



**CHABOT-LAS POSITAS
COMMUNITY COLLEGE DISTRICT
PURCHASING DEPARTMENT**

November 18, 2020

**Addendum No. 2
TEMPORARY FACULTY VILLAGE PROJECT
LAS POSITAS COLLEGE**

To: All Prospective Bidders

This Addendum Two (2) is issued to incorporate the following changes, additions or deletions to the Bid No. B20/21-00. Any modifications/changes made by this addendum affect only the portions or paragraphs specifically identified herein; all remaining portions of Bid No. B20/21-00 to remain in force. It is the responsibility of all responders to conform to this addendum.

A. ADDITIONS, CHANGES AND/OR CLARIFICATIONS:

Changes:

The following Changes have been Added and Changed to the bid documents:

1. Under GENERAL CONDITIONS, Special Conditions 3.2.4 **Delayed Completion of Punchlist Items** Add the following bolded words to the First sentence after "within the time established for completion, **provided in the contractors letter of substantial completion from the District**,....the contractor shall be subject to assessment of Liquidated Damages.....until all punchlist items are completed.
2. Special Conditions 3.3 Change adverse weather days from (10) to (12) calendar days.
3. 01-1100 Summary of Work 1.2.E. Add the following paragraph E.1 Modular building contractor will require approximately two-weeks to deliver and set modular's and another four-weeks to finish interiors. Site contractor is expected to coordinate with modular building contractor

regarding delivery, setting and interior work required by the modular building contractor.

4. 01-1100 Summary of Work 1.2 F. Remove second and third sentences, there is no requirement for “off-hours” work.
5. 01-1100 Summary of Work 1.2 G. Remove fourth and fifth sentences, there is no requirement for “off-hours” work or work in classrooms.
6. 01-1100 Summary of Work 1.3 A. Remove last sentence in its entirety.
7. 01-1000 Summary 1.3.D.1: Contact: Substitute Allan France for Diane Hardy.
8. 01-1100 Summary of Work 1.6 A. Fourth sentence remove in its entirety, not related to this project.
9. 01-2500 Product Options and Substitutions 1.3.B Change Thirty-five (35) days to Fifteen (15) calendar days.
10. 01-3200 Progress Schedules and Reports 1.3.F Remove CD Rom/Flash drive and add PDF file in addition to other requirements.
11. 01-3300 Submittal Procedures 1.5.D.1 Change 15 workdays to 21 Calendar days.
12. 01-3300 Submittal Procedures 1.5.D.2 Change 21 days to 21 Calendar days.
13. 01-5000 Temporary Facilities 1.2.A. Second sentence, add at end of sentence “with green fabric” on fencing.
14. During the TFV project walkthrough, all interested Low Voltage and Electrical contractors were shown the rooms in the LPC IT Building where fiber and copper backbones will be terminated. Because these rooms are small and contain critical infrastructure, COVID-19 and IT Security restrictions limited this viewing to the Low Voltage and Electrical contractors in attendance who could maintain social distancing requirements. The LPC IT Building (B1900) is a facility with restricted access for only those staff and supervised contractors with specific work purpose in that building. If other Low Voltage and/or Electrical contractors who are qualified CommScope Systimax VARs, per the bid requirements, want to view these rooms as they prepare their bid response, a

walkthrough can be coordinated through the CM and CLPCCD ITS.
Unescorted and unscheduled access to these rooms is not permitted.

Attached in **Exhibit A** are photos and descriptions of the LPC IT Building where fiber and copper backbones will be terminated for the project.

15. For information only a map of the construction/contractor parking area is attached. Please see **Exhibit B**.

16. Attached is Addendum 1 from Design Team LPAS that provides additional clarifications to Drawings C2.0; C3.0; C4.0. Also included in LPAS Addendum 1 is Interface Engineering Narrative, drawing sheets T1.10; T2.10; T3.10. Further, remove and replace in their entirety Specifications **27 000; 27 0528; 27 1300 and 27 1500**.

All other terms and conditions remain unchanged.

Michael McClung - Buyer, Purchasing and Warehouse Services
Chabot-Las Positas Community College District

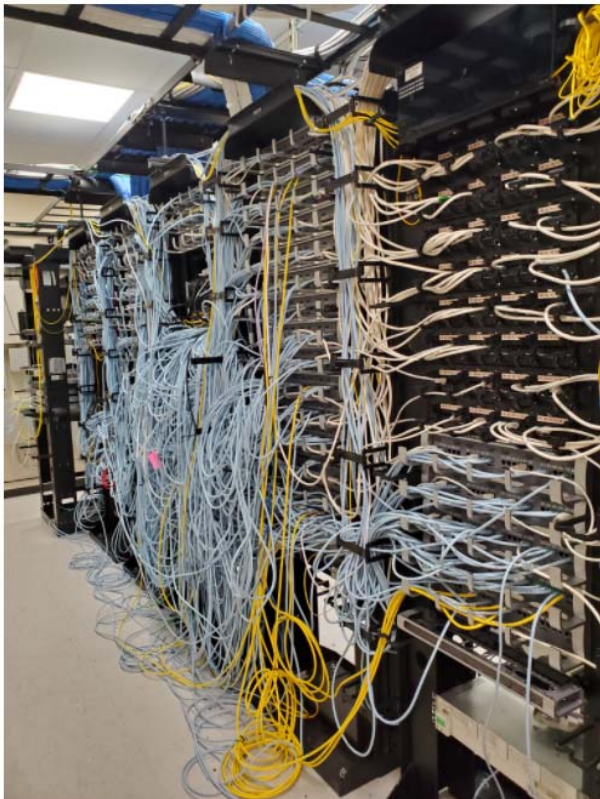
Network Room



OSP Conduits



Network Room Racks



FA Fiber Term

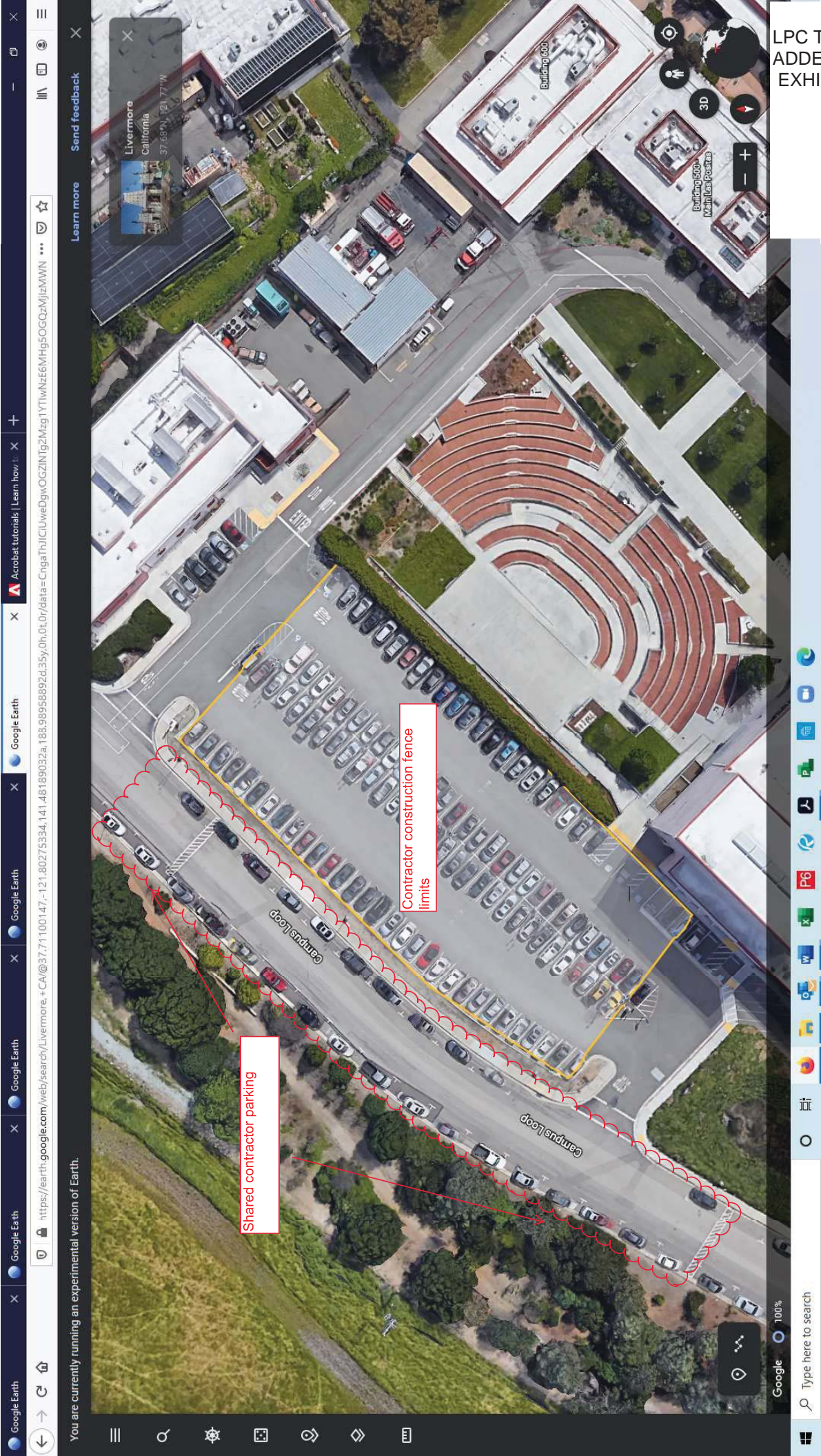


Room with FA Panel



FA Panel in B1900





Livermore
California
37.68°N, 121.77°W

Shared contractor parking

Contractor construction fence limits

You are currently running an experimental version of Earth.

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Addendum

PROJECT NAME: Las Positas Temporary Faculty Village Modular Offices
PROJECT NUMBER: 863-0005
TYPE: Addendums
SUBJECT: Revisions to Drawings and Specifications
ISSUE DATE: 11/11/2020
DATE ON DRAWINGS: 11/05/2020
ID: ADD 001
INITIATED BY: Tracy Hart

This addendum has been prepared to clarify, modify, delete, or add to the drawings and/or specifications for the above referenced project. The items listed herein supersede descriptions prior to the date listed above. All conditions not specifically referenced here shall remain the same. It is the obligation of the general contractor to make all trade partners aware of any items herein.

CHANGES TO DRAWINGS

Revisions to Drawings

1. C2.00
 - a. Keynote 6 added regarding trenching/restoration for new work.
2. C3.00
 - a. Keynote 7 added regarding trenching/restoration for new work.
3. C4.00
 - a. Keynote 4 added regarding trenching/restoration for new work.

See attached Narrative of Changes from Interface Engineering

END ADDENDUM 001

Narrative of Changes

Project Name	Las Positas College Temporary Faculty Village	Date	November 5, 2020
Subject	Addendum 1	Project Number	2020-0001
To	Tracy Hart	Phone	
From	LPAS Architecture + Design (Sacramento) 2484 Natomas Park Dr, Suite 100 Sacramento, CA 95833	@	Interface Engineering, Inc.
Distribution			

Applies To **Building Technologies**

TECHNOLOGY DRAWINGS

Sheet T1.10

- Added dimension to the telecommunication handhole.

Sheet T2.10

- Added general note B.
- Updated sheet keynote #2.
- Added sheet keynote #12.
- Relocated IDF cabinet in building 6 and 8.

Sheet T3.10

- Revised sheet keynote #1.
- Revised sheet keynote #3.
- Revised nema cans mounting note on details #3 and #9.
- Revised TGB mounting location and updated its note on details #1 and #2.
- Revised dedicated L5-30 receptacle symbol and updated its note on details #1 and #2.
- Removed dedicated quad 110, 20-amp receptacle on details #1 and #2.
- Updated cabinet's note on details #1 and #2.
- Added detail #10.

TECHNOLOGY SPECIFICATIONS

27 0000

- Removed part 1.2(C).
- Added "CLPCCD Cabling Infrastructure Standards 2018" in part 1.3(C)
- Removed "Provide engineered seismic drawings and equipment seismic certification" from part 1.4(C)(7).

27 0528

- Part 3.2 - Revise to "3.1" instead of "3.01"

27 1300

- Part 2.1(B) – Remove SYSTIMAX and added “CommScope/LazrSpeed, OM4, LOMM (for the fire alarm loop)”
- Part 2.5(A)
 - New section: CommScope Surface Wall Mount Enclosure: For Fire Alarm Terminations and Housing.
 - Fiber Adapter Panels – Changed “duplex” to “simplex” and added “12-simplex LC connector panel for fire alarm”
 - New section: “Multimode Connector”
- Part 3.1(W)(7) - Add information for testing of LOMMF.
- Part 3.3 (D)(1) – Added “OSP” before single. Removed items 2 and 3.
- Deleted part 3.5(K)
- Removed part 3.5(L)(3).
- Removed part 3.6(G).

