectors, patch panels, and connector blocks shall be repaired or replaced to ensure 100 percent useable conductors in all cables installed.

END OF SECTION

SECTION 27 11 23
COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes provision of cable management for cabling installed under the work of this Project.

B. Install plywood to surround each TR room to support systems and cable management.

C. Install ladder racking.

D. Install CFCI racks and vertical wire managers to support cable management and supporting systems within the room.

E. Contractor to furnish and install patch panels.

F. Contractor to furnish and horizontal cable management.

G. Install conduit, fire penetrations, and cable pathway suitable to support and manage the installation of fiber and copper data infrastructure per BICSI standards.

H. Ensure proper maximum fill ratios for all pathways. Do not overfill pathways.

I. Ensure proper EMI separation.

J. Install innerduct where required.

1.2 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

I. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

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K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

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Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

PART 2 - PRODUCTS

2.1 LADDER RACK

A. Cable Runway (Ladder Rack)

1. Construction:
    a. Solid steel side bar per ASTM A-36 or tubular steel side bar per ASTM A-513.
    b. Stringers shall be 1-1/2” x 3/8” x .065”.
    c. Cross members shall be ½” x 1” x .065” welded at 9” intervals.
    d. Overall length shall be 9’ 8-1/2”.
    e. UL classified
2. Accessories: Provide with a complete system of accessories, including radius corners at vertical and horizontal bends, section splice plates, expansion plates, blind-end plates, etc. Provide waterfall drop-outs at each end of cabling racks and cabinets or where needed to terminate open wiring systems.
3. Finish: Black powder coat
4. Runway shall be black in color minimum 18” wide.
5. Provide runway elevation kit.
6. Modular ladder rack, such as Panduit Redi-Rail, is not approved for use on UCDH projects.

2.2 LADDER RACK APPLICATION

1. Ladder Rack - Wraps and traverses within communications rooms, as shown on construction drawings.
2. Ladder Rack size is typically 18" wide unless the room size prohibits access when installed. Install ladder rack as sized on the drawings.

2.3 BACKBOARD CABLE MANAGEMENT (CONTRACTOR FURNISHED AND INSTALLED)

A. ¾ inch x 48” x 84 “ A/C grade, fire rated, painted plywood installed on perimeter of the room.

1. Plywood will be painted with an approved fire-retardant paint compliant with APWA and CSFM/CBC standards.
2. Fire rating labels on plywood will be covered with masking tape before painting and later removed to allow for inspection before turnover.

2.4 INNERDUCT (CONTRACTOR FURNISHED AND INSTALLED)

A. Interior (non-plenum)
   1. Carlon Optic-Gard/PVC.
   2. Arnco.

B. Interior (plenum)
   1. Carlon Plenum-Gard.
   2. Arnco.

2.5 CONDUIT SPILLWAY (CONTRACTOR FURNISHED AND INSTALLED)

A. For conduit transitions.

B. Constructed of fire-retardant ABS.
   1. Panduit CWF400 or equal.

2.6 LADDER RACK WATERFALL (CONTRACTOR FURNISHED AND INSTALLED)

A. Provide ladder rack water fall at all tray ends and side cuts.

B. Provide drop out at center cuts.
   1. Panduit WGBTMWFBL.
   2. Panduit WGSDWWF4BL.
   3. B-line WB06-DO (8 or 12).

2.7 J HOOK CABLE MANAGEMENT (CONTRACTOR FURNISHED AND INSTALLED)

A. Provide and install according to Section 27 05 29.

2.8 HORIZONTAL WIRE MANAGER (CONTRACTOR FURNISHED AND INSTALLED)

A. Install 2 or 4 RU assembly as indicated in Owner provided rack elevations.

B. Panduit NM2 or NMF4 as shown on IT rack elevation drawings.

2.9 VERTICAL WIRE MANAGEMENT (CONTRACTOR FURNISHED AND INSTALLED)

A. High density vertical wire manager to accommodate fiber and copper cross connecting patching cables in addition to providing power distribution power strip mounting surfaces and space.

B. Contractor installed; refer to Owner provided rack elevation drawings for placement.

1. Install according to construction documents.
2. Do not put large sweeps or service loops in vertical cable managers.

C. Provide Panduit PE2VD1096PT/N or equal.

PART 3 - EXECUTION

3.1 GENERAL EXECUTION - PREPARATION

A. UCDH IT is responsible for preliminary layout of the telecommunications room and shall provide requirements to Construction Team for the production of shop drawings.

B. The cabling contractor in addition to the engineer is responsible for managing cable quantities and validation of the pathways provided for fill ratio and placement to ensure cable length and capacities are according to Owner requirements. If a determination is made that the pathway is deficient, the contractor shall construct additional pathways accordingly.

C. Install products, components, accessories, hardware, etc., according to the manufacturer's instructions. Do not put service loops in vertical wire managers.

D. The contractor selected to provide the installation of this system shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein.

3.2 INSTALLATION

A. Do NOT Tie Wrap cables.

B. Ladder rack shall be securely bonded to the Telecommunications Grounding Busbar (TGB and TMGB). Attach a bonding conductor sized as defined in J-STD-607-D and as defined by local code or the authority having jurisdiction (AHJ) between the Telecommunications Grounding Busbar and the ladder rack. Attach the bonding conductor to the ladder rack using included hardware according to the manufacturer's installation instructions. The installer shall provide the bonding conductor and other necessary hardware required to make the connections between the ladder rack and the Telecommunications Grounding Busbar.

C. Install end caps for all exposed ends. File and deburr ladder rack then place end caps on all exposed ends.

3.3 J HOOK CABLE MANAGEMENT

1. Cables are to be consistently grouped together with like systems cabling (Fiber/AV/ Copper/Feeder, Etc.
2. Suspended cable runs (J-Hooks) shall be supported at intervals not exceeding every 5'. Cable installed on exposed surfaces or structural members shall be installed parallel and perpendicular to the surfaces unless a cable distance limitation arises. Cable distance and remaining within cable distance limits shall take priority. Surface contours shall be followed wherever possible.
3. Attaching cables to pipes, electrical conduit, mechanical items, existing cables, or the ceiling support system (grids, hanger wires, etc. – with the exception of ceiling support anchors) is not acceptable unless approved by the AHJ

4. Cabling installed in J-Hooks or Stiffy's, shall not have a deflection of more than 3", as identified in the cable support details, in the drawings.

3.4 EXAMINATION AND ACCEPTANCE

A. Perform walk thru with Owner representative to validate cable separation, cable routes and fill ratios.

END OF SECTION

SECTION 27 11 26
COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Building IT UPS. Three phase.

1. All IT equipment in the IT room shall be serviced (unless prohibited by code) by the IT UPS. A single efficient building UPS is the goal of IT to minimize UPS size and optimize maintenance. (Contractor Furnished, Contractor Installed)

B. Single phase IT UPS systems up to 10 KVA (Owner Furnished, Owner Installed)

C. 208 Volt power provided to the IT UPS systems, 10 KVA, 6 KVA, or three phase unit, Contractor Furnished Contractor Installed.

D. 110 Volt power provided to the IT UPS system 3 KVA, contractor furnished, and contractor installed.

E. Power Distribution from the three phase IT UPS power distribution panel to each outlet, Contractor Furnished and Contractor Installed.

F. Turn up, test and certification provided by Owner.

G. Installation of Power Strips in Cabinets and Racks are Owner Furnished Owner Installed.

1.2 REFERENCES

A. ANSI/TIA-569-E Telecommunications Pathways and Spaces, 2019

B. ANSI/TIA-568.0-D Generic Telecommunications Cabling for Customer Premises, 2015

C. ANSI/TIA – 568.1-D Commercial Building Telecommunications Cabling Standard, 2015.

D. ANSI/TIA-942-B Telecommunications Infrastructure Standard for Data Centers, 2017.

E. ANSI/TIA – 606-C Administration Standard for Telecommunications Infrastructure, 2017.

F. ANSI/TIA – 607-D Generic Telecommunications Bonding and Grounding (Earthing) For Customer Premises, 2019.

G. ANSI/TIA-862-B Structured Cabling Infrastructure Standard for Intelligent Building Systems, 2016

H. California Electrical Code (CEC).

1.3 SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for rack-mounted power protection and power strips.

2. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.

B. Shop Drawings: For communications equipment room fittings. Include plans, elevations, sections, details, and attachments to other work.

1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
2. Include workspace requirements and access for cable connections.
3. Grounding: Indicate any chassis bonding requirements.
4. Network Connection and Programming: Indicate networking and configuration requirements and connections.

1.4 QUALITY ASSURANCE

A. Product Certifications: UL & CUL 62368; IEC 62368; CE; FCC Part 15, Class A; EN 55022 and RoHS Compliant

1.5 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

I. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

J. 27 13 00 COMMUNICATIONS BACKBONE CABLING

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

1.6 SEQUENCING

A. Coordinate with Construction management and Owner representative. A 30-Day burn in is required for electronic equipment.

1.7 PREPARATION

A. Verify that no piping systems, (e.g., water sources) run through or above the UPS location.

B. Provide shop drawings indicating locations and sizes of UPS systems to receive approval of IT Facilities.

1.8 EMERGENCY POWER

A. Provide two (2) separate emergency distribution systems from two (2) ATS designed “Life Safety System” and “Equipment System” where available.

1.9 POWER NON-HOSPITAL (LEASED ADMIN)

A. Provide two (2) separate distribution systems from two diverse panels.

B. Where available backup generator service shall provide service to UPS equipment.

C. Owner required emergency power loads such as IT systems shall be placed on the “Equipment System” (Load shedding provisions).

PART 2 - PRODUCTS

2.1 UNINTERRUPTABLE POWER SUPPLIES

A. Liebert UPS

2.2 GENERAL

A. A bypass circuit shall be provided as an integral part of the UPS. The bypass control logic shall contain an automatic transfer control circuit that senses the status of the inverter logic signals and operating and alarms conditions. This control circuit shall provide a transfer of the load to the bypass source if available and if the inverter is capable of powering the load (i.e., if there is an overload condition, if the unit is in Manual Bypass Mode or if the voltage or frequency is out of tolerance).

1. Automatic Transfers

2.3 BYPASS

A. The transfer control logic shall activate the bypass automatically, transferring the critical AC load to the bypass source, shall be provided when applicable.

B. COMMUNICATION OPTIONS

1. Liebert IntelliSlot Communications

C. The UPS shall include one Liebert IntelliSlot communication port to allow the operator to field-install an optional Liebert IntelliSlot communication card. A Liebert IntelliSlot card may be installed during any state of UPS operation (On, Standby or Off states). Available Liebert IntelliSlot options are described below.

D. Liebert IntelliSlot Web Card (IS-WEBCARD)

E. The optional Liebert IntelliSlot Web Card shall deliver SNMP and Web management to the UPS when connected to any 10 or 100 Mbit Ethernet network. The card shall support 10 and 100 Mbit Ethernet and shall provide for in-the-field upgrade of SNMP firmware. The kit shall include the Liebert IntelliSlot card, MIB, configuration cable and user manual.

F. Liebert IntelliSlot Relay Interface Card (RELAYCARD-INT)

G. The optional Liebert IntelliSlot Relay Interface Card shall provide contact closure for remote monitoring of alarm conditions in the UPS, delivering signals for On Battery, On Bypass, Low Battery, Summary Alarm, UPS Fault and On UPS. The contacts shall be rated for 24VAC or 24VDC at 1A. Connections shall be to a DB25F connector with cable provided by the end user.

2.4 ANY-MODE SHUTDOWN

A. The purpose of Any-Mode Shutdown shall be to shut down the UPS output by turning off the rectifier, inverter, and bypass so that there is no power to the loads.

B. Any-Mode Shutdown can be operated locally and remotely, as described as follows:

C. Local Any-Mode Shutdown can be performed by shorting Pin 1 and Pin 2

D. Remote Any-Mode Shutdown can be performed by a switch connected to Pin 1 and Pin 2 and mounted at a remote location.

E. Remote Power Off shall be performed either by NO or NC contact of Any-Mode Shutdown, depending on the settings in the configuration program.

F. A current-limited source (+12VDC, 50mA) shall be available from the UPS.

G. The connection to the UPS for remote connection shall be via terminal block connector.

H. Any-Mode Shutdown wiring shall conform to all national, regional, and local wiring regulations.

2.5 BATTERY MODE SHUTDOWN

A. Battery Mode Shutdown shall permit shutting down the UPS by turning Off the rectifier, inverter, and bypass so that there is no power to the load when the UPS is On Battery. Battery Mode Shutdown can be performed locally or remotely:

B. Local Any-Mode Shutdown can be performed by shorting Pin 3 and Pin 4.

C. Remote Any-Mode Shutdown can be achieved by a switch connected to Pin 3 and Pin 4 and mounted at a remote location.

D. On Battery

E. On Battery signal shall be a normally open (NO) dry contact. When the UPS is supplying output power from the battery this dry contact shall be closed.

F. Low Battery

G. Low Battery signal shall be a normally open (NO) dry contact. When the UPS is supplying output power from the battery and has reached the Low Battery Warning time selected in the configuration program, this dry contact shall be closed.

H. The rated values for the dry contacts shall be:

I. Rated Voltage: 5V

J. Working Voltage Range: 4.5-10V

K. Rated Current: 30Ma

2.6 LIEBERT REMOTE SYSTEMS MONITORING

A. All UPS systems must integrate into the existing UPS remote monitoring system to be approved for installation.

2.7 WARRANTIES

A. Minimum of 3 years of standard warranty with ability to extend by at least 2 additional years. Advanced replacement of defective equipment shall be offered as a standard service.

PART 3 - EXECUTION

3.1 GENERAL

A. Confirm the exact power output distribution requirements with the Owner's Representative.

B. Estimated runtime of 30 minutes is required. Provide Quantity (2) Two Optional External Battery Cabinets in base bid. Check with Owner’s Representative for additional requirements.

C. Secure approval of UPS locations with IT Facilities.

D. Input Disconnect

1. Install disconnect to input of UPS applicable to the size and type of appliance.
2. 10 KVA UPS installations shall have a wall mounted disconnect (EPO) within the IT Equipment room.
3. 6 KVA UPS installations shall have a wall mounted disconnect (EPO) within the IT Equipment room.
4. 3 KVA Disconnect or EPO is provided within the UPS itself.

E. Demonstration

1. Full functionality of UPS by:

   a. Disconnecting power to the UPS and demonstrating ability of UPS to carry load consistent with the manufacturers' runtime for the attached load.

   b. Demonstrate that the UPS passes the manufacturers diagnostic software with no errors.

END OF SECTION

SECTION 27 13 00
COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. The Section applies to all new TR rooms within the project. Work of this Section includes:
   1. Indoor Copper Backbone Cabling between Telecommunications Rooms.
   2. Indoor Copper Backbone Cabling between Telecommunications Rooms and MPOE.
   3. Indoor Optical Fiber Backbone Cabling between Telecommunications Rooms.

1.2 SYSTEM DESCRIPTION

A. High-capacity infrastructure required to support aggregated voice and data communications to areas outside the immediate influence of the local TR Room.

B. Communications Back Bone typically consisting of:
   1. Category 3 Voice Grade Copper Communications Infrastructure Backbone
   2. Optical Fiber Transport Medium(s) Infrastructure Backbone

C. This section may describe configurations for cabling associate with the Owner Medical Center Campus. Offsite configuration may require circuit extensions and single entrances not described in the specification. Report conflicts between construction drawings and IT standard to the Owner representative before purchasing material or proceeding with installation.

1.3 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

I. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

J. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

K. 27 13 43 COMMUNICATIONS SERVICES CABLING

L. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, AND ANTENNA SYSTEMS

1.4 SUBMITTALS

A. Provide submittal information for the following submittal sections as described below:
   1. Product Data
   2. Shop Drawings:
      a. Cable routing and Grouping Plan.
      b. Front of Rack elevations showing completed as-built corrections.
      c. Provide as-built records of equipment cabinet/rack with addressing and labeling scheme.
      d. Provide as-built fiber strand, adapter panel, and FDU and WME housing addressing, and labeling scheme as installed.

PART 2 - PRODUCTS

2.1 CATEGORY 3 RISER / HORIZONTAL BACKBONE CABLING

A. Shall be EIA/TIA Category 3 cable

B. Each conductor shall be a minimum of 24 AWG

C. Plenum Rated (CMP) Solid conductor 100-ohm multipair UTP (Unshielded twisted pair), formed into 25 pair binder groups.

D. Imprinted with manufacturers name or identifier, flammability rating, gauge of conductor, transmission performance rating (category designation) at regular intervals not to exceed 2’.

E. The word "FEET" or the abbreviation "FT" shall appear after each length marking.

F. Provide Telecommunications plenum (CMP) rated cabling for horizontal and cables designated as riser cable.

G. Manufacturer:
   1. General Cable
   2. Or approved equal.

2.2 FIBER OPTIC COMMUNICATIONS CABLING

A. Fiber Optic Cable, Inside Distribution, Breakout Cable

1. Manufacturer: General Cable BEXXX1PNU-ILPA and APXXX1PNU-ILPA (where “XXX” equals strand count)

2. Or AFL .

B. Fiber Optic Cable, Plenum

1. General Cable BEXXX1PNU-ILPA and APXXX1PNU-ILPA, where XXX equals strand count.

2. Or AFL CRXXX9891#01-AIAR .

PART 3 - EXECUTION

3.1 GENERAL

A. All system cabling and terminations shall be installed in accordance with manufacturer's instructions and as indicated on Contractor’s submittal documentation, prior to final acceptance/approval by the Owner.

B. Installation shall be performed and accomplished in a professional manner, by qualified personnel.

3.2 PERFORMANCE STANDARDS

A. Telephone (Voice) Copper Cabling Plant

1. Suitable for direct connection to the public switched network in accordance with rules set forth by FCC Part 68, California Public Utilities Commission, and other authorities having jurisdiction.

2. Category 3 as defined in TIA-568-C.2

B. Fiber Optic Cabling

1. The optical loss budget for any end-to-end link not to exceed the sum of (optical fiber loss + splice loss + connector loss).

2. Optical fiber loss shall be the optical fiber specified cable performance, pro-rated for total link distance.

3. Fiber loss, multimode, not to exceed:

a. At 850 nanometers, 3.5 dB per kilometer; at 1300 nanometers, 1.5 dB per kilometer.

4. Fiber loss, single mode, outside plant cable, not to exceed:

a. At 1310 nanometers, 0.5 dB per kilometer; at 1550 nanometers, 0.5 dB per kilometer.

5. Fiber loss, single mode, inside plant cable, not to exceed:

a. At 1310 nanometers, 1.0 dB per kilometer; at 1550 nanometers, 1.0 dB per kilometer.

6. Splice loss, multimode not to exceed 0.15 dB for each fusion splice.

7. Splice loss, single mode not to exceed 0.06 dB for each fusion splice.

8. Connector loss, multimode not to exceed 0.75 dB for each mated pair of type lc, ultra polish connector.
9. Connector loss, single mode not to exceed 0.50 dB for each mated pair of type lc, ultra polish connector or 0.30 dB for each mated pair of type lc, angle polished connector.

3.3 INSTALLATION

A. CAT3 COPPER BACKBONE CABLE

1. Application for TR / MPOE / EF CAT3 Interconnectivity Copper Backbone.
2. Minimum configuration of CAT3 Interconnectivity between MPOE and all telecommunications TR rooms shall be a 50 Pair, to each TR.

B. FIBER OPTIC CABLING

1. Minimum Interconnectivity between MPOE and all TR's shall be 24 strand SM fiber, to each TR.
2. Interconnectivity from the secondary EF to all other TR's shall be 24 strand SM fiber, to each TR.
3. Diverse physical pathway shall be determined between telecommunications rooms that precludes using a single physical pathway for all backbone cabling between TR's.
4. At TR / MPOE and EFs, at both ends of cables, wrap the room before entering patch panel by a dressed route.
5. At interior: Provide splice free cabling between telecom rooms; as well as between telecom rooms and all locations in the same building indicated for fiber cabling media.
6. Terminate fibers using a pre-terminated AFL Ascend LC fiber cassette.
7. Review proposed breakout procedure with the Owner's Representative before beginning this work.
8. Refer to OWNER IT elevations and distribution drawings for further details.

3.4 TESTING

A. GENERAL

1. Test and report on each intermediate cabling segment separately, including station cabling, horizontal distribution (each segment, if multiple) and telecommunications room wiring.
2. Test each end-to-end cable link.
3. Submit machine-generated documentation and raw data of all test results on Contractor-provided, and Owner's representative approved, forms; and in electronic format approved by the Owner's Representative.

3.5 TEST PROCEDURES – COPPER

1. A new cable shall be tested only after all wires within the cable have been terminated at both ends.
2. The Contractor shall test all high-count copper cables and submit test result information in an electronic format. Acceptable formats are Word, Excel. Owner's representative to provide required format for test report documentation.
3. TEST #1 – Continuity: Use multi-meter capable of reading resistance.

4. Meter set for 20-ohm full scale ohm reading. Each pair shall be shorted at one end and the loop resistance value read at the other.
5. The difference between the largest and the smallest resistance reading from each pair in the cable shall be no more than 10 percent of the largest reading.
6. TEST #2 - Balance, Polarity and Conductor Transpositions:
7. Upon passing Test #1, the tester at one end of cable shall ground tip side of each pair in turn. The tester at other end of cable reads resistance to building ground of same conductor.
8. REQUIREMENT: Reading for each tip conductor in pair of approximately one-half the loop resistance value from Test #1.
9. The Contractor shall correct all defects possible.
10. If the maximum number of unrepairable defective pairs exceeds 1% of the cable's pair count, the cable shall be deemed unacceptable and shall be replaced. Replace, re-terminate and retest new cable at no additional cost to the Owner.
11. Comply with the detailed reporting results described above and the following: high pair count copper cables.
12. Submit Test Report. Documentation shall include loop resistance regarding any opens, shorts, transpositions found, as well as corrective action taken to correct any found opens, shorts, or transpositions.

3.6 TEST PROCEDURES – FIBER

A. Testing

1. The Contractor shall test all fiber optic cables and submit all fiber test result data in electronic format.
2. Perform fiber optic cable testing on all installed fiber optic cabling. Submit test results. Notify Owner’s representative in writing at least 72 hours in advance that fiber optic cable testing shall commence. Submit calibration certification for testing equipment to be used.
3. A new cable shall be tested only after all wires within the cable have been terminated at both ends unless specifically requested by the Owner.
4. Fibers tests shall include OTDR, results with the meter set to the wavelength measurements specific to the cable or as requested by IT.
5. A second set of testing shall be performed using an Optical Loss Test Set for the same strands.
6. OTDR Distance and Attenuation Assessments perform on all cabling segments perform in accordance with the requirements of: TIA-568-C.1, TIA-568-C.3, TIA-455-59-A.
7. Test all fibers with launch and far end cable of sufficient length for the OTDR to be able transmit through all installed connectors.
8. OTDR through all connectors, a one-way test is not acceptable. Means and methods to fully evaluate product installed shall be approved prior to commencing.
9. Test and submit strip charts and/or tracer recordings on all strands in each tube in every cable in both directions.
10. User Interface records including a graph depicting fiber loss locations and total DB loss per event via OTDR.
11. Submit test report no later than five days after the cables are tested.

B. Test and submit OTDR attenuation assessments test results on each fiber, in each cable, and in both directions under final installation conditions. Submit with the following information:

1. Date of test
2. Name of test personnel
3. Test wavelength
4. Pulse duration(s) and scale range(s)
5. Index of refraction
6. Fiber cable type and part number
7. Fiber tube and/or fiber strand number
8. Direction of test
9. Overall distance
10. Attenuation in dB
11. Localized attenuation shall not exceed 0.5 dB at any point

3.7 TEST EQUIPMENT

A. Contractor shall provide all test equipment as required to perform the scope of work.

B. Test the communication systems cabling using at least one (1) each of the following test measurement devices or their functional equivalents:

1. Level IIIe field testers as defined in TIA-1152 – Fluke DSX-5000, or equal. Test equipment shall have been calibrated within 1 year of test date.
2. The tester including the appropriate interface adapter must meet the specified accuracy requirements.
3. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 4 of TIA-1152.
4. The RJ45 test plug shall fall within the values specified in TIA-568-C Annex C for NEXT, FEXT and Return Loss.
5. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters.
6. In order to deliver optimum accuracy, permanent link interface adapter for the tester shall be used, which can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface. The contractor shall provide proof that the interface has been calibrated within 1 year of the test date.
7. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.
8. Outside Plant Voice Cabling Plant tester - capable of detecting shorts, opens, reversals, mis-wiring and cross twists.
    a. Siemon STM-8, Fluke or equal.

C. Optical Power Meter - Multimode

1. Corning Cable Systems, Fluke or equal
2. Minimum Performance - Multimode Power Meter 850nm and 1300nm +/- 20 nm wavelength LED light sources.

