

Cable Specifications	ITD	Communications Operations	7001
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1.0 - PRINCIPLE

1.1 – CABLE SPECIFICATIONS

The El Paso County Network infrastructure is currently an industry standardized enterprise networking system. The El Paso County Network infrastructure provides secure IT transport of information, data, voice, and communication services. The structured cabling system supports voice, data, and imaging applications within County facilities which are located throughout El Paso.

To ensure the integrity, stability, proper operation, security, compliance, and performance of the El Paso County network the Network Operations Team and Telecommunications Team has designed the infrastructure to industry networking specifications.

The below are practices and guidelines that must be followed by El Paso County employees, customers, vendors, the public, and ITD staff members to ensure the integrity of the El Paso County Network infrastructure and minimize performance degradation and/or security issues.

2.0 - PRACTICE

2.1 – SPECIFICATIONS INTENT

The documented information states standards for a structured Telecommunications cabling system for the County of El Paso. The structured cabling system will support voice, data, and imaging applications within County facilities which are located throughout El Paso. This document describes the system requirements which include all materials, design, engineering, and installation, for the structured cabling system. The County of El Paso prefers to standardize future structured cabling systems to be Panduit. Any substitute to Panduit must carry a warranty to be equal or better than Panduit. By no means should any assumptions be made that this document is inclusive of all County projects. Any deviation from these specifications must be authorized and approved by COUNTY ITD personnel.

2.1.1 CURRENT ENVIRONMENT & STANDARDS

The COUNTY is currently an industry standardized networking system. Cabling and parts MUST easily integrate into the COUNTY existing network. If the COUNTY determines that a competing product does not meet the current standards, and it is not in the best interest of the COUNTY to invest into the product, or the product would require additional resources to install, train or operate, thereby indirectly impacting operating budgets, we have the option to disqualify the product.

2.1.2 - SPECIFICATIONS

MINIMUM SPECIFICATIONS: The specifications listed are to be interpreted as meaning the minimum required by the COUNTY. If the goods/services do not meet or exceed the COUNTY's specifications because of the exception, the COUNTY will consider the specifications to not be to the County's standards.

2.1.3- VENDOR AND EQUIPMENT SPECIFICATIONS

QUALITY ASSURANCE / QUALIFICATIONS OF THE CONTRACTOR

The Contractor installing the Telecommunications cabling system shall at a minimum possess the following qualifications:

- Be in business a minimum of five (5) years.
- Contractor shall demonstrate satisfaction of sound financial condition and can be adequately bonded and insured if the project deems necessary.
- Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
- Personnel knowledgeable in local, state, province and national codes and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
- Must possess current liability insurance certificates.
- Contractor must be registered with Building Industry Consulting Services International (BICSI).
- Must have personnel fluent in the use of Computer Aided Design and possess and operate CAD software using .DWG or .DXF format.

REQUIRED CONTRACTOR TRAINING

The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:

- Personnel trained and certified in the design of the Panduit Cabling System. Personnel trained and certified to install the Panduit Cabling System. The Designer and Installer shall show proof of current certification in Panduit Cabling. Provide references of the type of installation provide in this specification.
- Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques. Personnel must have experience using a light meter and OTDR.
- Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.

CONTRACTOR RESPONSIBILITY

- Contractor shall be obligated to exercise the highest standard of care in performing its obligations as required per the County's standards.
- Contractor acknowledges that the County of El Paso will rely on contractor's expertise, ability and knowledge of the system being proposed and shall be obligated to exercise the highest of standard care in performing its obligation as defined in the following Scope of Work.