27 1500

- Part 2.5(B)(7) – Remove words: integrated front, hooks and, cable.
- Part 3.2 – Change to “3.1” instead of “3.01”

T:\2020\2020-0001\Correspondence\Outgoing\2020-11-05 Addendum 1 NOC\20201105 Addendum 1 Narrative of Changes.docx

LPAS

2684 Midway Park, Suite 100, Livermore, CA 94550
 925.432.0028 | info@lpas.com
 Architecture • Design

**LAS POSITAS
 TEMPORARY FACULTY
 VILLAGE MODULAR
 OFFICES**

LAS POSITAS COMMUNITY COLLEGE
 LIVERMORE, CA

LEGEND

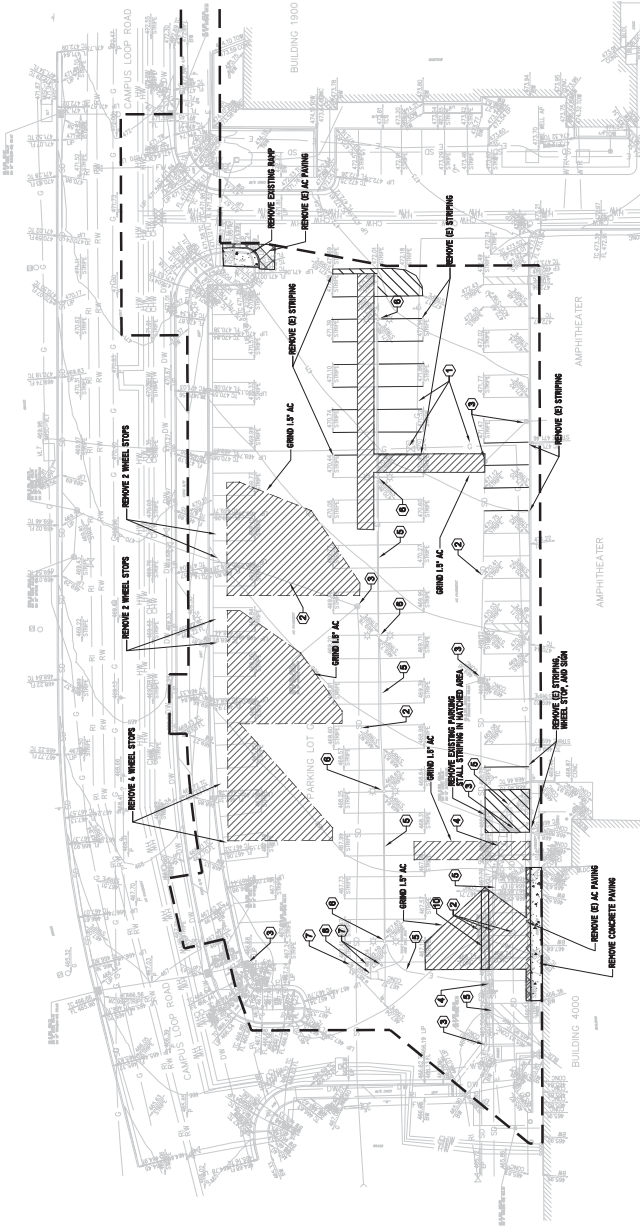
- REMOVE EXISTING CONCRETE FLOORING
- REMOVE EXISTING CONCRETE SLAB
- REMOVE EXISTING CONCRETE CURB
- LIMIT OF WORK

GENERAL NOTES

- CALL OUT ALL DIMENSIONS FROM THE FACE OF THE CURB UNLESS OTHERWISE NOTED.
- REMOVE EXISTING CONCRETE FLOORING TO BE REPAIRED AND REFINISHED TO MATCH EXISTING CONCRETE FLOORING.
- REMOVE EXISTING CONCRETE CURB TO BE REPAIRED AND REFINISHED TO MATCH EXISTING CONCRETE CURB.
- SEE EXISTING CONTRACT PLAN FOR PROTECTION OF EXISTING UTILITIES.
- PROTECT ALL EXISTING UTILITIES FROM DAMAGE DURING CONSTRUCTION. SEE EXISTING CONTRACT PLAN FOR PROTECTION OF EXISTING UTILITIES.
- CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE CALIFORNIA CONSTRUCTION CODE AND ALL APPLICABLE REGULATIONS AND ORDINANCES. ALL WORK SHALL BE DONE IN ACCORDANCE WITH THE LATEST EDITIONS OF THE INTERNATIONAL BUILDING CODE (IBC) AND THE INTERNATIONAL RESIDENTIAL CODE (IRC).

DEMOLITION NOTES

- EXISTING GAS LINE AND VALVES TO REMAIN. PROTECT IN PLACE.
- EXISTING STORM DRAIN LINE TO REMAIN. PROTECT IN PLACE.
- EXISTING STORM STRUCTURE TO REMAIN. PROTECT IN PLACE.
- EXISTING ELECTRICAL WALT TO REMAIN. PROTECT IN PLACE.
- EXISTING ELECTRICAL TO REMAIN. PROTECT IN PLACE.
- REMOVE AND REPAIR EXISTING EXTERIOR BRICK WALLS TO REMAIN. PROTECT IN PLACE.
- REMOVE EXISTING EXTERIOR BRICK WALLS TO REMAIN. PROTECT IN PLACE.
- EXISTING EXTERIOR BRICK WALLS TO REMAIN. PROTECT IN PLACE.
- EXISTING CURB AND GUTTER TO REMAIN. PROTECT IN PLACE.
- REMOVE EXISTING CONCRETE WALKWAY GUTTER.



ARCHITECT'S STAMP

APPROVAL

CONSULTANT

BKF100
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 ARCHITECTS
 ENGINEERS
 SURVEYORS
 PLANNERS

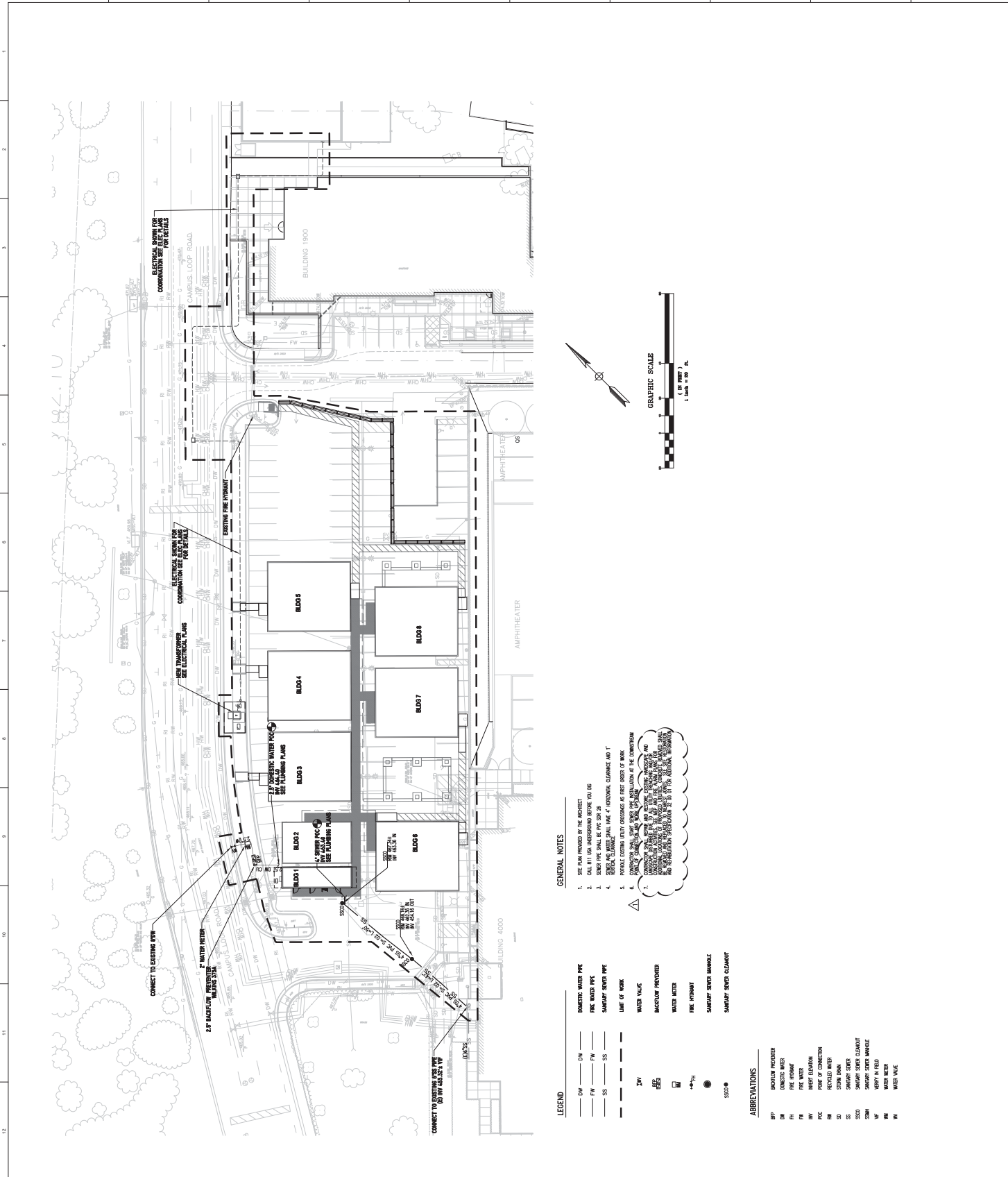
1000 WILSON BLVD
 SUITE 1000
 OAKLAND, CA 94612
 925-339-1799 (FAX)

**SITE DEMOLITION
 PLAN**

PROJECT NO: 2020-1106
 DATE: 2020-11-06

SHEET NO:
C2.00

FOR CONSTRUCTION



GENERAL NOTES

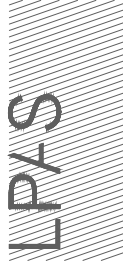
- SEE PLAN PROVIDED BY THE ARCHITECT
- CALL UP FOR UNDERGROUND BEFORE YOU GO
- VERIFY ALL DIMENSIONS AND LOCATIONS
- VERIFY AND MARK SHALL HAVE A MINIMUM CLEARANCE AND 1"
- VERIFY ALL DIMENSIONS AND LOCATIONS
- VERIFY ALL DIMENSIONS AND LOCATIONS
- VERIFY ALL DIMENSIONS AND LOCATIONS

LEGEND

- DW DOMESTIC WATER PIPE
- FW FIRE WATER PIPE
- SS SANITARY SEWER PIPE
- LW LIMIT OF WORK
- WV WATER VALVE
- BPF BACKFLOW PREVENTER
- WM WATER METER
- FH FIRE HYDRANT
- SSM SANITARY SEWER MANHOLE
- SSC SANITARY SEWER CLEANOUT

ABBREVIATIONS

- BPF BACKFLOW PREVENTER
- DW DOMESTIC WATER
- FW FIRE WATER
- SS SANITARY SEWER
- PVC PIPE OF POLYETHYLENE
- SS SANITARY SEWER
- SSM SANITARY SEWER MANHOLE
- SSC SANITARY SEWER CLEANOUT
- WM WATER METER
- WV WATER VALVE



Las Positas Community College
 Temporary Faculty Village Modular Offices

LAS POSITAS
 TEMPORARY FACULTY
 VILLAGE MODULAR
 OFFICES

LAS POSITAS COMMUNITY COLLEGE
 LIVERMORE, CA

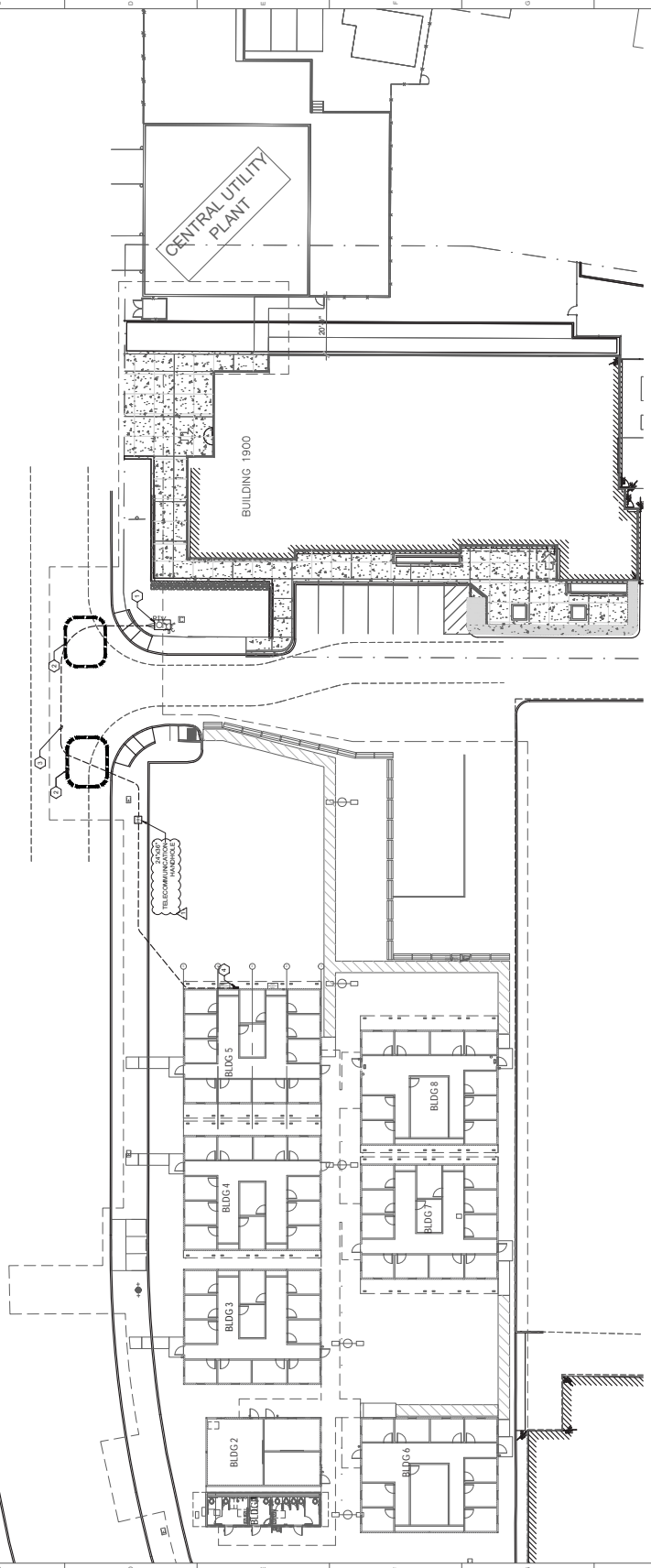
NO. ISSUE DATE
 01 ADDENDUM 1 REVISION 1 11/06/20