3. Spectral width of sources shall be </= 50nm for 850nm wavelengths and </= 140nm for 1300nm wavelengths.
4. Output Stability +/- 0.40 dB from 0 to 50 degrees C
5. Long Term output stability +/- 0.10dB at 25 degrees C Connector types to include: LC only.

D. Optical Power Meter – Single Mode

1. Corning Cable Systems, Fluke or equal
2. Minimum Performance - Single Mode Power Meter 1300nm and 1500nm +/- 20 nm wavelength laser light sources.
3. Output Stability +/- 0.40 dB from 0 to 50 degrees C
4. Long Term output stability +/- 0.10dB at 25 degrees C Measurement range shall be from 10 to -60 dBm
5. Accuracy shall be +/- 5% at 0 to -50dBm and +/- 10% 10 to 0dBm and -50 to-60 dBm.
6. Resolution shall be 0.1 dB
7. Connector types shall include LC only.
8. Optical Time Domain Reflectometer. (Fluke, JDSU or equal).

3.8 EXAMINATION & ACCEPTANCE

A. Testing Results Review and Verification by the Owner

1. Contractor shall submit (1) copy of software capable of viewing the electronic test result files.
2. Data found to be altered from the manufacturers recommended settings may result in retention by the Owner of a 3rd party test company to retest the installed cabling at the expense of the Contractor.
3. Events exceeding industry standards will cause the test result to be rejected. Direct review by UCDH IT will be required to allow for an exception of a test result.
4. Data found to be incomplete may result in retention by the Owner of a 3rd Party Test Company to retest the installed cabling at the expense of the Contractor.

3.9 FINAL REVIEW

1. Walk each route defined in preparation section and describe the diverse and redundant routes taken for each and all backbone cables.
2. Produce documentation and illustrate during walk thru the labeling completed.
3. Provide UL listings and display conformance to all Fire ratings and UL listings between all locations. Provide signed inspections reports depicting authority having jurisdiction approval of all work completed.

END OF SECTION

SECTION 27 13 43
COMMUNICATIONS SERVICES CABLING

PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Outdoor (Outside Plant) Communications Cabling placed underground in existing communications ducts.
   1. High pair count copper cabling
   2. Fiber Optic Cabling
   3. Terminate fiber on patch panels as specified in Section 27 11 19
   4. Terminate copper cabling on lightning protectors as specified in Section 27 05 00

B. For all cabling
   1. Test cabling to demonstrate performance to specified standards or better using test equipment and methods as specified in Section 27 05 00.
   2. Label cables, jacks, plates, and patch panels as specified in Section 27 05 53.
   3. Document on Record Documents as described in Section 27 05 00.

1.2 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

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1.3 REFERENCES

A. In addition to the requirements of Section 27 05 00 - Common Work Results for Communications, conform to the applicable portions of the following standards agencies:
   1. BICSI
   2. Customer Owned Outside Plant Design Manual, Latest Edition.

1.4 SUBMITTALS

A. All submittals shall be approved by IT Facilities.

1.5 SEQUENCING

A. Complete entrance facilities prior to need for communications to fire life safety.

B. Complete Section 27 13 00 to facilitate need for communications to fire life safety.

PART 2 - PRODUCTS

2.1 FIBER OPTIC CABLING

A. As specified in Section 27 00 50 – Common Work Results for Communications

B. Fiber Optic Cable, Outside Plant:
   1. AFL
   2. Corning
   3. Approved Equal

C. Drawing References:
   1. F-XXX Multimode, where XX indicates fiber count.
   2. F-XXX Singlemode, where XX indicates fiber count.
   3. Contact Owner Representative for next sequenced designation number.
   4. Contact Owner Representative for underground plant MAP.

D. Refer additionally to Fiber Cable Construction, General, and elsewhere herein.
   1. Adhere to TIA-455 or TIA-568c.3 or applicable.

E. Suitable and approved for wet location/direct burial.

F. Ribbon fiber bundles
   1. Armored/rodent resistant or similar construction
   2. AFL part # DNT-0019-04 WTC SWR OSP, (XXX) (strand count) or
   3. SM SR15E-(XXX)-K-C-(XXX)-1-00N1D

G. Performance:
   1. Maximum attenuation per EIA/TIA-455-61
   2. Multimode
   3. 850 nm: ≤ 3.5 dB/km
   4. 1300 nm: ≤ 1.0 dB/km
   5. Singlemode
   6. 1300 nm: ≤ 0.4 dB/km
   7. 1550 nm: ≤ 0.3 dB/km

H. Maximum required bend radius:
   1. At installation: 20x's diameter
   2. Long term application: 10x's diameter
   3. Zero water entry per FOTP-82, 24 hours immersion
   4. Crush resistance: 600N/cm min per EIA-455-41
   5. Impact Resistance: 25 impacts, per FOTP-25
   6. Flex, Twist/Bend: 25 cycles, per FOTP-104 and FOTP-85

I. Loose Tube Manufacturer:
   1. General Cable
   2. AFL
   3. Approved Equal

2.2 OPTICAL FIBER SPLICE CLOSURE

A. Functions/Features
   1. Provide re-enterable underground or inside plant splice closure as shown on the Drawings.
   2. Metal Stainless Steel or plastic construction – no corrodible materials.
   3. Waterproof, suitable for direct burial.
   4. Fusion splice protection chamber.
   5. Grommet cable entrance and exits.

B. Manufacturers
   1. Preformed Line Products Coyote Series.
   2. AFL Apex.

3. Or approved equal.

2.3 TELEPHONE, OUTSIDE PLANT, UNDERGROUND IN DUCTBANK

A. Drawing Reference: xx CU, with pair counts and Building Termination as indicated.

B. Features/Functions

1. Solid round copper wire individually bound per REA PE-39 color coded.
2. Meets RUS REA 1755.390.
3. Solid aluminum tape overall shield.
4. Gel filled.
5. Polyethylene Overall Jacket.
6. Suitable for direct burial.
7. 6 to 3000 Pair counts available.

C. Manufacturer

1. General Cable
2. Any meeting REA PE-39 for cable smaller than 400 pair.
3. Any meeting REA PE-39 or REA PE-89 for cable 400 pair or larger.
4. Or approved equal.

2.4 OUTSIDE PLANT HORIZONTAL CABLING

1. General Cable GenSPEED 10 UTP Indoor-Outdoor Plenum Category 6A Cable, Part No. 7141007.
2. Or approved equal.

2.5 SHIELD CONNECTORS

A. Shield connectors shall make a stable, low-impedance electrical connection between the shield of the communications cable and a conductor such as a strap, bar, or wire.

B. The connector shall be made of tin-plated tempered brass.

C. Shield bond connectors shall comply with REA PE-33.

2.6 GROUNDING BRAID

A. Grounding braid shall provide low electrical impedance connections for dependable shield bonding.

B. The braid shall be made from flat tin-plated copper.

2.7 OUTSIDE PLANT TELEPHONE CABLING CLOSURES

A. In Building Telephone Closure:

B. Drawing Reference: IBTC

C. Features and Functions:

1. Provides transition point from unlisted, gel-filled Outside Plant Cabling to Interior (CU) cabling.
2. Can house a straight, butt, and branch splice in a protective housing.
3. Not pressurized or encapsulated.
4. Fire-retardant Plastic construction, meeting PUB55006 for interior (in-building) installation.

D. End Caps

1. Multiple End caps shall be sized precisely to fit the diameter of the tip cables entering the closure.
2. Number of openings in the multiple end caps shall be determined by dividing the number pairs in the feed cable by 100 and doubling that number. (ie. 1200 pair cable would have 24 openings for tip cables.
3. Collared Cap opening can be up to 6.35mm (1/4") larger than the feed cable diameter.
4. Actual end cap to be provided shall be based on the diameter of the feed cable to be spliced.

E. Plugs

1. Use tapered or collared plugs as required to fill extra opening in end caps.
2. Seal if inside diameter of hole is less than 6.35mm (.25").

F. Bushings

1. Use rubber or variable bushings as required to reduce standard opening in end caps to accommodate custom diameters.
2. Seal if inside diameter of hole is less than 6.35mm (.25").

G. Manufacturer

1. UraSeal 2000FR Type.
2. 3M K&B Series.
3. Tyco Electronics.
4. Or approved equal.

2.8 OUTSIDE PLANT TELEPHONE CLOSURE, VAULT

A. Drawing Reference: OTC, TOSC

B. Features/Functions

1. Stainless Steel outer jacket housing
2. Can house a straight, butt, and branch splice in a protective housing.
3. Rigid outer protective body
4. Suitable for periodic water immersion - air and watertight.
5. Renter able.
6. Gel Filled, Injected encapsulant using precision means.
7. Minimum inside diameter shall be 5" (127mm).

8. Minimum inside length shall be 26" (660mm).

C. Manufacturer

1. Preformed Line Products Armadillo Stainless.
2. UraSeal
3. 3M
4. Emerson Network Power
5. Or approved equal.

2.9 MULTIPAIR SPLICING CONNECTORS

A. Drawing Reference: None. Provide at all IBTC, TOSC, OTC and similar locations where shown on the plans or required in the field.

B. Function

1. Can provide gas tight termination for large pair counts of copper cabling to connectorized ends and reliable mate ends in compact area.
2. Industry standard termination means.
3. All modules shall have test entry ports on the front side of the module.
4. All straight splicing modules shall be tap modules.

C. Manufacturer

1. 3M 710 (Industry standard item).
2. Or approved equal as required to match the standard used at the facility.

2.10 MISCELLANEOUS UNDERGROUND PRODUCTS

A. Encapsulant

1. Encapsulates shall be transparent.
2. Splice case and Encapsulant must be re-enterable.
3. Shall be compatible with the cable insulation.
4. Shall not be corrosive to copper and must not support fungi or mold growth.

2.11 WATER IMPERMEABLE CONDUIT PLUGS

1. Tyco RDSS Duct seal / E7512-160 / E7512-160.
2. Jack moon compression plugs.
3. Or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Provide safety barriers and flag persons for all open manholes and pull-boxes that are located in areas accessible to the public.

B. Provide traffic control in accordance with the requirements of Campus policies and standards. Conform to OSHA guidelines when accessing manholes and handholes, inclusive of the requirement for air sampling. Provide continuous measurements. Provide the Owner's Representative with contractor-maintained logs of air samples taken at most two hours apart.

C. Provide sufficient personnel to permit one individual to remain above the surface at all times, in visual contact with persons in manholes and similar. Provide the observer with an appropriate means of obtaining assistance.

D. Provide ladders for access to manholes. Do not permit workers to use cables or splice cases as ladders.

E. Install a ¾", 2500lb rated, mule tape with detectable tracer wire and sequential footage markers.

3.2 CABLE PULLING

A. Test existing duct lines with a mandrel and thoroughly swab out to remove foreign material before pulling cables.

B. If basket-grip type cable-pulling devices are used to pull cable in place, cut off the section of cable under the grip before splicing and terminating.

C. OSP Copper Cabling Special Procedures

1. Contractor shall provide notice 2 days in advance notice prior to pulling any cable greater than 400 pairs in size or when a winch is planned for use.
2. Owner's representative shall have the option to be present to observe all pulling activities of cable greater than 400 pair or when a winch is planned for use.
3. Contractor shall be responsible for verifying that ducts are ready for occupancy prior to cable placement.
4. Contractor shall assume responsibility for any difficulties or damage to the cable during placement.
5. Adhere to all manufacturers requirements regarding pulling tension allowable lubricants and bending radius.
6. All un-terminated cable pair ends must be cleared (not shorted or crossed) and binder tagged.
7. All open-ended cables must be watertight sealed using temporary end caps or encapsulation.

3.3 CABLES IN MANHOLES, PULL BOXES AND HANDHOLES

A. Support cable splices in underground structures by racks on each side of the splice.

B. 100 ft of slack shall be installed (in aggregate) at one or more maintenance vaults to accommodate possible service outage and cable repairs.

C. Wrap each vault when passing thru each Maintenance Hole.

D. Install cables at middle and bottom of cable racks, leaving top space opening or future cables, except as otherwise indicated for existing installations.

3.4 BUILDING ENTRANCE CONDUIT WATER BARRIER

A. Conduits entering a structure are to penetrate the last vault at the highest elevation possible to prevent water penetration.

B. All Conduits entering a structure are to be sealed and watertight from the last vault to the MPOE, TR or ER.

C. NO conduits shall be sealed (other than fire stopping materials required by the AHJ) inside the structure.

3.5 SERVICE LOOP AND TRANSITION SPLICE AT BUILDING ENTRY

A. For outside plant, flooded cables of 100 pair or greater entering a Building Distribution Facility or Entrance Facility, provide a transition in a splice case, Type IBTC, to non-flooded cable prior to termination on the protector blocks. Unless otherwise indicated on the plans, position the splice case high on the backboard, parallel to the floor at location suitable for service and where gel will not be drawn from the serving outside plant cabling into the IBTC.

B. At Telecommunications Rooms, at both ends of cables, provide at least 20 feet of cable in excess of that required to reach the protectors or terminal block by. Form into a storage loop and mount to wall using a loop ring as directed by the Owner's Representative.

C. Bonding Harnesses shall be used to ground the shields of the spliced cables to the TGB or building service ground. Bonding harness shall be 14 AWG and sized according to closure.

D. Refer to Section 27 13 00 – Communications Backbone Cabling for additional requirements for termination within Telecommunications Rooms.

END OF SECTION

SECTION 27 15 00
COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Provisioning, installation, termination, and testing of twisted pair, horizontal cabling in modular furniture and hard wall workstations located throughout the project area. Work under this section will include:

1. Wireless Access Point cabling
2. Printer Stations
3. IP Camera Cabling
4. Monitor and CATV cabling
5. IP Medical Equipment in Exam Rooms
6. All workstation cabling as defined on the construction documents

1.2 TYPICAL WORK AREA OUTLETS

A. A typical work area outlet (per chair) or (Drop) shall consist of two (2) (Purple end to end) Category 6A Data cables, unless otherwise indicated.

1. When re-cabling a building or office consideration shall be made to add Data Cables to support devices that will continue to be viable after a transition to a VoIP network such as fax machines, fire alarms, elevator phones, pay phones etc.

B. A typical work area outlet shall have a slack loop of 10 feet at the field end of the run.

1.3 OTHER OUTLET CONFIGURATIONS

A. Wireless Access Points

1. A typical wireless access point (WAP) Outlet shall consist of two (2) (Purple end to end) Category 6A Data cables, unless otherwise indicated.

B. Timeclock Outlet

1. A typical time cock outlet shall consist of one (1) (Purple end to end) Category 6A Data cable, unless otherwise indicated.

C. Other outlet configurations as defined by and coordinated with Owner IT.

D. All Outlet types listed above shall have a slack loop of 10 feet at the field end of the run.

1.4 RELATED SECTIONS

A. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

B. 27 05 26 GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS

C. 27 05 29 HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS

D. 27 05 33 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

E. 27 05 36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

F. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

G. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

H. 27 11 19 COMMUNICATIONS TERMINATION BLOCKS AND PATCH PANELS

I. 27 11 23 COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK

J. 27 11 26 COMMUNICATIONS RACK MOUNTED POWER PROTECTION AND POWER STRIPS

K. 27 13 00 COMMUNICATIONS BACKBONE CABLING

L. 27 13 43 COMMUNICATIONS SERVICES CABLING

M. 27 41 33 MASTER ANTENNA TELEVISION SYSTEMS

N. 27 51 16 PUBLIC ADDRESS SYSTEMS

O. 27 52 13 PATIENT MONITORING AND TELEMETRY SYSTEMS

P. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

Q. 27 53 13 CLOCK SYSTEMS

R. 27 53 19 INTERNAL CELLULAR, PAGING, AND ANTENNA SYSTEMS

PART 2 - PRODUCTS

2.1 MODULAR JACK COMPONENTS, GENERAL

A. Modular Jacks rated Category 6A
   1. Panduit Mini-Com CJ6X88TGVL.
   2. Colored Icons as needed per UCDM service designation.
   3. Panduit PAN_CID(XX).

2.2 COPPER CABLING, CATEGORY 6A

A. High Speed, TIA category 6A Cabling, Plenum Rated
   1. General Cable GenSpeed 6A Part No. 7151855 Purple.

2.3 TELECOMMUNICATIONS OUTLET COMPONENTS

A. Modular Furniture Surface Mount Box, Black
   1. Panduit CBXQxBL-A Where x = number of ports

2. Modular Surface Mount Box Attachment System Mini-Com CBM-X
3. Modular Surface Mount Box Blank Insert Panduit CMB(BL)

B. Faceplate
1. Panduit- Mini-Com Faceplates (CFP (2,4,6)SY I CFP (4,8,10) S-2GY
2. Coordinate finish with Architect prior to submittals

C. Faceplate Blank Insert
1. Panduit CMB(WH)

D. Stainless Wall Telephone Outlet
1. Leviton 40223-S (where specified)

E. One Hole Wall Plate
1. Leviton 84004-40 Stainless where requested.
2. Leviton 80720-W White where requested.
3. Coordinate finish with Architect prior to submittals.

F. Black Loom
1. Panduit loom CLT100F/CLT150F (choose size appropriate for cable installation quantity)
2. Thomas & Betts black liquid tight EFC150

G. Duplex In-Line Jack frame, one to four jacks (only where required, NOT standard installation)
1. Panduit Mini-Com 106 Duplex Module Frame

PART 3 - EXECUTION

3.1 CABLING RUN LENGTHS

A. Distance limitation of the in-wall cabling shall be thoroughly reviewed and calculated to be less than 275' when including the anticipated plug pack cabling length in the telecommunications room (TR).

B. Contractor to field verify the performance including cable length of the proposed installation in a mockup using the proposed cabling, jacks, raceway and test equipment prior to proceeding.
1. Locate proposed cable pathway drawing for the upcoming cable run.
2. Contractor to install One (1) typical copper work area outlet complete with jacks at both ends.
3. Use the proposed pathway and cabling to the furthest location from the TR.
4. Install a cable simulating the cable length of the Plug Pack configuration.
5. The cabling contractor is to perform testing of these cables patched together to determine the true length of this mockup.
6. Test Results are to be inspected and reviewed by the University's Representative prior to proceeding with the rest of the installation.

7. Any deficiencies in the installation of the mockup are to be corrected by the Contractor and re-inspected by the University's Representative prior to proceeding with the rest of the installation.

3.2 MODULAR JACK COMPONENTS

A. Category 6A Data Jacks performance shall meet requirements as defined in TIA standards.

B. Follow manufacture's Installation procedures.

3.3 TELECOMMUNICATIONS OUTLET EXECUTION

A. Modular Furniture Surface Mount Box, One to Four Jacks
   1. Surface mount box magnetically attached to furniture.
   2. Removing knockouts in the base of the furniture shall be avoided.

B. Telecommunications Outlets. New, Copper Jacks, Wall Mount, Flush Mount Assembly.
   1. Complete outlet assembly, including but not limited to:
   2. Faceplate with manufacturer's standard jack openings
   3. Blank connector modules at faceplate openings not filled with connector modules.
   4. Features: Single gang with openings for the required number of cables. Provide flat stainless steel.
   5. Features: Double gang with openings for the required number of cables. Provide flat stainless steel.

C. Voice Telephone Station Plates and Jacks (special provision)
   1. Wall Mounted Analog Telephone
   2. Wall mounted IP Telephone Station
   3. Single outlet wall plate w8P8C data Jack

3.4 COPPER CABLING DATA VOICE/DISTRIBUTION

A. Maintain the following clearances from EMI sources (Per BICSI Standards)
   1. Power cable – 6 in.
   2. Fluorescent Lights - 12 in.
   3. Transformers- 48 in.

B. Monitor cable length limitations.
   1. All cable installations shall be continuous, un-spliced runs
   2. All wiring above ceilings shall be installed in cable tray or cable hangers.
   3. Cable in accessible ceilings shall be supported 5' on center (min) attached to building structure.
   4. Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket.
   5. Cables jackets that are chaffed or burned exposing internal conductor insulation or have any bare copper ("shiners") shall be replaced.

6. Limit cable bends to a minimum radius of 4 times cable diameter except where otherwise noted herein.
7. Refrain from exceeding fill ratio on horizontal cabling installations
8. Do not put large sweeps or service loops in vertical wire managers.
9. Provide slack, which is to be no less than 2.5" and no greater than 5.0", in the station cable at the station outlet end. The Work Area Outlet shall provide enough slack to be serviceable without excess.
10. Service loop at outlet locations: Provide a (10') Ten Foot Slack Loop for all horizontal cabling, supported on J-hook with wire above all drop locations.
11. All data and voice station cable shall be terminated at the individual receptacle modules in accordance with ANSI/TIA-568-C, assignment T568B.

3.5 TESTING

A. All system cabling and terminations shall be installed in accordance with manufacturer's instructions and as indicated on Contractor's submittal documentation, prior to final acceptance/approval by the University.

B. Installation shall be performed and accomplished in a professional manner, by qualified personnel.

3.6 PERFORMANCE STANDARDS

A. Horizontal (Station) category 6A Copper cabling - Permanent Link
   1. Testing shall commence while the University's equipment in the area of service is operational and creating worst case emissions associated with its operation while in good working order. Every effort shall be made to include worst case influence on the materials installed shall be taken.
   2. In accordance with the field test specifications defined in TIA-568-C.2 "Commercial Balanced Twisted-Pair Telecommunications Cabling and Components Standard", every horizontal station cabling link in the project shall be tested for:
      a. Wire Map Length Insertion Loss NEXT Loss
      b. PS NEXT Loss
      c. ACR-F Loss
      d. PS ACR-F Loss
      e. Return Loss
      f. Propagation Delay
      g. Delay Skew

B. Using the listed category 6A cable test set, test installed cabling using Permanent Link procedure and submit report demonstrating that the link meets the following:
   1. Each permanent link shall demonstrate a positive PSACR beyond 350 MHz to meet and exceed the bandwidth requirements of TIA-568-C.2 Category 6A standards.
   2. Each permanent link shall demonstrate 2 dB of cross talk headroom over TIA -568-C.2 Category 6A standard for NEXT, PSNEXT, ELFEXT and PSELFEXT bit error rate.
   3. Report whether tested link passes or fails.

4. Note exceptions to required Category standards. Remedy and retest.
5. Test and report on each intermediate cabling segment separately, including station cabling, horizontal distribution (each segment, if multiple) and telecommunications room wiring.
6. Test each end-to-end cable link
7. Submit machine-generated documentation and raw data of all test results on Contractor-provided, and University's Representative approved, forms; and in electronic format approved by the University's Representative.
8. Test stations wire only after all pairs of station wire in a work area have been terminated at both ends, and no work of this Section or other Sections may cause physical disturbance to the wiring.
9. Correct any and all transpositions found. Retest.
10. If any conductor in a station wire tests either open or short, then the entire station wire is to be removed, replaced, and re-tested.
11. The Contractor shall test all cables and submit all horizontal copper cable test result data in electronic format, with the resulting file formatted with one test result per 8.5"x 11" page. Export or Download the test results from the cable tester for submission in native format.
12. Data found to be altered from the manufacturers recommended settings may result in retention by the University of a 3rd Party Test Company to retest the installed cabling at the expense of the Contractor.
13. Events exceeding industry standards will cause the test result to be rejected. Direct review by UCD IT will be required to allow for an exception of a test result.
14. Data found to be incomplete may result in retention by the University of a 3rd Party Test Company to retest the installed cabling at the expense of the Contractor.
15. Contractor shall submit (1) copy of software capable of viewing the electronic test result files. Testing Results shall be reviewed and verified by the University before payments are remitted.

C. Test Equipment

1. Contractor shall provide all test equipment as required to perform the scope of work.
2. Test the communication systems cabling using at least one (1) each of the following test measurement devices or their functional equivalents:
    a. Level IIIe field testers as defined in TIA-1152 - Fluke DSX-5000, or equal.
    b. The tester including the appropriate interface adapter must meet the specified accuracy requirements. The accuracy requirements for the permanent link test configuration (baseline accuracy plus adapter contribution) are specified in Table 4 of TIA-1152
    c. The RJ45 test plug shall fall within the values specified in TIA-568-C Annex C for NEXT, FEXT and Return Loss.
    d. The tester interface adapters must be of high quality and the cable shall not show any twisting or kinking resulting from coiling and storing of the tester interface adapters.
    e. In order to deliver optimum accuracy, permanent link interface adapter for the tester shall be used, which can be calibrated to extend the reference plane of the Return Loss measurement to the permanent link interface.
    f. The contractor shall provide proof that the interface has been calibrated within the period recommended by the vendor.

g. To ensure that normal handling on the job does not cause measurable Return Loss change, the adapter cord cable shall not be of twisted-pair construction.

h. Site portable communications systems (walkie-talkie, cell phone, or similar to aid in communications between test device locations)

END OF SECTION

SECTION 27 41 33
MASTER ANTENNA TELEVISION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of the distribution of the TV signal to patient rooms, lobbies, conference rooms, and the display devices used as described in this Section, including but not limited to:

1. All MATV Video Distribution Equipment and Cabling including but not limited to:
    a. Coax
    b. Fiber
    c. Terminations
    d. Wall plates

B. Related Work: Equipment and materials provided and installed by others, and require coordination with the work of this Section, shall include the following:

1. Conduits and back-boxes
2. 120v, 60Hz AV Outlets

1.2 RELATED SECTIONS

A. 01 00 00 GENERAL REQUIREMENTS

B. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

C. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

D. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

E. 27 52 23 NURSE CALL/CODE BLUE SYSTEMS

1.3 SYSTEM DESCRIPTION

A. Provide devices specified in this Section and related Sections

B. The Video Cabling System will be used for distribution of local MATV (Master Antenna TV system), satellite, and on demand, pre-recorded programming.

