



Hill Air Force Base Communications Standards

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CHAPTER 1 INTRODUCTION

1.1 PURPOSE AND SCOPE

This document, based on UFC 3-580-01, incorporating change 1 and dated 1 June 2016, provides requirements for the planning, design, and construction of outside plant and interior telecommunications infrastructure guidance for Hill Air Force Base (HAFB) specific projects.

Unless otherwise noted in this document, the Registered Communications Distribution Designer (RCDD), engineer, or technician should follow the UFC.

The scope includes telecommunications spaces, pathways, cabling and interconnecting components necessary to support the infrastructure for voice, data and video systems. “Video systems” includes the necessary infrastructure for Closed Circuit Television (CCTV), Community Antenna Television (CATV), generally referred to as Cable TV, and Video Teleconferencing (VTC). This document does not address the design and specifics of the technologies that utilize the telecommunications infrastructure.

1.2 APPLICABILITY

This document applies to all interior telecommunications infrastructure planning, design and installation in new or existing facilities located at Hill Air Force Base. Waivers and exemptions to the requirements in this document must be coordinated with the Project Manager (PM) identified in the Statement of Work (SOW), Performance Work Statement (PWS), or contract. Please submit additional questions to the project-specific manager or 75 ABW/SC at 75ABW.SCXP@us.af.mil

1.3 REFERENCES

Originally UFC 3-580-01, para 1-6. Appendix A contains a list of references used in this document. Publication dates are not included as the latest available issuance of the reference is used.

1.4 ACTIVITY SPECIFIC TELECOMMUNICATIONS MANAGERS

Originally UFC 3-580-01, para 1-7. This document addresses only Air Force telecommunications requirements at Hill Air Force Base.

1.5 GLOSSARY

Originally UFC 3-580-01, para 1-8. The glossary at the end of this document contains acronyms, abbreviations, and terms.

CHAPTER 2 DESIGN REQUIREMENTS

2.1. ARCHITECTURAL CONSIDERATIONS

2.1.1. Sizing and Quantity

Originally UFC 3-580-01, para 2-4.2.2. Size ERs in accordance with TIA-568-C-1.1 except that the minimum size for all Hill AFB buildings is 10 feet x 10 feet (3m x 3m) when supporting standard Air Force networks e.g. NIPR. Comm room sizes will increase to accommodate equipment used to support additional customer-required networks e.g. JWICS, SIPR, DevNet, etc.

The Telecommunication Room (TR) should be approximately 1.1 percent of the area it serves. For example, a 10,000 sq. feet (929 sq. m) area requires a minimum of one 10 foot x 10 foot (3 m x 3 m) TR. Divide large floor areas into “serving areas” with TRs for each serving area. Each serving area can be no larger than 10,000 sq. feet (929 sq. m) as stipulated in TIA-568-C-1.1.

TR sizing, power, and HVAC requirements may be substantially impacted if additional systems (e.g. audio visual (A/V) systems, servers, disk storage arrays, etc.) are required in the TR. Consult with the architectural designer or facilities engineer when additional system requirements are integrated into the TR. Consider utilizing an Equipment Room (ER) for areas exceeding 10,000 sq. feet (929 sq. m) or buildings supporting substantial Information Technology (IT) electronics.

Provide a minimum of one TR per floor and additional rooms when the floor area is greater than 10,000 sq. feet (929 sq. m) and or the total cable distance to the outlet is over 295 feet (90 m).

Note: One TR may suffice for multi-story buildings in unique instances. Refer to section on 2-4.2.5 Multi-Story Buildings in UFC 3-580-01.

When renovating existing spaces, avoid rooms containing transformers, air handling units, and similar equipment types, unless no other option exists. If shared facilities are unavoidable, comply with TIA-569-C to maintain proper separation for electrical and telecommunications cables, and provide working clearances per the National Electrical Code (NEC).

Provide adequate space in TRs to facilitate tenant owned data and telecommunications systems, and other low voltage systems such as fire alarm, CATV, CCTV, and electronic security systems (ESS). Support equipment requirements in tenant installed freestanding cabinets or racks. Increase total TR space, as a percentage of the building’s area, to reflect the increased number of circuits in buildings with more than the standard number of circuits to each workspace.

