

PART 1 - GENERAL

This section of the Telecommunications Construction Guide Specification has references, products, procedures, processes, and work descriptions/summaries that are common to many Washington State University Pullman (WSUP) campus telecommunications projects. This information is provided in specification format to serve as a guide to the Designer in producing a CSI-compliant specification that will meet the unique requirements of WSUP Telecommunications projects. However, this document is not intended to be a Master Specification. The information included in this section is not intended to be all-inclusive for any given project.

The Designer shall edit this section (adding and/or removing content where required) to meet the requirements of a given project.

Prior to publishing the specifications for bid or construction purposes, all edits shall be made using the MS Word Tracking Changes feature. **When submitting the specifications for review at each progress milestone, print the specifications showing the revision markings.**

Text in shaded boxes (such as this text) is included to aid the Designer in understanding areas of this section that may require modification for a particular circumstance. Although this text is generally written in declarative form, the Designer shall consider it guidance only. The Designer shall not assume that the content of this specification section is suitable or sufficient for any given project in its current form, and shall remain responsible for developing a thorough and complete specification that meets the requirements of the project being designed.

1.1 SUMMARY

Review and edit the following list of generic type products for relevance to this project. This listing should not include procedures or processes, preparatory work, or final cleaning.

- A. Provide all materials and labor for the installation of an inside plant telecommunication system. This section includes Inside Plant Communications cabling, termination, and administration equipment and installation requirements for the specified Structured Cabling System (SCS - See Definition Below).

1.2 SYSTEM DESCRIPTION

Review and edit the following statement(s) for applicability to this project, restricted to describing performance, design requirements and functional tolerances of a complete system.

- A. Furnish, install, test and place into satisfactory and successful operation all equipment, materials, devices, and necessary appurtenances to provide a complete ANSI/TIA/EIA, NECA/NEIS and ISO/IEC compliant communications Structured Cabling System (SCS) as hereinafter specified and/or shown on the Contract Documents. The system is intended to be capable of integrating voice, data, and video signals onto a common media, and shall be tested for and be capable of 10 Gigabit Ethernet operation as specified in TIA/EIA 568-B.2-10 and ISO/IEC 11801:2002/Amd 1:2008.
- B. The work shall include all materials, equipment and apparatus not specifically mentioned herein or noted on the plans but which are necessary to make a complete working ANSI/TIA/EIA and ISO/IEC compliant SCS.

1.3 SEQUENCING

Include any requirements for coordinating work with potentially unusual or specifically required sequencing. WSUP may choose to construct a project under two bid packages - one for pathways and spaces (perhaps under a General Contract), and a second bid package for the Structured Cabling System (perhaps using the WA State DIS Master Contract). The Designer must coordinate with WSUP to determine if two bid packages will be used and include verbiage in the appropriate specification sections requiring the contractors to coordinate construction phasing and schedules.

- A. Provide coordination with the cabling manufacturers to ensure that manufacturers' inspectors are available to schedule site visits, inspections, and certification of the system. Provide and coordinate any manufacturer-required modifications and have manufacturer re-inspect and certify the system prior to the scheduled use of the system by the Owner.
- B. The Contractor is solely responsible for all costs associated with scheduling the manufacturer inspection, the inspection itself and any manufacturer-required re-inspections, and for any modifications to the installation as required by the manufacturers.

PART 2 - PRODUCTS

Ensure that products listed under the PART 2 – Products paragraphs have corresponding installation instructions in PART 3 – Execution, or in another specification section if furnished but not installed under this section.

WSUP has standardized on certain manufacturers and certain products for all new Structured Cabling Systems in WSUP facilities. Products shall be specified accordingly. The Designer shall ensure that the latest part numbers are used for specified products. Any substitutions require WSUP pre-approval before specification.

If the Designer wishes to use products that deviate from WSUP standards, a Standards Variance Request shall be made, as described in the Technology Infrastructure Design Guide (TIDG). If the alternative product is approved, the Designer shall adapt this to reflect the approved changes.

The products listed throughout Part 2 - Products below are not all-inclusive for any given project. The Designer shall ensure that all required products are specified. The Designer shall also verify that the most current part number of each specified product is listed in this section.