C. Each end device will be fed with a single quad-shielded coaxial cable with appropriate code compliant outer jacketing, one per outlet. (“Home Run”)

D. The Video Cabling System will be able to achieve bi-directional signals, two-way communication over a single coaxial cable, using different frequency bands carrying signals in opposite directions.

E. An electronic receiving device (End Device) will provide a video for display.

1.4 REFERENCES

A. American National Standards Institute (ANSI)

1. ANSI/TIA-568-C.3, Optical Fiber Cabling Components Standard, published 2008, plus errata issued in October 2008.

B. National Fire Protection Association

1. NFPA 101, Chapter 8 for firestopping in healthcare facilities

C. National Electrical Manufacturer's Association (NEMA)

D. BICSI Telecommunications Distribution Methods Manual, 14th Edition (2020)

E. American National Standards Institute (ANSI)

F. California Electrical Code (CEC), 2019

G. California Building Code Title 22 (Accessibility) and Title 24, Part 6 – California Energy Code

1.5 SUBMITTALS

A. Conform with the Division 1 33 00 Submittal Procedures:

B. Shop Drawings: Submit in accordance with Division 1 requirements. Including the following:

1. Any Changes in functional block diagrams showing all equipment, connections, tap values and calculated dBmv levels.
2. Shop drawings: provide a complete set of drawings and with as-built drawings information prior to final acceptance. These drawings shall contain outlet designations and any changes made to the system during installation. The as-built drawings shall be provided as required by Division 1.
3. Complete riser diagrams showing all devices, tap values, calculated dBmv levels and cabling as installed.
4. Descriptions of all equipment and normal operating procedures and channel assignments

C. Warranty Documentation: Provide one (1) copy containing all warranty information required by manufacturers for submission of warranty claims for all equipment installed. Comply with Division 1 requirements.

D. Technical Documentation: Furnish one (1) complete copy technical service manual.

1.6 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Installer shall have at least three (3) years' experience in the installation of similar systems.

C. Licensed to install low voltage electronic cabling systems in the State of California where applicable (C7).

D. Provide a 1-year warranty on materials and installation.

E. Provide a 1-year warranty on all electronics provided.

PART 2 - PRODUCTS

2.1 DEVICES

A. General

1. Contractor shall be prepared to receive and deliver materials listed below from 7301 14th Ave. Supports to be sized to suit load and selected to match mounting conditions.
2. Owner Provided Contractor Installed (OFCI):
    a. Optical Amplifier
    b. Optical Receiver
    c. TV
    d. TV bracket mount
    e. CommScope Coax or approved equal

B. Manufacturers

1. CommScope Coax or approved equal
2. CommScope Multimode Fiber or approved equal

C. Spare Parts

1. Installation packages should include one TV per 15 installed as a spare, or as determined by UCDH representative.
2. Installation packages should include one TV bracket mount per project as a spare, as determined by UCDH representative.
3. Installation packages should include one Optical Receiver per project as a spare, as determined by UCDH representative.
4. Installation packages should include one Optical Amplifier as a spare, as determined by UCDH representative.
5. Deliver Spare parts and obtain a receipt for spare parts from UCDH representative.
6. Additional spare parts shall be determined by project and by UCDH representative.

PART 3 - EXECUTION

3.1 GENERAL

A. Backboards: Telecommunications Room (TR) used for TV distribution will have a fire-resistant backing board provided and used to mount video system equipment. This area of installation will include a designated 20-amp, 120 Volt AC quad circuit minimally.

B. All fiber connectors shall be SC/APC polished connector. Fiber requires both a transmitter and receiver to replace a hardline ½" RG-11 trunk feed.

C. Cable Connectors: Furnish and install RF connectors for RG6 and RG11 cable for use with radiation proof passives or as directed by UCDH standards. Quantities as required. Holland Electronics SLEV or Beldon PPC style compression fittings.

D. RG6 to RG11 Transitions: Provide sufficient adaptors for all transitions from RG6 to RG11 cable runs.

E. Furnish grommets in wire mold, outlet boxes, and communications pathways as required to prevent damage to insulation or conductors.

F. Secure all cabling to avoid damage to cabling and shielding. Manufacturer's recommended pulling tensions and bend radius shall not be exceeded.

G. In the Telecommunications Room (TR) furnish Cable Distribution Rings (D-Rings) as necessary to route and support cables no greater than 18" apart. Provide vertical support as necessary to prevent cable sheering.

H. Provide slack in cable to prevent cable system wear and to allow for access and service of the Video Cabling System and other building systems. Wrap the room when terminating in a Telecommunications Room (TR) or distribution location.

I. A minimum 3’ slack loop shall be provided at the device end of the cable.

J. Wall mount Optical Amplifier.

K. Adjust Video Cabling System to meet the following parameters and test with one of these or other approved test equipment with 2-gigabit bandwidth range: Manufacturer: HP; Model: Lanalizer or equal; Manufacturer: Scope; Model: Current handheld version by this manufacturer or equal.

1. For RG11: Sweep testing and attenuation readings (plus manufacturers recommended allowances for connector loss) pass at:

a.	5 MHz	< .7 dB
b.	300 MHz	< 3.7 dB
c.	450 MHz	< 4.5 dB
d.	900 MHz	< 6.3 dB
e.	1200 MHz	< 7.5 dB
f.	1500 MHz	< 8.5 dB

2. For RG6: Sweep testing and attenuation readings (plus manufacturers recommended allowances for connector loss) pass at these reading or better dB per 100 ft:

a.	5 MHz	< .4 dB
b.	50 MHz	< 1.0 dB
c.	100 MHz	< 1.4 dB
d.	300 MHz	< 3.0 dB
e.	450 MHz	< 4.5 dB
f.	900 MHz	< 4.2 dB
g.	1000 MHz	< 4.5 dB
h.	1450 MHz	< 6.2 dB

L. Labeling

1. Conform to requirements of Section 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS.
2. Update room numbers to final room numbers on all documentation.
3. As-built drawings will be placed in each Telecommunications Room (TR) next to TV distribution placement location.
4. Copies of as-built drawings shall be securely mounted in Telecommunications Room (TR) to be used as references for on-going Video Cabling System management.

M. Preparation

1. Evaluate DB load
2. Evaluate MATV capability
3. Evaluate designated installation site
4. Investigate and validate cabling pathway
5. Provide for MATV required outputs on desired formats such coax or SMAP fiber and correct where necessary on shop drawings.
6. Coordinate with project management schedules and installation.

N. Installation

1. Install Horizontal Video Cabling: Furnish, install, and test RG6 for runs 100' or less and RG11 for runs in excess of 100', rated at 2-gigabit bandwidth, quad shielded, solid conductor, UL listed and code compliant cable. All RG-11 runs will be "pigtailed" with RG-6 from the hallway into the patient's/room homerun TV outlet box. Quantity as required. CommScope or equal.
2. 75-ohm Terminators shall be installed on all unused ports.
3. Install Video Trunk Line Cabling (Project dependent) : Furnish, install, and test ½" RG11 (as per design) rated at 2-gigabit bandwidth minimally, quad shielded, solid conductor, UL listed and code compliant cable.
4. Install SMAP fiber feed, in a redundant terminated secondary feed. (as per design)
5. Install Directional Couplers: Furnish and install Directional Couplers with -100 dB radiation shielding, isolation values as required for proper dBmv levels and port as specified. Coupler outlet dB value calculated to obtain a 10-dB power output at TV outlet. Quantities as required. Blonder-Tongue SRT Series or equal.
6. Install Splitters: Furnish and install Splitters with -80 dB radiation shielding, ports as required. Quantities as required. Blonder-Tongue SDS Series or equal.
7. Install Cable Connectors: Furnish and install RF connectors for RG6 and RG11 cable for use with radiation proof passives or as directed by UCDH standards. Quantities as required. Holland Electronics SLEV or Beldon PPC style compression fittings. Install infrastructure for connectivity to nurse call TV connectivity as required.
8. Install all equipment and components in accordance with manufacturer's written instructions, in compliance with CEC, and with recognized industry practices, to ensure that all items comply with specifications and serve intended purposes.
9. All fiber connections shall be SC/APC style connectors
10. All cable to be swept to 2 GIGHZ

O. Examination/Acceptance

1. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and specification tolerances.

2. As-built drawings updates:
    a. Provide documentation on moves, adds and changes to the Video Cabling System.
    b. Updating distribution values and transfer to as-built drawings and provide update to UCDH representative.
3. Run Lengths:
    a. Confirm with test results that the total length does not to exceed limitation expressed herein.
4. Provide room location of all cables
5. Provide documentation of all tests as specified by this and other Sections in the following formats. Submit in CAD and in hard copy form (2 copies).
6. Submit interim test reports to the UCDH representative and ‘final’ acceptance test reports (where only one test iteration is required consider it be the ‘final’).
7. Complete walk thru with UCDH representative.
8. Provide overview of operation and maintenance on equipment that has adjustable settings.
9. Complete punch lists as necessary.

3.2 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.

B. Tests and Inspections:
1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
2. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
3. Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements.
4. Replace malfunctioning or damaged items.
5. Retest until satisfactory performance and conditions are achieved.
6. Prepare television equipment for acceptance and operational testing.
7. Use an agile receiver and signal strength meter or spectrum analyzer for testing.
8. CCTV Sources: Connect receiver to the output of each CCTV signal source or the distribution amplifier associated with it.

C. Test Schedule: Schedule tests after pretesting has successfully been completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days' notice of test schedule.
1. Operational Tests: Perform tests of operational system to verify that system complies with Specifications. Include all modes of system operation. Test equipment for proper operation in all functional modes.
2. Distribution System Acceptance Tests:
    a. Field-Strength Instrument: Rated for minus 40-dBmV measuring sensitivity and a frequency range of 54 to 812 MHz, minimum. Provide documentation of recent calibration against recognized standards.

b. Signal Level and Picture Quality: Use a field-strength meter or spectrum analyzer, and a standard television receiver to measure signal levels and check picture quality at all user-interface outlets.

c. Test the signal strength in dBmV at 55**,** 151, 547, and 750 MHz.

d. Minimum acceptable signal level is 10 dBmV (1000 mV).

e. Maximum acceptable signal level over the entire bandwidth is 17 dBmV.

f. Television receiver shall show no evidence of cross-channel intermodulation, ghost images, or beat interference.

3. Signal-to-Noise-Ratio Test: Use a field-strength meter to make a sequence of measurements at the output of the last distribution amplifier or of another agreed- on location in system. With system operating at normal levels, tune meter to the picture carrier frequency of each of the designated channels in turn and record the level. With signal removed and input to corresponding headend amplifier terminated at 75 ohms, measure the level of noise at same tuning settings. With meter correction factor added to last readings, differences from first set must not be less than 45 dB.

D. Headend and distribution system will be considered defective if they do not pass tests and inspections.

E. Prepare test and inspection reports.

F. Cap all unused connectors and seal weather tight.

3.3 DEMONSTRATION

A. Train UCDH maintenance personnel to adjust, operate, and maintain MATV equipment.

1. Train UCDH maintenance personnel on procedures and schedules for troubleshooting, servicing, and maintaining equipment.

2. Demonstrate methods of determining optimum alignment and adjustment of components and settings for system controls.

3. Demonstrate programming and tuning of satellite receivers.

3.4 CLEAN UP

1. Clean up per 01 00 00 General Requirements

END OF SECTION

SECTION 27 51 16
PUBLIC ADDRESS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of an Overhead Public Address System.

B. Related Work: Equipment and materials provided and installed by others, and require coordination with the work of this Section, shall include the following:

1. Conduits and back-boxes
2. 120v, 60Hz Outlets

1.2 RELATED SECTIONS

A. 01 00 00 GENERAL REQUIREMENTS

B. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

C. 27 05 53 IDENTIFICATION FOR COMMUNICATIONS SYSTEMS

D. 27 11 16 COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES

E. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

1.3 SYSTEM DESCRIPTION

A. Provide and install all equipment to provide a VoIP overhead paging system including, but not limited to, outlet boxes, cabling, speakers, and all other necessary equipment to provide a complete operating system.

B. The design of the overhead paging system shall be centered on the Informacast platform that integrates the UCHD Cisco Call Manager through a SIP (Session Initiation Protocol) trunk.

C. Provide system design and illustrate on the T drawings.

D. Provide Overhead Public Address System covering all corridors, general work areas, public areas and other areas as required by the customer and reviewed by UCDH.

E. Overhead Public Address System shall be constructed to provide audible overhead paging to any one of the UCDH provided zones.

F. Components installed outdoors shall meet minimum IP54 standard for exterior damp locations.

G. Ceiling speaker placement shall be designed using the industry standard paging system speaker spacing formula of twice the distance from the floor to ceiling for speaker placement. For example, a 9 foot ceiling would require speakers be spaced 18 feet apart on center.

H. High quality speakers designed for IP PoE operation shall be strategically placed throughout the facility to ensure even coverage and optimal audio quality. Speakers shall have ambient noise detection and talkback capabilities.

I. Designer and installer are required to designate and use colors to create a customer expected aesthetically and visually appealing environment.

1.4 SEISMIC DESIGN REQUIREMENTS

A. Items requiring adherence to CBC Chapter 16A - OSHPD:
   1. Ceiling Speaker
   2. Grill
   3. Back Box
   4. External Speaker

1.5 SUBMITTALS

A. Conform with the Division 1 33 00 requirements Submittal Procedures.

B. Submit shop drawings and product data with the following information.
   1. Floor plans showing the entire project area illustrating all audible overhead paging devices
   2. Floor plans showing the entire project area cable paths
   3. Floor plans showing speaker zone designation
   4. Speaker hardware cut sheets

1.6 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused.

B. All materials shall be warranted for a period of one year from date of installation.

PART 2 - PRODUCTS

2.1 PUBLIC ADDRESS PRODUCTS

A. Speakers:
   1. Algo #8188-IC Informacast IP (ceiling), or approved equal.
   2. Algo #8198-IC Informacast IP PoE+ (ceiling master speaker), or approved equal.
      a. Algo #1189 (ceiling remote speaker)
   3. Algo 8196 (IP PoE+ outdoor horn), or approved equal.

B. Cabling: CAT-6A Plenum Twisted Pair.
   1. GenSpeed #7151855, or approved equal.

PART 3 - EXECUTION

3.1 GENERAL

A. Install paging system and accessories in compliance with Manufacturer's instructions..

B. Label all paging system speakers with device area covered e.g. zone identifier, Telecommunications Room (TR) where terminated, and sequential speaker number.

3.2 PREPARATION

A. Registered Communications System Designer shall provide design drawings for OSHPD and/or building permit.

1. Drawings shall indicate speaker cable pathway
2. Drawings shall indicate firewall penetrations
3. Drawings shall indicate elevations showing rack mounted amplifier placement
4. Drawings shall indicate zone assignment exceptions

3.3 INSTALLATION

A. Install cabling per fire code. Install all wiring in conduit only where applicable by fire code.

B. Install cabling and speaker locations as indicated on the drawings.

C. Install speakers using home run 4 Pair Plenum CAT-6A cables.

D. Adjust speaker volume so that speaker dB level in no less than 10 dB and no more than 15 dB above ambient noise level in area.

3.4 EXAMINATION

A. Contractor shall adjust zones and volume settings during acceptance testing as recommended by UCDH representative.

B. Contractor shall demonstrate proper operation of all system components and functions during the acceptance tests.

1. Contractor shall provide all test equipment necessary to test systems, including but not limited to an impedance meter and sound pressure level meter.
2. Contractor shall pretest all Overhead Public Address System devices and functions,and shall document the results of this pretest before calling for final acceptance test. Pretest shall also include testing for buzzes and rattles.

3.5 FIELD TESTS

A. Contractor shall test all systems and devices and shall submit a report certifying that the installation is in full compliance with the contract documents. Testing of the system shall be performed with test instruments and procedures recommended by the manufacturer, and in full conformance with NEC guidelines. Upon review of these documents by UCDH representative, final acceptance tests shall be scheduled for all concerned parties. The test reports shall include the following:

1. A complete list of all equipment installed.

2. Certification by the Contractor and manufacturer's representative that all equipment is properly installed, functional, and conforms to the requirements of this Section.

3. Certification by the Contractor that all systems and devices have been tested for proper operation.

4. A spreadsheet having the measured and calculated impedance across each speaker zone line plus the resistance to ground of each speaker zone wire as metered at the equipment rack. Contractor shall resolve any discrepancies between measured and calculated impedances. Contractor shall provide an impedance meter during all testing. This requirement shall apply to all new and existing speaker zones.

5. Contractor shall perform a “buzz and rattle” test of the speakers by inserting pink noise into the system and running the output of the amplifiers at 90% of their rated output voltage. Contractor shall listen to each speaker for unwanted buzzes and/or rattles and shall correct the cause of any found buzzes and rattles. This test shall be done after hours with the building empty due to irritating noise created during this test.

6. As-built floor plans with required port count for the system.

7. Technician's name, company, and date of test.

3.6 COMMISSIONING AND ACCEPTANCE

1. Contractor shall demonstrate proper operation of all system components and functions.

2. The final acceptance test shall be performed in the presence of UCDH representative. The final acceptance test shall include a complete test of all system devices and functions, and any additional testing requested by UCDH representative. Contractor shall provide all personnel and equipment necessary to accomplish the test. A copy of the test result shall be provided to the UCDH representative.

3.7 RECORD DRAWINGS

A. Maintain a complete set of prints and shop drawings of the work forming a part of the Public Address Systems. As work is installed, carefully draw on prints, in colored pencil, actual location of work including depth of underground runs, if any, with dimensions from permanent walls, walks, etc. Wiring diagrams and details shall be included.

B. Upon completion of the project, transfer this information to reproducible Drawings and updated CAD (AutoCAD DWG files), submit to UCDH.

C. One additional complete set shall remain on the job site in folders secured inside the electronic racks.

D. Record Drawings shall include:

1. Complete wiring diagrams for all components, including cable types and quantities, conduit routings, cable routing, floor plans indicating device locations, conduit sizes, riser diagrams, etc.

2. Complete elevation, mounting, and point-to-point and termination drawings for all devices. Partial or “Typical” drawings will not be accepted.

3. Dimensioned drawings of all racks and any fabricated equipment showing locations of all major components.

4. A Master Legend/Spreadsheet on the drawings that identifies all devices, device location on the drawings, wire label verbiage, and termination points.

5. A complete list of all equipment installed, including serial numbers of major components.

END OF SECTION

SECTION 27 52 23
NURSE CALL CODE BLUE SYSTEMS

GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of the complete installation and integration of a Nurse Call system.

B. The Owner is defined herein as “UCDH” which represents University of California Davis Health and specifically includes IT Facilities, IT Facilities Infrastructure, IT Facilities Engineering, Network Operations, Auxiliary Services, and other relevant UCDH departments and representatives.

C. All work in OSHPD-1 Hospital and associated facilities shall be executed in accordance with the requirements of UCDH Infection Control Risk Assessment (ICRA) and Pre-Construction Risk Assessment (PCRA) requirements, standards, forms, policies, and procedures.

1.2 SYSTEM DESCRIPTION

A. Each Nurse Call system shall be capable of operating as a stand-alone system, with the ability of interfacing to the existing Hospital-wide Nurse Call network.

1. Nurse Call Master Stations

a. The Nurse Call Master Stations (NCMS) shall be at the caregiver stations and as indicated on the Drawings. The NCMS shall be the primary call annunciation point for the Nurse Call system. Each NCMS shall consist of a full color touchscreen monitor and an alphanumeric display microphone, keypad, and handset.

2. Nurse Call Central Station

a. The Nurse Call Central Station shall be located in the Telecommunications Room (TR) as indicated on the Drawings. The Nurse Call Central Station shall be the primary processing point of the Nurse Call system.

3. Patient Stations

a. Patient stations shall provide the interface between the patient and the NCMS. Each Patient Stations will display on its face plate a light indicating a call has been placed and a separate light indicating an open audio path. Each patient station shall be able to accept input from peripheral devices including emergency stations, staff presence stations, remote switches, and auxiliary devices. Patient stations shall be microcomputer based.

4. Staff Stations

a. Staff stations shall provide an interface between the nursing staff and the nurse control station. Each Staff Stations will display on its face plate a light indicating a call has been placed and a separate light indicating an open audio path. Each staff station shall be able to accept input from peripheral devices including emergency stations, staff presence stations, remote switches, and auxiliary devices. Staff stations shall be microcomputer based.

5. Emergency Stations

a. Provide emergency pull cord stations in the toilets and in other locations as indicated on the Drawings. Stations shall meet UL waterproof requirements. The faceplate shall be electrically isolated from internal electrical components.

6. Corridor Lights

a. Provide corridor lights at the entrance to the patient rooms (dome lights) and in the corridors to indicate the wing of a patient call (zone lights) as indicated on the Drawings.

7. Smart Dome Lights

a. Provide smart dome lights at locations indicated.

8. Staff Presence Stations

a. Provide wall mounted recessed manual staff presence stations at the locations indicated on the floor plans. These stations shall report back to the NCMS monitoring the patient room.

9. Entertainment and Environmental Interface Units

a. Provide recessed mounted interface units for the patient entertainment system (television) and the patient-controlled lighting fixture for each bed. Interface units may not be shown on the Drawings but shall be installed in a location accessible from the patient room. These units shall provide control of the television set and lighting fixture through the patient control unit and patient station.

10. Vocera

a. Provide Vocera paging capability for each of the caregiver stations. These systems shall operate in either a manual mode or an automatic mode, as selected from the NCMS.

1.3 SEISMIC DESIGN REQUIREMENTS

A. Identify each item requiring seismic restraint installation in accordance with CBC Chapter 16A. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

B. Supports for such items, including racks and rack cabinets, conduit, cable trays and similar, shall be provided support, bracing, and anchorage designed by the Contractor in accordance with the following criteria:

1. Design to resist seismic forces in accordance with CBC Chapter 16A.

2. Minimum Design Parameters - As defined for the Building, with respect to Occupancy Category, Site Classification, Seismic Design Category, Importance Factor, and Spectral Response Acceleration.

1.4 RELATED SECTIONS

A. Division 27 Communications Sections

B. 27 05 41 FIRE-STOPPING SYSTEMS

C. 28 10 00 ACCESS CONTROL

D. 28 20 00 VIDEO SURVEILLANCE

E. 28 31 00 INTRUSION DETECTION

F. 28 49 00 ELECTRONIC PERSONAL PROTECTION SYSTEMS

1.5 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Building Industry Consulting Services International (BICSI)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Manufacturers Association (NEMA)

F. National Fire Protection Association (NFPA)

G. Telecommunications Industry Association (TIA)

H. Underwriters Laboratories, Inc. (UL)

I. California Building Standards Code (California Code Of Regulations, Title 24), 2019

J. Public Safety (California Code of Regulations, Title 19), 2021

K. Office of the California State Fire Marshal (CSFM) Building Materials Listing (BML) Program

L. NFPA 70 National Electrical Code (NEC), 2020

M. NFPA 70 National Electrical Code (NEC), Chapter 8 Communications Systems, Article 800 Communications Circuits, 2020

N. NFPA 99 Health Care Facilities Code, 2021

O. ANSI/TIA-568.0 Generic Telecommunications Cabling for Customer Premises, Rev. E, 2020

P. ANSI/TIA-568.1 Commercial Building Telecommunications Infrastructure Standard, Rev. E, 2020

Q. ANSI/TIA-568.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Rev. D, 2018

R. ANSI/TIA-568.3 Optical Fiber Cabling and Components Standard, Rev. D, 2016

S. ANSI/TIA-568.4 Broadband Coaxial Cabling and Components Standard, Rev. D, 2017

T. ANSI/TIA-569 Telecommunications Pathways and Spaces, Rev. E, 2019

U. ANSI/UL 2900-1 Standard for Software Cybersecurity for Network-Connectable Products, General Requirements, 2020

V. ANSI/UL 2900-2-1 Software Cybersecurity for Network-Connectable Products, Particular Requirements for Network Connectable Components of Healthcare and Wellness Systems, 2020

W. ANSI/UL 2900-2-3 Standard for Software Cybersecurity for Network-Connectable Products, Particular Requirements for Security and Life Safety Signaling Systems, 2020

1.6 SUBMITTALS

A. Procurement and installation shall not begin until product data and shop drawings submittals have been approved by UCDH.