MANUFACTURER QUALITY & PRODUCT SUBSTITUTIONS

- All telecommunications connecting hardware and cable must be made by an ISO 9001 Certified Manufacturer Industry requirements

- The following installation, documentation, component and system industry specifications shall be met or exceeded:
- Any product substitution must provide equal or better warranty
 - ANSI/TIA/EIA-568-B.1 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements"
 - ANSI/TIA/EIA-568-B.2 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair"
 - ANSI/TIA/EIA-568-B.3 and addenda
"Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling and Components Standard"
 - ANSI/TIA/EIA-569-B and addenda
"Commercial Building Standard for Telecommunications Pathways and Spaces"
 - ANSI/TIA/EIA-606-A and addenda
"Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"
 - ANSI-J-STD-607-A and addenda
"Commercial Building Grounding and Bonding Requirements for Telecommunications"
 - ANSI/TIA/EIA-526-7
"Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant"
 - ANSI/TIA/EIA-526-14A
"Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
 - IEC/TR3 61000-5-2 - Ed. 1.0 and amendments
"Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling"
 - ISO/IEC 11801:2002 Ed2.0 and amendments
"Information technology - Generic cabling for customer premises"
" Information Technology - Generic cabling systems

BALANCED TWISTED-PAIR PRODUCT SPECIFICATIONS

In addition to meeting the category 6 specifications outlined in ANSI/TIA/EIA-568-B.2-10, the requirements in this section must also be met for all applicable balanced twisted-pair products.

OUTLETS

All category 6 outlets designed for termination of twisted-pair category 6 copper cables must possess the following characteristics at the minimum:

- Labeling must be used.
- Labeling mappings must be provided.
- Termination must follow category 6 standards.
- Quad face plates must be used, and fully populated with cabling unless otherwise identified in the project scope of work.
- Depending on the needs of the County or the building some outlets may require a different category of twisted pair cable.

- Three distinct color coded twisted pair category 6 cables with the associated RJ45 modules: for data, voice, and state government cables.
- Outlet faceplates must be single jack module type.

PATCH CORDS

The following category 6 patch cords specifications are required:

- Patch cables must be factory made per category 6 specifications.
- 5 ft. Patch cords provided for the data closets (Pending COUNTY ITD determination).
- 14 ft. Patch Cords provided for all end user cable drops (Pending COUNTY ITD determination).
- All Patch Cables will use proper cable management in the data closets.
- Cable management provided for all data racks provided by contractor.

PATCH PANELS

All termination panels shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, 19 inch relay rack mounting requirements.

Patch panels must be 24 port w/Mini-Com Universal Jacks.

OPTICAL FIBER PRODUCT SPECIFICATIONS

In addition to meeting the specifications outlined in ANSI/TIA/EIA-568-B.3 and ISO/IEC 11801:2000 Ed2.0, the requirements in this section must also be met for all applicable optical fiber products as listed below.

OUTLETS/ADAPTERS/CONNECTORS

All optical fiber outlets/adapters shall meet the following characteristics:

- All Data Closets shall use LC Connectors.
- Note: LC Style Connectors shall be utilized in all new installations
- Proper labeling will be provided with all terminations.

PATCH CORDS/PIGTAILS

Fiber equipment cords shall possess the following characteristics:

- Patch cords will allow for connectivity from the enclosure to the 19" racks (not to exceed 10 meters).
- LC to SC patch cords will be used (COUNTY ITD will be notified prior to ordering patch cords).

ENCLOSURES

All interconnect centers, panels and trays (units) shall provide cross-connect, inter-connect, splicing capabilities and contain cable management for supporting and routing the fiber cables/jumpers.

CABLE

In addition to meeting the applicable performance specifications, all optical fiber cable shall be appropriate for the environment in which it is installed.

MULTIMODE OPTICAL FIBER CABLE

All horizontal multimode optical fiber cable must be a minimum of two strands of 50/125µm multimode.

- 50/125µm shall be utilized in all new installations, OM3/OM4, LC style

SINGLEMODE OPTICAL FIBER CABLE

Single mode optical fiber cable shall be used for distances greater than 500 Meters.

MOUNTING OPTIONS

RACKS

For rack mounted installations in a telecommunications room the installer shall use a 19 inch equipment rack unless otherwise specified in the project scope of work.

