

Guidelines for Architects and Engineers
Fairfax County, BDCD
270000 – Information Technology



Multiple Updates – Guide changed from Appendix B to Division 270000. All changes are highlighted in red.

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Developed by:
Department of Information Technology (DIT)

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1.0 Introduction

1.1 General: Provision of the Information Technology (IT) infrastructure and equipment is essential in the design, construction and the subsequent operation of all new building construction and renovation projects. Whether it is voice, data, building automation systems, access control, security, or other specialized communications technologies, early coordination and full integration of these complex systems is critical.

This document provides information and guidance to preferred practices and does not waive or grant exceptions to any element of federal, state, or local building codes, ordinances, and regulatory requirements as applicable to the specific project. Any conflict between these Guidelines and the governing local, state, or federal codes shall be brought to the immediate attention of the Building Design & Construction Division (BDCD), Fairfax County Department of Public Works and Environmental Services (DPWES).

In the design of the IT infrastructure, the Architect/Engineer (A/E) is responsible for ensuring that the most current version of referenced design standards in the Guidelines is used for the project. The Consultants shall verify with the Owner that Exhibits and Appendices are the most current versions. Any variance from these IT Guidelines must be submitted in writing to the BDCD Project Manager / Project Coordinator no later than 50% design submission.

1.2 Standards and References:

- A. Fairfax County communications systems shall follow all applicable codes and standards set forth in the following: National Electrical Code (NEC); National Fire Safety Council (NFSC); National Fire Protection Association (NFPA); American National Standards Institute (ANSI); Telecommunication Industries Association (TIA); Electronic Industries Alliance (EIA); Telecommunication Building Wiring Standards; Federal Communications Commission (FCC); Institute of Electrical and Electronic Engineers (IEEE); and Building Industry Consulting Service International (BICSI) - Telecommunication Distribution Methods Manual. These standards and other governing codes and requirements are to be used as reference when designing telecommunication systems.

- B. These standards are not intended to be used as the final specifications for any specific project, as they set the starting point in the process of coordination and collaboration between the A/E and the owner, including DIT, for any given capital project.

2.0 Telecommunication Services

2.1 General: Department of Information Technology (DIT) provides telecommunication (voice and data) services to county agencies for capital and maintenance projects, consisting of a vast range of information-transmitting technologies such as wireless, land lines, VoIP, and broadcast networks. This is accomplished by the installation of required infrastructure and the core technology network that provides the required services to

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customers. DPWES and DIT are responsible for overseeing the design, construction, and integration of the range of technology systems as required in each project.

The following general guidelines are provided for clarity of roles and responsibilities for the base building infrastructure and the telecommunications equipment:

- A. A/E shall design and identify the locations of the conduits with mule tape, pull boxes, junction boxes, grounding wire and buss bar, electrical outlets, HVAC system, and fit-up of Telecommunication Room with plywood, as described in these guidelines.
- B. General contractor shall install the required telecommunication equipment identified by the A/E. This shall include conduits with mule tape from the property line to the IT room.
- C. All voice and data jacks, cabling and cover plates, racks, cable trays, servers, and other IT in the Telecommunications Rooms will be furnished and installed by Fairfax County's authorized Telecommunication Vendors (Telecom Vendors). DIT is responsible for overseeing the procurement, design, and installation of the required servers/equipment.
- D. DIT is responsible for recommending the computer hardware and software that may be required as part of the project. This is to ensure that all computer hardware and software follow DIT standards for compatibility required for the County's IT infrastructure.
- E. No non-DIT network hardware shall be connected to the DIT network without the prior approval of DIT.