B. Submit product data submittals to UCDH for review and approval.

1. Submit product data submittals system, product, device, and equipment product data cutsheets.
2. Manufacturer's published cutsheets shall be marked with boxes, arrows, highlighting, lines, and notes as needed to clearly indicate the exact product make, model, and options to be provided.
3. Mark cutsheets to indicate the associated Section.
4. Provide documentation of Contractor's factory-trained and authorized service representatives.
5. Compile system, product, device, and equipment product data cutsheets, including templates, graphics, tables, diagrams, and installation instructions, in Abode Acrobat or Bluebeam Revu complete with a Table of Contents linked to the bookmarks within the submittal and submit an electronic copy in .pdf format.

C. Submit shop drawings submittals to UCDH for review and approval.

1. Submit shop drawings submittals including device and equipment locations.
2. Prepare floor plans including room names, room numbers, and door numbers indicating all device locations labeled with unique device name and number.
3. Include point-to-point drawings of systems, wiring diagrams of individual devices, equipment elevations, and installation details.
4. Indicate wall space and rack space requirements.
5. Indicate IP addresses, Ethernet switch ports, and fiber connectivity requirements.
6. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.
7. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.
8. Include user defined information per floor and per system component.
9. Compile shop drawings in AutoCAD and submit an electronic copy in .pdf format.

D. Submit Operation and Maintenance Manual (O&M) submittals to UCDH for review and approval.

1. Prepare O&M manual in 8-½” × 11" letter size sheet format, labeled, grouped, and ordered, with bookmarks as indicated in a Table of Contents.
2. Include manufacturer’s system and product data sheets, operation and maintenance information, troubleshooting and servicing instructions, routine maintenance instructions, and copies of all programming sheets.
3. Provide a copy of the final approved acceptance testing reports and documentation.
4. Reflect final UCDH occupancy room numbers in the O&M manuals, programming sheets, and system programming.
5. Compile system, product, device, and equipment documentation (including graphics, tables, and diagrams) complete with a Table of Contents linked to the bookmarks within the manual and submit an electronic copy in Abode Acrobat or Bluebeam Revu .pdf format.

E. Submit as-built drawings submittals to UCDH for review and approval.

1. As work progresses, maintain field redlines of actual installation conditions, including device, equipment, and cabling locations.
2. At project close-out, transfer these redlines to as-built drawings in AutoCAD format.
3. Reflect final UCDH occupancy room numbers on as-built drawings, programming sheets, and system programming.
4. Include floor plans clearly indicating all device locations labeled with unique device name and number.
5. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.
6. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.
7. Compile as-built drawings in AutoCAD and submit an electronic copy in AutoCAD .dwg and in Abode Acrobat or Bluebeam Revu .pdf format.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Units and components offered under this Section shall be covered by the manufacturer's warranty for a minimum of two years from date of UCDH acceptance of the project, a copy of which shall be included in the shop drawings submittals. Submitted system shall have been used on at least five projects of similar size and scope as this project. A reference of these similar systems shall be provided.

C. Vendor shall provide 24×7×365 support to validate features and functionality for a period of 30 days following the opening of the unit.

D. A factory-trained and authorized service representative shall perform the work of this Section.

E. Provide documentation stating that spare parts will be continued to be manufactured or be stocked and available for a minimum of 5 years after the complete system acceptance by UCDH representative. Including equipment not manufactured by West Com.

1. Provide spare parts minimum of 10% of each item or 1 whichever quantity is greater.

1.8 WARRANTY

A. Contractor shall provide labor and hardware repairs and replacement for a period of one year following the acceptance of the installation.

PRODUCTS

2.1 DEVICES

A. General

1. UCDH has a sole source agreement with West-Com Nurse Call Systems, Inc. for all Nurse Call systems.
2. UCDH uses West-Com Novus in clinic environments and West-Com Novus Connect in Hospital environments.

B. NURSE CALL MASTER STATIONS

C. NURSE CALL CENTRAL STATIONS

D. PATIENT STATIONS

E. STAFF STATIONS

F. EMERGENCY STATIONS

G. CORRIDOR LIGHTS

H. SMART DOME LIGHTS

I. STAFF PRESENCE STATIONS

J. ENTERTAINMENT AND ENVIRONMENTAL INTERFACE UNITS

K. VOCERA INTEGRATION

2.2 GENERAL

A. System Operation and Description

1. The Nurse Call system shall provide a minimum but not limited to:
    a. Enables a patient to alert a nurse of the need for any type of assistance
    b. Provides a visual indication of where services are required
    c. Must provide an audible signal indicating a call on the system
    d. Must adhere to the state health department requirements
    e. Must page or provide a wireless means of communicating to nursing staff
    f. Must provide patient services from bed side, rest room or shower
    g. Must be able to integrate with Patient bedside TV controls
    h. Must be able to integrate with room lighting controls
    i. Must be able to integrate with existing Nurse Call systems
    j. Must be able to provide nursing statistics of responses
    k. Must be able to provide manual locaters indicating a staff presence in a room
    l. Must integrate with other devices, seizure alarm equipment, ventilators, and other auxiliary devices as required
    m. Must be Ethernet network compatible
    n. Must be able to be programmed to be supported from any nursing station on the floor or in the Hospital
2. Complete Vocera interface.

3. Complete Electronic Medical Records (EMR) integration.

EXECUTION

3.1 GENERAL

A. Coordinate with UCDH representatives the location, physical wall and rack space, power, and network connections required in designated Telecommunications Room (TR) for the installation of systems, products, devices, equipment, and enclosures in this Section.

B. All materials and labor required to produce a completely operational and fully functional system shall be supplied by the Contractor. It will be the responsibility of the Contractor to conform to the requirements of this Section for system operation, final connection, testing, turnover, and warranty compliance.

C. Network cable and patch cables shall be provided in accordance with the requirements of Division 27 Communications Sections.

3.2 PREPARATION

A. Thoroughly examine site for acceptance of device installation to verify conformance with manufacturer and UCDH requirements.

B. Validate that the system is meeting the customers' needs and feature set at UCDH.

1. Coordinate with construction management on scheduling details.
2. Coordinate with UCDH to provide IP addresses.
3. Coordinate with UCDH for fiber connectivity.
4. Verify antivirus software and security updates have been installed per UCDH Security Standards.
5. Coordinate Nurse Call network cabling with the structured cabling package in accordance with Division 27 Communications requirements.

3.3 INSTALLATION

A. Install a fully functional Nurse Call System as required and approved by UCDH for the project

1. No electrical outlet splitters allowed. Hospital approved UPS or power strip is acceptable.

3.4 LABELING

A. All system products, devices, equipment, power supplies, cabling, conduits, patch panels, and patch cables shall be labeled with their unique device name and number.

B. Labeling shall match the text and nomenclature in the programming sheets, system programming, and on the as-built drawings.

C. Labels shall be machine printed on adhesive labels, minimum 1" x 1.5" with minimum 12pt font.. Handwritten labels are not acceptable.

D. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be black characters on a white background.

3.5 EXAMINATION / ACCEPTANCE

A. Contractor shall conduct and document System Functional Testing and Onsite Acceptance Testing. System Functional Testing shall be performed by Contractor to ensure that the system is fully functional and completely operational in accordance with the requirements of this Section. Onsite Acceptance Testing shall be performed with UCDH representatives to demonstrate the operation of the completed system.

1. Onsite Acceptance Testing shall only be performed after the System Functional Testing is approved and accepted.
2. Contractor shall provide all personnel and equipment necessary to perform the System Functional Testing and the Onsite Acceptance Testing.
3. Punch list items from the System Functional Testing and Onsite Acceptance Testing shall be satisfactorily resolved by the Contractor prior to UCDH issuing a written notice of acceptance.

B. System Functional Testing:

1. At least ten working days (two weeks) prior to the scheduled Onsite Acceptance Testing date, Contractor shall provide printed System Functional Testing documentation indicating each device has been successfully tested and is in conformance with the operational intent outlined in the Contract Documents.
2. Printed System Functional Testing documentation should clearly indicate any remaining outstanding items, issues, and punch list items.
3. Failure to provide printed System Functional Testing documentation will prevent Onsite Acceptance Testing from being conducted.

C. Onsite Acceptance Testing:

1. After approval and acceptance of the printed System Functional Testing documentation, Contractor shall perform Onsite Acceptance Testing in collaboration with the UCDH representative.
2. Upon completion and resolution of all remaining outstanding punch list items, Contractor shall perform follow-up Onsite Acceptance Testing in collaboration with the UCDH representative.
3. Upon successful completion of the follow-up Onsite Acceptance Testing, resolution of all punch list items, delivery and acceptance of the final printed System Functional Testing documentation, and delivery and acceptance of the O&M manuals and as-built drawings, UCDH shall issue a written notice of acceptance, the project shall be considered substantially complete, and the warranty period shall begin.

3.6 DEMONSTRATION AND TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate and train UCDH maintenance personnel as described below.

B. Train personnel in the procedures and schedules involved in operating, troubleshooting servicing, and preventive maintenance of the systems. Provide a minimum of 16 hours training. Training shall be scheduled in more than one session, as agreed-upon by Contractor and UCDH.

C. Train caregiver personnel in proper use of the systems. Periods of training shall be coordinated with the UCDH representative to assure all nursing shifts receive the required training.

D. Schedule all training through the UCDH representative a minimum of 14 days in advance.

E. Provide on-site assistance in adjusting sound levels and adjusting controls to suit actual occupied conditions on an as-requested basis for the first year of operation. Provide a minimum of six visits to the site for this function.

F. Provide completed documentation of all tests as provided by the UCDH representative. Complete repairs at the time of inspections and review.

G. Vendor shall provide 24×7×365 support to validate features and functionality for a period of 30 days following the opening of the unit. 2-hour response time required.

H. Provide spare parts to UCDH at the time of building occupancy. The UCDH representative shall provide to the Contractor a list of spare parts to be purchased and shall notify the Project Manager of the required purchase of spare parts acceptable to all parties.

I. Deliver and obtain a receipt for spare parts from the designated UCDH representative.

J. Comply with AHJ to provide a fully functional system to comply with state and local codes and authorities to provide a compliant Nurse Call system.

END OF SECTION

SECTION 27 53 13
CLOCK SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of a centrally controlled clock system as described in this Section, including but not limited to:

1. Centrally controlled clocks
2. Elapse time clocks

B. Related Work: Equipment and materials provided and installed by others, and require coordination with the work of this Section, shall include the following:

1. Conduits and back-boxes
2. 120v, 60Hz AV Outlets

1.2 RELATED SECTIONS

A. 01 00 00 GENERAL REQUIREMENTS

B. 27 05 00 COMMON WORK RESULTS FOR COMMUNICATIONS

C. 27 15 00 COMMUNICATIONS HORIZONTAL CABLING

1.3 SYSTEM DESCRIPTION

A. A wired master clock system consisting of master clocks and secondary clocks including analog and digital displays.

1.4 REFERENCES

A. Most Recent California Building Code (CBC).

1. California Energy Code, Title 24, Part 6 of the CBC

B. NEMA ICS 6 enclosure for Industrial Control and Systems.

1.5 SUBMITTALS

A. Conform with the Division 01 00 00 Submittal Procedures.

B. Submit the following with shop drawings:

1. Technical data showing exact types and quantity of all Simplex clock devices. Highlight or otherwise identify specific components on catalog cut sheets.
2. In addition, the legend must include the quantity and model numbers
3. Point to point details that indicate the interconnections between the items of equipment.

4. Provide single line riser diagram.

5. The title page of the shop drawings must include the following statements:

   a. A set of approved clock shop drawings stamped by UCDH engineer of record shall be on the job site and used for installation. Any deviation from approved shop drawings, including substitution of devices, shall be approved by UCDH representative.

   b. Any discrepancies between the shop drawings, applicable code or recognized standards shall be brought to the attention of the UCDH representative via the RFI process.

   c. Stamp and signature of the design professional of record.

   d. Submit simultaneously with shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s) including technical data sheets.

   e. Submittals will be automatically rejected if complete product listing information does not accompany submittal.

C. Provide sequence of operations to show how the system will react to master clock corrections.

1.6 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Provide documentation stating that spare parts will be continued to be manufactured or be stocked and available for a minimum of 5 years after the complete system acceptance by UCDH representative.

1. Provide 10% spares, minimum 1 additional clock, for replacement if a clock fails and while replacement is being shipped.

C. Manufacturer shall have local service organization in the Northern California area.

PART 2 - PRODUCTS

2.1 DEVICES

A. Acceptable manufacturers:

1. Clock system and components:

   a. Simplex

B. All components by same manufacturer. If clocks are other than Simplex, submit certification that clocks will operate on the existing system and will not adversely affect the operation of the existing system.

2.2 CENTRALLY CONTROLLED CLOCKS

A. Clock system: Centrally controlled with master clock, secondary clocks, elapsed-time clocks, and wiring system.

B. Synchronous wired.

C. 120v/60Hz AC.

D. All components: UL approved.

E. Surface, semi surface and flush mount clocks are typical round, 12” surface mount, 4-wire, individually reset clocks.

F. Provide clocks designed to operate fifteen years without servicing.

G. Modern styled, satin white dials with black minute and hour hands, and red sweep-second hand.

H. Bezels: Etched and black in color

I. Including 4-wire polarized disconnect plug.

J. Clock crystals: slightly convex to minimize glare and reflection.

K. Simplex 6310 series or equal.

2.3 ELAPSE TIME CLOCKS

A. Surface mount with separate installed single gang push button, start/stop/reset control station.

B. Rectangular digital clock with black face and 4” red numerals.

C. 120v/ 60Hz AC with integral battery backup.

D. All components: UL approved.

PART 3 - EXECUTION

3.1 PREPARATION

A. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and technical specification tolerances. Do not commence with installation until all conditions are made satisfactory.

3.2 INSTALLATION

A. Connect all secondary clocks in parallel on 3-wire circuit.

B. Install and wire system in accordance with manufacturer's recommendations.

C. Connect the clock system to the existing clock relay panel to synchronized clocks throughout the existing building where applicable.

1. Provide a specific demarcation point so that suite can be isolated for service, no clock locations are acceptable.

D. Coordinate the connection to the existing hospital with UCDH representative.

E. Test and prepare to commission system.

3.3 EXAMINATION/ACCEPTANCE

A. The UCDH representative reserves the right to request additional validation of the system control equipment

B. Upon completion of the installation of the clock system, Contractor shall coordinate an acceptance test. This must be performed in the presence of UCDH representative. The acceptance test must successfully demonstrate all functions required in the contract.

C. Provide clear and concise operating instructions that gives, in detail, the information required to properly operate the equipment and system.

END OF SECTION

SECTION 275319 - DISTRIBUTED ANTENNA SYSTEM CELLULAR

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Distributed Antenna System (DAS) to distribute multiple cellular services, primarily in- building — herein “System".

B. Base Bid Work

1. The work of this section includes furnishing materials, installation, and coordination through the General Contractor with other trades for a complete, operational, and balanced distributed antenna system. Provide a complete turnkey system that supports frequencies and services throughout the coverage spaces specified herein. Furnish materials, accessories, fasteners, etc., and the labor and associated services necessary for a complete and operational System, whether expressly stated or not. Coordinate the work of this section with other trades through the General Contractor.

2. The work of this section includes the following:

a. Provide project management services.
b. Coordinate antenna placement and mounting coordination with the General Contractor and affected trades, confirm mounting with both the architect and the owner.
c. Include installation, system functionality testing, and carrier integration.
d. Provide coordination with the overall construction team for usage of pathways provided by others.
e. Include patch cords to connect System equipment.
f. Manage wireless service providers’ connection to the System.
g. Manage E911 coordination and integration.
h. Manage FCC registration including Part 90 requirements and FCC licensing Provide system acceptance testing and turn over to owner.
j. Provide warranty information for all active and passive system elements.
k. Provide maintenance and support services.

3. Power Service:

a. Coordinate with the electrical contractor the power provisions required for the System. The DAS contractor is solely responsible to ensure proper electrical power service.

4. Coordination Requirements:

a. Ceiling Types: Understand every ceiling type and its interaction with the System. For example, some ceiling types may impede RF signals and, subsequently, performance.
b. Mounting Details: Coordinate antenna mounting and the resulting RF performance. Coordinate with both the architect and the owner. Adjust as approved to optimize performance.
c. Pathways: Coordinate placement of System cables within pathways provided by others. Only place System cables into pathways provided by others with their permission.
d. Fiber Distribution System: Coordinate the System’s fiber distribution requirements with the backbone fiber cabling contractor. Provide patch cords connect equipment to the fiber distribution system. Ensure compatibility with the cabling described in section 271300, “Backbone Fiber Optic Cabling".

C. Work Covered Under Other Sections

1. Electrical power — raceways, junction boxes, circuits, branch wiring, and receptacles
2. Pathways — backbone conduits, primary pathways (such as cable trays), conduits, sleeves
3. Telecommunications Rooms — equipment support (racks/frames), power service, cooling, and grounding
4. Backbone Fiber Optic Cabling
5. Wired network

D. Related Sections

1. Comply with the Related Sections requirements of the following:
   a. Section 27 05 26 “GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS"
   b. Section 27 05 29 “HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS."
   c. Section 27 05 33 “CONDUITS AND BACKBOXES FOR COMMUNICATIONS
   d. Section 27 05 36 “CABLE TRAYS FOR COMMUNICATIONS SYSTEMS"
   e. Section 27 05 41 “FIRE-STOPPING SYSTEMS"
   f. Section 27 05 53 “IDENTIFICATION FOR COMMUNICATIONS”
   g. Section 27 11 16 “COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES”
   h. Section 27 53 29 “EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM”
   i. Section 27 11 23 “COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK
   j. Section 27 13 43 “COMMUNICATIONS SERVICES
   k. Section 27 15 00 “COMMUNICATIONS HORIZONTAL CABLING”
   l. Section 27 13 00 “COMMUNICATION BACKBONE CABLING"

1.2 SYSTEM DESCRIPTION

A. System Description

1. The System, or “DAS", shall reliably distribute RF signals and/or wireless services throughout the specified frequency ranges and the specified coverage areas. The System shall be implemented based on proven technology that can seamlessly integrate with the rapid evolution of wireless technologies and business applications. The System shall be flexible and shall easily accommodate additional wireless services within the System’s frequency bands without requiring significant upgrades or system modifications.
2. The System shall include subsystems, equipment, components, transmission media, connection/ termination apparatus, etc., necessary for a complete operating system as described herein.
3. The System’s head-end and signal sources are existing and located in the North Admin building. UCDH is coordinating any modifications of the head-end with carriers. This project will provide fiber remote units to connect back to the existing head-end.
4. In the future, the System’s head-end will be relocated to the new RHT tower. This DAS system must be compatible with planned RHT head-end. Migration of the head-end connection will be excluded from this scope of work.
5. The System shall have lightning protection.

B. Design Criteria

1. Frequency Range: The System shall support frequencies between 700 MHz to 2600 MHz C band.
2. The System shall distribute RF coverage at levels indicated below in the following areas of the building(s) — herein specified coverage areas:

a. Floor areas
b. Basement
c. General Use spaces (break rooms, staff rooms)
d. Mechanical / Electrical Rooms
e. Restrooms
f. Stairwells
g. Elevators
h. Patient
Rooms Exam
Rooms
j. Operating Rooms
k. Procedure / Treatment Rooms
l. Penthouse
m. Sub-Floor and other ancillary spaces

3. The System shall be able to simultaneously support the following wireless services, technologies, and associated frequencies — values in MHz:

a. Wireless Operators Verizon, T-Mobile, AT&T

b. C band should be considered for Future Deployment

Service	Uplink	Downlink
Cellular	824 - 849	869 - 894
PCS	1850 - 1915	1930 - 1995
AWS	1710 - 1755	2110 - 2155
700 LTE	698 – 716, 777-787	728 - 757
BRS/EBS	2496 - 2690	
CBRS	3400-4200	

4. The System shall have the capability for separate control over each service (or wireless operator) to allow adjustment and control of power levels without disturbing other services/operators.

5. The System shall support multiple services in a modular architecture so services can be added or removed without requiring new infrastructure, without readjustment of signal power levels, and disturbing existing services.

6. The System shall enable services to be added without requiring additional cabling or antennas.

7. The System shall not impede any management features or functionality of any attached network and/or device management system.

8. The System shall allow for proactive management and end-to-end alarming of active electronics.

9. The System shall be able to engage with 3rd party SNMP-based element management systems and provide fault management information.

10. The Owner prefers that the System's antennas be mounted below ceiling grids. Coordinate the RF design, antenna placement, and mounting with both the Architect and the Owner throughout the project.

11. E911: The System must support E911 and associated sectors.

12. Cellular Services:
    a. The System shall support the latest advancement in mobile broadband and LTE, to support the growth of mobile computing, low-latency transmission, and the demand for higher throughput requirements as necessary for different applications.
    b. The System shall provide RSSI cellular signal strength of -75 dBm or stronger for 3G (-85 dBm for LTE/ 4G) services throughout at least 95% of the required coverage areas, and the System shall provide a signal strength of -85 / -95 dBm, minimum, for the remaining 5% of the building.
    c. The System shall provide RSRP signal strength of at least -104 dBm for LTE / 4G services.
    d. The System shall provide at least 8 dB higher (signal dominance) than the cellular carriers' macro signal based upon the current macro coverage.
    e. The System shall provide RSRQ signal quality of at least -14 throughout at least 95% of the required coverage areas.
    f. The System shall provide a SNIR signal-to-noise ratio of at least 10 dB or better throughout the coverage areas at least 95% of the required coverage areas.
    g. The System shall provide a PIM level of 100 dBm / -143 dB or better on segments for the 850 MHz frequency band.
13. The System and the associated wireless devices shall comply with the FCC and regional regulatory authorities' emission rules for wireless devices.
    a. Refer to: FCC advisory: "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety Rules, Procedures, and Practical Guidance", FCC's OET Bulletin 65, and FCC Rule 47-part 17 and (ANSI/IEEE C95.1-1992) Hazardous Emission document.

1.3 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements.

B. Submittal Requirements with the Bid:
    1. Statement of Work that describes the entire proposed scope.
    2. Acknowledge that the specified equipment will be installed per design or provide a substitution request letter.
    3. A certificate from the manufacturer of the equipment to be installed stating that the DAS installer is trained and qualified on the equipment.

C. Submittal Requirements Prior to Start of Construction:
    1. Product data submittal
    2. Shop Drawings Submittal: Include the following in the shop drawing submittal:
        a. Pathway and cable support systems
        b. Wall and/or rack elevations, showing equipment layout, space requirements and integration with other systems (outside the scope of the DAS)
        c. Installation details for unique antenna mounting conditions, specialty cable hangers, and other components specific to the system not covered under the contract drawings.
    3. Compliance with permitting agency requirements

D. Submittal Requirements Prior to Acceptance Testing:
    1. Test equipment to be used during commissioning that shows current calibrations and test data.
    2. Acceptance Test Plan (ATP): In this submittal, describe in detail the procedure for testing the System's performance and balancing the System's signal strength, including a description

of the test data (or an example of the test report). The procedures and results shall demonstrate the desired services have been successfully deployed and tested. The DAS must be deployed with the WSP criteria and approval.

E. Submittal Requirements at Close Out:

1. As-Built Drawings, including.
   a. Cable routing, splitters, couplers, and coverage antenna locations
   b. Active component locations, layout, and configuration
2. Test Reports
   a. Cable test results: include every cable segment.
   b. Validation survey report
3. Warranty Documents
   a. Submit Contractor's System warranty, including procedures and contact information for service calls under warranty.
   b. Submit Manufacturers' warranties, including procedures and contact information for service calls under warranty.

1.4 QUALITY ASSURANCE

A. Comply with manufacturers specifications.

PART2 PRODUCTS

2.1 MANUFACTURERS

A. DAS required manufacturer CommScope Inc.

2.2 SUBSTITUTIONS

A. Comply with the Substitution requirements.

2.3 DATA COLLECTION TEST EQUIPMENT

A. Specifications
   1. Accuracy: 1 dB (across basic RF input power range)
   2. Dynamic range: -120 dBm to -20 dBm at 30 kHz
   3. Frequency range: 10 MHz to 6GHz<, 26GHz to 40GHz>
   4. Technologies: 4G LTE,5G, C-Band &CBRS
   5. Antenna configuration: Capable of 2x2 and 4x2 4X4 LTE MIMO measurements
   6. Connection: Bluetooth or USB to Windows laptop or Android tablet
   7. Power: Hot-swappable batteries

B. Manufacturers, or equal:
   1. PCTEL — IBM/ex
   2. Keysight — Nemo
   3. FalconSmart — Falcon Kitt
   4. Enhancell — Echo
   5. Accuver — XCAL
   6. Infovista — TEMS

PART 3 EXECUTION

3.1 GENERAL

A. Comply with manufacturers specifications.

3.2 PRE-INSTALLATION AND COORDINATION

A. Coordinate RF rebroadcasting agreements with WSPs.

B. Represent the Owner during negotiations with the WSPs to obtain their approval.

c. Examination and Preparation

1. Examine equipment rooms, pathways, power service, and other aspects for completeness, the compatibility with the work of this section, and the readiness for connections with the work of this section.