- Racks to be installed 3 feet from the floor and should be accessible on three sides. (Actual placement to be determined during walkthrough with County ITD).
- Cable tray / Conduit extend to 19 inch rack.
- Bolted to floor.
- Properly grounded.
- Racks will not be collocated with electrical power distribution systems or major electrical hardware.
- Space permitting, two racks will be installed in each TR, with one rack dedicated to data/voice connections on universal WAO's and one rack dedicated to voice patch panels connected to multi pair CAT 5e cables terminated on 110 block located adjacent to the service provider wall field.
- Racks will be located adjacent to each other with enclosed cable management between racks and on the outside of racks at the end of a series of racks.
- All racks will be installed in accordance with the manufactures specifications.
- All racks shall incorporate vertical and horizontal cable management enclosures unless otherwise specified.
- Racks will have Category 6 patch panels installed in sufficient quantity to terminate all CAT 6.
- UTP from wall jacks plus 20%. Patch panels for cabling from walls jacks will be mounted in the upper half of the equipment rack.
- Unless otherwise defined in the project scope of work patch panels for connection to voice services shall be installed in the lower half of the equipment rack. Dedicated patch panels will be installed to connect/punch down multi-pair tie cables as required for connectivity to incoming voice lines from the phone company DP. Voice connections from the phone system will not be connected (i.e. punched down) on the same patch panels as the work area outlets.
- Wall mounted racks that have been identified in the project scope of work will be the hinged type to allow easy access to the back of patch panels and equipment. If not located in a secured room these wall mounted racks must also be lockable.

SYSTEM DESIGN REQUIREMENTS

HORIZONTAL CABLING

The Horizontal Subsystem is the portion of the telecommunications cabling system that extends from the work area telecommunications outlet/connector to the horizontal cross- connect in the telecommunications room. It consists of the telecommunications outlet/connector, the horizontal cables, optional consolidation point, and that portion of the cross-connect in the telecommunications room serving the horizontal cable. Each floor of a building should be served by its own Horizontal Subsystem.

BACKBONE CABLING

Cables allowed for use in the backbone include: 4-pair 100Ω balanced twisted-pair copper, multi-pair 100Ω balanced twisted-pair copper, hybrid or bundled 100Ω balanced twisted-pair copper, 50/125μm multimode optical fiber, and 8.7-10μm single mode optical fiber cables. The cable shall support voice, data and imaging applications. The bending radius and pulling strength requirements of all backbone cables shall be observed during handling and installation.

INTRA-BUILDING CABLING

The cable route within a building, connecting closet to closet or closet to the equipment room is referred to as the Intra-building Backbone Subsystem. It links the Main Cross-connect (MC) in the equipment room to Intermediate Cross-connects (IC) and Horizontal Cross-connects (HC) in the Telecommunications Rooms (TR). It consists of the backbone transmission media between these locations and the associated connecting hardware terminating this media.

INTER-BUILDING CABLING

When a distribution system encompasses more than one building, the components that provide the link between buildings constitute the Inter-building Backbone Subsystem. This subsystem includes the backbone transmission media, associated connecting hardware terminating this media, and electrical protection devices to mitigate harmful voltages when the media is exposed to lightning and/or high voltage power surges that pass through the building cable. It is normally a first-level backbone cable beginning at the main cross-connect in the equipment room of the hub building and extending to the cross-connect in the equipment room of the satellite building.

TELECOMMUNICATIONS ROOM

- The Telecommunications Room is generally considered to be a floor serving facility. The Horizontal Cross-connect links the Horizontal Subsystem and the Backbone Subsystem together.
- The Horizontal Cross-connect shall consist of rack or wall mounted wiring blocks or panels for termination of copper cables or rack or wall mount interconnect centers or fiber management panels/trays for the termination of optical fibers.
- Cross-connect spaces include the labeling of hardware for providing circuit identification and patch cords or cross-connect wire used for creating circuit connections at the cross-connect.
- The telecommunications room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.

- Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-A and local codes.
- Communication grounding and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI- J-STD-607-A, or both be observed throughout the entire cabling system.
- The telecommunications room shall be dedicated to the telecommunications function. Access to telecommunications rooms shall be restricted to authorized service personnel and shall not be shared with building services that may interfere with the telecommunications systems or be used for building maintenance services.
- Lighting in the telecommunications room should be a minimum of 500 lx (50 foot candles) at the lowest point of termination. Light switch should be easily accessible when entering the room.
- A minimum of two dedicated duplex or two dedicated simplex electrical outlet, each on a separate circuit, should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.

EQUIPMENT ROOM

- The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications room and the transmission media required to terminate this equipment on distribution hardware.
- The equipment room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-A and local codes.
- New equipment rooms should have double doors that open outward to provide easy access to 19" racks, and provide for proper ventilation/cooling to insure equipment overheating does not occur.
- Communication grounding and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed.1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.
- The equipment room shall not be shared with building services that may interfere with the telecommunications systems or be used for custodial services.
- Lighting in the equipment room should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
- A minimum of two dedicated duplex or two dedicated simplex electrical outlet each on a separate circuit should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.
- All walls within the TR will be lined with AC grade or better void free ¾" plywood securely fastened to the existing walls. Plywood will be either fire rated or treated with at least two coats of fire-resistant paint. For framed walls plywood will be mounted to directly to wall framing members.
- The recommended size of the telecommunications room should be 10'x10' for MDF and 8'x8' for IDF. Equipment rooms not meeting the size shall be discussed with ITD personnel.

INSTALLATION SITE SURVEY

Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.

PHYSICAL INSTALLATION

CABLE PATHWAYS (WIRE MESH BASKET 12" WIDE X "HEIGHT)

- Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
- Grounding and bonding of pathways shall comply with applicable codes and regulations.
- Pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.
- The number of cables placed in a pathway shall not exceed manufacture specifications, nor, will the geometric shape of a cable be affected.
- Pathways shall not be located in elevator shafts.

INTRA-BUILDING CABLE ROUTING

- The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications rooms and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications rooms and the main or intermediate cross-connect in a long single story building like a school or factory.
- Unless otherwise recommended by the manufacturer, all fiber cables will be run in inner-duct.
- Fibers will be terminated in the telecommunications rooms using LC connectors in wall mounted interconnect centers or rack mounted panels equipped with sufficient ports, slack storage space and splice trays if required to terminate and secure all fibers.
- Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all telecommunications rooms, such that no drilling of additional sleeves/slots is necessary. The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect.
- At least one 25-pair balanced twisted-pair; hybrid/bundled or multi-pair cable should be run for each Intra-building backbone segment.
- Optical fiber should be run for any backbone segment greater than 90 m (295 ft.). If the Intra-building backbone segment is less than 90 m (295 ft), and fiber is not routed, the balanced twisted-pair cable shall be category 5e or higher.
- Backbone pathways shall be installed or selected such that the minimum bend radius of backbone cables is kept within manufacturer specifications both during and after installation.

INTERBUILDING CABLE ROUTING

- The backbone subsystem shall include cable installed between buildings via underground, tunnel, direct-buried, aerial or any combination of these from the main cross-connect to an intermediate cross-connect in a multi-building campus.
- Unless otherwise recommended by the manufacturer, all fiber cables will be run in inner duct.
- Fibers will be terminated in the telecommunications rooms using LC connectors in wall mounted interconnect centers or rack mounted panels equipped with sufficient ports, slack storage space and splice trays if required to terminate and secure all fibers.

- In an underground system, adequate underground conduit space shall be available and accessible at each building. The conduits shall not exceed a fill factor of 40%.
- All underground systems shall be designed to prevent water runoff from entering the building.
- The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each satellite building telecommunications room. All Inter-building cables shall be installed to the applicable codes and regulations.
- Optical fiber shall be run for all Inter-building backbone segments, and as a recommendation, at least one balanced twisted-pair cable should be run for each Inter-building backbone segment.
- Backbone pathways shall be installed or selected such that the minimum bend radius and pulling tension of backbone cables is kept within cable manufacturer specifications both during and after installation.