2.2 Telecommunications Room:

- A. Telecommunication Room (TR) must be of adequate size to accommodate requirements for County voice, data, security, fire alarm system and cable television (CATV) infrastructure and equipment. Therefore, TR must be minimum 10' X 12' with 8 feet ceiling height. Additional systems placed in the TR will require coordination with DIT for additional space to be allocated.
- B. TR provides a connection point between backbone and horizontal cabling. Backbone is a facility (pathways, cable, conductors, structured wiring) that allows the placing of main and high-volume cables between cross-connect points within the buildings and between buildings. Horizontal cabling extends from work area telecommunications outlet/connectors to the horizontal cross-connect. This consists of connectors (patch panels, punch down blocks) that allow horizontal backbone, and equipment cabling to be cross connected with patch cords or jumpers.
- C. TR shall be a secured room dedicated to telecommunications services with no other building services sharing the space. This shall be separated from the electrical room.

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- D. Minimum of one TR must be provided on each floor of a facility with additional rooms as required to accommodate the communications equipment and wiring requirements. The rooms shall be stacked when on different floors. However, if the TRs are not stacked between the two floors above and below metal conduits or sleeves shall be provided.
- E. Workstation cable runs cannot exceed 290 feet from the Telecommunications Room. When the distance exceeds 290 feet from workstation to the TR an additional room/closet may be required as follows:
- If the additional serve area is less than 5,000 square feet provide 10'x 8' with 8' ceiling height TR.
 - If the additional service area is between 5,000 to 8,000 square feet provide 10'x 9' with 8' ceiling height TR.
- F. All walls shall be covered with 4'x 8'x ¾" fire retardant plywood for County voice, data and CATV equipment and shall have two coats of fire-retardant white paint. Fire-retardant stamp on the plywood must be in full view for inspection. Additional plywood backboards may be required for voice, CATV, and other telecommunication equipment.
- G. Floor shall be anti-static VCT flooring.
- H. Exposed ceiling or tiles shall be fire-rated in accordance with ASTM standards.
- I. The room door shall be a minimum of 36" wide. The door shall open outward and be secured by lock and key and access control system.
- J. Provide a minimum of 3 feet of clear, unobscured space for the installation and maintenance of all cabling and equipment mounted on walls, racks, cabinets, or enclosures. Allocate 3 feet by 7 ½ feet high for each equipment, rack, or cabinet.
- K. Provide floor space for **three (3)** 19" wide by 26" deep by 84" high cable racks with a minimum of 3 feet of clear space on all sides of electrical/communications racks.
- L. **Clear spaces around racks, cabinets, equipment, or enclosures may not overlap per NEC 110.26.**
- M. **Ductwork assemblies larger than required to service the HVAC requirements of the TR shall not be located within the TR.**
- N. **Plumbing supply lines shall not be located within the TR.**
- O. **Fire sprinkler supply lines shall not be located over equipment racks or enclosures where possible. Where fire sprinkler supply lines must be located over equipment racks or**

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enclosures a drip tray shall be mounted below the supply line above the rack or enclosure. The drip tray width shall extend a minimum of 2” on either side of the supply line and shall extend lengthwise a minimum of 3” beyond the equipment.

P. Electrical Requirements:

- See Figure 1 Telecommunications Room Electrical Requirements
- Provide a two hundred (200) amp electrical panel in the Telecommunications Room dedicated to low voltage equipment
- For every rack included in the design, provide two (2) 120Vac/20A quadplex outlets at 90” AFF behind the proposed rack location (s) or installed on the rack. Each outlet shall be on a dedicated circuit.
- For all walls provide one 120Vac/20A electrical duplex outlet every 4 feet at 12” AFF.
- Provide a dedicated twenty (20) amp quadplex outlet on wall behind rack 18” AFF (supplies power to UPS).
- DIT will provide an Uninterruptable Power Source (UPS) for the IT equipment; no central UPS is required.
- Provide a minimum of two ceiling-mounted, LED tube light fixtures with cover guard and a separate wall-mounted switch connected to emergency power (UPS or generator). The fixture shall provide a minimum of 50-foot candles at 3’ above finish floor.

Q. HVAC Requirements: All Telecommunications Rooms shall be provided with a dedicated HVAC system capable of maintaining the temperature of the room between 64 to 75 degrees F with humidity between 35 and 55 percent non-condensing. Split system units and/or other HVAC systems are acceptable.