3.3 PROJECT MANAGEMENT SERVICES:

A. Assign a project manager, a single-point-of-contact, to this project with overall responsibility for communications and ultimate delivery of contracted materials, installation, performance criteria, and services. This PM shall be responsible for interfacing with the Owner, telcos, the General Contractor, and their own subcontractors.

B. Present the system design to the Owner, coordinate cable routes with the telecom engineer.

C. Represent the Construction Team to coordinate on-site construction activities with the General Contractor and coordinate receiving Telco services ordered by the Owner.

D. Manage the wireless operators bringing their equipment and services into the facility.

E. Close out the project with the Owner.

3.4 INSTALLATION

A. Coordinate the installation and schedule with the owner, General Contractor, and electrical contractor prior to the start of installation activities. Once the owner and General Contractor have accepted the coordination and schedule, proceed with the installation.

B. Indoor Antenna Installation

1. Mount according to manufacturers' recommendations.

2. Mount at locations identified within DAS design drawings. Avoid mounting locations as follows:

a. Adjacent to metal materials
b. Adjacent to RF signal sources

3. Cable paths to antenna must match DAS design drawings.

4. Deviation of installation details and/or locations must be coordinate with DAS design engineer.

c. Change default passwords in accordance with the Owner's direction.

D. Install latest software versions, firmware, and security patches.

E. Disable unused communication ports, protocols, and access accounts.

F. Test the following during installation: Sweep Testing (SYS RL/DTF, Load RL/DTF + short), PIM testing (PIM vs Time, DTP +Loads), Fiber Testing (OTDR+ Scopes) & CW Testing when applicable.

G. System Balancing: Balance system component (e.g., antenna) signal strength to device signal levels.

H. Connections to the System: Coordinate connection of wireless service providers to the System.

1. Manage wireless operators' connections to the System.

2. Assist the owner with the carrier coordination of this expanded system.

3. Assist the owner with E911 services throughout the System.

4. Integration includes BDA.

5. If Alternate # is selected, manage integration of telemetry services and applications into the System. Coordinate the services and applications with the telemetry integrator. Provide

equipment and components required to support the wireless services and to make adjustments to the System necessary for full operation.

I. Manage FCC License: Acting as a representative of the Owner, obtain required licenses for operation under FCC Regulations.

3.5 LABELING

A. General Requirements

1. Label equipment, components, and cables.
2. Labels shall be permanent, minimum 1” x 1.5”.
3. Text shall be machine-generated minimum 12pt. font. Handwritten labels will not be accepted.
4. Labeling, label colors, and identifier assignment shall conform to the TIA-606 standard. Coordinate labeling and identifier assignment with the Engineer or Owner.
5. Submit a labeling plan compliant with the labeling requirements shown in the Technology drawings.

B. Equipment Labeling

1. Affix labels to equipment (such as fiber remote units) such that they will be clearly visible.

C. Cable Labeling

1. Affix label as close as practical to each end of each cable.
2. Cable labels shall fully wrap around cable jackets resulting in a self-laminating result.

D. Antenna Labeling

1. Affix labels to antennas such that they will be clearly visible.

3.6 ACCEPTANCE TESTING / VALIDATION SURVEY

A. Complete acceptance testing in accordance with the approved Acceptance Test Plan (ATP). Only a qualified person or persons familiar with DAS and cellular data collection tools shall test the System.

B. Perform an on-site survey to validate RF coverage (signal strength) throughout coverage areas (listed in Part 1) using approved test equipment.

1. Outdoor Perimeter Area: Survey the building perimeter on the ground level within 5 to 10 meters of the entire building.

C. Testing Procedure

1. Verify that remote units for the area under test are on.
2. Collect validation survey data continually at two-second or shorter intervals for each frequency band required in the “Wireless Operators" frequencies table (listed in Part 1).
3. Walk at a normal and constant pace.
4. Correlate validation survey data during the data collection with floor plans.
5. Use actual signal sources from wireless carriers to measure quality parameters. If carriers are not yet available, then use a signal generator connected to the head-end downlink (TX) interface via tested and approved coaxial cabling and connectors.
6. Record test frequencies and signal power with the date and time of each site walk.
7. Save site walk screen shots with a frequency span of? 20 MHz relative to the center / measured frequency.

D. Equipment Requirements

1. Testing equipment must be calibrated within the past 12 months.
2. Allow test equipment to stabilize in the test environment prior to calibration for a minimum of thirty minutes. Changes in temperature can void the calibration.
3. Signal generator transmission frequency (MHz) and power (dBm) must be preapproved by the project engineer prior to testing. The control channel from the base station can be used as a

signal source as well.

4. Use a spectrum analyzer to capture and present signal strength, preapproved by the project engineer.

a. Verify the spectrum analyzer is set to unity gain (0dB, frequency specific) so that the combination of analyzer and its antenna do not artificially increase measurement results.
b. Present signal strength as a graphical “heatmap".

5. Use a Link Master LML Air Interface (or equivalent) tool to capture and present signal strength.

E. Documentation

1. Produce a validation survey report documenting the results including heat maps of the following:

a. RSRQ
b. RSRP
c. SNIR / LTE Reference Signal SNIR
d. Signal strength (RSSI)
e. Present signal results as a graphical “heatmaps”.

3.7 FINAL INSPECTION

A. Participate in a punch walk with the engineer to demonstrate that the work complies with the requirements of this section.

B. Submit Certificate of Compliance with manufacturers specifications.

C. Submit final testing documentation to and obtain acceptance from the wireless carriers. Include these documents in the as-builts.

3.8 TURNOVER AND TRAINING

A. Pre-emptive Maintenance Minimum Requirements: Perform the following just prior to closeout.

1. Clean filters, vents, and equipment components that may accumulate dust and dirt.
2. Organize and manage cables and cords that have been placed.
3. Update firmware with latest versions.
4. Document and photograph any conditions that may affect the continuing function and long-term operation of the System and report to Owner.

B. Present the completed system and wireless services to the Owner, including functionality, features, ongoing maintenance, and warranty procedures. Demonstrate to Owner and engineer, system operation, including signal strength at selected locations. Turnover at least one set of both electronic and printed records, per the Owner’s request.

c. For this System, provide up to 8 hours of training for the Owner.

3.9 WARRANTY PERIOD MAINTENANCE

A. Correct deficiencies within 24 hours of notification during the warranty period.

B. 1. Splitters, couplers, and Coverage Antennas: 5-Year limited Warranty from date of system acceptance.

2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.
3. Fiber- Optic Cable: 25-year limited warranty from date of acceptance
4. Active Components: The earliest 0f 1- year limited warranty from date of system installation

3.10 EXTENDED SERVICES

A. Submit costs for extended services (additional service levels beyond the warranty period) as follows:

1. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and same- day issue response

2. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 24- hour issue response

B. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 48-hour issue response.

END OF SECTION

SECTION 275329 - EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Radio distribution system to support Emergency Responder Radio Communication System, Emergency Communications Systems, P25, and multiple first responder Radio Systems for Emergency Response wireless services, primarily in-building — herein “System”.

B. Base Bid Work

1. The work of this section includes furnishing materials, installation, and coordination through the General Contractor with other trades for a complete, operational, and balanced Emergency Responder Radio Communication System, P25. Provide a complete turn-key system that supports frequencies and services throughout the coverage spaces specified herein. Furnish materials, accessories, fasteners, etc., and the labor and associated services necessary for a complete and operational System, whether expressly stated or not. Coordinate the work of this section with other trades through the General Contractor.

2. The work of this section includes the following:

   a. Provide Project management services.
   b. Validate current and planned future emergency services and associated frequencies.
   c. Coordinate antenna placement and mounting coordination with the General Contractor and affected trades, mounting confirmation with both the architect and the Owner.
   d. Conduct initial on-site discovery survey “where applicable.”
   e. Provided detailed system design and drawings.
   f. Review of pathways and enclosures for NFPA 1221 compliance
   g. Provide coordination with the overall construction team and usage of provided pathways.
   h. Provide installation and system commissioning.
   j. Connect back to existing JMA system in the Davis Tower.
      1) Initial signal source will be provided by an existing Comba 800MHZ amplifier, also Westell 900MHZ amplifier-JMA DAS located in the Davis Tower. Note that this radio system also provided P25 and Paging service to the campus.
      2) In the future (-2030), a new NFPA compliant head-end system will be installed within the new RHT tower. The RHT head-end will eventually be the primary distributor and BDA location with donor antenna on roof. The contractor will coordinate cut-over dates where the old BDA in Davis Tower is decommissioned, and signal source switched over to RHT.
   k. Provide NEMA 4-type waterproof cabinet.
   l. Include patch cords (to connect System equipment)
   m. Provide system acceptance testing and turn over to Owner.
   n. Provide a warranty.
   o. Provide maintenance and support services.

3. Power Service:

   a. Coordinate with the electrical contractor the power provisions required for the System. The ERRCS contractor is solely responsible to ensure proper electrical power service.
   b. Provide distributed UPSs with a minimum runtime of 24 hours, with enclosures meeting NFPA 72 and 1221 requirements.

4. Coordination Requirements:

   a. Ceiling Types: Understand every ceiling type and its interaction with the System. For example, some ceiling types may impede RF signals and, subsequently, performance.

b. Mounting Details: Coordinate antenna mounting and the resulting RF performance. It may be preferred that antennas be mounted above or below ceiling grid. Coordinate with both the architect and the Owner. Adjust as approved to optimize performance.

c. Pathways: Coordinate placement of System cables within pathways provided by others. Only place System cables into pathways provided by others with their permission.

d. Fiber Distribution System: Coordinate the System's fiber distribution requirements with the backbone fiber cabling contractor. Provide patch cords connect equipment to the fiber distribution system. Ensure compatibility with the cabling described in section 27 13 00, "Communications Backbone Cabling".

C. Work Covered Under Other Sections

1. Electrical power — raceways, junction boxes, circuits, branch wiring, and receptacles
2. Pathways — backbone conduits, primary pathways (such as cable trays), conduits, sleeves
3. Telecommunications Rooms — equipment support (racks/frames), power service, cooling, and grounding
4. Communications Backbone cabling
5. Wired network

D. Related Sections

1. Comply with the Related Sections requirements of the following:
   a. Section 27 05 26 "GROUNDING AND BONDING FOR COMMUNICATIONS SYSTEMS"
   b. Section 27 05 29 "HANGERS AND SUPPORTS FOR COMMUNICATIONS SYSTEMS."
   c. Section 27 05 33 "CONDUITS AND BACKBOXES FOR COMMUNICATIONS
   d. Section 27 05 36 "CABLE TRAYS FOR COMMUNICATIONS SYSTEMS"
   e. Section 27 05 41 "FIRE-STOPPING SYSTEMS"
   f. Section 27 05 53 "IDENTIFICATION FOR COMMUNICATIONS"
   g. Section 27 11 16 "COMMUNICATIONS CABINETS, RACKS, FRAMES, AND ENCLOSURES"
   h. Section 27 53 29 "EMERGENCY RESPONDER RADIO COMMUNICATION SYSTEM"
   i. Section 27 11 23 "COMMUNICATIONS CABLE MANAGEMENT AND LADDER RACK
   j. Section 27 13 43 "COMMUNICATIONS SERVICES
   k. Section 27 15 00 "COMMUNICATIONS HORIZONTAL CABLING"
   l. Section 27 13 00 "COMMUNICATION BACKBONE CABLING"

1.2 REFERENCES

A. Comply with the References requirements of related sections (above).

B. In addition to the codes and standards listed, comply with the latest edition of the following applicable specifications and standards except as otherwise shown or specified:

1. Committee of the Federal Register (CFR) Title 47 "Telecommunication", Chapter I "Federal Communications Commission" (FCC) Regulations:
   a. Part 24, "Personal Communications Services"
   b. Part 27, "Miscellaneous Wireless Communications Services"
   c. Part 95, "Personal Radio Services.

2. California Code of Regulations (CCR), Title 24

a. Part 9, “California Fire Code" (CFC), Section 510

3. NFPA 72 “National Fire Alarm and Signal Code Regulations"
   a. Chapter 24, “Emergency Communication Systems (ECS)"
      1) Pathway Survivability
      2) Two-Way Radio Communication Enhancement System

4. NFPA 1221 “Standard for the Installation, Maintenance, and Use of Emergency Services Communications Systems"

C. Refer to Predictive Survey Design Report for coverage analysis.

1.3 SYSTEM DESCRIPTION

A. System Description

1. The P25 System, or “ERRCS", shall reliably distribute RF signals for multiple first responder/emergency response wireless services throughout the specified frequency ranges and the specified coverage areas. The System shall be implemented based on proven technology that can seamlessly integrate with the rapid evolution of wireless technologies and business applications. The System shall be flexible and shall easily accommodate additional wireless services within the System's frequency bands without requiring significant upgrades or system modifications.

2. The System shall include subsystems, equipment, components, transmission media, connection/ termination apparatus, etc., necessary for a complete operating system as described herein.

3. The System shall continuously distribute public safety radio signal throughout the building for 24 hours, minimum, during an event such as loss of utility power, as required per CFC and NFPA 1221. Therefore, the System requires continuous power with a runtime of 24 hours, minimum. The System requires dedicated circuit(s) to the equipment primary power source(s).
4. The active equipment and battery systems shall be electrically supervised and monitored by a supervisory service, or when approved by the AHJ, shall sound an audible signal at a constantly attended location, as required per CFC 510.4.2.4 #3.
5. Riser and feeder cables shall be plenum rated.
6. Feeder cables shall be connected to riser cables via either coaxial couplers/splitters or to fiber remotes.
7. Riser cables shall route through a 2-hour rated assembly.
8. Connections between riser and feeder cables shall be made within the 2-hour rated assembly, and passage of feeder cables into/out of 2-hour rated assemblies shall be fire-stopped to 2-hour ratings.
9. The System shall have lightning protection.

B. Design Criteria

1. Frequency Range: The System shall support all frequencies in the 800, 900 MHz bands.
2. The System shall distribute RF coverage throughout interior spaces.
3. The system shall be sized to support connectivity to the Davis Tower JMA head-end.
4. The system shall be expandable to support connectivity to a future JMA head-end in RHT.
5. The System shall support public safety (including “First Responder”) wireless services and technologies, including the following:
    a. Local police department
    b. City police department
    c. County sheriff
    d. Fire department
6. The System shall have the capability for separate control over each service to allow adjustment and of control power levels without disturbing other services/operators.
7. The System shall support multiple services in a modular architecture so services can be added or removed without requiring new infrastructure, without readjustment of signal power levels, and disturbing existing services.
8. The System shall not impede any management features or functionality of any attached network and/or device management system.
9. The System shall allow for proactive management and end-to-end alarming of active electronics.
10. The System shall provide fault management information.
11. System Supervision
    a. The System’s electronic supervision shall monitor, at a minimum, the following:
        1) Normal AC power
        2) Loss of normal AC power
        3) Battery charger failure
        4) Low-battery capacity (i.e., to 70 percent depletion)
        5) Donor antenna failure
        6) Active RF emitting device malfunction/failure.
        7) Active system component malfunction
    b. The System shall audibly annunciate alarms generated by the supervision.

c. The System shall have a separate dedicated supervision panel located near the building's fire alarm control panel.

12. The Owner prefers that the System's antennas be mounted below ceiling grids. Coordinate the RF design and the antenna placement and mounting with both the architect and the Owner throughout the project.

13. The System shall interface with the Fire Alarm System, compliant with NFPA 1221.

14. The System shall monitor the power source, system status, and other critical aspects to the System's overall operation and shall provide alarming annunciation —all as required by the AHJ.

15. The System shall distribute public safety channels with -95 dBm (or stronger) signal strength (RSSI) throughout 95% of occupied building spaces and 99% in critical areas as defined in NFPA 1221 and IFC or as required by local ordinance and agencies, including local and city police, county sheriff, and fire departments. Confirm with the AHJ, Owner, and additional authorities' frequencies that will be in use at the time of facility opening.

16. The System shall have at a minimum 20 dB isolation between a donor antenna and all inside antenna as defined in NFPA 1221 or as required by local ordinance and agencies, including local and city police, county sheriff, and fire departments. Confirm with the AHJ, Owner, and additional authorities' frequencies that will be in use at the time of facility opening.

17. The sound quality shall meet or exceed DAQ 3.4 per SRRCS requirements ("Speech understandable with slight effort; requires occasional repetition due to noise or distortion") as defined in NFPA 1221.

18. The System and the associated wireless devices shall comply with the FCC and regional regulatory authorities' emission rules for wireless devices.

a. Refer to: FCC advisory: "A Local Government Official's Guide to Transmitting Antenna RF Emission Safety Rules, Procedures, and Practical Guidance", FCC's OET Bulletin 65, FCC Rule 47-part 17 and (ANSI/IEEE C95.1-1992) Hazardous Emission document.

1.4 SUBMITTALS

A. Comply with Submittal procedural, quantity, and format requirements.

B. Submittal Requirements with the Bid:

1. Statement of Work that describes the entire proposed scope.

2. Acknowledge that the specified equipment will be installed per design or provide a substitution request letter as outlined.

3. A certificate from the manufacturer of the equipment to be installed stating that the ERRCS installer is trained and qualified on the equipment.

4. An FCC-issued GROL for the lead installation personnel and the testing personnel

C. Submittal Requirements Prior To Start of Construction:

1. Initial on-site discovery survey report following NFPA 1221 Annex A testing guidelines.

2. Product data submittal

3. Shop Drawings Submittal: Shop drawings shall include the following information:

a. Pathway and cable support systems

b. Wall and/or rack elevations, showing equipment layout, space requirements and integration with other systems (outside the scope of the ERRCS)

c. Installation details for unique antenna mounting conditions, specialty cable hangers, and other components specific to the system not covered under the contract drawings.

4. Compliance by permitting agency.

D. Submittal Requirements Prior to Acceptance Testing:

1. Test equipment to be used during commissioning that shows current calibrations and test data.

2. Acceptance Test Plan (ATP): This submittal shall describe in detail the procedure for testing the System's performance and balancing the System's signal strength, including a description of the test data (or an example of the test report). The procedures and results shall demonstrate the desired.

services have been successfully deployed and tested. The ERRCS must be deployed with the FCC Licensee (SRRCS) AHJ criteria and approval.

E. Submittal Requirements at Close Out:

1. As-Built Drawings, including.
   a. Donor antenna, grounding, and lightning protection details
   b. Cable routing, splitters, couplers, and coverage antenna locations
   c. Active component locations, layout, and configuration
2. Letter from the FCC Licensee/AHJ accepting the ATP results.
3. Test Reports
   a. Cable test results — includes every cable segment sweep.
   b. Validation survey report Walk Testing-to include heat maps and or grid test results.
4. Operations and Maintenance Manual
5. Warranty Documents
   a. Submit Contractor's System warranty, including procedures and contact information for service calls under warranty.
   b. Submit Manufacturer's warranty, including procedures and contact information for service calls under warranty.
6. Integration of components and pathways into the Building Information Model (BIM)

1.5 QUALITY ASSURANCE

A. Comply with Quality Assurance requirements.

B. Comply with manufacturers' specifications.

1.6 WARRANTY

A. 1. Splitters, couplers, and Coverage Antennas: 5-Year limited Warranty from date of system acceptance.

2. Coaxial Cable and Connectors: 10-year limited warranty from date of system acceptance.

3. Fiber- Optic Cable: 25-year limited warranty from date of acceptance

4. Active Components: 1- year limited warranty from date of system installation

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Comba

B. JMA Wireless

C. Westell

2.2 SUBSTITUTIONS

A. Comply with the Substitution requirements.

2.3 ANNUNCIATOR

A. Displays status of BDA, Donor Antenna, AC Power, Battery Capacity, Battery Charger, and System Status.

B. Includes a form C relay for interface with fire alarm system

c. NEMA-4 enclosure

D. Internal battery back-up

E. Manufacturer, or equal:

1. DASalert #1221

2.4 TEST EQUIPMENT

A. Specifications

1. Accuracy: t1 dB (across basic RF input power range)
2. Dynamic range: -120 dBm to -20 dBm at 30 kHz
3. Frequency range: 150 MHz to 900MHz
4. Technologies: LMR, and P25
5. Connection: Bluetooth or USB to Windows laptop or Android tablet
6. Power: Hot-swappable batteries

B. Manufacturers, or equal:

1. Anritsu MS2720T “or equivalent” spectrum analyzer
2. PCTEL — IBflex
3. Keysight — Nemo
4. FalconSmart — Falcon Kitt
5. Enhancell — Echo
6. Accuver — XCAL
7. Infovista —TEMS

PART 3 EXECUTION

3.1 GENERAL

A. Comply with manufacturers specifications.

3.2 PRE-INSTALLATION AND COORDINATION

A. Coordinate RF rebroadcasting agreements with AHJ.

B. Represent the Owner during negotiations with the FCC Licensee/AHJ to obtain their approval.

C. Examination and Preparation

1. Examine equipment rooms, pathways, power service, NFPA 72 and NFPA 1221 compliance, and other aspects for completeness, the compatibility with the work of this section, and the readiness for connections with the work of this section.
2. Confirm the enterprise Ethernet network is ready for connection to the System.
3. Confirm that the fire-alarm system’s annunciator is ready for connection to the System.

3.3 PROJECT MANAGEMENT SERVICES:

A. Assign project manager, a single-point-of-contact, to this project with overall responsibility for communications and ultimate delivery of contracted materials, installation, performance criteria, and services. This PM shall be responsible for interfacing with the Owner, AHJ, the General Contractor, and their own subcontractors.

B. Represent the Construction Team to coordinate on-site construction activities with the General Contractor.

C. Close out the project with the Owner.

3.4 INSTALLATION

A. Coordinate the installation and schedule with the Owner, General Contractor and electrical contractor prior to the start of installation activities. Once the Owner and General Contractor have accepted the coordination and schedule, proceed with installation.

B. Coordinate the location of and power service to a NEMA 4 type cabinet. Anchor the cabinet to the building structure per the project's approved methods.

c. Install active signal components and battery systems (used for emergency power) in a NEMA 4 type cabinet.

D. Meet with the Owner to discuss their needs for monitoring the System. Set up the electronic supervisory system (used to monitor signal booster components, emergency power and battery systems) per the Owner's requirements.

E. Indoor Antenna Installation

1. Mount according to manufacturers' recommendations.
2. Mount at locations identified within ERRCS design drawings. Avoid mounting locations as follows:
   a. Adjacent to metal materials
   b. Adjacent to RF signal sources
3. Cable paths to antennas shall match ERRCS design drawings.
4. Deviation of installation details and/or locations must be coordinated with ERRCS design engineer.

F. Change default passwords in accordance with the Owner's direction.

G. Install latest software versions, firmware, and security patches.

H. Disable unused communication ports, protocols and access accounts.

I. Test the following during installation: Return Loss (RL) and Distance to Fault (DTF)Loads ,system

J. System Balancing: Balance system component (e.g., antenna) signal strength to the device signal levels.

K. Alert the FCC Licensee prior to bringing the system operational.

L. Manage FCC License: Acting as a representative of the Owner, obtain required licenses for operation under FCC Regulations.

M. Do not install amplification systems capable of operating on frequencies licensed to any public safety agency by the FCC without prior coordination and approval by the AHJ.

3.5 LABELING

A. General Requirements

1. Label equipment, components, and cables.
2. Labels shall be permanent.
3. Text shall be machine-generated; handwritten labels will not be accepted.
4. Labeling, label colors, and identifier assignment shall conform to the TIA-606 standard. Coordinate labeling and identifier assignment with the Engineer or Owner.
5. Submit a labeling plan compliant with the labeling requirements shown in the Technology drawings.

B. Equipment Labeling

1. Affix labels to equipment (such as fiber remote units) such that they will be clearly visible.

C. Cable Labeling

1. Affix label as close as practical to each end of each cable.
2. Cable labels shall fully wrap around cable jackets resulting in a self-laminating result.

D. Antenna Labeling

1. Affix labels to antennas such that they will be clearly visible.

3.6 ACCEPTANCE TESTING / VALIDATION SURVEY

A. Complete acceptance testing in accordance with the approved Acceptance Test Plan (ATP). Only a qualified person or persons familiar with ERRCS and associated data collection tools shall test the System.

B. Perform an on-site survey to validate RF coverage (signal strength) throughout coverage areas (listed in Part 1) using approved test equipment.