2.1 GENERAL

- A. SCS components shall be manufactured by the manufacturers listed below. Components shall not be intermixed between different manufacturers unless the manufacturer of the SCS has listed (in writing) another manufacturer's component as an "Approved Alternative Product" and will warrant the "Approved Alternative Product" as part of the SCS Manufacturer Warranty (see Section 27 05 00 — "Common Works Results for Communications" PART 1 – WARRANTY).
 - 1. Bid only the following SCS Manufacturers and only bid manufacturers for which the Contractor is certified. The SCS Manufacturers shall be the following. Substitution is not acceptable:
 - a. TE, for copper-related products
 - b. Fiber optic-related products: Corning
 - 1) TE Connectivity fiber optic cabling products are not acceptable for non-GPON horizontal fiber optic applications. For GPON applications, see Section 27 15 23 – Communications Optical Fiber Horizontal Cabling.

- B. All copper-related components shall be part of the copper SCS product line – components shall not be intermixed between manufacturers' SCS product lines. The SCS product lines shall be engineered "end-to-end" – the system and all of its components shall be engineered to function together as a single, continuous transmission path.
1. The SCS Product Line shall be the following:
 - a. Category 6 U/UTP Copper Distribution: TE 620 Series solution. Substitution is not acceptable.

WSUP has standardized on using Category 6 cabling for all projects – no exceptions.

However, some audio visual applications require Category 6A cabling. The Telecommunications Designer shall work with the Audio Visual Designer to determine whether/where Category 6A cabling is required. The Telecommunications Designer shall specify all telecommunications cabling, including that required to serve audio visual system requirements.
 - b. Category 6A F/UTP Copper Distribution: TE XG Series solution. Substitution is not acceptable.

2.2 PATCH PANELS

- A. Copper Patch Panels: Shall be complete with pre-manufactured cable management for supporting station cable behind the patch panel, with incidental materials necessary for mounting and wired for T568A.
1. Category 6 Horizontal Distribution Patch Panels (Workstation Patch Panels):
 - a. 24 Port, SL, Straight, Multimedia: TE 1375291-1 with Category 6 connectors TE 1375055-2 (Black) as required

Category 6A is only required for certain Audio/Visual applications. Verify requirements with AVPM and Audio Visual Designer. Delete the following paragraph if it is not required.
 2. Category 6A Horizontal Distribution Patch Panels (Workstation Patch Panels):
 - a. Category 6A, 24 Port, SL, Shielded, Straight: TE 1933319-2
 - b. Cable Management Bar: TE 557548-1
 3. Horizontal Cable Management Panels
 - a. 2U: Panduit WMPH2E

Review and edit the following fiber optic products/part numbers as applicable to this project.
- B. Fiber Optic Patch Panels: See Section 27 13 00 – Communications Backbone Cabling.
1. Connector Panels:
 - a. Multimode: Corning (12-strand/6-connector) duplex SC, CCH-CP12-91

2.3 CONNECTORS

- A. Copper Connectors (modular jacks): 8-position/8-conductor, insulation displacement connection (IDC), non-keyed, and shall accept modular 8-position/8-conductor plugs, complete with multicolored identification labels/icons for identification, and with a universally color-coded wiring pattern for both T568A and T568B. Copper connectors shall be manufactured by the selected SCS Manufacturer.
1. Category 6 Horizontal Distribution: Shall meet or exceed Category 6 transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA 568-B.2-10 and ISO/IEC 11801:2002/Amd 1:2008, and shall be part of the UL LAN Certification and Follow-up Program:
 - a. Category 6:
 - 1) TE 1375055-1 (both rear and side cable entry), (Almond)
 2. Category 6A Horizontal Distribution: Shall meet or exceed Category 6A transmission requirements for connecting hardware, as specified in ANSI/TIA/EIA 568-B.2-10 and ISO/IEC 11801:2002/Amd 1:2008, and shall be part of the UL LAN Certification and Follow-up Program:
 - a. Category 6A:

Category 6A is only required for some Audio Visual applications.

