

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Testing Publications and Standards
- B. Category rated UTP systems shall be provided and tested in accordance with the performance level established in Specification Section 16720, paragraph 2.1.B.
- C. Inspection and testing procedures for copper and fiber optic cable and RF CATV riser systems.
- D. Documentation and As-Built Requirements
- E. The Contractor shall acquire and be intimately familiar with the latest issue and publication of documentation provided by its selected Structured Cable System supplier to its certified installation contractors. Final testing of all installed systems, subject to the supplier extended warrantee, shall be consistent with the supplier's testing requirements and shall be accomplished in a manner that assures a fully warranted installation. Selected examples of this documentation is listed below. This listing is for information and may not be complete. The Contractor is specifically responsible for compliance with all necessary the SCS suppliers recommended installation and testing procedures.

The Contractor shall assure the certification of and familiarity with the applicable documentation by all telecommunications systems installers. The Contractor shall identify to the University the documents it understands to be the comprehensive installation guidelines for the SCS supplier proposed by the Contractor for this project.

1.2 PUBLICATIONS AND STANDARDS

- A. Electronics Industry Association/Telecommunications Industry Association (EIA/TIA)
 - (1) EIA/TIA 568B.1 – General Requirements
EIA/TIA 568B.2 – 100-Ohm Balanced twisted Pair Cabling Standard
EIA/TIA 568B.3 – Optical Fiber Cabling Component Standard
 - (2) EIA/TIA 569 - Commercial Building Standard for Telecommunications Pathways and Spaces
 - (3) EIA/TIA TSB 36 - Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted Pair Cables
 - (4) EIA/TIA TSB 40A - Additional Transmission Specifications for Unshielded Twisted-Pair Connecting Hardware
 - (5) EIA/TIA TSB 67 - Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems.
 - (6) EIA/TIA TSB 72 - Centralized Optical Fiber Cabling Guidelines
 - (7) EIA/TIA 606 - Administration Standard for the Telecommunications Infrastructure of Commercial Buildings

- (8) EIA/TIA 607 - Commercial Building Grounding and Bonding Requirements for Telecommunications
 - (9) EIA - 310-D - Cabinets, Racks, Panels, and Associated Equipment
 - (10) EIA/TIA-455-57A - Optical Fiber End Preparation and Examination
 - (11) EIA/TIA 455-59 - Measurement of Fiber Point Defects Using An OTDR
 - (12) EIA/TIA 455-60 - Measurement of Fiber or Cable Length Using An OTDR
 - (13) EIA/TIA 455-61 - Measurement of Fiber or Cable Attenuation Using An OTDR
 - (14) EIA/TIA 455-95 - Absolute Optical Power Test for Optical Fibers and Cables
 - (15) EIA/TIA 526-14 - Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant
 - (16) ANSI/ICEA S-83-596-1994 - Fiber Optic Premises Distribution Cable Technical Requirements
- B. Federal Communications Commission (FCC) part 15 and part 68
- C. Rural Electrification Association (REA), Bulletin 345-63, REA Standards for Acceptance Tests and Measurements of Telephone Plant

1.3 RELATED SECTIONS

- A. Contract General Conditions, Supplemental General Conditions, Special Conditions and Contract Terms
- B. Section 16710 - Telecommunications General Requirements
- C. Section 16720 - Telecommunications Basic Materials and Methods
- D. Section 16725 - Telecommunications Cable
- E. Section 16730 - Underground Structures – Telecommunications.
- F. Section 16740 - Building (RF) CATV System
- G. Section 16760 - Telecommunications Grounding and Bonding

1.4 SUBMITTALS

The Contractor shall submit a comprehensive test plan for all systems installed under this contract for review by the Trustees/University. This shall be submitted two (2) months prior to his initiating final testing of any system on campus. This plan can be format in a manner convenient to the Contractor, but must contain itemization of systems to be tested as described in these specifications, estimated dates and duration's, staff to be applied and their responsibility, qualifications, certifications and experience, and a summary of testing equipment to be used. The plan shall show, at a minimum, test configurations, calibration procedures, impedances, and measurement equipment

The staff selected to provide the testing of this installation shall be certified by the manufacturing company in all aspects of design, installation and testing of the products described herein, and have a minimum of five (5) years experience on similar SCS cabling systems.