C. Testing Procedure

1. Verify that remote units for the area under test are on.
2. Record signal strengths of required frequency bands present at the donor antenna.
3. Each floor of the building shall be divided into a grid of equal test areas.
    a. Floors with less than or equal to 128,000 sq-ft use a grid of 20 approximately equal test areas between 20 to 80 ft each.
    b. Floors with greater than 128,000 sq-ft use equal grids that have a maximum of 80 ft. It is recommended that the floor be subdivided into sectors each having an area less than or equal to 128,000 sq-ft, and each sector be tested individually with 20 ft grid cells in each sector.
4. A test location approximately in the center of teach test area shall be selected for the test. Once the location has been selected, the location shall represent the entire test area.
5. Downlink received signal level will be recorded in the coverage area using a continuous wave test signal. Measurements will be collected using a spectrum analyzer and a dipole antenna.
6. Signal strength and link spectrum: Must meet or exceed all critical areas and less than nine nonadjacent and/or six adjacent cell failures.
7. DAQ: Must meet or exceed all critical areas and not more than two non-adjacent grid cells failures. If two adjacent areas fail the DAQ test, then grid should be halved and retested with no *more* than eight nonadjacent and/or five adjacent cell failures

D. Equipment Requirements

1. Testing equipment must be calibrated within the past 12 months.
2. Allow test equipment to stabilize in the test environment prior to calibration for a minimum of thirty minutes. Changes in temperature can void the calibration.
3. Verify that all remote units for the area under test are ON.
4. Test frequency and power measurements shall be time stamped.
5. Use a spectrum analyzer to capture and present signal strength, preapproved by the project engineer.
    a. Verify the spectrum analyzer is set to unity gain (0dB, frequency specific) so that the combination of analyzer and its antenna do not artificially increase measurement results.
    b. Present signal strength as a graphical “heatmap”.
6. Site walk screen shots shall be saved with frequency span +/- 20 MHz relative to the center / measured frequency.

E. Documentation

1. Exact location of measurement must be marked on the grid print.
2. Screen shots must be taken in all designated grid spaces. If more than one reading is saved per grid zone, saved results shall be distinguished from one another using Grid# “A”, Grid# “B”, etc.
3. Produce a validation survey report documenting the results including heat maps of the following:
    a. Signal strength (RSSI)
4. Report testing results to the project engineer for analysis.

3.7 FINAL INSPECTION

A. Participate in a punch walk with thee engineer to demonstrate that the work complies with the requirements of this section.

B. Submit Certificate of Compliance with manufacturers specifications.

C. Submit final testing documentation to and obtain acceptance from the AHJ. Include these documents in the as-builts.

3.8 TURNOVER AND TRAINING

A. Pre-emptive Maintenance Minimum Requirements: Perform the following just prior to closeout.

1. Clean filters, vents, and equipment components that may accumulate dust and dirt.
2. Organize and manage cables and cords that have been placed.
3. Update firmware with latest versions.
4. Document and photograph any conditions that may affect the continuing function and long-term operation of the System and report to Owner.

B. Present the completed system and wireless services to the Owner, including functionality, features, ongoing maintenance, and warranty procedures. Demonstrate to Owner and engineer, system operation, including signal strength at selected locations. Turnover at least one set of both electronic and printed records, per the Owner's request.

C. Comply with training requirements of section 270000. For this System, provide up to 8 hours of training for the Owner.

3.9 WARRANTY PERIOD MAINTENANCE

A. Correct deficiencies within 24 hours of notification during the warranty period.

3.10 EXTENDED SERVICES

A. Submit costs for extended services (additional service levels beyond the warranty period) as follows:

1. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and same-day issue response
2. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 24-hour issue response
3. One-year, two-year, and three-year service with quarterly pre-emptive maintenance calls and 48-hour issue response

END OF SECTION

SECTION 28 10 00
ACCESS CONTROL

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of complete installation and integration to control the physical security and access to UCDH buildings.

B. The Owner is defined herein as “UCDH” which represents University of California Davis Health and specifically includes IT Facilities, IT Facilities Infrastructure, IT Facilities Engineering, Network Operations, Auxiliary Services, and other relevant UCDH departments and representatives.

C. All work in OSHPD-1 Hospital and associated facilities shall be executed in accordance with the requirements of UCDH Infection Control Risk Assessment (ICRA) and Pre-Construction Risk Assessment (PCRA) requirements, standards, forms, policies, and procedures.

1.2 SYSTEM DESCRIPTION

A. Access control is an integral part of the UCDH Campus Security program. This system shall provide security for staff and students to freely but securely enter buildings under a controlled access policy.

B. UCDH has standardized on the Lenel OnGuard access control system. UCDH shall provide and install Lenel OnGuard Professional software and licensing. Contractor shall provide and install access control hardware and program to interface to the existing access control server and cardholder database.

1.3 SEISMIC DESIGN REQUIREMENTS

A. Identify each item requiring seismic restraint installation in accordance with CBC Chapter 16A. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

B. Supports for such items, including racks and rack cabinets, conduit, cable trays and similar, shall be provided support, bracing, and anchorage designed by the Contractor in accordance with the following criteria:

1. Design to resist seismic forces in accordance with CBC Chapter 16A.
2. Minimum Design Parameters - As defined for the Building, with respect to Occupancy Category, Site Classification, Seismic Design Category, Importance Factor, and Spectral Response Acceleration.

1.4 RELATED SECTIONS

A. Division 27 Communications Sections

B. 27 05 41 FIRE-STOPPING SYSTEMS

C. 27 52 23 NURSE CALL CODE BLUE SYSTEMS

D. 28 20 00 VIDEO SURVEILLANCE

E. 28 31 00 INTRUSION DETECTION

F. 28 49 00 ELECTRONIC PERSONAL PROTECTION SYSTEMS

1.5 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Building Industry Consulting Services International (BICSI)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Manufacturers Association (NEMA)

F. National Fire Protection Association (NFPA)

G. Telecommunications Industry Association (TIA)

H. Underwriters Laboratories, Inc. (UL)

I. California Building Standards Code (California Code Of Regulations, Title 24), 2019

J. Public Safety (California Code of Regulations, Title 19), 2021

K. Office of the California State Fire Marshal (CSFM) Building Materials Listing (BML) Program

L. NFPA 70 National Electrical Code (NEC), 2020

M. NFPA 70 National Electrical Code (NEC), Chapter 8 Communications Systems, Article 800 Communications Circuits, 2020

N. NFPA 99 Health Care Facilities Code, 2021

O. ANSI/TIA-568.0 Generic Telecommunications Cabling for Customer Premises, Rev. E, 2020

P. ANSI/TIA-568.1 Commercial Building Telecommunications Infrastructure Standard, Rev. E, 2020

Q. ANSI/TIA-568.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Rev. D, 2018

R. ANSI/TIA-568.3 Optical Fiber Cabling and Components Standard, Rev. D, 2016

S. ANSI/TIA-568.4 Broadband Coaxial Cabling and Components Standard, Rev. D, 2017

T. ANSI/TIA-569 Telecommunications Pathways and Spaces, Rev. E, 2019

U. ANSI/UL 2900-1 Standard for Software Cybersecurity for Network-Connectable Products, General Requirements, 2020

V. ANSI/UL 2900-2-1 Software Cybersecurity for Network-Connectable Products, Particular Requirements for Network Connectable Components of Healthcare and Wellness Systems, 2020

W. ANSI/UL 2900-2-3 Standard for Software Cybersecurity for Network-Connectable Products, Particular Requirements for Security and Life Safety Signaling Systems, 2020

X. ANSI/UL 294 Standard for Access Control System Units, 2018

1.6 SUBMITTALS

A. Procurement and installation shall not begin until product data and shop drawings submittals have been approved by UCDH.

B. Develop a Facility Access Control Plan in accordance with the UCDH Campus Security program.

1. Include exterior doors, perimeter doors, and vertical transportation including stairs and elevator floor access for staff and general public.
2. Develop interior access control zoning plan by floor, suite, and individual room.
3. Include coordination with the project construction management for differences in the access control plan during construction and after completion of construction.
4. Compile the access control plan, including color-coded graphics and diagrams, in Adobe Acrobat or Bluebeam Revu and submit an electronic copy in .pdf format.

C. Submit product data submittals to UCDH for review and approval.

1. Submit product data submittals system, product, device, and equipment product data cutsheets.
2. Manufacturer's published cutsheets shall be marked with boxes, arrows, highlighting, lines, and notes as needed to clearly indicate the exact product make, model, and options to be provided.
3. Mark cutsheets to indicate the associated Section.
4. Contractor’s lead technician shall be a Lenel Certified Professional in Access.
    a. Provide documentation of Contractor's factory-trained and authorized service representatives.
5. Compile system, product, device, and equipment product data cutsheets, including templates, graphics, tables, diagrams, and installation instructions, in Abode Acrobat or Bluebeam Revu complete with a Table of Contents linked to the bookmarks within the submittal and submit an electronic copy in .pdf format.

D. Submit shop drawings submittals to UCDH for review and approval.

1. Submit shop drawings submittals including device and equipment locations.
2. Prepare floor plans including room names, room numbers, and door numbers indicating all device locations labeled with unique device name and number.
3. Include point-to-point drawings of systems, wiring diagrams of individual devices, equipment elevations, and installation details.
4. Indicate wall space and rack space requirements.
5. Indicate IP addresses, Ethernet switch ports, and fiber connectivity requirements.
6. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.

7. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, reception station, or other location, where applicable.
8. Compile shop drawings in AutoCAD and submit an electronic copy in .pdf format.

E. Submit Operation and Maintenance Manual (O&M) submittals to UCDH for review and approval.
1. Prepare O&M manual in 8-½" × 11" letter size sheet format, labeled, grouped, and ordered, with bookmarks as indicated in a Table of Contents.
2. Include manufacturer's system and product data sheets, operation and maintenance information, troubleshooting and servicing instructions, routine maintenance instructions, and copies of all programming sheets.
3. Provide a copy of the final approved acceptance testing reports and documentation.
4. Reflect final UCDH occupancy room numbers in the O&M manuals, programming sheets, and system programming.
5. Compile system, product, device, and equipment documentation (including graphics, tables, and diagrams) complete with a Table of Contents linked to the bookmarks within the manual and submit an electronic copy in Abode Acrobat or Bluebeam Revu .pdf format.

F. Submit as-built drawings submittals to UCDH for review and approval.
1. As work progresses, maintain field redlines of actual installation conditions, including device, equipment, and cabling locations.
2. At project close-out, transfer these redlines to as-built drawings in AutoCAD format.
3. Reflect final UCDH occupancy room numbers on as-built drawings, programming sheets, and system programming.
4. Include floor plans clearly indicating all device locations labeled with unique device name and number.
5. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.
6. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.
7. Compile as-built drawings in AutoCAD and submit an electronic copy in AutoCAD .dwg and in Abode Acrobat or Bluebeam Revu .pdf format.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Contractor must be a Lenel VAR in good standing.

1.8 WARRANTY

A. Access control hardware products and components shall be covered by the manufacturer's warranty for a minimum of two years from date of UCDH acceptance of the project.

B. Maintenance and repair service shall be available locally and within four hours of notification for emergency conditions.

C. Contractor shall provide labor and hardware repairs and replacement for a period of one year following the acceptance of the installation.

PART 2 - PRODUCTS

2.1 ACCESS CONTROL PRODUCTS

A. Access Control Panels

1. Intelligent system controllers serve as the primary communication devices between the access control system software and the individual door controllers and card readers. The Intelligent system controller provides decision-making, event reporting, and database storage for access control system field devices and card numbers.
2. Performance Criteria: Intelligent system controllers must have and be configured to utilize the following capabilities:
    a. Provide data encryption for all data stored at rest within the controller
    b. Provide data encryption for all data when in transit to and from the UCDH networks
    c. Provide data encryption for all data when in transit to and from associated door controllers and card readers
    d. Communicate with the access control system server via on-board 10-BaseT/100Base-TX Ethernet port
    e. Provide secure encrypted communication to downstream door controllers and input/output boards via either of two SIO 2-wire RS-485 communication ports; card readers configured to utilize OSDP version 2 with Secure Channel
    f. Include two digital inputs to monitor access control panel enclosure tamper switch and AC power fail monitoring
    g. Power: 12-24VDC
    h. Dimensions: 6”L by 5”W by 1”H
3. Intelligent system controller:
    a. LNL-X3300 (Default Controller model)
    b. LNL-X2220 (Alternate Controller model)
    c. Series X3

B. Access Control Input Boards

1. Provide input boards at intelligent system controller locations for alarm device and I/O interfaces.
2. Input board:
    a. LNL-1100
    b. Series X3

C. Access Control Output Boards

1. Provide output boards at intelligent system controller locations for alarm device and I/O interfaces.
2. Output board:
    a. LNL-1200

b. Series X3

D. Access Control Reader Interface Boards

1. Reader interface boards serve as the primary communication devices between the intelligent system controller and the card reader.
2. Performance Criteria: Reader interface boards must have and be configured to utilize the following capabilities:
   a. Provide data encryption for all data stored at rest within the reader interface board
   b. Provide data encryption for all data when in transit to and from associated intelligent system controller and card readers
   c. Support OSDP Secure Channel technology for communication to card readers
   d. Communicate to intelligent system controller via SIO 2-wire RS-485 communication
   e. Power: 12-24VDC power
3. Reader interface board:
   a. LNL-1300
   b. LNL-1320
   c. Series X3

E. Access Control Card Readers

1. Card readers serve as the primary communication devices between access control cards and the reader interface boards.
2. Performance Criteria: Card readers must have and be configured to utilize the following capabilities:
   a. Support the ability to read and process HID iCLASS SEOS credentials
   b. Support the ability to read and process HID Mobile Identity credentials
   c. Support OSDP version 2 Secure Channel technology for communication to reader interface boards
   d. Support Bluetooth/NFC communication technology for utilization with mobile credentials
   e. Powered via reader interface boards
   f. Including an autotuning feature to maximize and normalize signal strength
   g. Utilize pig-tail wiring for connection to cabling
   h. Provided with a standard mounting plate and black cover
   i. Display no LED when the associated door is secure, and the card reader is ready to accept an access attempt
   j. Provide an audible beep upon each card read
   k. Display a solid green LED upon a valid card read that stays on for a fixed duration. (until the unlock time expires.)
   l. Display a red LED upon invalid card read
   m. Display a steady green LED when the door is unlocked via a time schedule
   n. Provided in form factors that match existing reader mounting hardware and installation configurations
3. Card readers – mullion mount

a. HID Signo, model 20, part number 20NKS-02-000000
b. 13.56 mHz Profile, OSDP, Pigtail, Mobile Ready
c. Dimensions - 1.77" x 4.78" x 0.77"

4. Card readers – mullion mount with keypad
   a. HID Signo, model 20K, part number 20KNKS-02-000000
   b. 13.56 mHz Profile, OSDP, Pigtail, Mobile Ready
   c. 2x6 backlit keypad
   d. Dimensions - 1.78" x 4.79" x 0.85"
5. Card readers – wall mount
   a. HID Signo, model 40, part number 40NKS-02-000000
   b. 13.56 mHz Profile, OSDP, Pigtail, Mobile Ready
   c. Dimensions – 3.15" x 4.78" x 0.77”
6. Card readers – wall mount with keypad
   a. HID Signo, model 40K, part number 40KNKS-02-000000
   b. 13.56 mHz Profile, OSDP, Pigtail, Mobile Ready
   c. 3x4 backlit keypad
   d. Dimensions – 3.16" x 4.79" x 0.85"

F. Lock Power Supply Panel
1. Lock power supply shall be complete with enclosure and two 12VDC, 7Ah, sealed batteries, connected in series, to supply 24VDC.
2. Power supply shall include expansion capability, and ability to accept dry contact interface from fire alarm system to initiate power shutdown to “Fail Safe” electrified lock hardware.
   a. Altronix AL600ULM

G. Magnetic Door Contact
1. Flush concealed mounted in door frames and doors.
   a. GE/Sentrol 1076C
   b. Or approved equal

H. Request-To-Exit Motion Detector
1. Mounted above access controlled doors on egress side of door.
   a. Detection Systems DS-150i

I. Door Alarm Sounder
1. Provide door alarm sounders where indicated on Drawings.
   a. System Sensor PA400W Mini-Alert Sounder
   b. System Sensor MHW Mini Horn
   c. Or approved equal

2.2 DOOR HARDWARE PRODUCTS

A. Electrified locking hardware installed on labeled fire door assemblies shall be installed without altering the rating of the fire door assembly. If a door is cored in the field for a door-mounted electrified door lock, the work shall be performed, and the fire door assembly shall have a new rating label applied, by a Nationally Recognized Testing Laboratory (NRTL) certified Contractor.

B. Electric Strike

1. Provide electric strike, non-handed, and constructed of stainless steel. The electric strike shall have the ability to accept locksets with ¾" throw latch bolt. The solenoid shall be rated for continuous duty, 24VDC powered for silent operation. The unit shall meet all standards and shall be UL listed.
    a. Von Duprin 6200 Series
    b. Or approved equal

C. Magnetic Lock

1. Provide electromagnetic lock which meets ANSI/BHMA A156.23 for the minimum holding force of 1500 LBF.
    a. Locknetics MagForce+ Series
    b. Or approved equal

D. Electrified Exit Device

1. Provide electrified exit device, shall be non-handed and constructed of stainless steel; it shall require no more then 15 pounds of force to operate. Additional functionality requirements
2. Electrified exit devices shall internally provide request-to-exit function
3. Fire alarm and auxiliary lock functionality
    a. Von Duprin 99 series

E. Delayed Egress Exit Device

1. Provide code-compliant delayed egress where indicated on Drawings.
2. Available on all 98/99 Series, XP98/99 Series, and 33A/35A Series electrified exit devices
    a. Von Duprin CHEXIT Delayed Egress System

F. Electric Power Transfer

1. Electric power transfer provides a means of transferring electrical power from a door frame to the edge of a swinging door. The units are completely concealed when the door is in the closed position, and are ideally suited for installations involving abuse or heavy traffic.
2. Ten 24-gauge conductors
3. UL Listed for use on fire doors
4. Coordinate door and frame preparation with Division 08 door hardware contractor.
    a. Von Duprin EPT-10

G. Electrified Lockset

1. Provide electrified locksets with lever handles.
    a. Schlage ND Series Grade 1 Cylindrical Lock

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate with UCDH representatives the location, physical wall and rack space, power, and network connections required in designated Telecommunications Room (TR) for the installation of systems, products, devices, equipment, and enclosures in this Section.

B. All materials and labor required to produce a completely operational and fully functional system shall be supplied by the Contractor. It will be the responsibility of the Contractor to conform to the requirements of this Section for system operation, final connection, testing, turnover, and warranty compliance.

C. Card reader access controlled doors shall be “Fail Secure” unless required by code, authorities having jurisdiction, or as otherwise shown on Drawings to be “Fail Safe”.

D. Card reader access controlled doors are access controlled in the ingress direction. Card reader access controlled doors shall always allow free egress in the egress direction without special knowledge, effort, or the use of a key.

E. Coordinate with elevator vendor for elevator to integrate into the card access system. Validate travelers are sufficient for the installation to support the card access reader installation within the cab.

F. Coordinate with Division 08 door hardware contractor:
   1. Locking Door Hardware and Accessories
   2. Keying
   3. Electrified Exit Devices and Power Supplies
   4. Door Closers

G. Coordinate communications infrastructure with UCDH:
   1. Telecommunications Room (TR) Equipment
   2. Ethernet Connections
   3. IP Addresses
   4. Network Cabling

H. Consideration for the following items shall be included in a typical installation:
   1. ADA Accessibility Requirements
   2. Elevator Interface / Cabling to Elevator Equipment Room
   3. Fire Relay Interface
   4. Overrides / Keypads
   5. Card Readers / Reader Stanchions
   6. Magnetic Lock Installation
   7. Lever Set / Door Coring
   8. Exit Device / Power Transfer / Remote Power Supply
   9. Independent Pharmacy Systems

3.2 PREPARATION

A. Review approved Facility Access Control Plan, product data, and shop drawings submittals.

B. Thoroughly examine installation conditions to verify conformance with manufacturer and technical specification tolerances.

C. Complete design and verify equipment location placement.

D. Validate quantity of reader modules, lock power supplies, and batteries to support readers prior to arrival on site.

3.3 INSTALLATION

A. Install the system in accordance with the requirements of this Section, the approved Facility Access Control Plan, product data, and shop drawings submittals.

B. Install a fully functional and completely operational access control system as required and approved by UCDH for the project.

C. Low-voltage power supplies for access control panels and electrified locking door hardware will be installed with a plug pigtail, and connected to a Power Distribution Unit (PDU).

1. Ensure security low-voltage power supply is connected to a PDU receptacle (5-15) which is connected to a UPS.
2. Low-voltage power supplies shall not be hardwired to 120VAC.
3. Confirm with UCDH that a designated PDU is available for the access control panels, all expansions, and locking hardware power supplies.
4. Provide AC power quick disconnect on all AC powered low-voltage power supplies.

D. Connect automatic door operators at card reader access-controlled entrance doors.

E. Confirm 120 VAC power for door hardware power supplies where required for electrified exit devices.

1. Local power supply for door hardware shall be 120VAC, 60 Hz supplied from the emergency back-up source. Local power supply shall support battery backup.
2. Local power supply not required for low-amperage electrified exit devices, such as Von Duprin Quiet Latch Retraction (QEL).

F. Access control panel enclosure and low-voltage power supply enclosure doors must have a minimum of 180-degree swing and maintain clearances to avoid blocking personnel movement within the room. Each Access Controller enclosure door shall be equipped with a cylinder lock, a tamper switch, and a piano-type hinge with welded tamperproof pins.

G. Card readers shall be installed no more than 12” from strike side of associated door, unless otherwise shown on Drawings.

H. Card reader installation surfaces shall be validated for proper operational considerations. Provide card reader standoff spacer when mounting directly onto a metal surface.

I. For card reader installation: Cut off tinned end of card reader wiring pigtails before twisting and connecting with crimp (B) connectors. Tinned end of pigtail only remains if soldering connections.

J. Make provisions for field wiring to enter the access control panel enclosures and low-voltage power supply enclosures via standard knockouts at the top and sides. Provide sufficiently-sized conduits to allow for future expansion. Provide bushings on all conduit knock-outs and exposed conduit ends.

3.4 LABELING

A. All system products, devices, equipment, power supplies, cabling, conduits, and cables shall be labeled with their unique device name and number.

B. Labeling shall match the text and nomenclature in the programming sheets, system programming, and on the as-built drawings.

C. Labels shall be machine printed on adhesive labels, minimum 1’x1.5” with minimum 12pt. font. Handwritten labels are not acceptable.

D. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be black characters on a white background.

3.5 EXAMINATION / ACCEPTANCE

A. Contractor shall conduct and document System Functional Testing and Onsite Acceptance Testing. System Functional Testing shall be performed by Contractor to ensure that the system is fully functional and completely operational in accordance with the requirements of this Section. Onsite Acceptance Testing shall be performed with UCDH representatives to demonstrate the operation of the completed system.

1. Onsite Acceptance Testing shall only be performed after the System Functional Testing is approved and accepted.
2. Contractor shall provide all personnel and equipment necessary to perform the System Functional Testing and the Onsite Acceptance Testing.
3. Punch list items from the System Functional Testing and Onsite Acceptance Testing shall be satisfactorily resolved by the Contractor prior to UCDH issuing a written notice of acceptance.

B. System Functional Testing:

1. At least ten working days (two weeks) prior to the scheduled Onsite Acceptance Testing date, Contractor shall provide printed System Functional Testing documentation indicating each device has been successfully tested and is in conformance with the operational intent outlined in the Contract Documents.
2. Printed System Functional Testing documentation should clearly indicate any remaining outstanding items, issues, and punch list items.
3. Failure to provide printed System Functional Testing documentation will prevent Onsite Acceptance Testing from being conducted.

C. Onsite Acceptance Testing:

1. After approval and acceptance of the printed System Functional Testing documentation, Contractor shall perform Onsite Acceptance Testing in collaboration with the UCDH representative.
2. Upon completion and resolution of all remaining outstanding punch list items, Contractor shall perform follow-up Onsite Acceptance Testing in collaboration with the UCDH representative.

3. Upon successful completion of the follow-up Onsite Acceptance Testing, resolution of all punch list items, delivery and acceptance of the final printed System Functional Testing documentation, and delivery and acceptance of the O&M manuals and as-built drawings, UCDH shall issue a written notice of acceptance, the project shall be considered substantially complete, and the warranty period shall begin.

END OF SECTION

SECTION 28 20 00
VIDEO SURVEILLANCE

PART 1 - GENERAL

1.1 SUMMARY

A. Create an IP-based, video security surveillance system, providing proper visual coverage and recording as defined by the customer.

B. The Owner is defined herein as “UCDH” which represents University of California Davis Health and specifically includes IT Facilities, IT Facilities Infrastructure, IT Facilities Engineering, Network Operations, Auxiliary Services, and other relevant UCDH departments and representatives.

C. All work in OSHPD-1 Hospital and associated facilities shall be executed in accordance with the requirements of UCDH Infection Control Risk Assessment (ICRA) and Pre-Construction Risk Assessment (PCRA) requirements, standards, forms, policies, and procedures.