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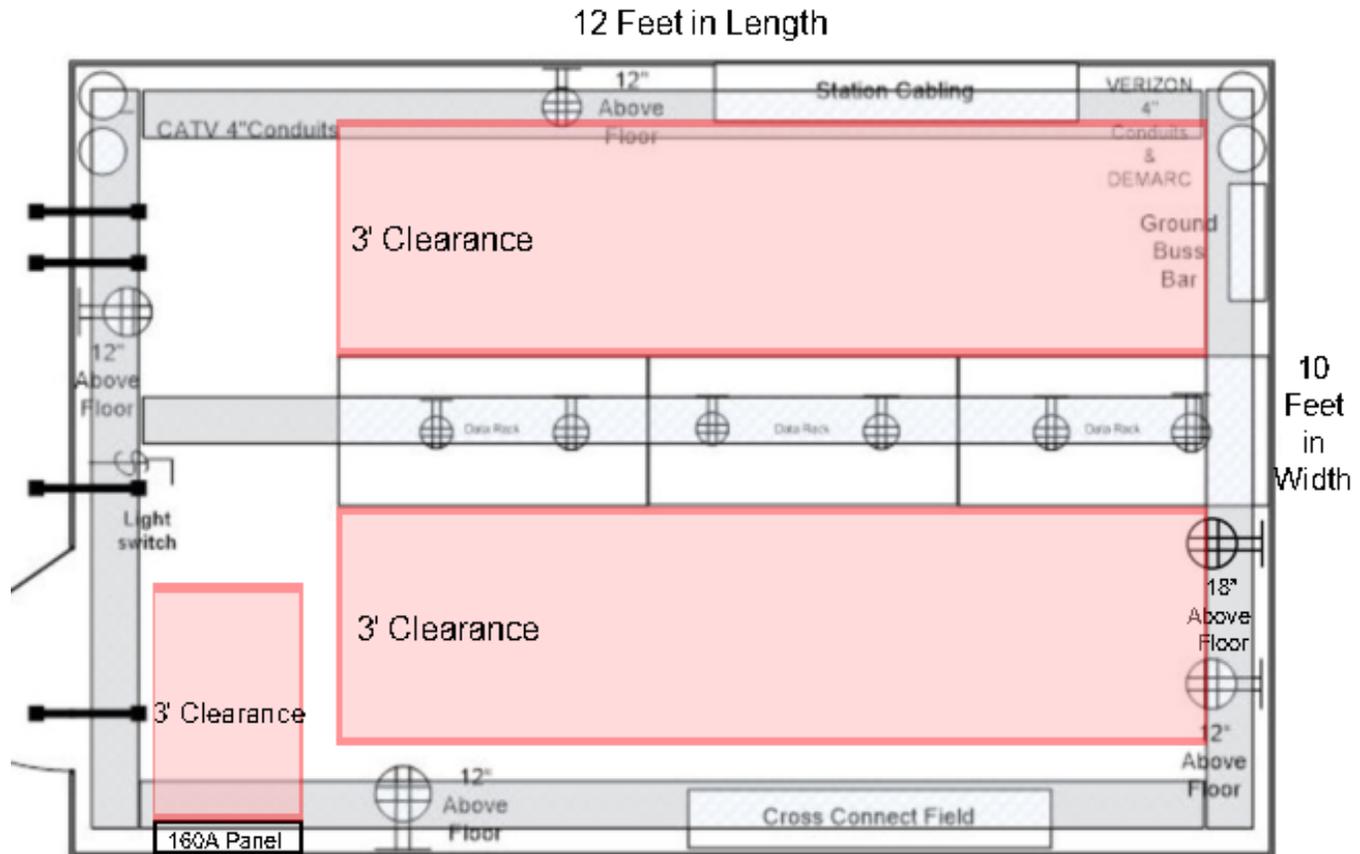