The various systems testing results and systems documentation are described throughout the execution section of this specification. All systems testing results and any systems documentation shall be submitted in both hardcopy and electronic format (Microsoft Excel). Format for reporting of test results and any system documentation shall be provided in the format defined by the campus. A sample is provided in the Exhibit A at the end of this specification. The final campus preferred labeling convention will be provided by the campus.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1 GENERAL PROCEDURES

- A. The Contractor will provide all tools, equipment, and fully trained staff necessary to conduct fully witnessed acceptance testing of all installed telecommunications-related products and systems.
- B. The contractor shall provide to the University, as part of the project as-built documentation, complete, accurate and detailed records of the cable plant installation suitable for inclusion in a generic computer-based asset management system. These records shall be provided [five (5) copies each] in both electronic (CD) and hardcopy form as a spreadsheet developed in Microsoft Excel software and capable of being uploaded into the asset management system database. The contractor shall collect this information on a continuous basis during all aspects of cable plant installation, and shall provide complete and appropriate updates of the MS Excel database to the University as each element of the project becomes subject to contingent acceptance (e.g., beneficial occupancy) according to the accepted project schedule.
- C. The University will collaborate with the contractor to define a convenient and acceptable spreadsheet format, but an example of one possible version of that format is provided herewith as Exhibit 16715A, included at the end of this section. The required data elements to be captured and incorporated into the spreadsheet are those contained in Exhibit 16715A.
- D. The scope of this work includes, but is not limited to, the following:
 - (1) All system(s) shall be checked for compliance with the construction documents.
 - (2) The Contractor shall maintain a check-off list for all tests. This shall be formatted to be used as tool to apprise the Construction Administrator of the testing program, its general schedule and accomplishment to-date.
 - (3) The result of the measurements outlined shall be recorded and submitted in a neatly bound format along with current as-built drawings to the Trustees/University as final proof of system performance.
 - (4) The Contractor shall immediately replace any system not meeting specifications at no cost to the Trustees/University. Failure to act in a timely and expeditious manner to properly remedy any abnormality resulting from installation/construction defects or workmanship; faulty material; and/or the failure of the systems, components, or the cable medium to perform in accordance with the construction documents and/or the SCS supplier's technical specifications shall cause the Trustees/University, at its discretion, to place a "hold" on any

other telecommunications development or construction associated with this project. The Construction Administrator will notify the Contractor in writing of such action and is absolved and shall be held harmless from any delays, costs over-runs, scheduling difficulties, etc. assessed by others due to the Contractor's failure to meet the final proof of system performance specifications. Final as-builts will be provided, as specified, at the end of the project.

- (5) All systems shall meet the construction specifications, SCS supplier's performance requirements and be accepted by the Trustees/University before the work will be considered complete.
- E. After the Contractor has provided complete documentation of all testing and the documentation has been reviewed by the University, the Contractor shall conduct "proof of performance" testing on selected components at the direction and discretion of the University. These tests will be conducted on approximately 5% of the system installed capacity. Such testing will utilize the same equipment and procedures used to conduct and document the initial tests but will be applied on a random basis to verify the testing documentation. If in the judgment of the Trustees/University, the proof-of-performance test results vary significantly from the acceptance test results, the Contractor shall continue with testing beyond the 5% at the discretion of the Construction Administrator until cleared to the satisfaction by the Architect.
- F. All test equipment shall be calibrated by a certified laboratory or the manufacturer within the last six months, and such certification shall be submitted to the University prior to testing.
- G. The Construction Administrator shall be provided a minimum of one week's notice of all acceptance and proof-of-performance testing to be conducted throughout the project..