- 1) TE 1711160-2 (rear cable entry) (Orange)
- 2) TE 1711295-2 (side cable entry)

2.4 STATIONS

- A. Faceplates: Complete with port identification labels and blank inserts/fillers for covering unused connector openings:
1. Stations to be used for VOIP wall-mount telephones: Brushed stainless steel with stainless steel mounting lugs suitable for supporting wall-mount telephones:
 - a. SEMTRON 1FM-0E-TE-Phone-DP (with CAT6 jack)
 - b. or approved equal.
- Review faceplate material/color and mounting strap color with Architect/Interior Designer for coordination with design.
2. All other stations shall be double-gang standard 4-port faceplates (Almond):
 - a. TE 83935-1 with blank inserts as required 406339-1
 3. All stations without cabling shall be double-gang standard blank faceplates (Almond).
- B. Fiber Optic Outlets:
1. Corning: Single-Panel Housing with SC-Duplex Connector Panel:
 - a. Corning SPH-01P with CCH-CP06-91.
- C. Surface Device Boxes: Surface mount device boxes shall be:
1. Wiremold

2.5 CABLE

- A. General: Cables shall be manufactured by the selected SCS Manufacturer. All cables shall be plenum-rated.
- B. Copper Cables: Shall be 4-pair, 23 AWG, with solid copper conductors:
1. Category 6 U/UTP:
 - a. Plenum (CMP): TE TE620P-WTxx (white), plenum-rated.
- Delete the following paragraph if there is no requirement for cabling in slab-on-grade conduit/floor box applications or outdoor conduit applications.
- NOTE: The Mohawk cable is not suitable for direct bury applications.
- NOTE: In order for the Mohawk cabling to be included in under the TE warranty, the Cabling Contractor must submit a form to TE titled "TE Connectivity Product Warranty Deviation" prior to installing the cabling. The ND&I Cabling Contractor can request this form from TE's representatives. See paragraph 3.5.x below for more information.
2. Category 6 U/UTP Indoor/Outdoor Wet Environment Rated:
 - a. Mohawk VersaLAN M59092 (White) (not plenum-rated)
- Delete the following paragraph if Category 6A cabling is not part of this project.
3. Category 6A F/UTP:
 - a. Plenum: TE TE640PF-WTxx (white)
- C. Fiber Cable:
1. Multimode 50/125 μ m OM3: Shall be graded index, tight-buffered, extended/high grade with a maximum attenuation of 2.8 dB/km @ 850 nm and 1.0 dB/km @ 1300 nm and a minimum effective modal bandwidth of 4700 MHz/km @ 850 nm. Cable shall support 1GB Ethernet for

lengths of up to 1000 meters, 10GB Ethernet for lengths up to 550 meters and 100GB for lengths up to 150 meters. Cable shall be manufactured by the selected SCS Manufacturer:

- a. Corning Pretium 300, MIC and Unitized MIC

TE and Commscope will merge in late 2015, after which warranty coverage should be simpler for wet environment cable. Delete the following paragraph if there are no wet environment indoor fiber applications, otherwise additional part number information should be added.

- b. Indoor/Outdoor Wet Environment Rated:
 - 1) Commscope OM3 zipcord

- D. Hook and Loop Cable Managers: Reusable hook and loop straps (similar to Velcro), adjustable tension, roll or spool dispensed:
 - 1. Panduit HLS-15R0
 - 2. SIEMON VCM-xxxx-xxx
 - 3. TE 5/8 inch wide: 1375255-X
 - 4. Or approved equal

2.6 LABELING AND ADMINISTRATION

- A. Labels:
 - 1. As recommended in ANSI/TIA/EIA 606. Permanent (i.e. not subject to fading or erasure), permanently affixed, self-laminating vinyl, and created by a hand-carried label maker or a computer/software-based label making system. Handwritten labels are not acceptable.
 - a. Copper and Fiber Optic Cables:
 - 1) Brady: Bradymaker Wire Marking Labels WML-511-292 (or approved equal)
- B. Hand-carried label maker:
 - 1. Brady: ID Pro Plus (or approved equal).

PART 3 - EXECUTION

Ensure that products incorporated into the project under PART 3 paragraphs have corresponding Product information in PART 2 – Products, or in another specification Section if installed but not supplied under this Section.

The following paragraphs include installation requirements written specifically for the Products listed in Part 2 above. If other products are approved, the Designer shall ensure that appropriate Part 3 installation requirements are added/removed or modified as applicable and described in equal or greater detail to the following paragraphs.

All installation requirements shall be consistent with the manufacturer's requirements.

3.1 PATCH PANELS

Review and edit the following installation requirements based on the products specified in PART 2 – Products above or on the products specified in another section if installed but not supplied under this section, and as applicable to this project.