HORIZONTAL CABLE ROUTING

- All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
- The combined length of jumpers, or patch cords and equipment cables in the telecommunications room and the work area should not exceed 10m (33 ft) unless used in conjunction with a multi-user telecommunications outlet.
- Two horizontal cables shall be routed to each work area. At least one horizontal cable connected to an information outlet shall be 4-pair, 100 Ω balanced twisted-pair.
- It is recommended that a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and the work area.
- For installations with consolidation points, a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and consolidation point, and 5m (16 ft.) between the consolidation point and the work area.
- Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.
- In open ceiling cabling, cable supports shall be provided by means that is structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.5 m (5 ft) apart.
- Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is less than or equal to 480 Vrms, shall be installed with a minimum clearance of 50 mm (2 in).
- The installation of telecommunications cabling shall maintain a minimum clearance of 3 m (10 ft) from power cables in excess of 480 Vrms.
- No telecommunications cross-connects shall be physically located within 6 m (20 ft) of electrical distribution panels, step down devices, or transformers, which carry voltages in excess of 480 Vrms.
- For voice or data applications, 4-pair balanced twisted-pair or fiber optic cables shall be run using a star topology from the telecommunications room serving that floor to every individual information outlet. The customer prior to installation of the cabling shall approve all cable routes.
- The Contractor shall observe the bending radius and pulling strength requirements of the 4-pair balanced twisted-pair and fiber optic cable during handling and installation.
- Each run of balanced twisted-pair cable between horizontal portions of the cross- connect in the telecommunication closet and the information outlet shall not contain splices.
- In a false ceiling environment, a minimum of 3 inches (75 mm) shall be observed between the cable supports and the false ceiling.
- Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than

two (2) 90 degree bends without utilizing appropriately sized pull boxes.

- All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
- The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not cause a geometric shape of the cables.
- Maximum conduit pathway capacity shall not exceed a 40% fill. However, perimeter and furniture fill is limited to 60% fill for move and changes.
- Horizontal distribution cables shall not be exposed in the work area or other locations with public access.
- Cables routed in a suspended ceiling shall not be draped across the ceiling tiles. Cable supports shall be mounted a minimum of 75 mm (3 in) above the ceiling grid supporting the tiles.

WORK AREA TERMINATION

- All balanced twisted-pair cables wired to the telecommunications outlet/connector, shall have 4-pairs terminated in eight-position modular outlets in the work area. All pairs shall be terminated.
- The telecommunications outlet/connector shall be securely mounted at planned locations.
- The height of the telecommunications faceplates shall be to applicable codes and regulations.

PULLING TENSION

- The maximum cable pulling tensions shall not exceed manufacturer's specifications.

BEND RADIUS

- The maximum cable bend radii shall not exceed manufacturer's specifications.
- In spaces with balanced twisted-pair cable terminations, the maximum bend radius for 4- pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
- During the actual installation, bend radius on 4-pair cable shall not exceed eight times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

SLACK

- In the work area, a minimum of 300 mm (12 in) should be left for balanced twisted-pair cables, while 1 m (3 ft) is left for fiber cables.
- In telecommunications rooms a minimum of 3 m (10 ft) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.

CABLE TIE WRAPS

- Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath.
- Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

- Velcro tie wraps will be provided for IDF and MDF.

GROUNDING

- All grounding and bonding shall be done to applicable codes and regulations.
- Properly installed fire stop systems shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications use that may or may not be penetrated by cables, wires, or raceways.
- Fire stops shall be done to applicable code.

WORKMANSHIP

- All work shall be done in a workman like fashion of the highest standards in the telecommunications industry.
- All equipment and materials are to be installed in a neat and secure manner, while cables are to be properly dressed.
- Workers must clean any debris and trash at the close of each workday.

TESTING

- Testing of all installed fiber, cable drops, and cable channels shall be performed prior to system cutover.
- Test results will be submitted for review and acceptance of COUNTY ITD staff prior to system cutover.
- Test results must state pass status prior to acceptance by COUNTY ITD staff.
- Documentation of the type of device used to test fiber and copper must be provided to COUNTY ITD staff. Documentation of the calibration settings used by the device must be provided to COUNTY ITD staff.