3.2 INSPECTION AND TESTING PROCEDURES FOR COPPER CABLE

- A. The Construction Administrator will conduct routine inspections of the work in progress, and any deficiencies will be discussed at the regular progress meeting. In the event Construction Coordinator determines work is progressing in an incorrect manner and waiting for the regular meeting could cause significant rework by the Contractor, the Contractor's on-site project manager will be notified.
- B. Copper Station and Riser Cables: The Contractor shall conduct witnessed acceptance testing on all station and riser cable installed as part of this project as defined below:
 - (1) The correct and continuous bonding of cable shields through all riser and tie cable splices will be verified. This test shall be conducted from the BDF prior to strapping shield grounds at splice or termination points.
 - (2) Each station cable and all riser cable pairs will be tested for crosses, opens, grounds, reversed and/or transposed pairs, shorts, foreign battery, continuity, and resistance (in ohms). All riser cable pairs shall be tested for loss in dB. All problems will be resolved and the cable re-tested to ensure compliance.
 - (3) Using a Level-2 Category rated (for that Category as specified) pair scanner or similar device, all copper station cables will be tested to verify the installation meets the EIA/TIA Category performance specifications as defined in TSB-40A and TSB 67. Should any Category rated cable be specified greater than 5e, the pair scanner used for UTP testing shall be similarly rated and approved for that use. All test results, including jack numbers and cable lengths, shall be printed on a hardcopy report. All stations shall meet or exceed this performance standard.

- (4) All pair scanners used on the project shall be calibrated to a single common test cable at the start of each shift and after changing batteries. The hardcopy of the calibration results shall be included as a reference with each batch of station test results submitted.
 - (5) At the Contractor's option, the station test results can also be provided in electronic format (floppy disk), as long as a copy of any software required to read and/or print the results is also provided at the same time.
- C. Copper Interbuilding and Entrance Cables: The Contractor's witnessed acceptance testing on all interbuilding and entrance cables installed as part of this project is defined below:
- (1) The correct and continuous bonding of cable shields through all riser and tie cable splices, where permitted, shall be verified. This test shall be conducted from the voice and data centers and building MDF prior to strapping shield grounds at splice or termination points.
 - (2) Each cable pair shall be tested for crosses, opens, grounds, reversed and/or transposed pairs, shorts, foreign battery, continuity, resistance (in ohms) and loss in dB.
 - (3) All irregularities will be resolved and the cable re-tested to ensure compliance.
 - (4) At the Contractor's option, the station test results shall also be provided in electronic format (floppy disk), as long as a copy of any software required to read and/or print the results is also provided at the same time.

3.3 INSPECTION AND TESTING PROCEDURES FIBER CABLE

A. Fiber Optic Riser and Station Cable

- (1) The appropriate high resolution OTDR device shall be used to test the fiber riser cable. OTDR testing of riser cables is limited to those with one or more 90 bends and/or a length greater than 80 feet.
- (2) Continuity of all riser and station fiber optic cables, regardless of length, shall be verified by emitting an intense light source at one end of the fiber and measuring the intensity of light using a power meter at the opposite end of the fiber.
- (3) Tracing printouts (noting the appropriate optical fiber and buffer tube color designation) shall be mounted on separate pages and bound into a three-ring notebook. An incremental scale that reflects the short lengths of cable involved in these tests shall be utilized.
- (4) All fiber riser cable shall be tested from the building's BDF to each fiber IDF terminal. The results of OTDR testing to define the length of each riser cable shall be documented.
- (5) The Contractor shall conduct a power meter (loss) test of each fiber optic station and riser cable at both wavelengths A to B, B to A, and OSPL (OSPL is defined as $L_a + L_b$). No individual station or riser fiber link segment (including connectors) shall measure more than 2.0 dB. Tests shall be conducted using ANSI/EIA/TIA-526-14A, Method B. The Contractor shall provide a list reflecting cable ID and actual measured loss directly downloaded from the OTDR.
- (6) At the Contractor's option, the station test results shall also be provided in electronic format (floppy disk), as long as a copy of any software required to read and/or print the results is also provided at the same time.

B. Fiber Optic Interbuilding and Entrance Cable

- (1) The appropriate high resolution OTDR device to test the fiber interbuilding and entrance cables shall be used. Multimode fiber shall be tested at both operating wavelengths and singlemode fiber shall be tested at 1300 and 1500nm. Tracing printouts (noting the appropriate optical fiber and buffer tube color designation) shall be mounted on separate pages and bound into a three-ring notebook. Test results shall also be provided in electronic format (Microsoft Excel), or shall be accompanied by any software needed to read or print the files. An incremental scale that reflects the short lengths of cable involved in these tests shall be utilized.
- (2) All fiber riser cable shall be tested from the campus-wide voice and data center to each building's BDF terminal. The results of OTDR testing to define the length of each riser cable shall be documented.
- (3) The Contractor shall conduct a power meter (loss) test of each fiber optic station and riser cable at both wavelengths A to B, B to A, and OSPL (OSPL is defined as $L_a + L_b$). No individual fiber link segment (including connectors) shall measure more than 2.0 dB. The tests shall be conducted using ANSI/EIA/TIA-526-14A, Method B. A typed list reflecting cable ID and actual measured loss shall be submitted to the University. Tests results shall also be provided in electronic format (Microsoft Excel), or shall be accompanied by any software needed to read or print the files.
- (4) At the Contractor's option, the station test results can also be provided in electronic format (floppy disk), as long as a copy of any software required to read and/or print the results are also provided at the same time.