Figure 1 Telecommunications Room Electrical Requirements

2.3 Grounding:

All cabling systems and electronics distribution equipment shall be grounded for both safety and minimization of electromagnetic interference. A 12-inch bus bar **with eighteen (18) ¼” pre-drilled holes with insulators (See Figure 2) shall be installed. An insulated #1/0 ground wire** shall be installed from the bus bar to the main building ground using a double lug nut, in accordance with the NEC guidelines. All building wiring, pathways and spaces, grounding and bonding shall meet or exceed the ANSI/EIA/TIA Telecommunications Infrastructure Standards as well as the NEC Electrical Code (NFPA 70). See Figure 2 for TR grounding requirements.

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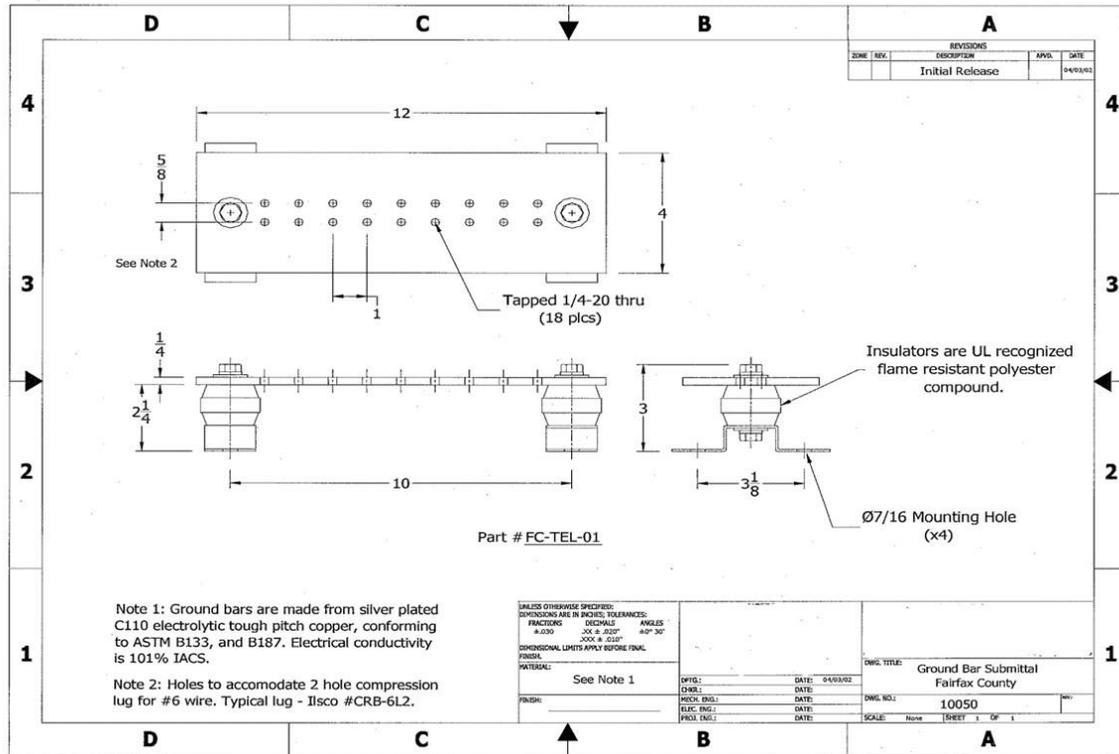