COPPER TESTING

- All category 6 field-testing shall be performed with an approved level field test device.
- All installed category 6 channels shall perform equal to or better than the minimum requirements as specified EIA/TIA Standards.
- Category 3, balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1.
- All balanced twisted-pair backbone cables exceeding 90 m (295 ft) or 100 m (328 ft) shall be 100% tested for continuity if applications assurance is not required.
- Category 6 balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the basic link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1.

TEST EQUIPMENT CRITERIA

All balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.

Auto-test settings provided in the field tester for testing the installed cabling shall be set to the default parameters.

Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

FIBER OPTIC TESTING HORIZONTAL FIBER TESTING

- Fiber horizontal cables shall be 100% tested for insertion loss and length.
- Insertion loss shall be tested at 850 nm or 1300 nm for 50/125 μ m and 62.5/125 μ m multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
- Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

BACKBONE FIBER TESTING

- Fiber horizontal cables shall be 100% tested for insertion loss and length.
- Insertion loss shall be tested at 850 nm and 1300 nm for 50/125 μ m and 62.5/125 μ m multimode cabling in at least one direction using the Method B (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-14A.
- Insertion loss shall be tested at 1310 and 1550 for single mode cabling in at least one direction using the Method A.1 (1-jumper) test procedure as specified in ANSI/TIA/EIA-526-7.
- Length shall be tested using an OTDR, optical length test measurement device or sequential cable measurement markings.

ADMINISTRATION & LABELING DOCUMENTATION

- Horizontal and backbone cables shall be labeled at each end. The cable or its label shall be marked with its identifier.
- A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- Each port in the faceplate shall be labeled with its identifier.
- A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
- Each port on the connecting hardware shall be labeled with its identifier.
- Labels will provide the following information and conform to the format defined below: Multi-level facilities served by a single Main Cross-Connect (MC)
 - The first number represents the building floor where the MC is located.
 - The second number indicates the floor on which the WAO is located.
 - The third number indicates the patch panel within MC.
 - The fourth number indicates the port on the patch panel.

SINGLE-LEVEL FACILITIES SERVED BY AN MC AND MULTIPLE IC/HC

- The first number represents the building floor where the MC/IC is located.
- The second number indicates the number of the HC on that floor.

- The third number indicates the patch panel within that MC/IC/HC.
- The fourth number indicates the port on the patch panel.

DRAWINGS

As-built drawings shall be supplied by the contractor utilizing CAD software in .DWG or DFX format. Drawings will show the locations of and identifiers for all:

- Horizontal cable routing and terminations.
- Telecommunications outlets/connectors.
- Backbone cable routing and terminations.

RECORDS AND REPORTS

All records shall be created by the installation contractor and turned over at the completion of work. The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:

- Cable records must contain the identifier, cable type, termination positions at both ends, splice information as well as any damaged pairs/conductors.
- Connecting hardware and connecting hardware position records must contain the identifier, type, damaged position numbers, and references to the cable identifier attached to it.
- Test documentation on all cable types shall be included as part of the As-built package.

All reports shall be generated from the computer-based program used to create the records above. These reports should include but not limited to:

- Cable Reports.
- Cross-connect Reports.
- Connecting Hardware Reports.

WARRANTY

Either a basic link or channel model configuration may be applied to the horizontal and/or backbone sub-systems of the structured cabling system. Applications assurance is only applied to a channel model configuration. All channels are to be qualified for linear transmission performance up to 500 MHz to ensure that high-frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

SYSTEM WARRANTY

The proposed category 6 structured cabling system must include a twenty five year (25) warranty to meet all relevant cabling system standards for up to twenty five years which will provide an end-to-end installation which covers applications assurance, cable, connecting hardware and the labor cost for the repair or replacement thereof.

3.0 – FREQUENCY

3.1 – FREQUENCY

A review of this Principle and Practice will be performed annually (or sooner) to evaluate its effectiveness and appropriateness.