1.2 SYSTEM DESCRIPTION

A. The work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of a video surveillance system, including but not limited to:

1. Installation of Owner-Furnished, Contractor-Installed (OFCI) new video surveillance cameras in specified locations.
2. Power as needed (rarely) for camera support in varying installation formats such as Pan Tilt Zoom (PTZ).
3. Provide devices specified in this Section and related Sections if required by project, and not supplied by UCDH.

B. Install Owner-Furnished, Contractor-Installed (OFCI) new mini-dome video surveillance camera with infrared inside Telecommunications Rooms (TR) on new projects.

1.3 SEISMIC DESIGN REQUIREMENTS

A. Identify each item requiring seismic restraint installation in accordance with CBC Chapter 16A. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

B. Supports for such items, including racks and rack cabinets, conduit, cable trays and similar, shall be provided support, bracing, and anchorage designed by the Contractor in accordance with the following criteria:

1. Design to resist seismic forces in accordance with CBC Chapter 16A.
2. Minimum Design Parameters - As defined for the Building, with respect to Occupancy Category, Site Classification, Seismic Design Category, Importance Factor, and Spectral Response Acceleration.

1.4 RELATED SECTIONS

A. Division 27 Communications Sections

B. 27 05 41 FIRE-STOPPING SYSTEMS

C. 27 52 23 NURSE CALL CODE BLUE SYSTEMS

D. 28 10 00 ACCESS CONTROL

E. 28 31 00 INTRUSION DETECTION

F. 28 49 00 ELECTRONIC PERSONAL PROTECTION SYSTEMS

1.5 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Building Industry Consulting Services International (BICSI)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Manufacturers Association (NEMA)

F. National Fire Protection Association (NFPA)

G. Telecommunications Industry Association (TIA)

H. Underwriters Laboratories, Inc. (UL)

I. California Building Standards Code (California Code Of Regulations, Title 24), 2019

J. Public Safety (California Code of Regulations, Title 19), 2021

K. Office of the California State Fire Marshal (CSFM) Building Materials Listing (BML) Program

L. NFPA 70 National Electrical Code (NEC), 2020

M. NFPA 70 National Electrical Code (NEC), Chapter 8 Communications Systems, Article 800 Communications Circuits, 2020

N. NFPA 99 Health Care Facilities Code, 2021

O. ANSI/TIA-568.0 Generic Telecommunications Cabling for Customer Premises, Rev. E, 2020

P. ANSI/TIA-568.1 Commercial Building Telecommunications Infrastructure Standard, Rev. E, 2020

Q. ANSI/TIA-568.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Rev. D, 2018

R. ANSI/TIA-568.3 Optical Fiber Cabling and Components Standard, Rev. D, 2016

S. ANSI/TIA-568.4 Broadband Coaxial Cabling and Components Standard, Rev. D, 2017

T. ANSI/TIA-569 Telecommunications Pathways and Spaces, Rev. E, 2019

U. ANSI/UL 2900-1 Standard for Software Cybersecurity for Network-Connectable Products, General Requirements, 2020

V. ANSI/UL 2900-2-1 Software Cybersecurity for Network-Connectable Products, Particular Requirements for Network Connectable Components of Healthcare and Wellness Systems, 2020

W. ANSI/UL 2900-2-3 Standard for Software Cybersecurity for Network-Connectable Products, Particular Requirements for Security and Life Safety Signaling Systems, 2020

X. ANSI/NECA 303-2019 Standard for Installing and Maintaining Closed-Circuit Television Systems

1.6 SUBMITTALS

A. Procurement and installation shall not begin until product data and shop drawings submittals have been approved by UCDH.

B. Submit product data submittals to UCDH for review and approval.

1. Submit product data submittals system, product, device, and equipment product data cutsheets.
2. Manufacturer's published cutsheets shall be marked with boxes, arrows, highlighting, lines, and notes as needed to clearly indicate the exact product make, model, and options to be provided.
3. Mark cutsheets to indicate the associated Section.
4. Provide documentation of Contractor's factory-trained and authorized service representatives.
5. Compile system, product, device, and equipment product data cutsheets, including templates, graphics, tables, diagrams, and installation instructions, in Abode Acrobat or Bluebeam Revu complete with a Table of Contents linked to the bookmarks within the submittal and submit an electronic copy in .pdf format.

C. Submit shop drawings submittals to UCDH for review and approval.

1. Submit shop drawings submittals including device and equipment locations.
2. Prepare floor plans including room names, room numbers, and door numbers indicating all device locations labeled with unique device name and number.
3. Include point-to-point drawings of systems, wiring diagrams of individual devices, equipment elevations, and installation details.
4. Indicate wall space and rack space requirements.
5. Indicate IP addresses, Ethernet switch ports, and fiber connectivity requirements.
6. Provide video surveillance camera schedule including camera unique device name and number, type of camera, lens, location, room number, cable, TR, cabling distances, mounting, and all accessories. Indicate intended video surveillance camera field of view. Indicate dedicated camera power supplies, where provided.
7. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.

8. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.

9. Compile shop drawings in AutoCAD and submit an electronic copy in .pdf format.

D. Submit Operation and Maintenance Manual (O&M) submittals to UCDH for review and approval.

1. Prepare O&M manual in 8-½" × 11" letter size sheet format, labeled, grouped, and ordered, with bookmarks as indicated in a Table of Contents.

2. Include manufacturer's system and product data sheets, operation and maintenance information, troubleshooting and servicing instructions, routine maintenance instructions, and copies of all programming sheets.

3. Provide a copy of the final approved acceptance testing reports and documentation.

4. Reflect final UCDH occupancy room numbers in the O&M manuals, programming sheets, and system programming.

5. Compile system, product, device, and equipment documentation (including graphics, tables, and diagrams) complete with a Table of Contents linked to the bookmarks within the manual and submit an electronic copy in Abode Acrobat or Bluebeam Revu .pdf format.

E. Submit as-built drawings submittals to UCDH for review and approval.

1. As work progresses, maintain field redlines of actual installation conditions, including device, equipment, and cabling locations.

2. At project close-out, transfer these redlines to as-built drawings in AutoCAD format.

3. Reflect final UCDH occupancy room numbers on as-built drawings, programming sheets, and system programming.

4. Include floor plans clearly indicating all device locations labeled with unique device name and number.

5. Include final updated video surveillance camera schedule including camera unique device name and number, type of camera, lens, location, room number, cable, TR, cabling distances, mounting, and all accessories. Include video surveillance camera field of view. Indicate dedicated camera power supplies, where provided.

6. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.

7. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.

8. Compile as-built drawings in AutoCAD and submit an electronic copy in AutoCAD .dwg and in Abode Acrobat or Bluebeam Revu .pdf format.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Equipment and accessories furnished under this Section shall be the standard products of manufacturers regularly engaging in the manufacture of this type of product for a period of at least three years.

C. The manufacturer shall guarantee the availability of parts for a minimum of three years from date of shipment.

D. The system shall be installed by a factory-trained and certified technician.

1.8 WARRANTY

A. Warranty workmanship and all material for a period of one year from the date of the installation and acceptance by UCDH.

PART 2 - PRODUCTS

2.1 VIDEO SURVEILLANCE PRODUCTS

A. Video Surveillance Cameras
   1. Owner-Furnished, Contractor-Installed (OFCI)
   2. High Definition PoE Cameras
   3. Shall be compatible with the current UCDH video surveillance system and specified per location by UCDH. Current standard are Axis cameras or similar.
   4. Indoor fixed cameras shall be surface-mount or flush ceiling mount.
   5. Outdoor fixed cameras shall be housed in a vandal-resistant housing.
   6. Cameras shall have remote focus and remote zoom capability.
   7. Contractor shall inquire/determine if supporting network switch is POE-capable.
      a. If supporting network switch is not POE-capable, contractor shall provide and install 1 (one), POE-injector per camera, or multiple-camera injector, as needed.

B. Camera Power Supplies
   1. Camera power supplies, where required (PTZ cameras), shall be Contractor-Furnished, Contractor-Installed (CFCI).
   2. Provide/install as needed.
   3. Contractor shall size wire gauge and power supply units in order to ensure sufficient power to each camera. (PTZ cameras).

C. Camera Enclosures and Mounting Accessories
   1. Contractor-Furnished, Contractor-Installed (CFCI)
   2. Owner shall provide a complete list of cameras to be provided.
   3. Contractor shall provide mounts, brackets, flush-mount kits, pendants, adapters, etc. as needed to suit the installation conditions, to produce the intended view.

D. Network Video Recorder (NVR)
   1. Owner-Furnished, Contractor-Installed (OFCI)
   2. NVR shall be specified by UCDH. Current standard is Razberi.

E. Video Management System
   1. Cameras shall be compatible with the existing UCDH Video Management System, Qognify Ocularis (formerly OnSSI).

F. Miscellaneous
   1. Media converters, Ethernet extenders, Camera Power Supplies, Pan-Tilt-Zoom (PTZ) camera equipment, and other equipment not specified, but required for the project to meet special and/or unusual applications, shall be submitted in writing to UCDH for approval.

G. Network Cable

1. Refer to the requirements of Division 27 Communications Sections.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate with UCDH representatives the location, physical wall and rack space, power, and network connections required in designated Telecommunications Room (TR) for the installation of systems, products, devices, equipment, and enclosures in this Section.

B. All materials and labor required to produce a completely operational and fully functional system shall be supplied by the Contractor. It will be the responsibility of the Contractor to conform to the requirements of this Section for system operation, final connection, testing, turnover, and warranty compliance.

C. Network cable and patch cables for cameras shall be provided in accordance with the requirements of Division 27 Communications Sections.

D. Exterior cameras shall be IP66 rated for outdoor installation.

3.2 PREPARATION

A. Contractor shall proactively initiate the planning, communication, and preparation for site visits and installation, including distribution of, and schedule for installation work, with project and UCDH representatives.

B. Contractor shall request IP addresses in advance of the need.

C. Thoroughly examine installation conditions to verify conformance with manufacturer and technical specification tolerances.

D. Validate intended site views prior to camera installation. Contractor and UCDH representative to walk jobsite and view every camera location.

E. Validate cable parameters and operational status to server(s).

F. Validate network equipment and capacity, licensing, and firmware with UCDH.

G. Coordinate Power over Ethernet (PoE) network switch requirements with UCDH.

3.3 INSTALLATION

A. Contractor to test network cable before installing camera.

B. Contractor shall install and configure initial camera field of view and focus for confirmation by UCDH representative. Refocus and fine tune camera field of view and focus with UCDH representative present for approval.

C. Contractor shall program initial camera settings such as resolution and frame rate for live and recorded video for confirmation by UCDH representative. Configure video data storage per UCDH requirements (Camera, Server, Enterprise).

D. Configure camera bandwidth utilization and codec compression as required by UCDH standards.

E. Program camera with IP address provided by UCDH.

F. Label MAC address on camera base during installation.

3.4 LABELING

A. All system products, devices, equipment, power supplies, cabling, conduits, patch panels, and patch cables shall be labeled with their unique device name and number.

B. Labeling shall match the text and nomenclature in the programming sheets, system programming, and on the as-built drawings.

C. Labels shall be machine printed on adhesive labels, minimum 1”x1.5” with minimum 12pt. font. Handwritten labels are not acceptable.

D. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be black characters on a white background.

3.5 EXAMINATION / ACCEPTANCE

A. Contractor shall conduct and document System Functional Testing and Onsite Acceptance Testing. System Functional Testing shall be performed by Contractor to ensure that the system is fully functional and completely operational in accordance with the requirements of this Section. Onsite Acceptance Testing shall be performed with UCDH representatives to demonstrate the operation of the completed system.

1. Onsite Acceptance Testing shall only be performed after the System Functional Testing is approved and accepted.
2. Contractor shall provide all personnel and equipment necessary to perform the System Functional Testing and the Onsite Acceptance Testing.
3. Punch list items from the System Functional Testing and Onsite Acceptance Testing shall be satisfactorily resolved by the Contractor prior to UCDH issuing a written notice of acceptance.

B. System Functional Testing:

1. At least ten working days (two weeks) prior to the scheduled Onsite Acceptance Testing date, Contractor shall provide printed System Functional Testing documentation indicating each device has been successfully tested and is in conformance with the operational intent outlined in the Contract Documents.
2. Printed System Functional Testing documentation should clearly indicate any remaining outstanding items, issues, and punch list items.
3. Failure to provide printed System Functional Testing documentation will prevent Onsite Acceptance Testing from being conducted.

C. Onsite Acceptance Testing:

1. After approval and acceptance of the printed System Functional Testing documentation, Contractor shall perform Onsite Acceptance Testing in collaboration with the UCDH representative.

2. Upon completion and resolution of all remaining outstanding punch list items, Contractor shall perform follow-up Onsite Acceptance Testing in collaboration with the UCDH representative.

3. Upon successful completion of the follow-up Onsite Acceptance Testing, resolution of all punch list items, delivery and acceptance of the final printed System Functional Testing documentation, and delivery and acceptance of the O&M manuals and as-built drawings, UCDH shall issue a written notice of acceptance, the project shall be considered substantially complete, and the warranty period shall begin.

END OF SECTION

SECTION 28 31 00
INTRUSION DETECTION

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of the complete installation and integration of a building Intrusion Detection System.

B. The Owner is defined herein as “UCDH” which represents University of California Davis Health and specifically includes IT Facilities, IT Facilities Infrastructure, IT Facilities Engineering, Network Operations, Auxiliary Services, and other relevant UCDH departments and representatives.

C. All work in OSHPD-1 Hospital and associated facilities shall be executed in accordance with the requirements of UCDH Infection Control Risk Assessment (ICRA) and Pre-Construction Risk Assessment (PCRA) requirements, standards, forms, policies, and procedures.

1.2 SYSTEM DESCRIPTION

A. The Integrated Digital Alarm Communicator System (DACS) includes but is not limited to:

1. Alarm Control Panels
2. Alarm Keypads
3. Panic and holdup sensors
4. Motion and Glass break Detection
5. Door sensors
6. Remote annunciators and bells
7. Other devices required for integration with Access Control System
8. Engineering, provision, coordination, installation, termination, testing and documentation of alarm panel and functions, as required.

B. The system shall support the integration of the building access system and reporting of intrusion/access monitoring devices to a remote Digital Alarm Communicator Receiver (DACR).

C. The system shall be modular in nature and will permit expansion in both capacity and functionality through the addition of controllers or sensors.

1.3 SEISMIC DESIGN REQUIREMENTS

A. Identify each item requiring seismic restraint installation in accordance with CBC Chapter 16A. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

B. Supports for such items, including racks and rack cabinets, conduit, cable trays and similar, shall be provided support, bracing, and anchorage designed by the Contractor in accordance with the following criteria:

1. Design to resist seismic forces in accordance with CBC Chapter 16A.
2. Minimum Design Parameters - As defined for the Building, with respect to Occupancy Category, Site Classification, Seismic Design Category, Importance Factor, and Spectral Response Acceleration.

1.4 RELATED SECTIONS

A. Division 27 Communications Sections

B. 27 05 41 FIRE-STOPPING SYSTEMS

C. 27 52 23 NURSE CALL CODE BLUE SYSTEMS

D. 28 10 00 ACCESS CONTROL

E. 28 20 00 VIDEO SURVEILLANCE

F. 28 49 00 ELECTRONIC PERSONAL PROTECTION SYSTEMS

1.5 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Building Industry Consulting Services International (BICSI)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Manufacturers Association (NEMA)

F. National Fire Protection Association (NFPA)

G. Telecommunications Industry Association (TIA)

H. Underwriters Laboratories, Inc. (UL)

I. California Building Standards Code (California Code Of Regulations, Title 24), 2019

J. Public Safety (California Code of Regulations, Title 19), 2021

K. Office of the California State Fire Marshal (CSFM) Building Materials Listing (BML) Program

L. NFPA 70 National Electrical Code (NEC), 2020

M. NFPA 70 National Electrical Code (NEC), Chapter 8 Communications Systems, Article 800 Communications Circuits, 2020

N. NFPA 99 Health Care Facilities Code, 2021

O. ANSI/TIA-568.0 Generic Telecommunications Cabling for Customer Premises, Rev. E, 2020

P. ANSI/TIA-568.1 Commercial Building Telecommunications Infrastructure Standard, Rev. E, 2020

Q. ANSI/TIA-568.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Rev. D, 2018

R. ANSI/TIA-568.3 Optical Fiber Cabling and Components Standard, Rev. D, 2016

S. ANSI/TIA-568.4 Broadband Coaxial Cabling and Components Standard, Rev. D, 2017

T. ANSI/TIA-569 Telecommunications Pathways and Spaces, Rev. E, 2019

U. ANSI/UL 2900-1 Standard for Software Cybersecurity for Network-Connectable Products, General Requirements, 2020

V. ANSI/UL 2900-2-1 Software Cybersecurity for Network-Connectable Products, Particular Requirements for Network Connectable Components of Healthcare and Wellness Systems, 2020

W. ANSI/UL 2900-2-3 Standard for Software Cybersecurity for Network-Connectable Products, Particular Requirements for Security and Life Safety Signaling Systems, 2020

X. ANSI/TIA-968 Telecommunications Telephone Terminal Equipment Technical Requirements for Connection of Terminal Equipment to the Telephone Network, 2016

1.6 SUBMITTALS

A. Procurement and installation shall not begin until product data and shop drawings submittals have been approved by UCDH.

B. Submit product data submittals to UCDH for review and approval.

1. Submit product data submittals system, product, device, and equipment product data cutsheets.
2. Manufacturer's published cutsheets shall be marked with boxes, arrows, highlighting, lines, and notes as needed to clearly indicate the exact product make, model, and options to be provided.
3. Mark cutsheets to indicate the associated Section.
4. Provide documentation of Contractor's factory-trained and authorized service representatives.
5. Compile system, product, device, and equipment product data cutsheets, including templates, graphics, tables, diagrams, and installation instructions, in Abode Acrobat or Bluebeam Revu complete with a Table of Contents linked to the bookmarks within the submittal and submit an electronic copy in .pdf format.

C. Submit shop drawings submittals to UCDH for review and approval.

1. Submit shop drawings submittals including device and equipment locations.
2. Prepare floor plans including room names, room numbers, and door numbers indicating all device locations labeled with unique device name and number.
3. Include point-to-point drawings of systems, wiring diagrams of individual devices, equipment elevations, and installation details.
4. Indicate wall space and rack space requirements.
5. Indicate IP addresses, Ethernet switch ports, and fiber connectivity requirements.
6. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.

7. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.
8. Compile shop drawings in AutoCAD and submit an electronic copy in .pdf format.

D. Submit Operation and Maintenance Manual (O&M) submittals to UCDH for review and approval.
1. Prepare O&M manual in 8-½" × 11" letter size sheet format, labeled, grouped, and ordered, with bookmarks as indicated in a Table of Contents.
2. Include manufacturer's system and product data sheets, operation and maintenance information, troubleshooting and servicing instructions, routine maintenance instructions, and copies of all programming sheets.
3. Provide a copy of the final approved acceptance testing reports and documentation.
4. Reflect final UCDH occupancy room numbers in the O&M manuals, programming sheets, and system programming.
5. Compile system, product, device, and equipment documentation (including graphics, tables, and diagrams) complete with a Table of Contents linked to the bookmarks within the manual and submit an electronic copy in Abode Acrobat or Bluebeam Revu .pdf format.

E. Submit as-built drawings submittals to UCDH for review and approval.
1. As work progresses, maintain field redlines of actual installation conditions, including device, equipment, and cabling locations.
2. At project close-out, transfer these redlines to as-built drawings in AutoCAD format.
3. Reflect final UCDH occupancy room numbers on as-built drawings, programming sheets, and system programming.
4. Include floor plans clearly indicating all device locations labeled with unique device name and number.
5. Indicate and label access controlled zones and electronic personal protection system secure zones, where applicable.
6. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station, where applicable.
7. Compile as-built drawings in AutoCAD and submit an electronic copy in AutoCAD .dwg and in Abode Acrobat or Bluebeam Revu .pdf format.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new and unused, and of current manufacturer.

B. Installation shall be accomplished in a professional manner by qualified personnel.

C. The manufacturer shall be able to demonstrate the features, functions, and operating characteristics to UCDH.

1.8 WARRANTY

A. Contractor shall provide labor and hardware repairs and replacement for a period of one year following the acceptance of the installation.

PART 2 - PRODUCTS

2.1 INTRUSION DETECTION PRODUCTS

A. Control Panel

1. Bosch Security Systems. Model B9512G, B930 Keypad, and enclosure with door tamper switch.

B. Keypad / Annunciator

1. Bosch model B930 keypad

C. Glass Break detectors

1. Honeywell FG-730 with sensitivity adjustment

D. Motion Detectors

1. Bosch motion detector ISC-BPQ2-W12

E. Panic/Robbery Switch

1. Potter HUB- M Single Button Hold up switch.

F. Door Contacts

1. Magnetic door contact, flush – GE/Sentrol 1078 N-C 7/8”
2. Magnetic door contact, flush – GE/Sentrol 1078 N-C 1”

G. Expansion Modules

1. Bosch B208 Octo-Input Module

H. Request to Exit (REX)

1. Bosch DS150i

I. Panel Power Supply

1. Bosch D1640

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate with UCDH representatives the location, physical wall and rack space, power, and network connections required in designated Telecommunications Room (TR) for the installation of systems, products, devices, equipment, and enclosures in this Section.

B. All materials and labor required to produce a completely operational and fully functional system shall be supplied by the Contractor. It will be the responsibility of the Contractor to conform to the requirements of this Section for system operation, final connection, testing, turnover, and warranty compliance.

C. Intrusion detection system enclosure doors must have a minimum of 180-degree swing and maintain clearances to avoid blocking personnel movement within the room.

3.2 PREPARATION

A. Develop security system plan and complete approval process with UCDH.

3.3 INSTALLATION

A. Low-voltage power supplies for intrusion detection system equipment will be installed with a plug and connected to a Power Distribution Unit (PDU).

1. Ensure security low-voltage power supply is connected to a PDU receptacle (5-15) which is connected to a UPS.
2. Low-voltage power supplies shall not be hardwired to 120VAC.
3. Confirm with UCDH that a designated PDU is available for the intrusion detection system panels and all expansions.
4. Provide AC power quick disconnect on all AC powered low-voltage power supplies.

B. Installation shall be accomplished in a professional manner by qualified personnel.

C. Install a fully functional access control system as required and approved by UCDH for the project.

3.4 LABELING

A. All system products, devices, equipment, power supplies, cabling, conduits, patch panels, and patch cables shall be labeled with their unique device name and number.

B. Labeling shall match the text and nomenclature in the programming sheets, system programming, and on the as-built drawings.

C. Labels shall be machine printed on adhesive labels, minimum 1”x1.5” with minimum 12pt. font. Handwritten labels are not acceptable.

D. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be black characters on a white background.

3.5 EXAMINATION / ACCEPTANCE

A. Contractor shall conduct and document System Functional Testing and Onsite Acceptance Testing. System Functional Testing shall be performed by Contractor to ensure that the system is fully functional and completely operational in accordance with the requirements of this Section. Onsite Acceptance Testing shall be performed with UCDH representatives to demonstrate the operation of the completed system.

1. Onsite Acceptance Testing shall only be performed after the System Functional Testing is approved and accepted.
2. Contractor shall provide all personnel and equipment necessary to perform the System Functional Testing and the Onsite Acceptance Testing.
3. Punch list items from the System Functional Testing and Onsite Acceptance Testing shall be satisfactorily resolved by the Contractor prior to UCDH issuing a written notice of acceptance.

B. System Functional Testing:

1. At least ten working days (two weeks) prior to the scheduled Onsite Acceptance Testing date, Contractor shall provide printed System Functional Testing documentation indicating each device has been successfully tested and is in conformance with the operational intent outlined in the Contract Documents.
2. Printed System Functional Testing documentation should clearly indicate any remaining outstanding items, issues, and punch list items.
3. Failure to provide printed System Functional Testing documentation will prevent Onsite Acceptance Testing from being conducted.

C. Onsite Acceptance Testing:

1. After approval and acceptance of the printed System Functional Testing documentation, Contractor shall perform Onsite Acceptance Testing in collaboration with the UCDH representative.
2. Upon completion and resolution of all remaining outstanding punch list items, Contractor shall perform follow-up Onsite Acceptance Testing in collaboration with the UCDH representative.
3. Upon successful completion of the follow-up Onsite Acceptance Testing, resolution of all punch list items, delivery and acceptance of the final printed System Functional Testing documentation, and delivery and acceptance of the O&M manuals and as-built drawings, UCDH shall issue a written notice of acceptance, the project shall be considered substantially complete, and the warranty period shall begin.

END OF SECTION

SECTION 28 49 00
ELECTRONIC PERSONAL PROTECTION SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. The work covered under this Section consists of the furnishing of all necessary labor, supervision, materials, equipment, and services to completely execute the provision of a Healthcare Patient Security (HPS) system.