Figure 2. Telecommunications Room Grounding Requirements

2.4 Conduit and Jack Requirements:

- A. Exterior Conduits: A minimum of four (4) 4” conduits must be provided from the Quazite pull boxes located near the property line to the Telecommunications Room. Each conduit must have mule tape with footage markings.
- B. Interior Conduits (connecting telecommunication rooms): Shall have a minimum of **three (3) 4” conduits** with mule tape identified with footages. **One shall be dedicated to telecom, one for other low voltage, and one for future expansion of both.** Within the building, conduits must be provided vertically and horizontally between all Telecommunications Rooms that are wired in a series. The number, locations, and routing of these conduits are to be reviewed and approved by the DIT.
- C. A 1 1/2” conduit with pull-string must be provided to each communication device location **that is not accessible through the drop ceiling** and homerun to the Telecommunications Room **or stubbed to the nearest drop ceiling area.** Cable trays may be required based on the overall density of the voice and data cabling and will be provided by Telecom Vendors. Only metallic conduit or PVC (schedule 40) smooth conduit are allowed.
- D. Where conduits for communication device locations exit the building a 12”x12”x3/4”**

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fire-rated plywood backer board or 12"x12"x6" junction box must be provided to accommodate indoor/outdoor cable transition hardware.

- E. J-hooks installed for telecom cabling shall be for the exclusive use of telecom cabling. No other low voltage may share the J-hook.
 - F. Co-located voice and data communications cables may utilize the same 1 1/2." conduit into a single gang box. There should be a minimum of 2' separation between electrical and telecom cabling to minimize interference.
 - G. Inaccessible or secure areas must have an entire conduit system from communication jack to the Telecommunications Room.
 - H. Provide **appropriately sized** conduit in all plenum and/or hard ceiling areas.
 - I. Provide two (2) 1-1/2" sleeves as required to provide cable pathway into each room from the main cable pathway. One shall be reserved for telecom, the other for other low voltage.
 - J. Empty conduits and boxes in concrete slabs or an under-slab duct /conduit distribution system such as Walker Duct system, are required for systems furniture and/or freestanding furniture requiring communications outlets. Provide sleeves through floors and ceilings as required for cable pathways.
 - K. All conduits shall be fire-stopped with the appropriate method, per NFPA standards. **Fire-stopping shall be performed by the installer to place cabling in the conduit. Spare conduits shall be fire-stopped by the general contractor.**
 - L. Provide a pull box every 200 feet and at each 90-degree bend. Total of (2) sweeping bends (90-degree bend) per each run of 200 feet are allowed.
 - M. Turn up Under Floor Duct (UFD) at least three inches above the finished floor and three inches away from the wall.
 - N. Accessible pull boxes can be used as a junction point for several 1 1/2" inch conduit runs. Provide a 4" conduit with mule tape and footage markings home run to the nearest Telecommunications Room.
 - O. 1" conduit shall be installed between drop ceiling and FACP cable trough.
 - P. 1" conduit shall be installed between FACP cable trough and FACP.
- 2.5 Cabling:** Cabling Infrastructure consisting of cables, patch cords, and accessories will be provided and installed by County's authorized Telecommunications Vendors. The following guidelines must be followed for all new construction jobs. Any deviation must

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be pre-approved by DIT.

- A. Station Cabling consists of cables from Telecommunication Room to communication jacks, and the wireless access point (WAP)
1. Data – **Single CAT 6A**, Siemon Premium, UTP (unshielded) Plenum (Blue).
 2. Fire Alarm & Elevator – **Single CAT 6A**, Siemon Premium, UTP (unshielded), Plenum (Blue)
 - Terminate FACP ends with RJ31X jacks.
 3. Wireless Access Point (WAP) & **Distributed** Antenna System (DAS) – Dual CAT 6A Siemon Premium F/UTP (shielded) Plenum (White).
 4. Wall phone outlets must be installed 40” to the bottom of the J-box above finished floor and a minimum of 8” from door frames or any other device. This will provide adequate space to install 10”x10” phone.
 5. **Install 12-strand armored single-mode fiber between closets and 12-strand single-mode OSP fiber when required based on structured cable standard.**
 6. **Television – RG6 Quad shielded Plenum coaxial cable when under 150’. RG11 Quad shielded Plenum coaxial cable when beyond 150’.**
- B. Patch Panels Standard
1. Siemon 48 Port **CAT 6A** Unshielded Patch Panel.
 2. Siemon 24 Port CAT 6A Shielded Patch Panel.
- C. Patch panels for telecom shall be for the exclusive use of telecom systems. No other low voltage shall share patch panels with telecom.**
- D. Patch Cords Standard
1. RJ45 to RJ45 8-pin-to-8-pin 568B **CAT 6A (gray)**.
 2. RJ45 to RJ45 8-pin to 8-pin 568B CAT 6A Shielded (white).
- E. Racks Standard
1. **Siemon or similar** 2 Post Rack, 7’x 19”, with vertical organizers, 20 AMP power strips, and ground racks to local bus bar using double lugs.
- F. Cable Management
1. For each rack **mount two 6”** vertical organizers.
 2. If there is more than one rack mount **10”** vertical organizer between each pair of racks.
 3. Between each patch panel install one **1.75” (1U)** horizontal organizer.
- G. Under Floor Duct Systems
1. General Contractor is responsible for providing Walker Duct system for flush-mounted jacks within concrete floors.