GENERAL SHEET NOTES

- A. CONTRACTOR SHALL VERIFY ALL UTILITIES PRIOR TO CONSTRUCTION. CONTRACTOR SHALL REFER TO ALL UTILITIES RECORDS AND TO COMMUNICATIONS COMPANY AND ELECTRIC UTILITY TO OBTAIN ALL NECESSARY INFORMATION REGARDING THE LOCATION AND DEPTH OF ALL UTILITIES.
- B. CONTRACTOR SHALL REFER TO ALL LABELING INFRASTRUCTURE RECORDS FOR CONDUIT RAYS, TRUNKING, AND TRENCHING AND TO ALL RECORDS FOR UNDERGROUND UTILITIES.
- C. PATHWAY FOR NEW UTILITIES IS DIAGNOSTIC IN NATURE AND DESIGNED TO PROVIDE VISUAL CONFIRMATION OF THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO TRENCHING AND CONSTRUCTION. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO TRENCHING AND CONSTRUCTION. CONTRACTOR SHALL VERIFY THE LOCATION AND DEPTH OF ALL UTILITIES PRIOR TO TRENCHING AND CONSTRUCTION.
- D. TRENCH DETAIL SHOWN IN ELECTRICAL S110.

SHEET KEYNOTES

- 1. TELECOMMUNICATIONS HANDBOOK.
- 2. HANDBOOK TRENCHING UNDERGROUND PIPES, CONDUIT, TRENCHES, AND WET UTILITIES.
- 3. 601 - 4" UNDERGROUND CONDUIT.
- 4. REFER TO ALL RECORDS FOR UNDERGROUND UTILITIES AND TO COMMUNICATIONS COMPANY AND ELECTRIC UTILITY TO OBTAIN ALL NECESSARY INFORMATION REGARDING THE LOCATION AND DEPTH OF ALL UTILITIES.



1 SITE PLAN - TECHNOLOGY
 SCALE: 1/8" = 1'-0"

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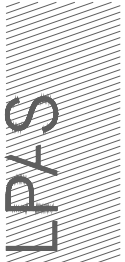
**SITE PLAN -
 TECHNOLOGY**

PROJECT NO. 2020-001
 DATE: 2020-11-06

SHEET NO.

T1.10

FOR CONSTRUCTION



Las Positas Community College
 Temporary Faculty Village Modular Offices
 11/16/20

LAS POSITAS
 TEMPORARY FACULTY
 VILLAGE MODULAR
 OFFICES

LAS POSITAS COMMUNITY COLLEGE
 LIVERMORE, CA

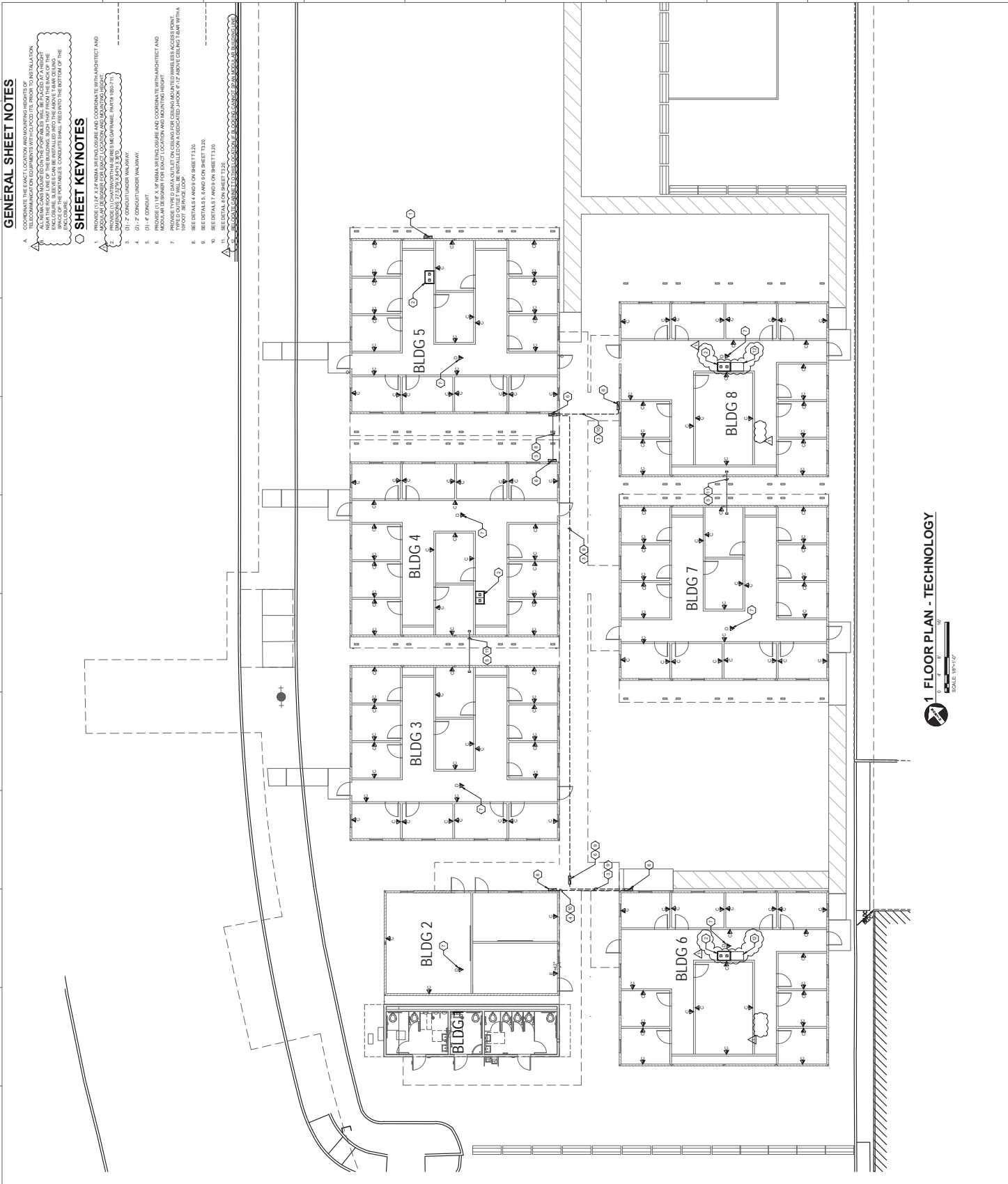
NO. ISSUE DATE
 01 ADDENDUM 1 REVISION 1 11/16/20

GENERAL SHEET NOTES

1. COORDINATE THE EXACT LOCATION AND MOUNTING HEIGHTS OF TELECOMMUNICATION EQUIPMENT WITH CLOUTIER PRIOR TO INSTALLATION. ALL RACK MOUNTED EQUIPMENT SHALL BE PLACED AT A HEIGHT OF 48" TO 60" ABOVE FINISHED FLOOR. TELECOMMUNICATION EQUIPMENT SHALL BE INSTALLED IN THE ABOVE DESIGNATED ENCLOSURE. TELECOMMUNICATION EQUIPMENT SHALL BE INSTALLED IN THE ABOVE DESIGNATED ENCLOSURE.

SHEET KEYNOTES

1. PROVIDE (1) CHARTERED AIRCRAFT CLEARANCE PERFORMANCE PART 100.7 (1) AND (2) CHARTERED AIRCRAFT CLEARANCE PERFORMANCES PART 100.7 (1) AND (2) CONDUIT UNDER RUNWAY.
2. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
3. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
4. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
5. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
6. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
7. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
8. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
9. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
10. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.
11. PROVIDE (1) 1" X 1" IF IN AREA ENCLOSED AND COORDINATE WITH ARCHITECT AND MODULAR BUILDER FOR EXACT LOCATION AND MOUNTING HEIGHT.



1 FLOOR PLAN - TECHNOLOGY

SCALE: 1/8" = 1'-0"

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FLOOR PLAN - TECHNOLOGY

PROJECT NO: 2020-0001
 DATE: 2020-11-16

SHEET NO:

T2.10

FOR CONSTRUCTION

SECTION 27 0000

COMMUNICATIONS BASIC REQUIREMENTS

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Work included in 27 00 00, Communications Basic Requirements applies to Division 27, Communications work to provide materials, labor, tools, permits, incidentals, and other services to provide and make ready for Owner's use of communications systems for proposed project.
- B. Contract Documents include, but are not limited to, Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Drawings, Addenda, Owner/Architect Agreement, and Owner/Contractor Agreement. Confirm requirements before commencement of work.
- C. Definitions:
 - 1. Provide: To furnish and install, complete and ready for intended use.
 - 2. Furnish: Supply and deliver to project site, ready for unpacking, assembly and installation.
 - 3. Install: Includes unloading, unpacking, assembling, erecting, installation, applying, finishing, protecting, cleaning and similar operations at project site as required to complete items of work furnished.
 - 4. Approved or Approved Equivalent: To possess the same performance qualities and characteristics and fulfill the utilitarian function without any decrease in quality, durability or longevity. For equipment/products defined by the Contractor as "equivalent," substitution requests must be submitted to Engineer for consideration, in accordance with Division 01, General Requirements, and approved by the Engineer prior to submitting bids for substituted items.
 - 5. Authority Having Jurisdiction (AHJ): Indicates reviewing authorities, including local fire marshal, Owner's insurance underwriter, Owner's Authorized Representative, and other reviewing entity whose approval is required to obtain systems acceptance.
 - 6. Entrance Facility (EF): Area or location that contains entrance point (demarcation) cable and associated equipment for telecommunication services entering the building.
 - 7. Equipment Room (ER): Area or location that contains backbone cabling associated with interbuilding cable or cable that connects buildings together in a campus environment. ERs may contain Main Cross-Connects, Intermediate Cross-Connects, Horizontal Cross-Connects, and Telecommunication Rooms.
 - 8. Main Telecommunications MDF Room (MDF) - is the central connection point between the Campus and the Local Exchange Carrier (LEC), Competitive Local Exchange Carriers (CLEC) or Internet Service Provides (ISP). This room or space is considered by the carriers

as the Minimum Point of Entry (MPOE) and demarcation point for communication services delivered to the Campus from external service providers and is located in B1900A.

9. Building Telecommunications Room (BDF) - is the main point of connectivity from the building to the outside plant infrastructure.
10. Telecommunications IDF Room (IDF) - located on each floor or building quadrant, and houses telecommunications equipment, cable terminations, and network equipment.
11. Intermediate Cross-Connect (IC): Area or location that contains telecommunications equipment for connecting backbone cable from the MC to backbone cable distributing to one or many Horizontal Cross-Connects. This location may contain active telecommunications equipment.
12. Horizontal Cross-Connect (HC): Area or location that contains telecommunications equipment, cable terminations and cross-connect wiring. HC is the recognized connection point between backbone and horizontal pathway facilities.
13. Telecommunications Room (TR): Area or location containing telecommunications equipment, cable terminations and cross-connect wiring. Three applications serviced by TRs are horizontal cable connections, backbone system interconnection and entrance facilities. The TR provides facilities (space, power, grounding, etc.) for housing telecommunications equipment. TR may contain a MC, IC or HC and a demarcation point or an interbuilding entrance facility.
14. Interbuilding Cable: Backbone cable associated with connecting buildings together in a multibuilding or campus environment.
15. Intrabuilding Cable: Backbone cable associated with connecting Entrance Facility, Equipment Rooms, Main Cross-Connects, Intermediate Cross-Connects, Horizontal Cross-Connects, and Telecommunication Rooms together on single floor or multifloor building.