2.2. POWER

Originally UFC 3-580-01, para 2-4.3.2. Provide two dedicated electrical branch circuit panel board for each TR with the following minimum requirements: 120 volt, 3-phase or 120 volt, 1-

phase, 24-(or 20 for 1-phase) space panel with a minimum 100 ampere (A) bus rated capacity. Feed all loads within the TR, except lighting, from this dedicated TR panel. Loads must include, but are not limited to, convenience receptacles, dedicated rack or cabinet receptacles, and HVAC systems (including exterior units for split systems). Provide 125V, 20A duplex convenience receptacles at 6 feet (1800mm) intervals on center around perimeter walls. When required by the Activity, provide an additional dedicated 125V, 20A circuit on the wall above the entry door for future electronic security system requirements. Coordinate with UFC 4-021-02, Electronic Security Systems (ESS).

Provide two NEMA L5-20R twist-lock type receptacles fed from dedicated circuits in the TR panel to power each power distribution unit. Install twist-lock receptacles above rack or cabinet, mounted to telecommunications cable tray or in ceiling space. As some rack or cabinet mounted equipment may require larger quantities of electrical power, the designer must consult with the local telecommunications group having jurisdiction to determine exact electrical power requirements for each TR.

At a minimum, provide two horizontal rack mount 120V 20A power distribution units with multiple NEMA 5-15 outlets in each rack or cabinet. To minimize accidental shut-off, power distribution unit shall have indicator lights, but no integral on/off switch.

Required rack elevations are shown below. For projects requiring non-standard racks, please refer to the Statement of Work (SOW) or Performance Work Statement (PWS) for instructions.