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2.6 Backbone and Tie Cabling:

- A. Outside plant tie cabling from structure to structure requires lightning protection on each end, protectors must be grounded.
- B. Backbone tie cables between closets terminate on 110/66 blocks as required.

2.7 Standard Numbering Plan for Cabling Systems:

- A. DIT contractor shall install labeling to conform to the latest DIT published standard “Cable and Patch Panel Identification.”

3.0 Video Conferencing (VTC)

- A. Video conferencing equipment that includes a television, speaker/microphones, camera, and associated control hardware.
- B. When television size is not known, one data outlet shall be installed 70” AFF offset 18” to the right of the center of the television mount. One (1) 15amp duplex outlet shall be installed 70” AFF offset 18” to the left of the center of the television mount.
- C. When television size is known request information from DIT for data and power outlet placement.

4.0 Distributed Antenna Systems (DAS)

- A. Extends mobile wireless signals within the building, whereby improving voice and data connectivity for end users by using network of antennas distributed throughout the building using carrier’s licensed frequencies. The network system typically utilizes coaxial, high-speed balanced twisted-pair copper and/or optical fiber cabling to connect antennas and support the delivery of wireless service.
- B. Radio Shop must evaluate each site to identify the need for DAS. If determined to be required, a Radio Shop contractor will be engaged to work with the A/E on coordinating the design of the DAS system in the facility.
- C. Radio Shop contractor will be responsible for the installation of cable, antenna, grounding wire and the required equipment.
- D. General contractor will be responsible for the following:
 - 1. The installation of the conduits and the vault with curb.
 - 2. Procure and install five Monitor Modules (MM) compatible with the existing Fire Alarm (FA) panel. The modules shall be mounted in 4” x 4” x 2 1/8” junction box.

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- a. Dual units can be used.
 - b. All dry contacts to be wired for Normally Open (NO)
 - c. Install resistors as specified for the MM use.
 - d. Wire to the closest FA device for a loop connection
 - e. Address and program to the FA panel for five supervisory alarms to be monitored for the integrity of the DAS.
- These alarms will work with the Bi-Directional Amplifier (BDA) and Battery Backup Unit (BBU) dry contacts.
 - The alarms will be labeled in the system as stated below.
 - BDA
 - Component Fail
 - Antenna Malfunction
 - BBU
 - AC Fail
 - Battery Low
 - Charger Fail
 - f. Test in advance and during the FA inspection.

5.0 Public Radio System

- A. Public radio system shall be installed at all Fire and Police Station. The radio system at the fire station shall be utilized with fire station alert system. This is a system that is IP based and connected to the Computer Aided Design (CAD) system.
- B. Radio Shop (DIT) will work with the A/E on the coordination of the conduit location for antenna cable.
- C. General contractor will be responsible for the installation of conduits and installation of the vault with curb.
- D. Radio Shop contractor will be responsible for the installation of cable, antenna, grounding wire and the required equipment.