1.2 RELATED SECTIONS

- A. Contents of Section applies to Division 27, Communications Contract Documents.
- B. Related Work:
 1. Additional conditions apply to this Division including, but not limited to:
 - a. Specifications including Division 00, Procurement and Contracting Requirements and Division 01, General Requirements.
 - b. Drawings
 - c. Addenda
 - d. Owner/Architect Agreement

- e. Owner/Contractor Agreement
- f. Codes, Standards, Public Ordinances and Permits



1.3 REFERENCES AND STANDARDS

- A. References and Standards per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, individual Division 27, Communications Sections and those listed in this Section.
- B. Codes to include latest adopted editions, including current amendments, supplements and local jurisdiction requirements in effect as of the date of the Contract Documents, of/from:
 - 1. State of California:
 - a. CBC - California Building Code
 - b. CEC - California Electrical Code
 - c. CEC T24 - California Energy Code Title 24
 - d. CFC - California Fire Code
 - e. CMC - California Mechanical Code
 - f. CPC - California Plumbing Code
 - g. CSFM - California State Fire Marshal
 - h. DSA - Division of State Architect Regulations and Requirements
- C. Reference standards and guidelines include but are not limited to the latest adopted editions from:
 - 1. ABA - Architectural Barriers Act
 - 2. ADA - Americans with Disabilities Act
 - 3. ANSI - American National Standards Institute
 - a. ANSI/TIA-568-0.E - Generic Telecommunications Cabling for Customer Premises
 - b. ANSI/TIA-568-0.E - Commercial Building Telecommunications Cabling Standard
 - c. ANSI/TIA-568-2.D - Balanced Twisted-Pair Telecommunications Cabling and Components Standard
 - d. ANSI/TIA-568-3.D-1 - Optical Fiber Cabling Components Standard. Commercial Building Telecommunicating Cabling Standard

- e. ANSI/TIA-569-E - Commercial Building Standard for Telecommunications Pathways and Spaces
 - f. ANSI/TIA-570-D - Residential Telecommunications Infrastructure
 - g. ANSI/TIA-942 - Telecommunications Infrastructure Standard for Data Centers
 - h. ANSI/TIA/EIA-606-C - Administration Standard for Commercial Telecommunications Infrastructure
 - i. ANSI-J-STD-607-D - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- 4. APWA - American Public Works Association
 - 5. ASCE - American Society of Civil Engineers
 - 6. ASHRAE Guideline 0, the Commissioning Process
 - 7. ASTM - ASTM International
 - 8. BICSI - Building Industry Consulting Service International
 - a. BICSI TDMM - Telecommunications Distribution Methods Manual current edition
 - b. BICSI ESSDRM - Electronic Safety & Security Design Reference Manual current edition
 - c. BICSI AVDRM - AV Design Reference Manual current edition
 - 9. CFR - Code of Federal Regulations
 - 10. CLPCCD Cabling Infrastructure Standards, 2018
 - 11. EIA - Electronic Industries Association
 - 12. EPA - Environmental Protection Agency
 - 13. ETL - Electrical Testing Laboratories
 - 14. FCC - Federal Communications Division
 - 15. FM - FM Global
 - 16. IBC - International Building Code
 - 17. IEC - International Electrotechnical Commission
 - 18. IEEE - Institute of Electrical and Electronics Engineers
 - 19. ISO - International Organization for Standardization

20. MSS - Manufacturers Standardization Society
21. NEC - National Electric Code
22. NEMA - National Electrical Manufacturers Association
23. OSHA - Occupational Safety and Health Administration
24. TIA - Telecommunications Industry Association
25. UL - Underwriters Laboratories Inc.

D. See Division 27, Communications individual Sections for additional references.

1.4 SUBMITTALS

- A. See Division 01, General Requirements for Submittal Procedures.
- B. Provide drawings in format and software release equal to the design documents. Drawings to be the same sheet size and scale as the Contract Documents.
- C. In addition:
 1. "No Exception Taken" constitutes that review is for general conformance with the design concept expressed in the Contract Documents for the limited purpose of checking for conformance with information given. Any action is subject to the requirements of the Contract Documents. Contractor is responsible for the dimensions and quantity and will confirm and correlate at the job site, fabrication processes and techniques of construction, coordination of the work with that of all other trades, and the satisfactory performance of the work.
 2. Provide product submittals and shop drawings in electronic format only. Electronic format must be submitted via zip file via e-mail. For electronic format, provide one file per division containing one bookmarked PDF file with each bookmark corresponding to each Specification Section. Arrange bookmarks in ascending order of Specification Section number. Individual submittals sent piecemeal in a per Specification Section method will be returned without review or comment. Copy Architect on all transmissions/submissions.
 3. Product Data: Provide manufacturer's descriptive literature for products specified in Division 27, Communications Sections.
 4. Identify/mark each submittal in detail. Note what differences, if any, exist between the submitted item and the specified item. Failure to identify the differences will be considered cause for disapproval. If differences are not identified and/or not discovered during the submittal review process, Contractor remains responsible for providing equipment and materials that meet the specifications and Drawings.
 - a. Label submittal to match numbering/references as shown in Contract Documents. Highlight and label applicable information to individual equipment or cross

out/remove extraneous data not applicable to submitted model. Clearly note options and accessories to be provided, including field installed items. Highlight connections by/to other trades.

- b. Include technical data, installation instructions and dimensioned drawings for products, fixtures, equipment and devices installed, furnished or provided. Reference individual Division 27, Communications specification Sections for specific items required in product data submittal outside of these requirements.
 - c. See Division 27, Communications individual Sections for additional submittal requirements outside of these requirements.
5. Maximum of two reviews of complete submittal package. Arrange for additional reviews and/or early review of long-lead items; Bear costs of additional reviews at Engineer's hourly rates. Incomplete submittal packages/submittals will be returned to contractor without review.
 6. Resubmission Requirements: Make corrections or changes in submittals as required, and in consideration of Engineer's comments. Identify Engineer's comments and provide an individual response to each of the Engineer's comments. Cloud changes in the submittals and further identify changes which are in response to Engineer's comments.
 7. Structural/Seismic: Provide weights, dimensions, mounting requirements and like information required for mounting, seismic bracing, and support. Indicate manufacturer's installation and support requirements to meet ASCE 7-10 requirements for non-structural components. Equipment Importance Factor as specified in Division 01 and in Structural documents.
 8. Trade Coordination: Include physical characteristics, electrical characteristics, device layout plans, wiring diagrams, and connections as required per Division 27, Communications Coordination Documents. For equipment with electrical connections, furnish copy of approved submittal for inclusion in Division 26, Electrical submittals.
 9. Make provisions for openings in building for admittance of equipment prior to start of construction or ordering of equipment.
 10. Substitutions and Variation from Basis of Design:
 - a. The Basis of Design designated product establishes the qualities and characteristics for the evaluation of any comparable products by other listed acceptable manufacturers if included in this Specification or included in an approved Substitution Request as judged by the Design Professional.
 - b. If substitutions and/or equivalent equipment/products are being proposed, it is the responsibility of parties concerned, involved in, and furnishing the substitute and/or equivalent equipment to verify and compare the characteristics and requirements of that furnished to that specified and/or shown. If greater capacity and/or more materials and/or more labor is required for the rough-in, circuitry or connections than for the item specified and provided for, then provide compensation for additional charges required for the proper rough-in, circuitry and connections for

the equipment being furnished. No additional charges above the Base Bid, including resulting charges for work performed under other Divisions, will be allowed for such revisions. Coordinate with the requirements of "Submittals." For any product marked "or approved equivalent," a substitution request must be submitted to Engineer for approval prior to purchase, delivery or installation.

11. Shop Drawings:
 - a. Provide coordinated Shop Drawings which include physical characteristics of all systems, device layout plans, and control wiring diagrams. Reference individual Division 27, Communications specification Sections for additional requirements for Shop Drawings outside of these requirements.
 - b. Provide Shop Drawings indicating access panel locations, size and elevation for approval prior to installation.
12. Samples: Provide samples when requested by individual Sections.
13. Resubmission Requirements:
 - a. Make any corrections or change in submittals when required. Provide submittals as specified. The engineer will not be required to edit and/or interpret the Contractor's submittals. Changes made for the resubmittal will be indicated in a cover letter with reference to page(s) changed and will reference response to comment. Indicate changes for the resubmittal in a cover letter with reference to page(s) changed and reference response to comment. Cloud changes in the submittals.
 - b. Resubmit for review until review indicates no exception taken, or "make corrections as noted."
 - c. When submitting Drawings for Engineers re-review, clearly indicate changes on Drawings and "cloud" any revisions. Submit a list describing each change.
14. Operation and Maintenance Manuals, Owner's Instructions:
 - a. Submit, at one time, electronic files (PDF format) of manufacturer's operation and maintenance instruction manuals and parts lists for equipment or items requiring servicing. Submit data when work is substantially complete and in same order format as submittals. Include name and location of source parts and service for each piece of equipment.
 - 1) Include copy of approved submittal data along with submittal review letters received from Engineer. Data to clearly indicate installed equipment model numbers. Delete or cross out data pertaining to other equipment not specific to this project.
 - 2) Include copy of manufacturer's standard Operations and Maintenance for equipment. At front of each tab, provide routine maintenance documentation for scheduled equipment. Include manufacturer's recommended maintenance schedule and highlight maintenance required to

maintain warranty. Furnish list of routine maintenance parts, including part numbers, sizes, quantities, relevant to each piece of equipment: batteries, lamp lenses, speakers and filters.

- 3) Include Warranty per Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Sections.
- 4) Include product certificates of warranties and guarantees.
- 5) Include copy of complete parts list for equipment. Include available exploded views of assemblies and subassemblies.
- 6) Include copy of burn-in and test reports specific to each piece of equipment.
- 7) Include copy of software/appliance programming.
- 8) Include commissioning reports.
- 9) Engineer will return incomplete documentation without review. Engineer will provide one set of review comments in Submittal Review format. Contractor must arrange for additional reviews; Contractor to bear costs for additional reviews at Engineer's hourly rates.

- b. Thoroughly instruct Owner in proper operation of equipment and systems. Where noted in individual Sections, training will include classroom instruction with applicable training aids and systems demonstrations. Submit copy of material used for Owner instruction. Field instruction per Section 27 00 00, Communications Basic Requirements Article titled "Demonstration."
- c. Copies of certificates of code authority inspections, acceptance, code required acceptance tests, letter of conformance and other special guarantees, certificates of warranties, specified elsewhere or indicated on Drawings.

15. Record Drawings:

- a. Maintain at site at least one set of drawings for recording "as-constructed" conditions. Indicate on Drawings changes to original documents by referencing revision document, and include buried elements, location of conduit, and location of concealed communication items. Include items changed by field orders, supplemental instructions, and constructed conditions.
- b. Record Drawings are to include equipment and fixture/connection schedules that accurately reflect "as constructed or installed" for project.
- c. At completion of project, input changes to original project on CAD Drawings and make one set of black-line Drawings created from CAD Files in version/release equal to Contract Drawings. Submit CAD disk and Drawings upon substantial completion.

- d. Invert elevations and dimensioned locations for incoming utilities and site raceways below grade extending to 5-feet outside building line.
- e. See Division 27, Communications individual Sections for additional items to include in Record Drawings.

1.5 QUALITY ASSURANCE

- A. Regulatory Requirements: Work and materials installed to conform with all local, State and Federal codes, and other applicable laws and regulations. Where code requirements are at variance with Contract Documents, meet code requirements as a minimum requirement and include costs necessary to meet these in Contract. Machinery and equipment are to comply with OSHA requirements, as currently revised and interpreted for equipment manufacturer requirements. Install equipment provided per manufacturer recommendations.
- B. Whenever this Specification calls for material, workmanship, arrangement or construction of higher quality and/or capacity than that required by governing codes, higher quality and/or capacity take precedence.
- C. Drawings are intended to be diagrammatic and reflect the Basis of Design manufacturer's equipment. They are not intended to show every item in its exact dimensions, or details of equipment or proposed systems layout. Verify actual dimensions of systems (i.e., conduit) and equipment proposed to assure that systems and equipment will fit in available space. Contractor is responsible for design and construction costs incurred for equipment other than Basis of Design, including, but not limited to, architectural, structural, electrical, HVAC, fire sprinkler, and plumbing systems.
- D. Manufacturer's Instructions: Follow manufacturer's written instructions. If in conflict with Contract Documents, obtain clarification. Notify Engineer/Architect, in writing, before starting work.
- E. Items shown on Drawings are not necessarily included in Specifications or vice versa. Confirm requirements in all Contract Documents.
- F. Provide products that are UL listed.
- G. Contractor Qualifications:
 - 1. Minimum of five years experience in the design, installation, testing and maintenance of communications systems.
 - 2. Must employ at least one full time BICSI certified Registered Communications Distribution Designer (RCDD) who is involved in reviewing work performed by contractor on this project.
 - 3. Maintain a local service facility which stocks spare devices and/or components for servicing systems.

4. Have performed successful installation and maintenance of at least three projects similar in scope and size. Be able to provide project references for these three projects, including scope of Work, project type, Owner/user contact name and telephone number.
5. The contractor selected for this project must be certified by the manufacturer of the approved products and utilize these components for completion of work.

1.6 WARRANTY

- A. Provide written warranty covering the work for a period of one year from date of Substantial Completion in accordance with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. For Backbone and Horizontal Cabling: Provide:
 1. Labor, materials and documentation according to selected manufacturer requirements necessary to ensure that the Owner will be furnished with Commscope Extended Product Warranty and Application Assurance of a minimum of 25 years in length. The Application Assurance Warranty will cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C.
 2. Provide a warranty on the physical installation.
 3. Furnish necessary documentation required by the manufacturer immediately following 100 percent testing of cables.
 4. Administer the warranty process with the responsible manufacturer's representative. Provide warranty directly to the Owner from the manufacturer. Ensure that the manufacturer provides the Owner with the appropriate warranty certification within 90 calendar days of the final project completion
- C. Sections under this Division can require additional and/or extended warranties that apply beyond basic warranty under Division 01, General Requirements and the General Conditions. Confirm requirements in all Contract Documents.