3.4 INSPECTION AND TESTING PROCEDURES CATV (RF) SYSTEM

- A. The Contractor will conduct witnessed acceptance tests on the complete CATV RF distribution system, including all cable and passive and active devices. Details of the methods to be followed in conducting the acceptance testing will be found in the current edition of the NCTA (National Cable Television Association) Recommended Practices for CATV Measurement.
- B. Overall, the system shall provide a Carrier/Noise ratio of >43 dB and a minimum signal level of +3 dBmV and shall not exceed +10 dBmV as measured at each jack.
- C. The Contractor shall perform the following tests on the completed CATV system as part of the acceptance procedure:
 - (1) All coaxial cable will be tested after installation for opens, shorts, and kinks with a Time Domain Reflectometer (TDR). Damaged sections will be replaced either by pulling a new line or by splicing out the defective portion. The actual length of each cable section, as installed, shall be indicated on the floor plans.
 - (2) NCTA Standard Broadcast Sweep (40 to 750 MHz) tests will be performed on the CATV RF broadband system as follows:
 - (a) A signal sweep test shall be conducted from the input side of the headend amplifier to the output side of the most distant jack on each floor of the building.
 - (b) After the sweep of the building RF distribution system is completed and the building system is balanced, a sweep shall be performed from the output of the building

amplifier to the output side of the most distant jack on each floor of the building to verify the 750 MHz bandwidth of all cable and passive devices.

- (3) Visual Carrier/Noise (C/N) shall be measured through the building amplifiers. The test procedure will be as outlined by the NCTA. Minimum C/N specifications are no less than 43 dB.
- (4) Each and every CATV jack installed as part of this system will be configured to output a minimum signal per channel of +3 dBmV and shall not exceed +10 dBmV into 75 Ohms. The Contractor shall test each jack and shall change tap values, add attenuators, or otherwise balance the system so that each jack provides the defined signal levels.
- (5) The signal at each television jack in the building shall be free of additional noise and distortion as judged by the University. The Contractor shall determine (using a Sencore Channelizer FS 74 or similar device) that the signal at each jack conforms to the bid specifications. If excessive noise is present, the Contractor shall either resolve the problem or demonstrate the problem is not a result of the current work. At a minimum, the following tests may be required to demonstrate the origin of the problem:
 - (a) Modulation distortion at power frequencies
 - (b) Composite third order distortion for CW and modulated carriers
 - (c) Carrier to second order beat ration
 - (d) Complete frequency response testing using the NCTA guidelines
- (6) The Contractor shall conduct witnessed signal leakage measurements in conformance with FCC 76.605(a)(14) and 76.609(h). Readings on all building floors shall be obtained. Any signal leakage in excess of that allowed by FCC and NCTA guidelines shall be identified and corrected. The maximum readings per floor shall be documented.

3.5 DOCUMENTATION

A. Fiber Cable Systems

- (1) All documentation shall be neatly and legibly done and shall provide a clear understanding of the installed system.
- (2) The Contractor shall prepare "as-built" plans of all work including interbuilding, entrance, and riser cable locations with footage. All approved changes and actual in-place footage shall be marked, in red, on the 22" x 34" size drawing, unless directed otherwise. The as-builts shall include all fiber optic cable placed with cable lengths, fiber assignments, and cable numbers and counts.
- (3) The Contractor shall provide signed originals of all acceptance testing documents, which are:
 - (a) Fiber optic insertion loss results (using forms provided by the University)
 - (b) OTDR graphs and printouts and test results (in a 3-ring binder)
 - (c) Current test equipment certifications