- A. Provide patch panels and horizontal wire management according to locations, elevations, and plan views as shown on the Contract Documents.
 - 1. Copper: Size and install rack-mountable patch panels as shown on the Contract Documents. Use patch panels to terminate copper horizontal cables. Do not exceed ten 2U-sized patch panels per rack.

2. Fiber Optic: Terminate horizontal fiber optic cabling from all floors in the backbone fiber optic patch panel in the MDF.
3. Horizontal Wire Management: Provide horizontal wire management as shown on the Drawings.

3.2 CONNECTORS

- A. Copper Connectors (modular jacks):
1. Provide connectors and install using T568A wiring pattern.
 2. Mount connectors at 90-degrees (i.e. straight, not angled)
 3. Punch down cable using only the selected SCS Manufacturer approved tool, achieving a fully repeatable, self-centering, non-impact mechanical termination process.
 4. Provide bend-limiting strain relief caps on both ends of cable.

3.3 STATIONS

- A. Faceplates: Provide faceplates for stations in the locations and gang counts shown on the Contract Documents.
1. Faceplates shall completely conceal outlet boxes, reducer plates, etc.
 2. Faceplates shall provide a snug and sure fit for connectors – loose connectors are not acceptable. Do not over-tighten faceplates such that warping occurs.
 3. Provide screws of sufficient length for each application.
- B. Flush-mount connectors in faceplates.
- C. Fiber Optic Stations: Provide SPH devices. Coordinate final location with Engineer prior to installation.
- Delete the previous paragraph if horizontal fiber is not part of this project.
- D. Surface Device Boxes: Provide surface mount device boxes as required and as shown for surface mounted communications outlets.

3.4 CABLE

- A. General (applicable to all cable types): Provide plenum (CMP, OFNP) rated cable for all horizontal applications. Cabling shall bear plenum markings.
1. Provide cabling in types, sizes, and quantities as defined by the Symbol Schedule and as shown on the Contract Documents. Install cable between the station and its associated telecommunications room. Provide one cable per each connector at each station. Provide cables of the same type in the same color – multiple colors of the same cable type are not acceptable.
 2. Install cable in compliance with ANSI/TIA/EIA and ISO/IEC 11801 requirements and BICSI TCIM practices.
 3. Inspect cabling and termination materials prior to installation. Verify that quality, condition, and product is as specified. Do not install materials that do not meet the specified requirements.
 4. Adhere to the bending radius and pull strength requirements as detailed in the ANSI/TIA/EIA standards and the manufacturer's installation recommendations during cable handling and installation.
 - a. The minimum bend radius shall be 10x the outside diameter of the cable.
 - b. The pulling tension shall not exceed 25 pounds per cable.
 - c. Pull all cables simultaneously where more than one cable is being installed in the same raceway.
 - d. Use pulling compound or lubricant where necessary. Use compounds that will not damage conductor or insulation (Polywater, or approved equal).
 - e. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips that will not damage media or raceway. Repair or replace conduit bushings that become damaged during cabling installation.