1.7 COORDINATION DOCUMENTS

- A. Prior to construction, prepare and submit coordinated layout Drawings (composite drawings), to coordinate installation and location of ductwork, grilles, diffusers, piping, fire sprinklers, plumbing, lights, and electrical services. Composite Drawings show services on single sheet. Key Drawings to structural column identification system. Prior to completion of Drawings, coordinate proposed installation with architectural and structural requirements, and other trades (including plumbing, HVAC, fire protection, electrical, ceiling suspension, and ceiling tile systems, etc.), and provide maintenance access requirements. Coordinate with submitted architectural systems (i.e. roofing, ceiling, finishes) and structural systems as submitted, including footings and foundation. Identify zone of influence from footings and ensure systems are not routed within the zone of influence. Unless otherwise required by Division 00, Procurement and Contracting Requirements and/or Division 01, General Requirements, Division

27, Communications to combine information furnished by other trades onto master coordination documents.

- B. Prepare Drawings as follows:
 - 1. Drawings in CAD Format. CAD format release equal to design documents. Drawings to be same sheet size and scale as Contract Drawings and indicate location, size and elevation above finished floor of equipment and distribution systems.
 - 2. Review and revise, as necessary, section cuts in Contract Drawings after verification of field conditions.
 - 3. Incorporate addenda items and change orders.
 - 4. Provide additional coordination as requested by other trades.
- C. Advise Architect in event conflict occurs in location or connection of equipment. Bear costs resulting from failure to properly coordinate installation or failure to advise Architect of conflict.
- D. Verify in field exact size, location, invert, and clearances regarding existing material, equipment and apparatus, and advise Architect of discrepancies between that indicated on Drawings and that existing in field prior to installation related thereto.
- E. Submit final Coordination Drawings with changes as Record Drawings at completion of project.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Articles, fixtures, and equipment of a kind to be standard product of one manufacturer, including but not limited to jacks, patch panels, equipment connection cords and wall plates.

2.2 STANDARDS OF MATERIALS AND WORKMANSHIP

- A. Base contract upon furnishing materials as specified. Materials, equipment, and fixtures used for construction are to be new, latest products as listed in manufacturer's printed catalog data and are to be UL approved or have adequate approval or be acceptable by State, County, and City authorities. Equipment/fixture supplier is responsible for obtaining state, county, and city acceptance on equipment/fixture not UL approved or not listed for installation.
- B. Names and manufacturer's names denote character and quality of equipment desired and are not to be construed as limiting competition.
- C. Hazardous Materials:
 - 1. Comply with local, State of California, and Federal regulations relating to hazardous materials.
 - 2. Comply with Division 00, Procurement and Contracting Requirements and Division 01, General Requirements for this project relating to hazardous materials.

3. Do not use any materials containing a hazardous substance. If hazardous materials are encountered, do not disturb; immediately notify Owner and Architect. Hazardous materials will be removed by Owner under separate contract.

PART 3 - EXECUTION

3.1 ACCESSIBILITY AND INSTALLATION

- A. Confirm Accessibility and Installation requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Install equipment requiring access (i.e., amplifiers, taps, zone controllers, volume controls, and storage devices) so that they may be serviced, reset, replaced or recalibrated by service people with normal service tools and equipment. Do not install equipment in obvious passageways, doorways, scuttles or crawlspaces which would impede or block intended usage.
- C. Install equipment and products complete as directed by manufacturer's installation instructions. Obtain installation instructions from manufacturer prior to rough-in of equipment and examine instructions thoroughly. When requirements of installation instructions conflict with Contract Documents, request clarification from Architect prior to proceeding with installation. This includes proper installation methods, sequencing and coordination with other trades and disciplines.
- D. Earthwork:
 1. Confirm Earthwork requirements in Contract Documents. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
 - a. Perform excavation, dewatering, shoring, bedding, and backfill required for installation of work in this Division in accordance with related earthwork divisions. Contact utilities and locate existing utilities prior to excavation. Repair any work damaged during excavation or backfilling.
 - b. Excavation: Do not excavate under footings, foundation bases, or retaining walls.
 - c. Provide protection of underground systems. Review the project Geotechnical Report for references to corrosive or deleterious soils which will reduce the performance or service life of underground systems materials.
- E. Firestopping:
 1. Confirm Firestopping requirements in Division 07, Thermal and Moisture Protection. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
 - a. Coordinate location and protection level of fire and/or smoke rated walls, ceilings, and floors. When these assemblies are penetrated, seal around piping, ductwork

and equipment with approved firestopping material. Install firestopping material complete as directed by manufacturer's installation instructions. Meet requirements of ASTM E814, Standard Test Method for Fire Tests of Through-Penetration Fire Stops.

- F. Plenums: In plenums, provide plenum rated materials that meet the requirements to be installed in plenums. Immediately notify Architect/Engineer of discrepancy.

3.2 SEISMIC CONTROL

- A. Confirm Seismic Control requirements in Division 01, General Requirements, Structural documents, and individual Division 27 Communications Sections.
- B. General:
 - 1. Earthquake resistant designs for Communications (Division 27) equipment and distribution, i.e. cabinets and racks, ceiling assemblies, raceways, ladder racking, etc. to conform to regulations of jurisdiction having authority.
 - 2. Restraints which are used to prevent disruption of function of piece of equipment because of application of horizontal force to be such that forces are carried to frame of structure in such a way that frame will not be deflected when apparatus is attached to a mounting base and equipment pad, or to structure in normal way, utilizing attachments provided. Secure equipment and distribution systems to withstand a force in direction equal to value defined by jurisdiction having authority.
 - 3. Provide stamped Shop Drawings from licensed Structural Engineer of seismic bracing and seismic movement assemblies for cabinets, racks, major equipment and overhead raceways. Engineer to design and provide stamped Shop Drawings cabinets, racks, major equipment and overhead raceway. Submit Shop Drawings along with equipment submittals.
 - 4. Provide stamped Shop Drawings from licensed Structural Engineer of seismic flexible joints for piping and crossing building expansion or seismic joints. Submit Shop Drawings along with seismic bracing details.
 - 5. Provide means to prohibit excessive motion of communications equipment during earthquake.

3.3 REVIEW AND OBSERVATION

- A. Confirm Review and Observation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Notify Architect, in writing, at following stages of construction so that they may, at their option, visit site for review and construction observation:
 - 1. Underground conduit installation prior to backfilling.

2. Prior to ceiling cover/installation.
 3. When main systems, or portions of, are being tested and ready for inspection by AHJ.
- C. Final Punch: Costs incurred by additional trips required due to incomplete systems will be the responsibility of the Contractor.

3.4 CONTINUITY OF SERVICE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
1. During remodeling or addition to existing structures, or addition of a structure to existing structure, while existing structure is occupied, current services to remain intact until new construction, facilities or equipment is installed.
 2. Prior to changing over to new service, verify that every item is thoroughly prepared. Install new wiring to point of connection.
 3. Coordinate transfer time to new service with Owner. If required, perform transfer during off peak hours. Once changeover is started, pursue to its completion to keep interference to a minimum. If overtime is necessary, there will be no allowance made by Owner for extra expense for such overtime or shift work.
 4. Organize work to minimize duration of power interruption.

3.5 CUTTING AND PATCHING

- A. Confirm Cutting and Patching Requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
1. Proposed floor cutting/core drilling/sleeve locations to be approved by Project Structural Engineer. Submit proposed locations to Architect/Project Structural Engineer. Where slabs are of post tension construction, perform x-ray scan of proposed penetration locations and submit scan results including proposed penetration locations to Project Structural Engineer/Architect for approval. Where slabs are of waffle type construction, show column cap extent and cell locations relative to proposed penetration(s).
 2. Cutting, patching and repairing for work specified in this Division including plastering, masonry work, concrete work, carpentry work, and painting included under this Section will be performed by skilled craftsmen of each respective trade in conformance with appropriate Division of Work.
 3. Additional openings required in building construction to be made by drilling or cutting. Use of jack hammer is specifically prohibited. Patch openings in and through concrete and masonry with grout.

4. Restore new or existing work that is cut and/or damaged to original condition. Patch and repair specifically where existing items have been removed. This includes repairing and painting walls, ceilings, etc. where existing conduit and devices are removed as part of this project. Where alterations disturb lawns, paving, and walks, surfaces to be repaired, refinished and left in condition matching existing prior to commencement of work.
5. Additional work required by lack of proper coordination will be provided at no additional cost to the Owner.

3.6 EQUIPMENT SELECTION AND SERVICEABILITY

- A. Replace or reposition equipment which is too large or located incorrectly to permit servicing, at no additional cost to Owner.

3.7 DELIVERY, STORAGE AND HANDLING

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
 1. Handle materials delivered to project site with care to avoid damage. Store materials on site inside building or protected from weather, dirt and construction dust. Insulation and lining that becomes wet from improper storage and handling to be replaced before installation. Products and/or materials that become damaged due to water, dirt and/or dust as a result of improper storage to be replaced before installation.
 2. Protect all equipment and conduit to avoid damage. Close conduit openings with caps or plugs. Keep motors and bearings in watertight and dustproof covers during entire course of installation.

3.8 DEMONSTRATION

- A. Confirm Demonstration requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Upon completion of work and adjustment of equipment and test systems, demonstrate to Owner's Authorized Representative, Architect and Engineer that equipment furnished and installed or connected under provisions of these Specifications functions in manner required. Provide field instruction to Owner's Maintenance Staff as specified in Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- C. Manufacturer's Field Services: Furnish services of a qualified person at time approved by Owner, to instruct maintenance personnel, correct defects or deficiencies, and demonstrate to satisfaction of Owner that entire system is operating in satisfactory manner and complies with requirements of other trades that may be required to complete work. Complete instruction and demonstration prior to final job site observations.

3.9 CLEANING

- A. Confirm Cleaning requirements in Division 00, Procurement and Contracting Requirements, Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Upon completion of installation, thoroughly clean exposed portions of equipment, removing temporary labels and traces of foreign substances. Throughout work, remove construction debris and surplus materials accumulated during work.

3.10 INSTALLATION

- A. Confirm Installation requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Install equipment and devices in accordance with manufacturer's installation instructions, plumb and level and firmly secured to mounting surfaces. Maintain manufacturer's recommended clearances.
- C. Start up equipment, in accordance with manufacturer's start-up instructions, and in presence of manufacturer's representative. Test operation and demonstrate compliance with requirements. Replace damaged or malfunctioning equipment.
- D. Provide miscellaneous supports/metals required for installation of equipment.

3.11 PAINTING

- A. Confirm Painting requirements in Division 01, General Requirements and Division 09, Finishes. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
 - 1. Ferrous Metal: After completion of communications work, thoroughly clean and paint exposed supports constructed of ferrous metal surfaces in telecommunications rooms, i.e., hangers, hanger rods, equipment stands, with one coat of black asphalt varnish for exterior or black enamel for interior, suitable for hot surfaces.
 - 2. In a telecommunications room, on roof or other exposed areas, equipment not painted with enamel to receive two coats of primer and one coat of rustproof enamel, colors as selected by Architect.
 - 3. See individual equipment Specifications for other painting.
 - 4. Structural Steel: Repair damage to structural steel finishes or finishes of other materials damaged by cutting, welding or patching to match original.
 - 5. Conduit: Clean, primer coat and paint interior conduit exposed in finished areas with two coats paint suitable for metallic surfaces. Color selected by Architect.

6. Covers: Covers such as manholes, vaults and the like will be furnished with finishes which resist corrosion and rust.

3.12 ACCEPTANCE

- A. Confirm requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements. In absence of specific requirements, comply with individual Division 27, Communications Sections and the following:
 1. System cannot be considered for acceptance until work is completed and demonstrated to Architect that installation is in strict compliance with Specifications, Drawings and manufacturer's installation instructions, particularly in reference to following:
 - a. Testing Reports
 - b. Cleaning
 - c. Operation and Maintenance Manuals
 - d. Training of Operating Personnel
 - e. Record Drawings
 - f. Warranty and Guaranty Certificates, including extended manufacturer's warranties.
 - g. Start-up/test Documents and Commissioning Reports

3.13 FIELD QUALITY CONTROL

- A. Confirm Field Quality Control requirements in Division 00, Procurement and Contracting Requirements and Division 01, General Requirements, Section 27 00 00, Communications Basic Requirements and individual Division 27, Communications Sections.
- B. Tests:
 1. Conduct tests of equipment and systems to demonstrate compliance with requirements specified. Reference individual Specification Sections for required tests. Document tests and include in Operation and Maintenance Manuals.
 2. During site evaluations by Architect or Engineer, provide appropriate personnel with tools to remove and replace trims, covers, and devices so that proper evaluation of installation can be performed.

3.14 LETTER OF CONFORMANCE

- A. Provide Letter of Conformance, copies of manufacturers' warranties and extended warranties with a statement that Communications items were installed in accordance with manufacturer's recommendations, UL listings and FM Global approvals. Include Letter of Conformance, copies of manufacturers' warranties and extended warranties in Operation and Maintenance Manuals.

END OF SECTION 27 0000

SECTION 27 1300

COMMUNICATIONS BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work included:
 - 1. Copper Backbone Cable
 - 2. Fiber Optic Backbone Cable
 - 3. Copper Termination Hardware
 - 4. Fiber Optic Termination Hardware

1.2 RELATED SECTIONS

- A. Contents of Division 27, Communications and Division 01, General Requirements apply to this Section.

1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Meet requirements of NFPA 780, Standards for Installation of Lightning Protection Systems.

1.4 SUBMITTALS

- A. Submittals as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
 - 1. Procedures for cable labeling and identification, long term documentation methods and numbering scheme in accordance with ANSI/TIA/EIA- 606-A.
 - 2. A copy of certified installer certificates and warranty certificates for products proposed.