B. Copper Cable Systems

- (1) The Contractor shall use forms provided by the University or by the Structured Cabling System manufacturer, if approved by the University, to document the successful testing of all interbuilding, entrance, riser and tie cables. All test results shall be provided in hardcopy and electronic format (MS Excel) for integration into the campus asset management system.
- (2) Test equipment used shall be Tektronix TPS 100 Twisted Pair Cable Analyzer or approved similar device. The Contractor shall prepare "as-built" plans of all work including interbuilding, entrance, and riser cable locations with footage. All approved changes and actual in-place footage shall be marked, in red, on a 22" x 34" size drawing, unless directed otherwise. The as-builts shall include all copper cable placed with cable lengths, fiber assignments, and cable numbers and pair counts
- (3) Category rated station cable test results noting unique station number and group test results by floor shall be provided. Station numbering scheme shall be verified with the Campus staff.
- (4) The Contractor shall neatly note floor plans with "as-built" station number and any changes, additions, or deletions to outlet placement.
- (5) Interbuilding, entrance, and riser plans shall be updated to include actual routes, cable numbers and counts, and lengths of cables.

C. CATV (RF) Riser Systems

- (1) The Contractor shall provide the campus with a copy of the test equipment certification.
- (2) The Contractor shall provide signed originals of all acceptance testing documents, which are:
 - (a) Typed list of signal strength measurements by jack location
 - (b) Tracings of TDR readings for each half-inch coaxial cable test
 - (c) Test measurement tracings (or scope pictures) to document the results of the sweep tests
 - (d) All test results shall be submitted in hardcopy and electronic format (MS Excel or other format if accompanied by the necessary software to read and print the files.
- (3) Three sets of original manufacturer's installation and maintenance manuals for each piece of equipment installed shall be provided.
- (4) As-built shop drawings reflecting the cable lengths, tap values, and component configuration of the installed systems shall be provided.
- (5) The Contractor shall neatly annotate floor plans to reflect actual backbone cable routing and exact location of taps.

D. Testing Publications and Standards

E. Inspection and testing procedures for copper and fiber optic cable, RF CATV systems, and the antenna systems.

F. Documentation and As-Built Requirements

G. The Contractor shall acquire and be intimately familiar with the latest issue and publication of documentation provided by its selected Structured Cable System supplier to its certified installation contractors. Final testing of all installed systems, subject to the supplier extended warranty, shall be consistent with the supplier's testing requirements and shall be accomplished in a manner that assures a fully warranted installation. Selected examples of this documentation is listed below. This listing is for information and may not be complete. The Contractor is specifically responsible for compliance with all necessary the SCS suppliers recommended installation and testing procedures.

The Contractor shall assure the certification of and familiarity with the applicable documentation by all telecommunications systems installers. The Contractor shall identify to the University the documents it understands to be the comprehensive installation guidelines for the SCS supplier proposed by the Contractor for this project.

3.6 INSPECTION AND TESTING PROCEDURES CATV (RF) SYSTEM

A. The Contractor will conduct witnessed acceptance tests on the complete CATV RF distribution system, including all cable and passive and active devices. Details of the methods to be followed in conducting the acceptance testing will be found in the current edition of the NCTA (National Cable Television Association) Recommended Practices for CATV Measurement.

B. Overall, the system shall provide a Carrier/Noise ratio of >43 dB and a minimum signal level of +3 dBmV and shall not exceed +10 dBmV as measured at each jack.

C. The Contractor shall perform the following tests on the completed CATV system as part of the acceptance procedure:

- (1) All coaxial cable will be tested after installation for opens, shorts, and kinks with a Time Domain Reflectometer (TDR). Damaged sections will be replaced either by pulling a new line or by splicing out the defective portion. The actual length of each cable section, as installed, shall be indicated on the floor plans.
- (2) NCTA Standard Broadcast Sweep (40 to 750 MHz) tests will be performed on the CATV RF broadband system as follows:
 - (a) A signal sweep test shall be conducted from the input side of the headend amplifier to the output side of the most distant jack on each floor of the building.
 - (b) After the sweep of the building RF distribution system is completed and the building system is balanced, a sweep shall be performed from the output of the building amplifier to the output side of the most distant jack on each floor of the building to verify the 750 MHz bandwidth of all cable and passive devices.
- (3) Visual Carrier/Noise (C/N) shall be measured through the building amplifiers. The test procedure will be as outlined by the NCTA. Minimum C/N specifications are no less than 43 dB.
- (4) Each and every CATV jack installed as part of this system will be configured to output a minimum signal per channel of +3 dBmV and shall not exceed +10 dBmV into 75 Ohms. The Contractor shall test each jack and shall change tap values, add attenuators, or otherwise balance the system so that each jack provides the defined signal levels.