5. Install cable in a continuous (non-spliced) manner unless otherwise indicated.
 6. Minimize the length of exposed (unjacketed) cable pairs, not to exceed ½ inch.
 7. Install exposed cable parallel to and perpendicular to surfaces on exposed structural members and follow surface contours where possible.
 8. Tie or clamp cabling. Attaching cables to pipes, electrical conduit, mechanical items, existing cables, or the ceiling support system (grids, hanger wires, etc. – with the exception of ceiling support anchors) is not acceptable. Cables shall not rest upon acoustic ceiling grids or panels. Install tie-wraps in conformance with the SCS manufacturer's installation recommendations. Do not over-tighten tie wraps or cause cross-sectional deformation of cabling.
 9. Cabling in conduits:
 - a. Where multiple conduits or sleeves are used to carry cabling, fill conduits completely (per fill-ratio requirements) prior to using the next adjacent available conduit. Do not partially fill multiple conduits (and thereby waste space in a conduit) when it would be possible to completely fill that conduit.
 10. Cabling in cable trays:
 - a. Do not bundle cables together.
 - b. During installation, temporarily install hook-and-loop straps (similar to Velcro) to hold cables in place near outside edges of cable tray around corners. After terminating the cables, remove the straps.
 11. Cabling at backboards:
 - a. Lay and dress cables to allow other cables to enter raceway (conduit or otherwise) without difficulty at a later time by maintaining a working distance from these openings.
 - b. Route cable as close as possible to the ceiling, floor, sides, or corners to insure that adequate wall or backboard space is available for current and future equipment and for cable terminations.
 - c. Do not use D-rings to route horizontal cabling. Instead, use vertical ladder racking (securing cabling with hook-and-loop straps) and horizontal ladder racking, using the most direct route to the termination point. Route via a path that will minimize obstruction to future installation of equipment, backboards or other cables.
 12. Cabling in telecommunications rooms:
 - a. For telecommunications rooms with ladder rack, lay cable neatly in ladder rack in even bundles and loosely secure cabling to the ladder rack at regular intervals with tie-wraps or hook-and-loop straps.
 13. Cabling terminating on patch panels located on racks:
 - a. Route cables in telecommunications rooms to patch panels on racks by routing across ladder rack across top of rack and then down vertical ladder rack to patch panel.
 - b. Wherever possible, terminate cables consecutively according to their far-end termination in intuitively occurring groups (jacks in an outlet, outlets in a room, etc.).
- B. Copper Cable: Terminate all pairs within a cable. Un-terminated cable pairs are not acceptable.
1. Provide station cable in the locations shown on the Contract Documents. Provide service loops for each outlet (minimum length of 18 inches) stored in the cable tray near the conduit serving the outlet. Provide service loops in telecommunications rooms (minimum length of 10 feet).
 - a. For copper station cabling installed in wet areas, including floor boxes in slab-on-grade applications, use outdoor-rated CAT6 cabling.
 - b. Route station cable that is exposed (not in conduit) to comply with ANSI/TIA/EIA-569 requirements for avoiding potential EMI sources and as follows:
 - 1) 48 inches from motors or transformers
 - 2) 12 inches from conduit and cables used for electrical power distribution
 - 3) 5 inches from fluorescent lighting
 - c. Cabling shall not share raceway with electrical power circuits, except for specifically designed system furniture raceways.

- C. Fiber Optic Cable: Terminate all strands within a cable. Un-terminated cable strands are not acceptable.
1. Provide station cable in the locations shown on the Contract Documents. Provide service loops with a minimum length of 12 inches in outlet boxes and no less than 10 feet in the ER/TR's.
 - a. For workstation outlets with both fiber and copper cabling, terminate fiber optic cabling after copper cabling has been installed and terminated.

Delete the following paragraph if there are no wet environment indoor fiber applications.
 - b. For fiber optic station cabling installed in wet areas, including floor boxes in slab-on-grade applications, use Indoor/Outdoor, plenum-rated, Wet Environment-rated cabling.
 2. Innerduct

The Designer shall indicate in the Contract Documents where innerduct is required, consistent with the requirements described below.

 - a. Innerduct is required for routing horizontal fiber optic cabling through all vertical riser pathways (conduits and sleeves) that exceed 4 feet in length.
 - b. Innerduct is also required for routing horizontal fiber optic cabling through cable trays where larger outside plant cable shares the cable tray.
 - c. Otherwise, innerduct is not required for routing horizontal fiber optic cabling.
 - d. Where innerduct is required, install fiber optic cable in innerduct per manufacturer's instructions. Innerduct shall terminate within 6 inches of top of each patch panel where fiber optic cable terminates. Secure innerduct with zip-ties at intervals not exceeding 24 inches. Do not use wire or tape.
 - e. See Sections 27 13 00 and 33 82 00 for innerduct requirements related to fiber optic backbone cabling in inside plant and outside plant backbone applications, respectively.
- D. Provide hook-and-loop cable managers for managing horizontal cabling in the telecommunications rooms. Cable managers shall be black colored.
1. Cut hook-and-loop cable managers to length, such that the cable bundle is encircled with a 50% overlap.
 2. Cables shall be independently supported, not attached to other existing conduit, piping or equipment.
 3. Zip ties are prohibited.