1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Manufacturers to have a recognized certified installer program in place for system components proposed. Cable will be approved with manufacturer system installed.

1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
 - 1. Labor, materials and documentation according to selected manufacturer requirements necessary to ensure that the Owner will be furnished with an Extended Product Warranty and Application Assurance of a minimum of 25 years in length. The Application Assurance Warranty will cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C.
 - 2. Provide a warranty on the physical installation.
 - 3. Furnish necessary documentation required by the manufacturer immediately following 100 percent testing of cables.
 - 4. Administer the warranty process with the responsible manufacturer's representative. Provide warranty directly to the Owner from the manufacturer. Ensure that the manufacturer provides the Owner with the appropriate warranty certification within 90 calendar days of the final project completion.

1.7 SYSTEM DESCRIPTION

- A. Provide a standards-based cable system to serve backbone communication systems requirements as specified in these specifications and shown on Drawings. Closely follow ANSI/TIA/EIA, IEEE and ISO standards which apply to backbone communication systems.
- B. Install intrabuilding backbone cables from BDF to IDF rooms through raceway systems as shown on Drawings.
- C. Install interbuilding (OSP) backbone cables from existing MDF to BDF room through new raceway systems as shown on Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Copper Backbone Cable:
 - 1. Superior Essex
- B. Fiber Optic Backbone Cable:
 - 1. CommScope/TeraSPEED
 - 2. CommScope/LazrSpeed, OM4, LOMM (for the fire alarm loop)

- C. Copper Termination Hardware:
 - 1. General:
 - a. CommScope
 - 2. Communication Entrance Protection:
 - a. Porta Systems BET with solid state fuses
 - b. Circa with solid state fuses

- D. Fiber Optic Termination Hardware:
 - 1. CommScope/SYSTIMAX

2.2 COPPER BACKBONE CABLE

- A. Backbone UTP copper cables shall consist of a core of 24 AWG solid annealed copper conductors, color-coded in accordance with telephone industry standards.
- B. As a minimum, UTP copper backbone cables will be UL Verified Category 3 and will meet or exceed the Category 3 requirements in ISO/IEC 11801, CENELEC EN50173 and EIA/TIA 568B.
- C. Conductors shall be twisted to form pairs. Cable having more than 25 pairs shall be assembled in units, each individually identified by color-coded unit binders.
- D. The mutual capacitance of any pair shall not exceed 5.6 nF per 100 m at 1 kHz. The core shall be covered with a plastic tape.
- E. The cable will be designed for use in the outdoor environment, with a gel-filled design to be used in wet locations. This includes an aluminum steel with polyethylene (ASP) sheath and a core of solid-copper conductors, dual insulated with foam skin and plastic, and surrounded by a gel filling compound.
- F. ANMW cabling is preferred.
- G. Outside Plant Cable installations will meet all ISO/IEC 11801 requirements for a horizontal link. No more than four connections are allowed, including the protection devices at each end.
- H. Refer to drawings for pair counts.

2.3 FIBER OPTIC BACKBONE CABLE

- A. The single mode fiber shall be CommScope SYSTIMAX TeraSPEED fiber.
- B. CommScope LazrSPEED OM4 LOMMF for the fire alarm loop. The 12 strand indoor-outdoor cable will run from the FA panel in building 5 to the IT building FA panel for connection to the campus loop. The data contractor is to install. To be terminated on 12 LC connectors at each

end. In the IT building it will use an available slot in the SME. In Building 5 it will terminate on a wall-mount SME.

- C. Class IVa Dispersion-Unshifted single mode optical fibers complying with ANSI/EIA/TIA-492BAAA.
 - 1. The zero dispersion wavelength shall be between 1300 nm and 1324 nm. The ANSI/EIA/TIA-455-168 maximum value of the dispersion slope shall be no greater than 0.093 ps/km-nm.
 - 2. Dispersion measurements shall be made in accordance with ANSI/EIA/TIA-455-169 or ANSI/EIA/TIA-455-175.
- D. The nominal core diameter shall be 8.3 μm to 10.0 μm with a tolerance of plus/minus 0.5 μm at 1300 nm when measured in accordance with ANSI/EIA/TIA-455-164 or ANSI/EIA/TIA-455-167
- E. Meet the graded performance specifications below.

Transmission Characteristics	
Maximum Attenuation	Cable Type
1.0 dB/km at 1310/1550 nm	Riser (inside) Plant
0.50 dB/km at 1310/1550 nm	Outside Plant

2.4 COPPER TERMINATION HARDWARE

- A. Patch Panels:
 - 1. 48-port - 8-position jack panel, high density with 8 port modules with IDC terminals, T568A/B wiring scheme.
 - 2. Install quantity required to terminate copper backbone cabling, 1-pair per port.
 - 3. Wire management will be integrated in the copper patch panels.
- B. Communications Entrance Protection (BET)
 - 1. Available in 25, 50 and 100 pair counts.
 - 2. Industry standard 5-pin sealed protector field.
 - 3. Available with factory install solid state protectors.
 - 4. IDC connections.

2.5 FIBER OPTIC TERMINATION HARDWARE

- A. High Density Fiber Termination Shelf:

1. 7-inch high shelf designed for mounting in 19-inch equipment racks and capable of accepting 12 adapter panels. The shelf will contain built-in slack management and be accessible from the front or rear with locking doors for use in IDFs. Commscope part # HD-4U
 - a. 19-inch rack mount, 13-inches deep.
2. 3.5-inch high shelf designed for mounting in 19-inch equipment racks and capable of accepting 6 adapter panels. The shelf will contain built-in slack management and be accessible from the front or rear with locking doors for use in IDFs. Commscope part # HD-2U
 - a. 19-inch rack mount, 13-inches deep.

3. CommScope Surface Wall Mount Enclosure: For Fire Alarm Terminations and Housing.
 - a. WBE-EMT-BK-2P-PNL.

4. Fiber patch panels will have integrated cable management in the front and cable guides in the rear.

5. Fiber Adapter Panels:

- a. Adapter panel for high density termination shelf with 6 simplex SC phosphor-bronze alignment sleeves.

- b. 12-simplex LC connector panel for fire alarm.

B. Singlemode Connector:

1. All connectors are to be glass-in-ceramic SC-compatible field-installable duplex connectors.
 - a. 568SC connectors shall meet ANSI/EIA/TIA-604-3 standards.
 - b. Connectors must have a locking feature to the coupler to prevent optical disconnect.
 - c. The connector shall have an optical axial pull strength of 2.2 N at 0 degree angle and an optical off axial pull strength of 2.2 N at a 90 degree angle, with a maximum 0.5 dB increase in attenuation for both tests when tested in accordance with ANSI/EIA/TIA-455-6B.
 - d. Adhere to all manufacturer installation guidelines.
 - e. Single mode duplex connectors shall be blue.
 - f. The maximum optical attenuation per each mated field installed connector pair shall not exceed 0.75 dB.

- g. The total optical attenuation through the cross-connect from any terminated optical fiber to any other terminated fiber shall not exceed 1.5 dB



PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Miscellaneous Hardware: Provide supporting hardware, cable ties, labels, underground vault racking, bullet bonds, gel blocking kits, pull rope and other miscellaneous hardware for a complete and operable system.
- B. Provide like items from one manufacturer, such as cable, patch panels, connectors, and equipment connection cords.
- C. Communications Backbone Cabling includes cables, connectors, patch panels, connecting blocks and patch cords, as well as the necessary support systems, such as cable managers, tie wraps and D-rings.
- D. Furnish and install materials necessary for a complete and working system.
- E. Contractor must be a Certified Installer for selected manufacturer prior to, during and through completion of the system installation and must be able to provide the manufacturer's extended warranty.
- F. Perform work in a neat and workmanlike manner.
- G. Firestopping: Install all firestop systems in accordance with manufacturer's recommendations. Firestop systems to be completely installed and available for inspection by local inspection authorities prior to cable system acceptance.
- H. Install cable after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- I. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned:
1. Inspect conduit, wireway, cable trays and innerduct systems prior to installation.
 2. Swab any additional enclosed raceway and innerduct systems.
- J. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.
- K. Install cable ties and other cable management clamps via hand so they fit snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.

- L. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use Velcro ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.
- M. Limit cable raceway fill to less than the TIA/EIA-569-B maximum fill for the particular raceway type.
- N. If a J-hook or trapeze system is used to support cable bundles, support cables at a maximum of 48-inch intervals. Cables are prohibited to rest on acoustic ceiling grids or panels.
- O. Install cable above fire-sprinkler systems and ensure the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware so it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- P. Do not attach cables to ceiling grid or lighting fixture wires. Where support for cable is required, install appropriate carriers to support the cabling.
- Q. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.
- R. Unshielded Twisted Pair Cable Installation Practices:
 - 1. Install cable in accordance with manufacturer's recommendations and best industry practices.
 - 2. Do not exceed the cable's minimum bend radius and maximum pulling tension.
 - 3. Install unshielded twisted pair cable so there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
- S. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:
 - 1. Open or Nonmetal Communications Pathways:
 - a. 12-inches from electric motors, fluorescent light fixtures and unshielded power lines carrying up to 3 kVA.
 - b. 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c. 48-inches from large electrical motors or transformers.
 - 2. Grounded Metal Conduit Communications Pathways:
 - a. 2-1/2-inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
 - b. 6-inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.

- c. 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - d. 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - e. 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.
- T. Determine requirements for plenum rated cable and devices. When doubt exists, seek prior determination in writing by AHJ.
- U. Seal conduits entering from outside the building and install listed firestop material in conduits and sleeves to satisfy CEC and local codes.
- V. Unshielded Twisted Pair Termination:
 - 1. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document, manufacturer's recommendations and best industry practices.
 - 2. Maintain the cable jacket within 1-inch of the termination point.
 - 3. Do not exceed 0.5-inch of pair untwist at the termination point.
 - 4. Do not exceed 4 times the outside diameter of the cable in the termination area for bend radiance compliance.
 - 5. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- W. Testing Procedures:
 - 1. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA 568-C. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels and connector blocks in order to ensure 100 percent useable conductors in cables installed.
 - 2. Test cables in accordance with this document, the ANSI/TIA/EIA standards, the manufacturer's procedures and best industry practice. If any of these are in conflict, bring any discrepancies to the attention of the project team for clarification and resolution.
 - 3. Test Unshielded Twisted Pair cables as follows:
 - a. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance.

- b. Continuity: Test each pair of each installed cable using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Test shielded/screened cables with a device that verifies shield continuity in addition to the above stated tests. Record the test as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures and referenced to the appropriate cable identification number and circuit or pair number. Correct or repair any faults in the wiring and re-test the cable prior to final acceptance.
 - c. Length: Test each installed cable link for installed length using a TDR type device. Test the cables from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multi-pair cables, record the shortest pair length as the length for the cable.
- 4. Follow the Standards requirements established in ANSI/TIA/EIA-568-C.
 - 5. Provide test results in electronic format, with the following minimum information per cable:
 - a. Circuit ID
 - b. Test result, "Pass" or "Fail"
 - c. Date and Time of test
 - d. Project Name
 - 6. The technician will examine open and shorted pairs to determine if the error is a termination issue. If not correctable, the technician shall tag bad pairs at both ends, and make note on the as-built documentation. If copper backbone cable contains more than one (1) percent bad pairs, the Contractor shall remove and replace the cable at the Contractor's expense.
 - 7. Test fiber backbone cabling as follows:
 - a. The tester shall be capable of performing the tests required by ANSI/TIA-568-C, ANSI/TIA-526-14C, and ANSI/TIA-526-7.
 - b. A manufacturer-certified calibration facility shall have calibrated the tester dated no more than 60 days prior to the start of testing.
 - c. All testing procedures and testers shall comply with applicable requirements of ANSI/TIA 568-C.
 - d. End-to-end attenuation testing using an approved Power Meter and Light Source per ANSI/TIA 455-53A.
 - e. Backbone single mode fiber shall be tested at both 850nm and 1300 nm in accordance with ANSI/TIA-526-7 method A.1.

- f. Backbone for Singlemode fiber shall be tested at both 1310 nm and 1550 nm in accordance with ANSI/TIA-526-7.
 - g. The acceptable link attenuation for backbone 8.3 to 9/125 single mode fiber based on distance shall be 1.0 dB/km at 1310 nm and 1550 nm for inside plant.
 - h. The acceptable link attenuation for backbone 50 Mu, LOMM, based on distance shall be 3.0 db/km at 850 nm and 1.0 db/km at 1300 nm.
 - i. All fiber optic cables will be tested and results will be submitted for all fibers in an electronic format and provide one (1) soft copy of the test results showing graphically, the entire length of the fiber. The Contractor shall submit (1) copy of software capable of viewing the electronic test result files.
8. Fiber Test Documentation: Provide electronic test reports from ANSI/TIA/EIA-526-14A Method B Standards. Calculate a "Loss Budget" for each cable length based on cable length and connectors. Provide as a minimum, OTDR test results in the form of a printed waveform and text table for 1350 nm and 1510 nm for singlemode fiber. Test fibers and connector systems for end-to-end attenuation. Provide a power meter test on fiber optic strands at both wavelengths A to B, B to A and OSPL (OSPL is as defined as $L_a + L_b$). Include the results of unsatisfactory tests, with an explanation of how the problem was corrected. Clearly label connector and fiber loss on test waveforms.
 9. Provide test results to CLPCCD ITS in electronic format, including native tested software format, and PDF.
 10. Provide a fully functional version of the tester software for use by CLPCCD ITS in reviewing the test results.