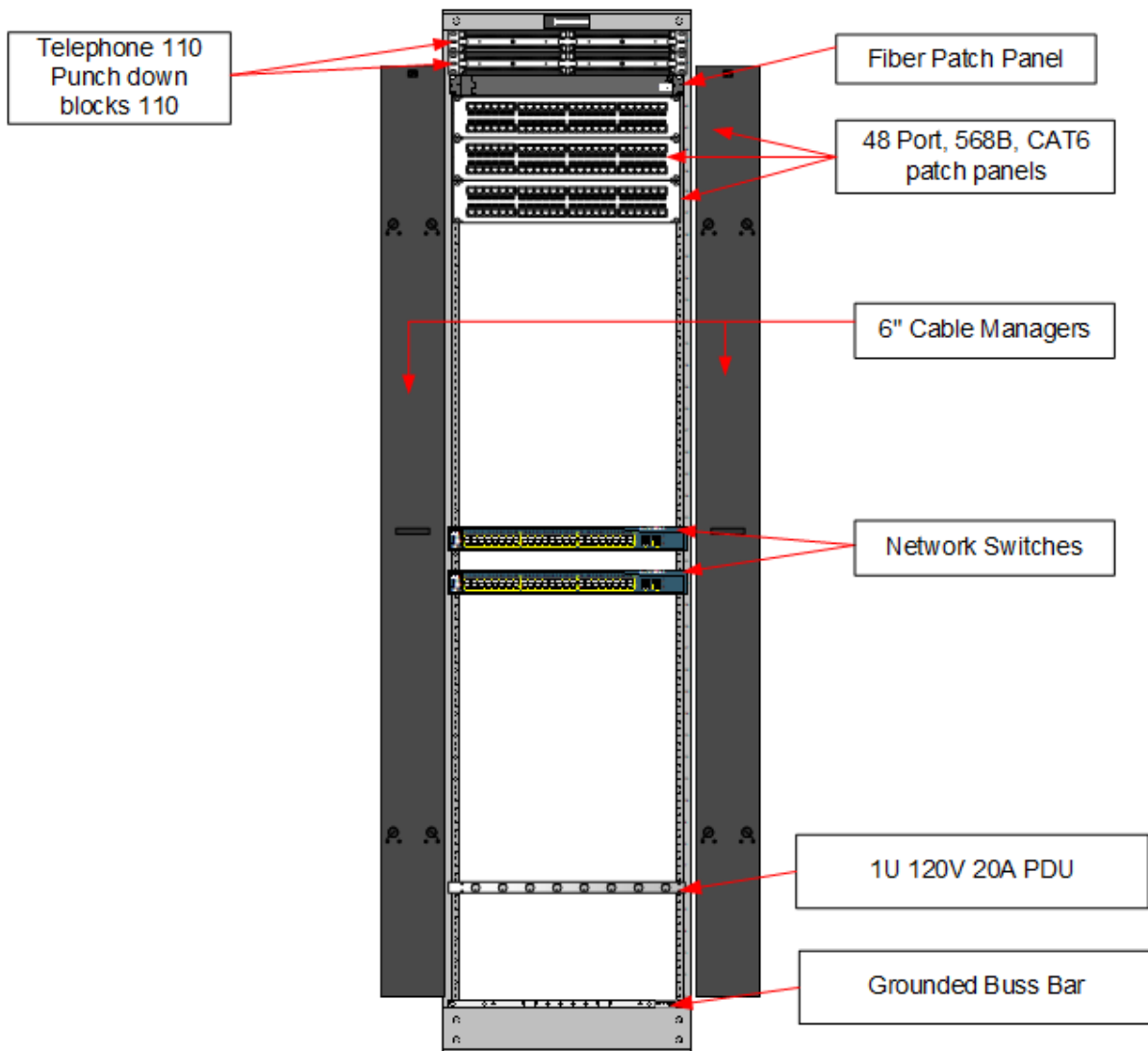


Figure 1: Single Rack Elevation

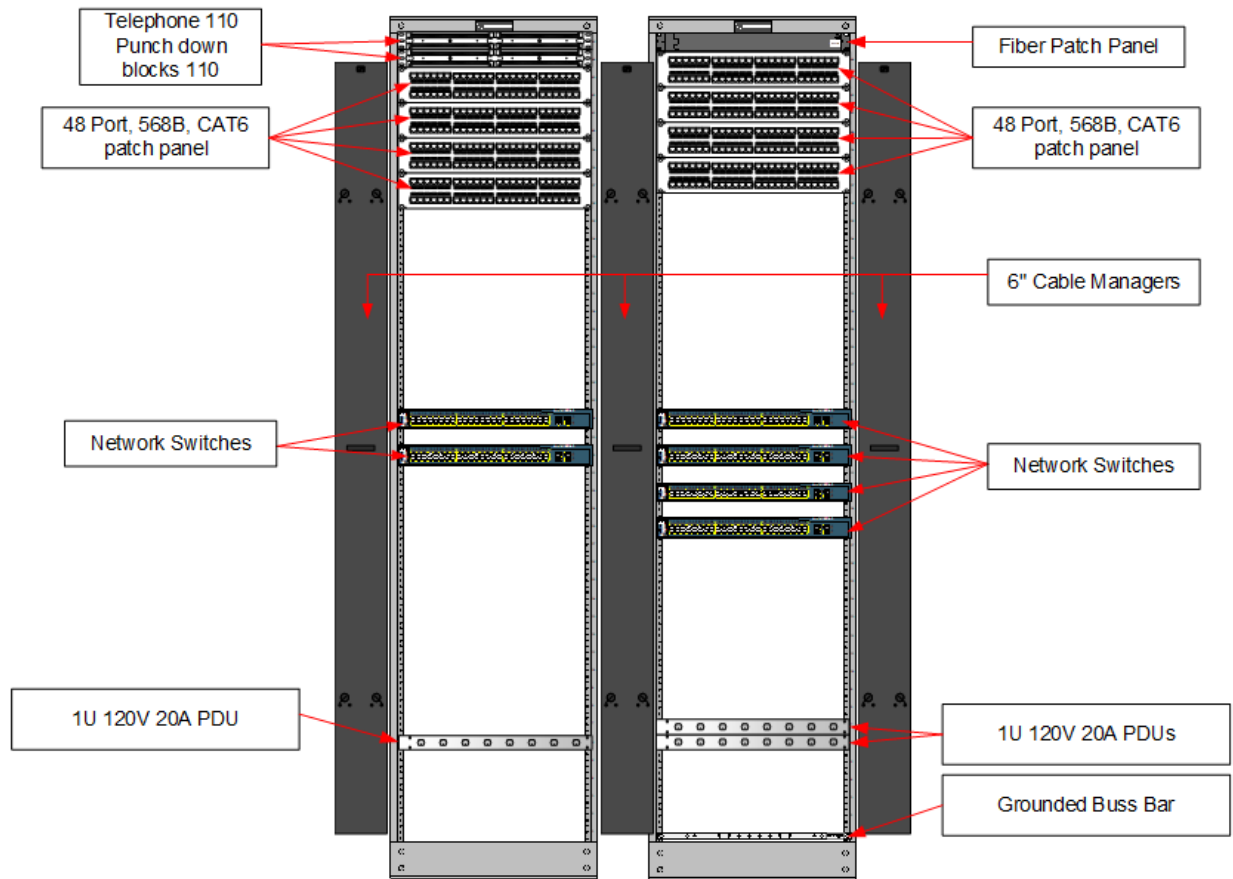


Figure 2: Dual Rack Elevation

2.3. SPACE COMPONENTS

2.3.1. Plywood Backboards

Originally UFC 3-580-01, para 2-4.4.1. Cover a minimum of one wall with two full sheets of backboards. When renovating an existing TR without adequate space, use the maximum backboard to accommodate wall mounted equipment. Backboards must be fire-retardant-treated wood, bearing the manufacturer's stamp. If painted, the manufacturer's fire rated-stamp must remain visible.

2.3.2. Horizontal and Vertical Cable Management

Originally UFC 3-580-01, para 2-4.4.5. Install horizontal cable management on the rear of patch panels to provide strain relief. The required ratio of horizontal cable management to patch panels is 1:1. Provide minimum of two vertical cable management per rack and at the end of racks when required to protect, manage, and organize cables. Vertical cable management panels should be a minimum of 6-inch (150mm) wide.

2.4. TELECOMMUNICATIONS CABLING

Originally UFC 3-580-01, para 2-6. Provide horizontal and backbone cabling in a hierarchical star configuration in accordance with TIA-568-C.1. The paragraphs in this section pertain to copper and fiber optic backbone and horizontal cabling. Cable to support Closed-Circuit Television (CCTV) and Community Antenna Television (CATV) is covered in section 2-8, *Other System Requirements* in UFC 3-580-01.

CLASSIFICATION LEVEL	CABLE COLOR
Unclassified	Blue
Collateral Confidential	Green
Collateral Secret	Red