B. The Owner is defined herein as “UCDH” which represents University of California Davis Health and specifically includes IT Facilities, IT Facilities Infrastructure, IT Facilities Engineering, Network Operations, Auxiliary Services, and other relevant UCDH departments and representatives.

C. All work in OSHPD-1 Hospital and associated facilities shall be executed in accordance with the requirements of UCDH Infection Control Risk Assessment (ICRA) and Pre-Construction Risk Assessment (PCRA) requirements, standards, forms, policies, and procedures.

1.2 SYSTEM DESCRIPTION

A. The HPS shall be designed to monitor tagged patients and alarm on unauthorized movement of infants, pediatric, or adult patients from protected areas. The system shall report violations of restricted passage to and from areas being monitored in order to generate an appropriate staff response.

B. When patients are admitted to a protected area, a monitoring tag shall be physically attached to the patient. Then, the monitoring tag shall be configured in software, with parameters specific to that patient and area. The monitoring tag shall be continuously monitored by the system software, to validate the appropriate location of the patient. When a tag is attached to a patient and admitted, an auto-admit signal shall be sent to the Server through a system Receiver. A tag description shall be entered at any dedicated workstation to identify the patient, along with the pre-determined zone ID, representing the physical area where the patient is to be monitored. While active, the tag shall transmit a “heartbeat” every 10 seconds, monitored by the Controller system software. If the heartbeat is not detected within a specified amount of time the system shall alarm. If the tag or band is tampered with, the tag shall alarm.

C. Perimeter areas shall be established that monitor patient traffic and differentiate monitored patients versus allowed foot traffic. UCDH representatives shall determine how the system reacts and alarms to unauthorized patient travel

D. The HPS system shall establish a "Safe Zone" within each protected Nursing Suite, within a particular building. A “Safe Zone” establishes a perimeter, through which a monitored patient is not allowed, without proper authorized Staff escort. Refer to the Drawings and Bid Instructions to determine the scope limitations for this work.

E. HPS Server: The HPS (virtual) Server shall be located in the designated Data Center, per the Drawings and Bid Instructions. System management e.g. User definition, patient identification, workstation configuration, and system configuration, device installation and alarm monitoring history shall be stored in the system database at this location. The HPS Server interfaces with system hardware on each monitored Nursing suite, via network interfaces, installed at each suite..

F. Patient Security Monitoring Locations (Workstations): Additional patient security monitoring workstations are provided for monitoring tags and system alarms in real time. Workstations shall be installed at Nurse Stations and other specified locations. (See Drawings and Bid Instructions.)

G. Patient Tag Registration: Patient tag registration shall occur at the Reception desk and all Nursing Stations, within the “Safe Zone” within each protected Nursing Suite. Login/Password authentication is required prior to tag configuration.

H. Tag alarm management shall be the responsibility of Nursing Staff, within each monitored Nursing Suite.

1.3 SEISMIC DESIGN REQUIREMENTS

A. Identify each item requiring seismic restraint installation in accordance with CBC Chapter 16A. Include floor mounted items weighing more than 400 pounds and wall mounted or suspended items weighing more than 20 pounds.

B. Supports for such items, including racks and rack cabinets, conduit, cable trays and similar, shall be provided support, bracing, and anchorage designed by the Contractor in accordance with the following criteria:

1. Design to resist seismic forces in accordance with CBC Chapter 16A.
2. Minimum Design Parameters - As defined for the Building, with respect to Occupancy Category, Site Classification, Seismic Design Category, Importance Factor, and Spectral Response Acceleration.

1.4 RELATED SECTIONS

A. Division 27 Communications Sections

B. 27 05 41 FIRE-STOPPING SYSTEMS

C. 27 52 23 NURSE CALL CODE BLUE SYSTEMS

D. 28 10 00 ACCESS CONTROL

E. 28 20 00 VIDEO SURVEILLANCE

F. 28 31 00 INTRUSION DETECTION

1.5 REFERENCES

A. American National Standards Institute (ANSI)

B. American Society for Testing and Materials (ASTM)

C. Building Industry Consulting Services International (BICSI)

D. Institute of Electrical and Electronic Engineers (IEEE)

E. National Electrical Manufacturers Association (NEMA)

F. National Fire Protection Association (NFPA)

G. Telecommunications Industry Association (TIA)

H. Underwriters Laboratories, Inc. (UL)

I. California Building Standards Code (California Code Of Regulations, Title 24), 2019

J. Public Safety (California Code of Regulations, Title 19), 2021

K. Office of the California State Fire Marshal (CSFM) Building Materials Listing (BML) Program

L. NFPA 70 National Electrical Code (NEC), 2020

M. NFPA 70 National Electrical Code (NEC), Chapter 8 Communications Systems, Article 800 Communications Circuits, 2020

N. NFPA 99 Health Care Facilities Code, 2021

O. ANSI/TIA-568.0 Generic Telecommunications Cabling for Customer Premises, Rev. E, 2020

P. ANSI/TIA-568.1 Commercial Building Telecommunications Infrastructure Standard, Rev. E, 2020

Q. ANSI/TIA-568.2 Balanced Twisted-Pair Telecommunications Cabling and Components Standard, Rev. D, 2018

R. ANSI/TIA-568.3 Optical Fiber Cabling and Components Standard, Rev. D, 2016

S. ANSI/TIA-568.4 Broadband Coaxial Cabling and Components Standard, Rev. D, 2017

T. ANSI/TIA-569 Telecommunications Pathways and Spaces, Rev. E, 2019

U. ANSI/UL 2900-1 Standard for Software Cybersecurity for Network-Connectable Products, General Requirements, 2020

V. ANSI/UL 2900-2-1 Software Cybersecurity for Network-Connectable Products, Particular Requirements for Network Connectable Components of Healthcare and Wellness Systems, 2020

W. ANSI/UL 2900-2-3 Standard for Software Cybersecurity for Network-Connectable Products, Particular Requirements for Security and Life Safety Signaling Systems, 2020

1.6 SUBMITTALS

A. Procurement and installation shall not begin until product data and shop drawings submittals have been approved by UCDH.

B. Submit product data submittals to UCDH for review and approval.

1. Submit product data submittals system, product, device, and equipment product data cutsheets.
2. Manufacturer's published cutsheets shall be marked with boxes, arrows, highlighting, lines, and notes as needed to clearly indicate the exact product make, model, and options to be provided.
3. Mark cutsheets to indicate the associated Section.

4. Provide documentation of Contractor's factory-trained and authorized service representatives.
5. Compile system, product, device, and equipment product data cutsheets, including templates, graphics, tables, diagrams, and installation instructions, in Abode Acrobat or Bluebeam Revu complete with a Table of Contents linked to the bookmarks within the submittal and submit an electronic copy in .pdf format.

C. Submit shop drawings submittals to UCDH for review and approval.
1. Submit shop drawings submittals including device and equipment locations.
2. Prepare floor plans including room names, room numbers, and door numbers indicating all device locations labeled with unique device name and number.
3. Include point-to-point drawings of systems, wiring diagrams of individual devices, equipment elevations, and installation details.
4. Indicate wall space and rack space requirements.
5. Indicate IP addresses, Ethernet switch ports, and fiber connectivity requirements.
6. Indicate and label access controlled zones and electronic personal protection system secure zones.
7. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station.
8. Include user defined information per floor and per system component.
9. Local Area Receivers (LAR) and Portal Exciters shall be accurately located on the shop drawings graphically indicating the diameter of the Local Area Receivers (LAR) coverage areas and the Portal Exciter coverage areas at the associated door.
10. Compile shop drawings in AutoCAD and submit an electronic copy in .pdf format.

D. Submit Operation and Maintenance Manual (O&M) submittals to UCDH for review and approval.
1. Prepare O&M manual in 8-½” × 11" letter size sheet format, labeled, grouped, and ordered, with bookmarks as indicated in a Table of Contents.
2. Include manufacturer’s system and product data sheets, operation and maintenance information, troubleshooting and servicing instructions, routine maintenance instructions, and copies of all programming sheets.
3. Provide a copy of the final approved acceptance testing reports and documentation.
4. Reflect final UCDH occupancy room numbers in the O&M manuals, programming sheets, and system programming.
5. Compile system, product, device, and equipment documentation (including graphics, tables, and diagrams) complete with a Table of Contents linked to the bookmarks within the manual and submit an electronic copy in Abode Acrobat or Bluebeam Revu .pdf format.

E. Submit as-built drawings submittals to UCDH for review and approval.
1. As work progresses, maintain field redlines of actual installation conditions, including device, equipment, and cabling locations.
2. At project close-out, transfer these redlines to as-built drawings in AutoCAD format.
3. Reflect final UCDH occupancy room numbers on as-built drawings, programming sheets, and system programming.
4. Include floor plans clearly indicating all device locations labeled with unique device name and number.

5. Indicate and label access controlled zones and electronic personal protection system secure zones.
6. Indicate which devices are to be controlled, and which areas and rooms are to be monitored, by a designated nursing station.
7. Local Area Receivers (LAR) and Portal Exciters shall be accurately located on the as-built drawings graphically indicating the diameter of the Local Area Receivers (LAR) coverage areas and the Portal Exciter coverage areas at the associated door.
8. Compile as-built drawings in AutoCAD and submit an electronic copy in AutoCAD .dwg and in Abode Acrobat or Bluebeam Revu .pdf format.

1.7 QUALITY ASSURANCE

A. All materials, equipment and parts comprising the units specified herein shall be new, unused, and of current manufacture.

1. Tags shall be provided with long-life batteries. Batteries shall be guaranteed to have a minimum one (1) year active life (tag performance shall show no signs of significant performance degradation for 1 year from the date of first-time enrollment). Tag battery expiration date shall be clearly and indelibly printed on the tag, where it may be readily viewed, without disturbing the patient or tag placement.
2. All PCs, Server (if provided), and other, system-related durable electronic appliances shall be warranted by the Contractor for a period of at least one year from date of acceptance.
3. All system-related, durable electronic equipment shall be warranted by the Contractor, for a period of at least one year from date of final acceptance. In the event of equipment failure, the Contractor shall provide replacement equipment, including parts, any required mounting hardware, and installation labor, for the period of one (1) year from the date of final acceptance. Further, Contractor shall either 1. Provide spare equipment to UCDH, for replacement use, or 2. Keep sufficient spare equipment on-hand, in new condition and specifically designate said equipment for use on UCDH site, in case of equipment failure. Spare parts and equipment costs may be included in Contractor's original bid package. Bid package must include type and quantity of each spare part and/or piece of equipment and be specified on individual line items.
4. The Contractor shall guarantee all wiring, terminations and connections, free from inherent mechanical and electrical defects for a period of one (1) year from the date of Final Acceptance by authorized UCDH personnel. Warranty service shall be provided within four hours' notice. If the problem cannot be corrected at that time a written plan of correction with a projected time schedule for completion shall be submitted to authorize UCDH personnel at that time.
5. Upon completion of system verification, Contractor shall submit a point-by-point checklist, indicating the date and time of each item inspected. Contractor shall furnish authorized UCDH personnel a System Certification of Inspection and Function, signifying that the system adheres to all contractually agreed requirements.
6. Prior to submitting a request for payment, based upon substantial completion, Contractor shall provide a written test report from an authorized representative of the equipment manufacturer, certifying that the system has been 100% tested and approved.
7. A UCDH representative shall be present during final testing of all system components and shall certify that the system meets or exceeds system technical specifications and the requirements of this Section. Any and all failures shall be corrected and retested at Contractor's expense, in the presence of UCDH personnel, to verify corrections.

8. Where needed, Contractor shall provide eight hours of use and operational training for the number of personnel specified by Auxiliary Services. Training can be spread over multiple days, if so agreed-upon in writing.

9. Provide 24 hour/7days per week of technical support from an employee of the HPS system manufacturer, or their designee, for initial programming and startup, and for a period of not less than 90 days after final system acceptance.

B. Installation shall be accomplished in a professional manner by qualified personnel regularly engaging in and experienced in this type of work for a period of at least 5 years.

1.8 WARRANTY

A. Contractor shall provide labor and hardware repairs and replacement for a period of one year following the acceptance of the installation.

PART 2 - PRODUCTS

2.1 DEVICES

A. General

1. Patient Security Receiver (PSR): Shall be system software and hardware-compliant, currently manufactured equipment, in new, unused condition.

2. Portal Exciters, Portal Exciter Slaves, and Portal Exciter Range Extenders: Shall be system software and hardware-compliant, currently manufactured equipment, in new, unused condition.

3. System: HPS system software configured by UCDH personnel, as required herein.

B. Software

1. Executive: Server and client software

2. Custom/User: Software and programming as required to include all alarm, map, and database functions described herein

C. Workstations

1. Provide workstation PC, as shown on the Drawings. The following describes the minimum guideline configuration for workstations: Contractor shall be responsible for ensuring the acceptable performance of the system based upon the HPS manufacturer's hardware requirements and the performance criteria specified herein for the patient security.

2. HPS workstations and monitoring devices shall report directly to the HPS Server.

3. HPS communication Network: for a supervised network shall provide communication between monitoring Patient Security Receiver (PSR), Portal Exciter units and the ILON appliance, from each monitored Nursing Suite.

4. Client Workstation: Workstations and video monitors shall meet computer workstation technical specifications in effect at the time of request.

D. HPS Devices

1. Provide Patient Security Receiver (PSR) and Portal Exciters, in sufficient quantities, to meet manufacturer's recommendations. Contractor shall ensure the provision of a complete system, and provide sufficient labor hours to test the system, after it is installed.

Further, Contractor shall remediate all malfunctions of equipment and/or cabling, discovered for a period of one year from acceptance date. Contractor shall provide trained, emergency response personnel, on a 24-hour, 7 days/week basis for the period of one year from acceptance. Personnel shall respond to emergency calls within 4 hours of initial contact.

E. Patient Security Receiver (PSR)

1. Provide open area reception. Quantity shall be as required to provide complete coverage on the designated floor. Each LAR includes,
2. Frequency: Per manufacturer's specs
3. Bandwidth: Per manufacturer's specs
4. Detection Radius: 50' (15 meters) overlapping PSRs, 35' (11 meters) PRs maximum, depending on site conditions
5. Communications: Dedicated network
6. Supervision: Fully supervised, with regular polling by HPS Server
7. Test Procedure: Self-diagnostic, polled by HPS Server
8. Power: 10 to 30 VDC, 100 mA maximum, powered from dedicated power supply
9. Operating Temperature: 32˚ to 122˚F (0˚ to 50˚C)
10. Humidity: 0 to 90% at 70˚F (21˚C), non-condensing
11. Weight: Approximately 9.2 oz. (260 g)
12. Dimensions: Approximately 5.2" wide x 3.3" long x 1.5" deep. (33 x 84 x 8 mm)
13. Mounting: Hardware to accommodate on-ceiling, surface mounting

F. Portal Exciter

1. Provide Portal Exciter for protection at each designated entry/exit location. Quantity shall be as required to provide sufficient coverage of all entry/exit locations. The Portal Exciter shall initiate an alarm when patient's tag is sensed passing through its respective RF field, unless the tag is designated to be on transport, prior to exit.
2. Coordinate with UCDH on the normal status of locks at each Portal Exciter location. Provide door position switch alarm contact at each Portal Exciter location (two for double doors), to monitor the open or closed position of the door.
3. Antenna
4. Dedicated Lonworks network interface
5. Frequency: Per manufacturer's specs
6. Bandwidth: Per manufacturer's specs
7. Operating Range: Approximately 30' radius
8. Detection Range: Adjustable up to 8.5 feet (2.6m)
9. Supervision: Fully supervised, with regular polling by HPS Server
10. Test Procedure: Self-diagnostic, polled by HPS Server
11. Power: 10 to 30 VDC, 200 mA @ 24 V DC, 500 mA maximum
12. Operating Temperature: 32˚ to 122˚F (0˚ to 50˚C)
13. Humidity: 0 to 90% at 70˚F (21˚C), non-condensing
14. Weight: Approximately 18.7 oz. (530 g)

15. Dimensions: Approximately 14.2” long x 4.9” wide x 2” deep. (360 x 124 x 50 mm)
16. Mounting: Hardware to accommodate wall or ceiling mounting

G. Portal Exciter Extender
1. Provide Portal Exciter range extender to extend the range of the Portal Exciter to cover a large opening, such as a hallway or double door.
2. Antenna
3. Dedicated LonWorks network interface
4. Frequency: Per manufacturer’s specs
5. Bandwidth: Per manufacturer’s specs
6. Operating Range: Approximately 15’ radius
7. Detection Range: Adjustable up to 8.5 feet (2.6m)
8. Supervision: Fully supervised, with regular polling by HPS Server
9. Test Procedure: Self-diagnostic, polled by HPS Server
10. Power: 10 to 30 VDC, 200 mA @ 24 V DC, 500 mA maximum
11. Operating Temperature: 32˚ to 122˚F (0˚ to 50˚C)
12. Humidity: 0 to 90% at 70˚F (21˚C), non-condensing
13. Weight: Approximately 18.7 oz. (530 g)
14. Dimensions: Approximately 14.2” long x 4.9” wide x 2” deep. (360 x 124 x 50 mm)
15. Mounting: Hardware to accommodate wall or ceiling mounting
16. Input/output Module: Provide Programmable I/0 Module to support integration with cameras, locking systems, and audible devices
17. Power Supply: Provide Altronix AL600ULM Power Supply compatible with the field equipment and in the quantity necessary to power system components.
    a. Provide one power supply for LARs and one power supply for Portal Exciters, per Monitored Nursing Unit.
18. The power supply shall provide 12/24VDC, for distribution to selected system components.
    a. 6 Amps with 5 individual regulated outputs.

H. Infant Protection Tags
1. Provide HUGS Infant Protection Tag with Baby Sense. Sensor shall be water resistant and shock proof.
2. Infant tags shall be used to monitor the passage through monitored portals and shall continually be monitored for presence and condition. The sensor shall be made of durable material and shall be in a form suitable for attachment to an infants' wrist or ankle.
3. Tags shall be provided with long-life lithium batteries. Batteries shall be guaranteed to have a minimum active life of 1-year.
4. Tags shall provide an alarm indication of low battery voltage.
5. Low battery tags shall be prohibited by system software, to be admitted.
6. Provide infant tags, compatible with the specified PSRs and required operation.
7. Provide Soft Touch Infant Bands suitable for fastening to a patient's wrist or ankle and compatible with HUGS tags.

8. The band shall be tamper resistant, and shall provide the system with a "continuity" check, to ensure its continued presence on the patient. The condition of the strap shall be continuously monitored by the system.

I. Miscellaneous parts

1. Provide a sample of each product used in the installation of system as a spare parts crash kit.

2. Provide a full product list of items that are available for installation with the system at the time of system acceptance.

PART 3 - EXECUTION

3.1 GENERAL

A. Coordinate with UCDH representatives the location, physical wall and rack space, power, and network connections required in designated Telecommunications Room (TR) for the installation of systems, products, devices, equipment, and enclosures in this Section.

B. All materials and labor required to produce a completely operational and fully functional system shall be supplied by the Contractor. It will be the responsibility of the Contractor to conform to the requirements of this Section for system operation, final connection, testing, turnover, and warranty compliance.

C. The use of wire nuts and crimp type connectors shall not be permitted. Where shielded wire is used it shall be connected to an earth ground at the power supply panel. All data signal wiring shall meet Echelon LonWorks network technical specifications.

D. No power supply enclosure shall be mounted where it is not readily accessible, the highest connection point shall not be above 8', nor shall the bottom of the panel be below 30".

3.2 PREPARATION

A. Connect equipment to 20 ampere 120 VAC circuit(s) from the emergency power system.

B. All equipment shall be listed by Underwriter's Laboratories.

C. Minimum conduit size for multiple conductor runs shall be ¾”. In each control panel 2 empty ¾ conduits shall be installed for future use. These conduits shall be routed to an accessible area above the ceiling or to a location approved by UCDH. Run circuits for AC separate from circuits using DC.

D. Thoroughly examine site conditions for acceptance of supporting device installation to verify conformance with manufacturer and technical specification tolerances. Do not commence with installation until all conditions are made satisfactory.

E. All equipment and material shall be new and not used even for demonstration purposes.

F. The Infant Security system shall co-exist with the access control system.

G. Review floor plan for access

1. Review for camera views

2. Isolate an area where foot traffic can be controlled
3. Determine square footage
4. Locate Patient Security Receivers (PSRs) and Portal Exciters

3.3 INSTALLATION

A. Equipment shall be installed in accordance with manufacturer's recommendations.

B. Installation shall be accomplished in a professional manner by qualified personnel regularly engaging in and experienced in this type of work for a period of at least 5 years and specifically trained to install Stanley Healthcare HUGS systems.

C. Bundle system conductors with nylon cable straps. General: All Cables installed in ceiling spaces shall be rated for plenum use.

D. Conduct ongoing local and remote diagnostic tests and validations as work progresses.

E. Controller Cable: Belden 9940, or equivalent, or as recommended by the manufacturer to ensure performance.
1. 2-wire alarm cable: Belden 8761, or equivalent as recommended by the manufacturer to ensure performance.
2. 4-wire alarm cable: Belden 9302, or equivalent as recommended by the manufacturer to ensure performance.
3. Electric Lock cable: Belden 8461, or equivalent as recommended by the manufacturer to ensure performance.
4. All wiring shall run continuous from device to device. No splices shall be permitted. The use of wire nuts and crimp type connectors shall not be permitted. Where shielded wire is used it shall be connected to an earth ground at the power supply panel. All data signal wiring shall meet Echelon LonWorks network technical specifications.
5. Installation shall be accomplished in a professional manner by qualified personnel regularly engaging in and experienced in this type of work for a period of at least 5 years.

3.4 LABELING

A. All system products, devices, equipment, power supplies, cabling, conduits, patch panels, and patch cables shall be labeled with their unique device name and number.

B. Labeling shall match the text and nomenclature in the programming sheets, system programming, and on the as-built drawings.

C. Labels shall be machine printed on adhesive labels, minimum 1”x1.5” with minimum 12pt. font. Handwritten labels are not acceptable.

D. The font shall be at least 1/8 inch in height, block characters, and legible. The text shall be black characters on a white background.

3.5 EXAMINATION/ACCEPTANCE

A. Contractor shall conduct and document System Functional Testing and Onsite Acceptance Testing. System Functional Testing shall be performed by Contractor to ensure that the system

is fully functional and completely operational in accordance with the requirements of this Section. Onsite Acceptance Testing shall be performed with UCDH representatives to demonstrate the operation of the completed system.

1. Onsite Acceptance Testing shall only be performed after the System Functional Testing is approved and accepted.
2. Contractor shall provide all personnel and equipment necessary to perform the System Functional Testing and the Onsite Acceptance Testing.
3. Punch list items from the System Functional Testing and Onsite Acceptance Testing shall be satisfactorily resolved by the Contractor prior to UCDH issuing a written notice of acceptance.

B. System Functional Testing:

1. At least ten working days (two weeks) prior to the scheduled Onsite Acceptance Testing date, Contractor shall provide printed System Functional Testing documentation indicating each device has been successfully tested and is in conformance with the operational intent outlined in the Contract Documents.
2. Printed System Functional Testing documentation should clearly indicate any remaining outstanding items, issues, and punch list items.
3. Failure to provide printed System Functional Testing documentation will prevent Onsite Acceptance Testing from being conducted.

C. Onsite Acceptance Testing:

1. After approval and acceptance of the printed System Functional Testing documentation, Contractor shall perform Onsite Acceptance Testing in collaboration with the UCDH representative.
2. Upon completion and resolution of all remaining outstanding punch list items, Contractor shall perform follow-up Onsite Acceptance Testing in collaboration with the UCDH representative.
3. Upon successful completion of the follow-up Onsite Acceptance Testing, resolution of all punch list items, delivery and acceptance of the final printed System Functional Testing documentation, and delivery and acceptance of the O&M manuals and as-built drawings, UCDH shall issue a written notice of acceptance, the project shall be considered substantially complete, and the warranty period shall begin.

3.6 DEMONSTRATION AND TRAINING

A. Provide the services of a factory-authorized service representative to demonstrate and train UCDH maintenance personnel as described below.

B. Train UCDH personnel in the procedures and schedules involved in operating, troubleshooting servicing, and preventive maintenance of the systems. Provide a minimum of 16-hours training. Training shall be scheduled in more than one session, as agreed-upon by Contractor and UCDH.

C. Train UCDH personnel in proper use of the system. Periods of training shall be coordinated with the UCDH representative to assure all nursing shifts receive the required training. Each session shall include instructions utilizing hands-on operation of the HUGS equipment in a typical system as selected by the staff. Provide handout material describing system features and functions to all who attend. Schedule all training through the UCDH representative a minimum of 14 days in advance.

D. Provide on-site assistance in adjusting sound levels and adjusting controls to suit actual occupied conditions on an as-requested basis for the first year of operation.

E. A failure of any test or any component during a test will require a complete retest program at no additional cost to UCDH.

END OF SECTION