3.2 COPPER BACKBONE CABLE

- A. Use pulling compound when necessary; pulling compound must be a water-base pulling lubricant that will not deteriorate cable or conduit. Adhere to all manufacturers' requirements regarding pulling tension and allowable lubricants.
- B. All cable/cabling shall be kept 30 inches away from any heat source; i.e., steam valves, etc.
- C. Cables shall be pulled free of sharp bends, kinks, twists, or impact damage to the sheath.
- D. Cables shall not be pulled across sharp edges. All conduits and sleeve with rough edges will be provided with bushings on both ends. Cables shall not be forced or jammed between metal parts, assemblies, etc.
- E. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
- F. Cable splicing will not be permitted at any point within a cable run.
- G. All outside plant backbone cables will be installed in conduit.

- H. Aerial runs are not permitted.
- I. Conduits will not be filled to greater than a 40 percent fill.
- J. Conduits must have appropriately size pull-boxes every 300 feet. When the conduit routes through up to a total of two 90 degree bends (180 degrees total) in any dimensional plane, pull-boxes are also required. Cabling will not be installed in conduits that do not meet these specifications.
- K. Backbone cables will be installed with a 30 foot service loop. At each building , the service loops will be coiled neatly in the pull box or nearest hand hole on the building's exterior wall. Cable mountings and service loops on backboards will be installed efficiently to minimize the backboard space consumed. All cables will be routed at right angles, in accordance with the bend radius specifications for the type of cable being routed. Cables will be tie-wrapped every 4 to 6 feet.
- L. Cable shall be continuous and without splices (Splices imply same pair count cable splices: i.e.: 200-pair to 200-pair).
- M. Verify all actual cable distances.
- N. All outside plant cables will be terminated within 50 feet of the entrance point. This is a maximum cable measurement and includes lengths for service loops, routing, backboard and patch panel mounting inside the building.
- O. Labeling:
 - 1. 1. All riser copper cables will be labeled at each end of the cable bundle at the furthest point where the sheath is intact (before breakout). If the riser cables pass through multiple pull points, Telecommunication rooms and riser openings, the cables will be labeled at each opening.
 - 2. All outside plant backbone copper cables will be labeled at each end and in each handhole/maintenance hole that they pass through. Labels will be heat and water-proof so they do not decay when exposed to the elements. All labels must be visible at every point of access.
 - 3. All cables will be labeled according to the guidelines as set forth in the EIA/TIA 606-A standard. This shall include:
 - a. The origination point
 - b. The destination point
 - c. The type of cable
 - d. The pair count

3.3 FIBER OPTIC BACKBONE CABLE

- A. Permanent buildings will be equipped with outside plant backbone cables to the Main Telecommunications MDF Room at each campus.
- B. For each building, outside plant backbone fiber will consist of, as a minimum, a 24-strand, single mode fiber bundle.
- C. Where diverse pathways exist and need dictates, a redundant set of backbone fiber cables may be specified for building connectivity. Redundant backbone cabling will be of the same type and composition as the primary fiber backbone cabling.
- D. Fiber backbone cabling is to be installed between the IDF rooms and the BDF.



- 1. All riser fiber backbones will consist of 12-strand, OSP, single mode fiber, CommScope TeraSPEED.



- E. All fiber optic cable shall be installed in the following manner:
 - 1. Use pulling compound when necessary; pulling compound must be a water-base pulling lubricant that will not deteriorate the cable or conduit.
 - 2. All cable/cabling shall be kept 30 inches away from any heat source; i.e., steam valves, etc.
 - 3. Cables shall be pulled free of sharp bends, kinks, twists, or impact damage to the sheath.
 - 4. Cables shall not be pulled across sharp edges. All conduits and sleeve with rough edges will be provided with bushings on both ends. Cables shall not be forced or jammed between metal parts, assemblies, etc.
 - 5. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
 - 6. Cable splicing will not be permitted at any point within a cable run.
 - 7. Conduits will not be filled to greater than a 40 percent fill.
 - 8. Outside Plant Conduits must have appropriately size pull-boxes every 400 feet. When the conduit routes through up to a total of two 90 degree bends (180 degrees total) in any dimension plane, additional pull-boxes are also required. Cabling will not be installed in conduits that do not meet these specifications.
 - 9. Backbone cables will be installed with a 30 foot service loop. The service loops will be coiled neatly in the nearest pull box or hand-hole to the building's exterior wall.
 - 10. Cable mountings and service loops on backboards inside Telecommunication Rooms will be installed efficiently to minimize the backboard space consumed. All cables will be routed at right angles, in accordance with the bend radius specifications for the type of cable being routed. Cables will be tie-wrapped every 4 to 6 feet.

11. All outside plant cables will be terminated within 50 feet of the entrance point. This is a maximum cable measurement and includes lengths for service loops, routing, backboard and patch panel mounting inside the building.
12. Polarization for entire system shall be maintained as described in ANSI/EIA/TIA-568-B section 12.7.1.
13. All optical fiber cables shall be terminated on rack-mounted optical fiber patch panels using six (6) SC connectors per slot.
14. No fiber will be left unterminated.

F. Labeling:

1. All backbone fiber cables (riser cables) will be labeled at each end of the cable bundle at the furthest point where the sheath is intact (before breakout). If the riser cables pass through multiple pullboxes, Telecommunication rooms and riser openings, they will be labeled at each opening.
2. All outside plant backbone fiber cables will be labeled at each end and in each handhole/maintenance hole that they pass through.
3. Labels will be heat and water-proof so they do not decay when exposed to the elements.
4. All labels must be visible at point of access.
5. All cables will be labeled according to the guidelines as set forth in the EIA/TIA 606-A standard. This shall include:
 - a. The origination point
 - b. The destination point
 - c. The type of cable (SMF, 50MMF)
 - d. The fiber strand count

3.4 COPPER TERMINATION HARDWARE

- A. Install per manufacturer's instructions and recommendations.
- B. Reference 3.1, General Installation Requirements.
- C. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-B standard, manufacturer's recommendations and best industry practices.
- D. Pair untwist at the termination is not to exceed 0.125-inch.
- E. Bend radius of the cable in the termination area is not to exceed four times the outside diameter of the cable.

- F. Dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle, separated and dressed back to the point of cable entrance into the rack or frame.
- G. Maintain the cable jacket to the termination point.

3.5 COMMUNICATIONS ENTRANCE PROTECTION

- A. Only the copper backbone cables that extend from the BDF to the IT buildings will be terminated at both ends on protector blocks.
- B. All pairs at both ends of the copper backbone cable shall be protected.
- C. The protector blocks will be housed within a covered case. Protectors will be sized for the termination of all pairs in the copper backbone cable.
- D. The protector blocks shall be fully populated with solid-state or gas-tube protection fuses.
- E. The protector blocks will contain an integrated 110 block for extension to the building cross connect fields or patch panels.
- F. The Protection Block Shall Have an integrated 26 AWG stub.
- G. the protection blocks shall be grounded with a #6 AWG copper bonding conductor between the protector ground lug and Telecommunications Grounding Busbar.
- H. Copper extension cables shall be installed from the protector blocks to the copper patch panels, extending one pair per jack.
- I. CLPCCD uses the Porta Systems BET with solid state fuses for its standard products.
- J. Each building is provisioned with a wall-mount BET of sufficient quantity, fully-fused at the building end.



Labeling:

1. Copper protectors shall be marked using adhesive labels indicating the range of copper backbone pairs installed in it.
2. Each panel shall be labeled with the origination and destination Telecommunication Spaces and the pair count.
3. Backbone cables will be labeled in the following locations:
 - a. 12-inch from each end
 - b. At each service loop
 - c. In each pullbox/maintenance hole/pull can

4. Data fiber will have YELLOW labels. Copper will have WHITE labels. FA fiber will have RED labels.

3.6 FIBER OPTIC TERMINATION HARDWARE

- A. Install per manufacturer's instructions and recommendations.
- B. Reference 3.1, General Installation Requirements.
- C. Neatly coil fiber slack within the fiber space tray or enclosure.
- D. All fiber patch panels shall be placed at the highest point possible in the rack or cabinet.
- E. Individually attach each cable to its respective fiber enclosure by mechanical means. Securely attach the cable strength member to the cable strain-relief bracket in the enclosure.



- F. Clearly label each cable at the entrance to the enclosure. Cables labeled within the bundle will not be accepted.

END OF SECTION 27 1300

SECTION 27 1500

COMMUNICATIONS HORIZONTAL CABLING

PART 1 - GENERAL

1.1 SUMMARY

- A. Work Included:
 - 1. Station Cabling
 - 2. Telecommunications Jacks
 - 3. Work Area Outlets
 - 4. Patch Panels

1.2 RELATED SECTIONS

- A. Contents of Division 27, Communications and Division 01, General Requirements apply to this Section.
- B. Use this Section in conjunction with other Division 27, Communications specifications and related Contract Documents to establish the total general requirements for the project communications systems and equipment.

1.3 REFERENCES AND STANDARDS

- A. References and Standards as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. Meet requirements of NFPA 780, Standard for the Installation of Lightning Protection Systems.

1.4 SUBMITTALS

- A. Submittals as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
 - 1. Procedures for cable labeling and identification, long term documentation methods and numbering scheme in accordance with ANSI/TIA/EIA-606A.
 - 2. A copy of certified installer certificates and warranty certificates for products proposed.

1.5 QUALITY ASSURANCE

- A. Quality assurance as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.

- B. Manufacturers to have a recognized certified installer program in place for system components proposed. Cable will be approved with manufacturer system installed.

1.6 WARRANTY

- A. Warranty of materials and workmanship as required by Section 27 00 00, Communications Basic Requirements and Division 01, General Requirements.
- B. In addition, provide:
 - 1. Labor, materials and documentation according to selected manufacturer requirements necessary to ensure that the Owner will be furnished with an Extended Product Warranty and Application Assurance of a minimum of 25 years in length. The Application Assurance Warranty will cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of ANSI/TIA/EIA-568-C.1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T, 10GBASE-T and 155 Mb/s ATM.
 - 2. A warranty on the physical installation.
 - 3. Necessary documentation required by the manufacturer immediately following 100 percent testing of cables.
- C. Administer the warranty process with the responsible manufacturer's representative. Provide warranty directly to the Owner from the manufacturer. Ensure that the manufacturer provides the Owner with the appropriate warranty certification within 90 calendar days of the final project completion.

1.7 SYSTEM DESCRIPTION

- A. Provide a standards-based cable system to serve horizontal communication systems requirements as specified and as shown on Drawings. Closely follow ANSI/TIA/EIA, IEEE and ISO standards.
- B. The horizontal distribution subsystem refers to intrabuilding twisted-pair communications cabling connecting telecommunications room (BDF and IDFs) to telecommunications outlets located at individual work areas and consists of the following:
 - 1. Category 6A 100 ohm, 4-pair, unshielded twisted pair cables from the telecom rooms to the outlets.
 - 2. The horizontal system includes cables, jacks, patch panels and patch cords, as well as the necessary support systems, such as cable managers and faceplates.
 - 3. Cables are routed through conduit, spaces below raised floors, open ceiling areas, non-ventilated spaces above ceiling tile and through plenum air-handling spaces above ceiling tile.
 - 4. Furnish and install materials necessary for a complete and working system.

- C. Telecommunications Outlets are provisioned with 5-inch square style Randl Telecommunications backboxes and single gang faceplates.
- D. Each Telecommunications outlet will have one (1) 1-1/4-inch conduit for every four cables that extends from the backbox to the accessible ceiling space, communications J-Hook or within 6-inch of a cable tray run.
- E. The following telecommunication outlet standards are in use:
 - 1. Type A – one voice, one data (1V1D) in four-port faceplate, unused ports blanked.
 - 2. Type B – two data (2D) in four-port faceplate, unused ports blanked.
 - 3. Type C – two voice, two data (2V2D) in four-port faceplate.
 - 4. Type D – four data (4D) in four-port faceplate.
 - 5. Type E – one voice (1V) in one port faceplate with knobs for hanging wall phones.
- F. Any outlets provisioned above ceiling for projector, access point or other device connectivity, shall be finished on a plenum surface mount box.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Station Cabling:
 - 1. CommScope/SYSTIMAX
- B. Telecommunications Jacks:
 - 1. CommScope/SYSTIMAX
- C. Work Area Outlets:
 - 1. CommScope/SYSTIMAX
- D. Patch Panels:
 - 1. CommScope/SYSTIMAX

2.2 STATION CABLING

- A. To support a complete Category 6A channel, all cabling components will be certified for Category 6A transmission. This includes patch panels, cross-connect blocks, patch cords and outlet jacks.