Collateral Top Secret	Orange
Special Category	Yellow

Figure 3: Preferred Cable Colors

2.4.1. Backbone Cabling

Originally UFC 3-580-01, para 2-6.1. The following subparagraphs pertain to copper and fiber optic intra-building backbone cable. Use no more than two hierarchical levels of cross-connects (main and intermediate) for the intra-building backbone. Use copper backbone cable only for voice circuits. Use fiber optic cable for data backbone circuits.

2.4.1.1. Copper Backbone Cabling

Originally UFC 3-580-01, para 2-6.1.1. Comply with the following:

- Provide multi-pair voice backbone cable meeting the requirements of Insulated Cable Engineers Association {XE "ICEA:Insulated Cable Engineers Association"} (ICEA) S-80-576 and TIA-568-C for riser-rated unshielded twisted pair {XE "UTP:unshielded twisted pair"} (UTP) cable.
- Use solid untinned copper, 24 American Wire Gauge {XE "AWG:American Wire Gauge"} (AWG) conductors.
- Coordinate the copper backbone design with the telecommunications manager to minimize the amount of copper deployed.

- Utilize minimal copper backbone to support traditional two-wire phones and legacy systems as the transition to an all-fiber backbone occurs.
- For facilities utilizing unified communications (i.e., voice, video, and data over Internet Protocol (IP), provide a minimum of 25-pair copper backbone to each TR. Provide additional cable counts to support actual legacy system requirements.
- For facilities utilizing legacy systems, provide copper backbone cables sized to support no more than 1.5 pairs for every outlet connected to the serving TR.