3.5 LABELING AND ADMINISTRATION

- A. Color Coding: Apply industry standard color coding to cable termination fields. Always apply the same color at both ends of any given cable. Cross-connections are generally made between termination fields of different colors. The color may be applied to the backboard behind the termination equipment, may be the color of a cover on the termination equipment, or may be the actual color of the insert label on the termination equipment. Use the following color code:
1. Orange: Identification of the telecommunication service (telephone company) demarcation point.
 2. Green: Identification of network connections on the customer side of the demarcation point.
 3. Blue: Identification of the horizontal distribution (station) cables. A blue color coding is only required at the telecommunications room end of the cable, not at the station end of the cable.
 4. Brown: Identification of inter-building backbone cables.
 5. Yellow: Identification of auxiliary circuits, alarms, maintenance, security, and other miscellaneous circuits.
 6. Red: Identification of key telephone systems.
- B. Horizontal Cables:
1. Label Colors: White.
 2. At Patch Panel:
 - a. Affix label at end of the cable within 4 inches of the cable end near the patch panel termination point (on the rear of the patch panel). Include a clear vinyl adhesive wrapping

1. Copper:
 - a. Horizontal Distribution: Test all pairs of each copper station cable, in accordance with the field test specifications defined in ANSI/TIA/EIA 568-B Category 6, and ANSI/TIA/EIA 568-B standards and ANSI/TIA/EIA-568-C.2. This document will be referred to as the Category 6 Standard. The test equipment shall comply with the accuracy requirements for the level III field testers as defined in the TIA Cat 6 Document. To the extent possible, perform tests with building electrical systems fully powered on (i.e. Lights, HVAC, etc.).
 - 1) Test each end-to-end link (the entire channel from the connector at the station to the connector or termination in the telecommunications room) utilizing sweep tests, for continuity, shield continuity, shorts, polarity, attenuation, installed length, transposition (wire map), mutual capacitance, characteristic impedance, resistance, ACR, Insertion Loss, Pair-to-Pair Near End Crosstalk (NEXT), Power Sum Near End Crosstalk (PSNEXT), Equal Level Far End Crosstalk (ELFEXT), Power Sum Equal Level Far End Crosstalk (PSELFEXT), Return Loss, and presence of AC voltage. Test each cable in both directions.
 - 2) Use a TIA/EIA Level III or higher accuracy level testing instrument, re-calibrated within the manufacturer's recommended calibration period or within one year (whichever is more recent), with the most current software revision based upon the most current ANSI/TIA/EIA testing guidelines, capable of storing and printing test records for each cable within the system.
 - a) Testing Device: Fluke DTX-1800, Micro-Test, Wirescope or Data Com Technologies, with latest software and hardware releases for TE CAT-6 horizontal distribution cables, or approved equal.
 2. Fiber Optic:
 - a. Horizontal Distribution: Test all strands following the procedure outlined in Section 27 13 00 – Communications Backbone Cabling.
- C. Identify cables and equipment that do not pass to the Owner and Designer. Determine the source of the non-compliance and replace or correct the cable or the connection materials. Retest the cable or connection materials at no additional expense to the Owner. Provide a complete revised set of all test results to the Owner and Designer, in the same manner as above. Remove original individual cable test reports that are unacceptable and insert the new corrected cable test reports. Do not simply resubmit the test reports for the corrected cabling only.
1. In addition to the above, if it is determined that the cable is faulty, remove the damaged cable and replace it with a new cable. Cable repairs are not acceptable. The procedure for removing the cable shall be as follows:
 - a. Prior to removal of damaged cable and installation of new cable:
 - 1) Inform the Owner and Designer of the schedule for the removal and installation.
 - 2) Test the new cable on the reel per paragraph B, above.
 - 3) Test cables that occupy the same innerduct or conduit (if not in innerduct) as the damaged cable per paragraph B, above, regardless of whether or not they are new cables installed as part of this project or existing cables installed prior to this project.
 - b. Remove the damaged cable and provide new cable.
 - c. After the removal of the damaged cable and installation of the new cable:
 - 1) Test the new cable per the paragraph titled TESTING.
 - 2) Test cables that occupy the same innerduct or conduit (if not in innerduct) as the damaged cable per paragraph B, above, regardless of whether they are new cables installed as part of this project or existing cables installed prior to this project.
 - a) If any of the cables requiring testing are in use, coordinate with the Owner to schedule an outage opportunity during which the testing can be performed.
 - d. If a cable which occupies the same innerduct or conduit (if not in innerduct) as a damaged cable is damaged by the extraction and installation process, replace the cable at no additional expense to the Owner.

- 1) Damaged cables which are replaced shall be subject to the testing procedures of the paragraph titled TESTING.

APPENDIX

Designer – add a cable labeling schedule to the end of this specification section, and change the red-colored “X” to indicate the number of pages.

The following X pages contain the horizontal cable labeling content for each cable.

END OF SECTION