- (5) The signal at each television jack in the building shall be free of additional noise and distortion as judged by the University. The Contractor shall determine (using a Sencore Channelizer FS 74 or similar device) that the signal at each jack conforms to the bid specifications. If excessive noise is present, the Contractor shall either resolve the problem or demonstrate the problem is not a result of the current work. At a minimum, the following tests may be required to demonstrate the origin of the problem:
 - (a) Modulation distortion at power frequencies
 - (b) Composite third order distortion for CW and modulated carriers
 - (c) Carrier to second order beat ration
 - (d) Complete frequency response testing using the NCTA guidelines
- (5) The Contractor shall conduct witnessed signal leakage measurements in conformance with FCC 76.605(a)(14) and 76.609(h). Readings on all building floors shall be obtained. Any signal leakage in excess of that allowed by FCC and NCTA guidelines shall be identified and corrected. The maximum readings per floor shall be documented.
- (6) All tested result shall be presented in electronic (MS spread sheet) and hardcopy format.

3.7 DOCUMENTATION

D. Fiber Cable Systems

- (1) All documentation shall be neatly and legibly done and shall provide a clear understanding of the installed system.
- (2) The Contractor shall prepare "as-built" plans of all work including interbuilding, entrance, and riser cable locations with footage. All approved changes and actual in-place footage shall be marked, in red, on a 24" x 36" size drawing. The as-builts shall include all fiber optic cable placed with cable lengths, fiber assignments, and cable numbers and counts.
- (3) The Contractor shall provide signed originals of all acceptance testing documents, which are:
 - (a) Fiber optic insertion loss results (using forms provided by the University)
 - (b) OTDR graphs and printouts and test results (in a 3-ring binder)
 - (c) Current test equipment certifications

E. Copper Cable Systems

- (3) The Contractor shall use forms provided by the University or by the Structured Cabling System manufacturer, if approved by the University, to document the successful testing of all interbuilding, entrance, riser and tie cables.
- (4) Test equipment used shall be Tektronix TPS 100 Twisted Pair Cable Analyzer or approved similar device.

- (3) Category 5e station cable test results noting unique station number and group test results by floor shall be provided. Station numbering scheme shall be verified with the Campus staff.
- (4) The Contractor shall neatly note floor plans with "as-built" station number and any changes, additions, or deletions to outlet placement.
- (5) Interbuilding, entrance, and riser plans shall be updated to include actual routes, cable numbers and counts, and lengths of cables.

F. CATV (RF) Systems

- (1) The Contractor shall provide the campus with a copy of the test equipment certification.
- (2) The Contractor shall provide signed originals of all acceptance testing documents, which are:
 - (a) Typed list of signal strength measurements by jack location
 - (b) Tracings of TDR readings for each half-inch coaxial cable test
 - (c) Test measurement tracings (or scope pictures) to document the results of the sweep tests
- (3) Three sets of original manufacturer's installation and maintenance manuals for each piece of equipment installed shall be provided.
- (4) As-built shop drawings reflecting the cable lengths, tap values, and component configuration of the installed systems shall be provided.
- (5) The Contractor shall neatly annotate floor plans to reflect actual backbone cable routing and exact location of taps.

Section 16715 - EXHIBIT A

Cable Type	Media Type (Copper/Fiber)	Manufact	rating	Cable Model #	Bldg	Floor	BDF/IDF #	Room #	Outlet- Position	Length of Cable (in feet)
Station Cable	copper	The Best	Cat ____		01	02	205	250	105a	180
					02					

Cable Type	Media Type (Copper/Fiber)	Manufact	rating	Cable Model #	Bldg	BDF Conduit #	IDF	Length of Cable # Cable (in feet)
Vertical Cable	MM Fiber		62.5/125	01	02	205		040
Vertical Cable	SM Fiber			01	03	305		
Vertical Cable	copper			01	04	405		

Cable Type	Type (Copper/Fiber)	Manufact	rating	Cable Model #	MD F	MDF Conduit #	Tunnel/ Manhole Location	BDF Conduit #	Length of Cable (in feet)
Horizontal (Interbuilding)	copper						MH022;MH015		
Horizontal (Interbuilding)	SM Fiber								

- END -