2.4.1.2. Copper Termination

Originally UFC 3-580-01, para 2-6.1.2. Hill is transitioning to a VoIP system and the following information represents the minimum requirements:

- OPS copper cable will be terminated on the appropriate sized BET (Building Entrance Terminal) with 5 pin gas fuses
- BET and cable will be grounded
- Mount a 110 block next to the BET
- Install and terminate a cable from the BET to the 110 block
- Install a voice patch panel into the rack
- Install and terminate a house cable from the 110 block to the rack-mounted patch panel
- Coil the final pair at the rack

2.4.1.3. Fiber Optic Backbone Cable

Originally 2-6.1.3. Provide a minimum of 12 strands single mode fiber (SMF) optic cable between the main TR, or main cross connect, and each TR. Where required by NFPA70 or by local regulations, fiber optic cable must be plenum rated.

Indicate the proper color coding of optical fiber cabling on design drawings. Use the TIA-598 jacket color coding scheme for fiber optic (FO) cable on military projects as follows:

Single-mode (ranges between 8 and 10um) (OS1)	Yellow
Multimode 62.5/125um (OM1)	Slate
Multimode 50/125um (OM2)	Orange
Multimode 50/125um Laser Optimized (OM3)	Aqua

Figure 4: Fiber Optic Cable Color Preferences

2.4.1.3.1. Fiber Optic (FO) Termination

Originally 2-6.1.3.1. Terminate backbone FO cabling, at each end, on cabinet/rack-mounted patch panels with Ultra Polished Connector (UPC) Lucent Connector (LC) type connectors. Do not use ST or MT-RJ fiber optic adapters and connectors for new construction unless specifically required for interface with existing equipment reused on installations. Provide fiber optic adapters and connectors in accordance with the appropriate TIA-604 Fiber Optic Connector Intermateability Standard (FOCIS). Fusion- splice backbone fibers to factory produced pigtails.

2.4.1.4. Fiber Optic Horizontal Cabling

2.4.1.4.1. Fiber Optic Cable

Originally UFC 3-580-01, para 2-6.2.2.1. Provide fiber optic cable to each outlet only when required by the mission and approved by the telecommunications manager. Provide a minimum of 50/125-um diameter laser optimized (OM3) multi-mode when the user requires fiber optic cable. When the telecommunications manager requires it, SMF (OS1), may be replaced with 50/125-um diameter laser optimized (OM3). Provide plenum cables in accordance with NFPA 70, or when directed by facility safety officer or UFC 3-600-01.

For in-slab or below grade telecommunications conduit systems, comply with NFPA 70 and provide cables listed and rated for wet locations. Do not use plenum or riser-rated cable, gel-filled OSP, and unlisted cables in such an environment.

2.5. WORK AREA

Originally UFC 3-580-01, para 2-7. A work area is defined as the building space where the occupants interact with the telecommunications terminal equipment.

2.5.1. Work Area Outlets

2.5.1.1. Wall-mounted Outlet Box

Originally UFC 3-580-01, para 2-7.1.1. Provide single gang electrical boxes, minimum standard size 3.7 inches high by 2.25 inches wide by 3.25 inches deep with plaster ring for connection of single gang faceplate. Design outlet box for recess mounting with the faceplate flush with the wall surface, at the same height as the electrical outlets.

For the power outlet circuits, assume that each duplex receptacle will power one personal computer with a monitor along with typical office appurtenances such as task lights, and assume there will be no diversification of this load.

2.5.1.2. Work Area Outlet Faceplate and Labeling

Originally UFC 3-580-01, para 2-7.2.1. Provide single gang, two position, modular, faceplate for each work area outlet. Standard configuration is two RJ-45 modular jacks as shown below. Provide other copper and fiber optic configurations to support special or legacy telecommunications systems, when required.

Provide machine printed labels at each jack, rack, cabinet, fiber shelves, patch panels, and cable bundle locations annotating purpose, source, and destination. Hand-written labels are unacceptable. Patch panel labeling shall be sequential following the current number pattern.

Label end point locations in a manner to identify its source, including communication closet room number, rack number, panel number, and associated sequential port number.