6.0 Roof Curb, Vault, and Conduits:

6.1 General: Provide a roof curb manufactured of 14-gauge galvanized steel with continuously welded seams and mitered corners providing air and watertight construction. The curb shall be minimum of 18” high, internally reinforced as needed for the installation of the vault.

6.2 Aluminum Vault

- A. The vault shall be minimum of 0.080-inch-thick aluminum with gaskets and stainless-

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steel hardware.

- B. It shall have UV protected powder coating.
- C. The vault is to be the minimum size of 12” (L) x 12” (H) x 20” (H) and constructed of aluminum or stainless-steel flange and have tight exit seals with inserts for the two (2) 4” conduits.

6.3 Conduits

- A. Install two (2) 4” PVC conduits with mule tape having footage marking, from the vault to a pull box located in an accessible space with a floor drains such as a janitor’s closet. From the pull box install two (2) 4” conduits and terminate them into the Telecommunication Room.
- B. Conduits shall be installed with minimum fitting consisting of 45- and 90-degree bends. All 45-degree bends shall be sweeping bends, and at each 90-degree bend install a pull box.

7.0 Standards and References: All building wiring/cablings, pathways, space grounding and bonding shall meet or exceed industry codes, standards, and current references as of the time of the project design.

- A. TIA/EIA-568-B.1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
- B. TIA/EIA-568-B.1-1 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements - Addendum 1 – Minimum 4-Pair UTP and SCTP Patch Cable Bend Radius
- C. TIA/EIA-568-B.1-2 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements Addendum 2 – Grounding and Bonding Requirements for Screened Balanced Twisted-Pair Horizontal Cabling
- D. TIA/EIA-568-B.1-3 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements Addendum 3 – Supportable Distances and Channel Attenuation for Optical Fiber Applications by Fiber Type
- E. TIA/EIA-568-B.1-5 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements Addendum 5 – Telecommunications Cabling for Telecommunications Enclosures
- F. TIA/EIA-568-B.1-7 Commercial Building Telecommunications Cabling Standard Part 1: General Requirements Addendum 7 - Guidelines for Maintaining Polarity Using Array Connectors

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- G. IA/EIA-568-B.2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components
- H. TIA/EIA-568-B.2-1 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum 1
– Transmission Performance Specifications for 4-Pair 100-ohm Category 6 Cabling
- I. TIA/EIA-568-B.2-2 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum2, Revision of Sub-clauses.
- J. TIA/EIA-568-B.2-3 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum 3, Additional Considerations for Insertion Loss & Return Loss Pass/Fail Determination.
- K. TIA/EIA-568-B.2-4 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum4, Solderless Connection Reliability Requirements for Copper Connecting Hardware
- L. TIA/EIA-568-B.2-5 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum5, Corrections to TIA/EIA-568-B.2
- M. TIA/EIA-568-B.2-6 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum 6, Category 6 Related Component Test Procedures
- N. TIA/EIA-568-B.2-11 Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components – Addendum 11, Specification of 4-Pair UTP and SCTP Cabling
- O. TIA/EIA-568-3 Optical Fiber Cabling Components Standard
- P. TIA-569-B Commercial Building Standard for Telecommunications Pathways and Spaces
- Q. TIA-598-C Optical Fiber Cable Color Coding
- R. TIA/EIA-606-A Administration Standard for Commercial Telecommunications Infrastructure
- S. J-STD-607-A Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications
- T. TIA-758-A Customer-owned Outside Plant Telecommunications Infrastructure Standard

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U. TIA-526-7 Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant – OFSTP-7

The following will be supplied by DIT as requested:

V. Fairfax County - Cable and Patch Panel Identification

W. Fairfax County – Generic 55 Inch LCD Display Elevation

X. Fairfax County – Generic 65 Inch LCD Display Elevation

Y. Fairfax County – Generic 75 Inch LCD Display Elevation

Z. Fairfax County – Generic 85 Inch LCD Display Elevation

End of Section.