- B. All station cabling is to be Category 6A Unshielded Twisted Pair: 100 ohm, Category 6A, 23 AWG, 4-pair unshielded twisted pair, with a CMP rated jacket. Indoor/Outdoor rated UTP cable is required for cabling between Building 2 and Building 6.
- C. Station cabling for different transmissions systems shall be cabled with different colors cable sheaths for ready identification. The cable sheaths will be blue for data and white for voice.
- D. Other low-voltage subsystems must specify cabling with different color sheaths, so as to avoid confusion with voice/data cabling.
- E. Cable colours will be
 - 1. Blue for data
 - 2. White for voice
 - 3. Black where OSP cabling is required

2.3 TELECOMMUNICATIONS JACKS

- A. Category 6A Jacks:
 - 1. Eight-position jack, Category 6A, IDC terminals, T568A/B wiring scheme
 - 2. Each jack must be stamped or have icons to identify it as CAT 6A.
 - 3. Commscope/SYSTIMAX MGS 600 (White for Voice and Blue for Data)

2.4 WORK AREA OUTLETS

- A. Flush Mounted Faceplate:
 - 1. Four-port faceplate, constructed from high impact thermo-plastic, with recessed label fields; mounts within a single-gang mud ring as indicated on the drawings.
 - 2. Coordinate faceplate color with building finishes. Submit to Architect for approval prior to installation.
- B. Flush Mounted Stainless Steel Faceplates:
 - 1. One-port stainless steel faceplate, with recessed label fields and lugs; mount within a single gang wall box as indicated on the drawings at phone locations only.
- C. Surface Mounted Outlet Boxes:
 - 1. Two-port surface mount box plenum rated, constructed from high impact thermo-plastic, with recessed label fields.
- D. For modular furniture locations, install the jacks using manufacturer-supplied faceplates and/or adapters that accommodate the CommScope SYSTIMAX MGS-600 jacks.

- E. Dust Covers: Single port dust cover for modular openings, color to match faceplate.

2.5 PATCH PANELS

- A. Category 6A patch panels will be used for termination of all voice and data station cabling.
- B. Category 6A patch panels shall meet or exceed the following specifications:
 - 1. EIA/TIA Category 6A standard.
 - 2. Rack mounted with front-facing RJ-45 patch panels and rear-facing 110 blocks.
 - 3. Will be T568-B wired.
 - 4. Have a paired punch down sequence with termination managers to allow pair-twist within 1/2-inch of the termination.
 - 5. RJ-45 jacks will be modular to allow discrete removal and replacement of jacks without removal of the entire patch panel, as maintenance issues arise.
 - 6. UL listed.
 - 7. Must have 48 ports Angled Patch Panels with cable management rear suspension racks.
 - 8. Must be from the same manufacturer as the other connectivity products (cable, jacks, faceplates, etc.).
- C. Rear patch panel cable management should include the 2-inch or 5-inch cable support bars.
- D. The cable is required to enter perpendicular to the termination.
- E. All cable bundles on cable support bars will be managed with Velcro straps. Tie-wraps are not acceptable. CLPCCD also permits the use of cable "sock" for cable management.

PART 3 - EXECUTION

3.1 GENERAL INSTALLATION REQUIREMENTS

- A. Miscellaneous Hardware: Provide supporting hardware, velcro ties, labels, pull rope and other miscellaneous hardware for a complete and operable system.
- B. Provide like items from one manufacturer, such as jacks, patch panels, equipment connection cords and wall plates.
- C. Horizontal cabling includes cables, jacks, patch panels, connecting blocks and patch cords, as well as the necessary support systems, such as cable managers and faceplates.
- D. Furnish and install materials necessary for a complete and working system.

- E. Contractor must be a Certified Installer for selected manufacturer prior to, during and through completion of the system installation and must be able to provide the manufacturer's extended warranty.
- F. Perform work in a neat and workmanlike manner.
- G. Install velcro after interior of building has been physically protected from the weather and mechanical work likely to damage cabling has been completed.
- H. Before installing cabling, ensure cable pathways are completely and thoroughly cleaned.
 - 1. Inspect conduit, wireway, cable trays and innerduct systems prior to installation.
 - 2. Swab any additional enclosed raceway and innerduct systems.
- I. Provide protection for exposed cables where subject to damage. Provide abrasion protection for any cable or wire bundles, which pass through holes or across edges of sheet metal.
- J. Install cable ties and other cable management clamps via hand so it fits snugly. Do not over tighten or use mechanical tools which could compress, crimp, or otherwise change the physical characteristics of the cable jacket or distort the placement of twisted-pair components. Replace any cable exhibiting stresses due to over tightening of cable management devices.
- K. Where possible, route cables in overhead cable trays and inside wire management systems attached to the equipment cabinets and racks. Use Velcro ties or ducts to restrain cabling installed outside of wire management systems on racks or in cabinets.
- L. Co-install a pull cord (nylon; 1/8-inch minimum) with cable installed in conduit.
- M. Limit cable raceway fill to less than the TIA/EIA-569-B maximum fill for the particular raceway type.
- N. If a J-hook or trapeze system is used to support cable bundles, support horizontal cables at a maximum of 48-inch intervals. Cables are prohibited to rest on acoustic ceiling grids or panels.
- O. Bundle horizontal distribution cables in groups of no more than 50 cables. Cable bundle quantities in excess of 50 cables may cause deformation of the bottom cables within the bundle and degrade cable performance.
- P. Install cable above fire-sprinkler systems and ensure that the cable does not attach to the system or any ancillary equipment or hardware. Install cable system and support hardware such that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- Q. Do not attach cables to ceiling grid or lighting fixture wires. Where support for horizontal cable is required, install appropriate carriers to support the cabling.
- R. Any cable damaged or exceeding recommended installation parameters during installation will be replaced by the contractor prior to final acceptance at no cost to the Owner.

- S. Determine requirements for plenum rated cable and devices. When in doubt, seek determination in writing by Authority Having Jurisdiction (AHJ) prior to ordering. Without written confirmation from the AHJ, Contractor to assume that a plenum rating is required.
- T. Unshielded Twisted Pair Cable Installation Practices:
1. Install cable in accordance with manufacturer's recommendations and best industry practices.
 2. Install cables in continuous lengths from origin to destination (no splices).
 3. Do not exceed the cable's minimum bend radius and maximum pulling tension.
 4. Install unshielded twisted pair cable so that there are no bends smaller than four times the cable outside diameter at any point in the run and at the termination field.
 5. Do not exceed 25-lbf pulling tension on 4-pair UTP cable.
- U. Provide the following minimum separation distances between pathways for copper communications cables and power wiring of 480 volts or less:
1. Open or Nonmetal Communications Pathways:
 - a. 12-inches from electric motors, fluorescent light fixtures and unshielded power lines carrying up to 3 kVA.
 - b. 36-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - c. 72-inches from large electrical motors or transformers.
 2. Grounded Metal Conduit Communications Pathways:
 - a. 2-1/2-inches from electrical equipment and unshielded power lines carrying up to 2 kVA.
 - b. 6-inches from electrical equipment and unshielded power lines carrying from 2 kVA to 5 kVA.
 - c. 12-inches from electrical equipment and unshielded power lines carrying more than 5 kVA.
 - d. 3-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying from 2 kVA to 5 kVA.
 - e. 6-inches from power lines enclosed in a grounded metal conduit (or equivalent shielding) carrying more than 5 kVA.
- V. Unshielded Twisted Pair Termination:

1. Coil cables in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturers bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. Do not store more than 12-inches of UTP in an in-wall box, modular furniture raceway, or insulated walls. Loosely coil and store excess slack in accessible ceiling space above each drop location when there is not enough space present in the outlet box to store slack cable.
2. Dress and terminate cables in accordance with the recommendations made in the ANSI/TIA/EIA-568-C.1 document.
3. Terminate four pair cables on the jack and patch panels using T568B wiring scheme.
4. Maintain the cable jacket within 1/2-inch of the termination point.
5. Do not exceed 0.5-inch of pair untwist at the termination point.
6. Do not exceed four times the outside diameter of the cable in the termination area for bend radiance compliance.
7. Neatly bundle and dress cables to their respective panels or blocks. Feed each panel or block by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.

W. Testing Procedures:

1. Test cables and termination hardware for defects in installation and to verify cabling system performance under installed conditions according to the requirements of ANSI/TIA/EIA-568-C. Verify pairs of each installed cable prior to system acceptance. Repair or replace any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels and connector blocks in order to ensure 100 percent useable conductors in cables installed.
2. Test cables in accordance with this document, the ANSI/TIA/EIA standards, the manufacturer's procedures and best industry practice. If any of these are in conflict, bring any discrepancies to the attention of the project team for clarification and resolution.
3. Test Unshielded Twisted Pair Cables as Follows:
 - a. Test twisted-pair copper cable links for continuity, pair reversals, shorts, opens and performance as indicated below. Additional testing is required to verify Category performance. Test horizontal cabling using a Level IV test unit for Category 6A performance compliance as specified in ANSI/TIA/EIA-568 C.
 - b. Continuity: Test each pair of each installed cable using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Test shielded/screened cables with a device that verifies shield continuity in addition to the above stated tests. Record the test as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures and referenced to

the appropriate cable identification number and circuit or pair number. Correct or repair any faults in the wiring and retest the cable prior to final acceptance.

- c. Length: Test each installed cable link for installed length using a TDR type device. Test the cables from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length will conform to the maximum distances set forth in the ANSI/TIA/EIA-568-C Standard. Record cable lengths, referencing the cable identification number and circuit or pair number. For multipair cables, record the shortest pair length as the length for the cable.
4. Follow the Standards requirements established in ANSI/TIA/EIA-568-C.
5. Perform testing with a Level IV tester. The basic tests required are:
 - a. Wire Map
 - b. Length
 - c. Attenuation
 - d. NEXT (Near-end Crosstalk)
 - e. Return Loss
 - f. ELFEXT Loss
 - g. Propagation Delay
 - h. Delay Skew
 - i. PSNEXT (Power Sum Near-end Crosstalk Loss)
 - j. PSELFEXT (Power Sum Equal Level Far-end Crosstalk Loss)
6. Provide test results in electronic format, with the following minimum information per cable:
 - a. Circuit ID
 - b. Test Result, "Pass" or "Fail" (NOTE: any "Fail" is not acceptable - re-terminate or replace the cable until a "Pass" is achieved)
 - c. Date and Time of Test
 - d. Project Name
7. Provide an electronic copy of the test results, in the native tester software format, to the Architect or Engineer along with the printed test results.
8. Provide a fully functional version of the tester software for use by the Architect or Engineer in reviewing the test results.

9. Cable Testing Validation: After installation is completed and the Telecommunication Contractor has completed testing, the CLPCCD District ITS reserves the right to separately test the installed cables, up to 100 percent using the Telecommunication Contractor testing equipment or with CLPCCD-provided computer/network equipment. Cables that have been tested and fail to meet performance requirements as stated in the specifications shall be removed and replaced with all new material and re-tested at no cost to the College.

X. Labeling:

1. Station cables shall be marked at each end, on the sheath indicating the Telecommunications Room and jack number to which the cable is wired.
2. Backbone cables shall be marked at each endpoint and at all intermediate pull/ access points or junction boxes. Label shall indicate origination and destination Telecommunication Rooms, sheath ID and strand or pair range.
3. Meet the legibility, defacement, exposure and adhesion requirements of UL 969.
4. Be pre-printed or laser printed type.
5. Where used for cable marking, a label with a vinyl substrate and white printing area and a clear "tail" that self laminates the printed area when wrapped around the cable shall be provided. The label color shall be different than that of the cable to which it is attached.
6. Where insert type labels are used, provide clear plastic covers to go over label.
7. The Contractor shall confirm specific labeling requirements with the Owner or Owner's Representative prior to cable installation or termination.


- Y. Coordination of Conditions: Structured cabling for wireless access points of a given description may be used in more than one type of ceiling or wall structure. Coordinate ceiling construction, wall types, recessing depth and other construction details prior to ordering special components indicated in the details for shipment. Where materials supplied do not match ceiling construction replace them at no cost to Owner.

3.2 STATION CABLING


- A. Reference 3.1, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Labeling: All station cables will be labeled at each end of the cable within 6-inches of the termination. At the patch panel end, all labels must be visible and not be placed inside wire management. Station cables will also be labeled on the faceplate. All cables will be labeled according to the guidelines as follows:
 1. Name of the Telecommunications Space where the cables terminate.

2. Faceplate/outlet number
3. Jack label – alpha (A, B, C, D) labeled left to right, top to bottom.
4. All labeling will be reviewed and approved by CLPCCD before cable installation.


3.3 TELECOMMUNICATIONS JACKS

- A. Reference  3.1, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.

3.4 WORK AREA OUTLETS

- A. Reference  3.1, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Labeling: All faceplates/outlets for station cable terminations will be labeled. This includes wall outlets, wall phones, faceplates in floor boxes and all other termination points. For faceplates equipped with a label trough and plastic cover, the Contractor shall include the jack designation in the label trough. If upper and lower troughs are available, the Contractor shall divide the jack labeling horizontally, labeling the top two jacks in the upper trough and the bottom two jacks in the lower trough. All faceplates/outlets will be labeled according to the following guidelines:
 1. Name of Telecommunication Space the cable routes to.
 2. Unique faceplate/outlet number, incrementing numerically.

3.5 PATCH PANELS

- A. Reference  3.1, General Installation Requirements.
- B. Install per manufacturer's instructions and recommendations.
- C. Labeling: All ports on the station patch panels shall be labeled with the station cable labels described above. Cables will be terminated in ascending outlet and jack order, and be so labeled. Patch panels which provide cabling connection to voice riser and backbone pairs shall be labeled using a similar convention as the backbone/riser cable labeling. The patch panel will be labeled with the cable name including:
 1. The origination point
 2. The type of cable
 3. Each jack will be labeled for each pair in the riser/backbone cable

END OF SECTION 27 1500