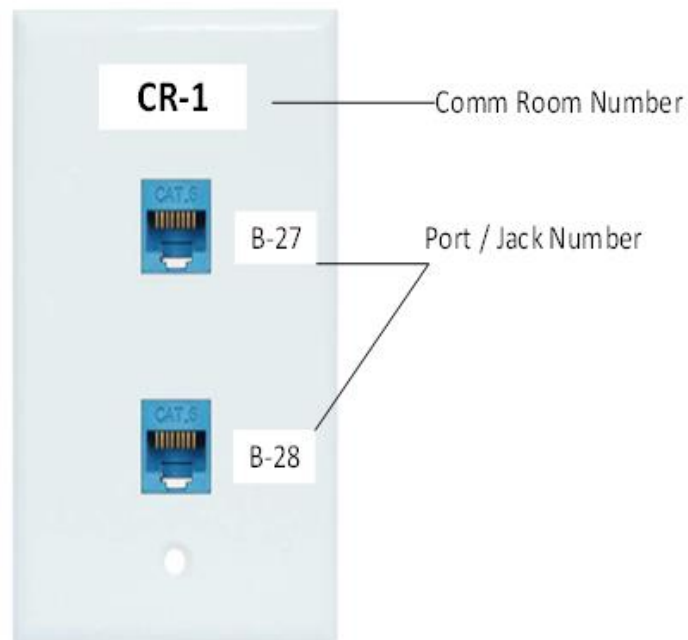


Figure 5: Typical Faceplate Configuration

2.5.1.3. Wall-Mounted Telephone Faceplate

Originally UFC 3-580-01, para 2-7.2.2. Provide single gang, single position modular faceplate with one wired modular jack and mounting lugs for each wall-mounted phone. The phones used by HAFB will require an adapter: Cisco part number CP-7800-WMK=.

The PM will approve and document any change to this configuration for the specific project.

2.5.1.4. Copper Modular Jack

Originally UFC 3-580-01, para 2-7.3.1. Provide un-keyed CAT6 modular jacks in accordance

with TIA-568-C.0, terminated per T568A configuration. Telecommunications manager approval is required for:

- Use of T568B configuration to maintain existing system uniformity
- Use of keyed modular jacks where required to maintain system uniformity, security, or other user specified reasons.

2.5.1.5. Fiber Optic Connectors and Adapters

Originally UFC 3-580-01, para 2-7.3.2. Provide un-keyed duplex UPC LC connectors and adapters in accordance with TIA-568-C.3. Terminate fiber optic cabling at both ends utilizing duplex UPC LC connectors, and utilize adapters at faceplates and patch panels to align and connect fiber optic cables.

Telecommunications manager approval is required for:

- Use of other types of connectors and adapters such as SC, ST, and MT-RJ as required to support existing systems
- Use of small form factor connectors and adapters with high density patch panels. This may offer a potential cost reduction in facilities with a high outlet concentration.

2.5.2. Outlet Types and Density

2.5.2.1. Elevators

Originally UFC 3-580-01, para 2-7.4.5. Provide a standard work area outlet to the elevator machine room for each elevator. Refer to Section 2-7.2.1 for drop configuration and labeling requirements.

2.6. DOCUMENT REVIEW

This document shall be reviewed annually or upon change of the UFC 3-580-01.

Approved for Implementation:

6/2/2022

X R Taylor

R Taylor
CTO

Signed by: TAYLOR.RICHARD.E.1152076580

Richard E. Taylor, Chief Technology Officer
75 ABW/SC

APPENDIX A REFERENCES

Note: The most recent edition of referenced publications applies, unless otherwise specified.

**INTERNATIONAL ORGANIZATION FOR STANDARDIZATION AND
INTERNATIONAL ELECTROTECHNICAL COMMISSION**

ISO/IEC 11801	Information Technology – Generic Cabling for Customer Premises
ISO/IEC 14763-1	Information Technology – Implementation and Operation of CustomerPremises Cabling, Part 1: Administration
ISO/IEC 14763-2	Information Technology – Implementation and Operation of CustomerPremises Cabling, Part 2: Planning and Installation
ISO/IEC 14763-3	Information Technology – Implementation and Operation of CustomerPremises Cabling, Part 3: Testing of Optical Fiber Cabling

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70, National Electrical Code, National Fire Protection Association, Inc.

Note: The NEC must be effective for new design projects awarded after January 1 of the year following the issuance of a revised edition unless specifically identified otherwise in contract documents

NFPA 780, Standard for the Installation of Lightning Protection Systems

TELECOMMUNICATIONS INDUSTRY ASSOCIATION (TIA)

TIA-568-C.1	Commercial Building Telecommunications Cabling Standard
TIA-568-C.2	Balanced Twisted-Pair Telecommunications Cabling and Components Standards
TIA-568-C.3	Optical Fiber Cabling Components Standard
ANSI/TIA-568-B.2 –1	Addendum 1, Transmission Performance Specifications for 4-pair 100-ohm CAT6 Cabling
ANSI/TIA-568-B.2–4	Addendum 4, Solderless Connection Reliability Requirements for Copper Connecting Hardware
ANSI/TIA-568-B.3-1	Addendum 1 – Additional Transmission Performance Specifications for 50/125 Optical Fiber Cables
TIA-569-C	Telecommunications Pathways and Spaces
TIA-570-C	Residential Telecommunications Infrastructure Standard
TIA-526-7	Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant
TIA -526-14-B	Optical Power Loss Measurement of Installed Multimode

	Fiber Cable Plant
TIA-606-A	Administrative Standard for the Telecommunications Infrastructure
TIA J-STD-607-B	Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises
TIA-758-B	Customer-Owned Outside Plant Telecommunications Infrastructure
TIA-862	Building Automation Systems Cabling Standard
TSB-162-A	TIA Systems Bulletin Telecommunications Cabling Guidelines for Wireless Access Points

DEPARTMENT OF DEFENSE

MIL-STD-188-124B	Grounding, Bonding And Shielding for Common Long Haul/Tactical Communication Systems Including Ground Based Communications- Electronics Facilities and Equipment
MIL-HDBK-419A	Grounding, Bonding, and Shielding For Electronic Equipment and Facilities
CNSSAM TEMPEST/1-13	Red/Black Installation Guidance
ICD/ICS 705 (U)	Technical Specifications for Construction and Management of Sensitive Compartmented Information Facilities
ICS 705-1	Physical and Technical Security Standards for Sensitive Compartmented Information Facilities
ICS 705-2	Standards for the Accreditation and Reciprocal Use of Sensitive Compartmented Information
MCO 5530.14A	Marine Corps Physical Security Program Manual NSTISSP 300 (U) National Policy on Control of Compromising Emanations
UFC 1-300-01	Criteria Format Standard
UFGS-27-10-00	Building Telecommunications Cabling System
UFC 1-200-01	General Building Requirements
UFC 4-010-05	Sensitive Compartmented Information Facilities Planning, Design, and Construction
MIL-HDBK-1012/3	Telecommunications Premises Distribution Planning, Design, and Estimating
ETL 02-12	Communications and Information System Criteria for Air Force Facilities

GLOSSARY**Abbreviations and Acronyms:**

ANSI	American National Standards Institute
A/V	Audio Visual
AWG	American Wire Gauge
BET	Building Entrance Terminal
BICSI	Building Industry Consulting Service, International, Inc.
CATV	Community Antenna or Cable Television
CCTV	Closed-Circuit Television
CP	Consolidation Point
DoD	Department of Defense
EF	Entrance Facility
ER	Equipment Room
FO	Fiber Optic
FOCIS	Fiber Optic Connector Intermateability Standard
FOPP	Fiber Optic Patch Panel
FOUO	For Official Use Only
HAFB	Hill Air Force Base
HVAC	Heating, Ventilation and Air Conditioning
IS	Information System
LAN	Local Area Network
LC	Lucent Connector
MHz	Megahertz
MILCON	Military Construction
MRI	Magnetic Resonance Imaging
NEC	National Electrical Code
NFPA	National Fire Protection Association, Inc.
OSP	Outside Plant
PET	Protected Entrance Terminal (sometimes referred to as BET)
PM	Project Manager
PON	Passive Optical Network
PWS	Performance Work Statement
RCDD	Registered Communications Distribution Designer
SIPRNET	Secret Internet Protocol Router Network
SMF	Single Mode Fiber
SOW	Statement of Work
TIA	Telecommunications Industry Association
TR	Telecommunications Room
UFC	Unified Facilities Criteria
UL	Underwriters Laboratory, Inc.
USACE	United States Army Corps of Engineers
UTP	Unshielded Twisted Pair
VTC	Video Teleconferencing