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COMMAND**



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**AFSOC COMMUNICATIONS
SPECIFICATIONS FOR FACILITY
CONSTRUCTION AND ALTERATIONS**

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This instruction implements AFI 33-104, *Base Level Planning and Implementation*. It contains design and implementation guidance for Air Force Special Operations Command (AFSOC) facility telecommunications cabling systems for all Military Construction (MILCON), facility additions and/or alterations (ADAL). This instruction applies to the Air National Guard (ANG) and the Air Forces Reserve Command (AFRC) components at AFSOC installations. Ensure that all records created as a result of processes prescribed in this publication are maintained in accordance with Air Force Manual (AFMAN) 33-363, *Management of Records*, and disposed of in accordance with Air Force Records Information Management System (AFRIMS) Records Disposition Schedule (RDS) located at <https://www.my.af.mil/gcss-af61a/afirms/afirms/>. Refer recommended changes and questions about this publication to the Office of Primary Responsibility (OPR) using the AF Form 847, *Recommendation for Change of Publication*; route AF Form 847s through local publications/forms managers.

SUMMARY OF CHANGES

This document has been revised to reflect appropriate tier waiver authority in accordance with AFI 33-360, *Publications and Forms Management*, Table 1.1., Tier Waiver Authorities, and requires a cursory review. A margin bar (|) indicates newly revised material.

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Chapter 1

GENERAL

1.1. Background. An acceptable building cabling system encompasses, but is not limited to: communication's closets, copper and fiber optic (FO) entrance conduits, cable ladders, troughs and racks, copper and fiber backbone cable, copper and fiber horizontal distribution conduits and cable, workstation outlets, patch panels, termination equipment, electrical power/grounding, cable management and labeling. Ultimately, facility communications systems must satisfy the end-user mission requirements and activities. This document addresses the need for baseline interior and exterior communications architecture for AFSOC.

1.2. Reasons for Development. AFSOC missions require specialized communications capabilities unique to the command. While other Department of Defense (DOD) and Air Force Instruction (AFI) documents reference facility telecommunications parameters and possibilities, they do not specify baseline facility requirements. The design of building telecommunications cabling systems is a specialized technical discipline not falling within the normal skill record and résumés of commanders, architects, engineers and project managers. This document provides standardized guidance and establishes baseline requirements to those parties tasked with developing telecommunications cabling system solutions within existing and emerging AFSOC facilities. Applicable reference material is provided when required. Augmentation/enhancements to the baseline are permitted for specific mission interests or initiatives, as required and validated by the Base CSO.

1.2.1. Additional reference materials for planning and installation activities include but are not limited to: UFC 3-580-10, *Design*, National Electric Codes, Electronic and Telecommunications Industry Association (EIA/TIA) standards, Asynchronous Transfer Mode (ATM) Forum physical medium dependent specifications, Engineering Technical Letter (ETL) 02-12, and various DOD and AF Technical Order publications (cited in text everywhere they are applicable).

1.3. Impact. The following are expected benefits of a uniform AFSOC Communications specification:

1.3.1. A single technical reference source for commanders, designers, architects, installers and project management personnel for the installation of telecommunications systems within AFSOC facilities or at designated AFSOC locations suited to the specific requirements of the command.

1.3.2. Documentation of communication's pre-requisites for prospective installation activities during the contracting/bidding phases of the project plan.

1.3.3. Cross-spectrum understanding of communications baseline requirements and deliverables.

1.3.4. Clearly defined installation standards and efficiencies.

Chapter 2

UNCLASSIFIED COMMUNICATIONS INFRASTRUCTURE SPECIFICATIONS

2.1. Qualification Requirements for System Designers and Installers.

2.1.1. All telecommunication designers/installers must have: a minimum two years field experience; Information Transport Systems certification credentials, and; proof of regular engagement in communications systems installation. The Contracting Officer may reject any installer who can't show evidence of qualification. **(T-2)**

2.1.2. BICSI RCDD Certification. The entire installation will be certified by a Building Industry Consulting Service International (BICSI) Registered Communications Distribution Designer (RCDD). **(T-2)**

2.2. Mission Facilities. The designer/architect will use all applicable National Electric Code (NEC) and Electrical/Telecommunications Industry Association specifications for residential and light commercial purposes (specifically, EIA/TIA 568-1991). **(T-2)**

2.3. Military Family Housing and Dormitories. The designer/architect must use all applicable National Electric Code (NEC) and Electrical/Telecommunications Industry Association specifications in accordance with TIA/EIA-570-B for the interior wiring and demarcation of communication's cabling. **(T-2)**

2.3.1. The contractor will facilitate periodic inspections by a government representative to ensure compliance with this document **(T-2)**. Corrective measures for improperly or inadequately performed installations are the responsibility of the installation activity, including any liabilities in the procurement of material, time or additional services. **(T-2)**

2.4. Communications Closets. The communications wiring closets will include the following provisions as part of the construction effort:

2.4.1. **General Sizing and Configuration.** Locate the main communications closet central to the facility floor plan. Ground floor closet dimensions will be a minimum of ten foot by ten foot (10' x 10', except in specialized cases) **(T-2)**. Include additional dedicated communications closets for every additional floor (preferably directly above the main closet), or as required to maintain cable termination distances requirements (See paragraph 3.7.1.2.). Physical dimensions for additional communications closets will be determined by the Base Communications and Information Systems Officer (CSO) on a case-by-case basis. **(T-2)**

2.4.2. **Electrical Power and Grounding.** Installation activity will provide, at minimum:

2.4.2.1. Four (4) quad-plex 110/120 Volts Alternating Current (VAC) minimum 20-amp dedicated power outlets utilizing NEMA L-5-20 R receptacles within six (6) feet of communication rack locations.

2.4.2.2. One (1) duplex 110/120 VAC minimum 20-amp dedicated power outlets utilizing NEMA L-5-20 R receptacles under each Telephone Backboard (TBB) (See paragraph 2.0.5.).

2.4.2.3. One (1) duplex 110/120 VAC minimum 30-amp dedicated power outlets utilizing NEMA L-5-30 R receptacle. This is specifically for Uninterrupted Power Supply (UPS) installations.

2.4.2.4. Provide dedicated insulated ground wire (six American Wire Gage (AWG)) from the facility, site, or building ground to a terminal block located on the Telephone Back Board (TBB) (Leave 10' feet slack). The resistance to ground (of ground wire and the grounding electrode system) must be seven (7) Ohms (Ω) or less (**T-2**). Accomplish work in accordance with T.O. 31.10.24, Part 2, Chapter 6, and NEC Sections 250-81, 250-83 and 250-86. (**T-2**)

2.4.2.5. Include pre-wiring for facility uninterrupted power supply (UPS) and facility generator support.

2.4.2.6. Additional Electrical Service Specifications:

2.4.2.6.1. Insulation resistance: 500 M Ω . Minimum.

2.4.2.6.2. Dielectric withstands voltage 1,000 VAC RMS, 60Hz minimum, contact-to-contact and 1,500 VAX RMS, 60 Hz minimums from any contact to exposed conductive surface.

2.4.2.6.3. Contact resistance: 20m. maximum.

2.4.2.6.4. Current rating: 1.5A at 68° F (20°C) per IEC Publication 512-3, Test 5b.

2.4.2.6.5. UL Listed from ISO 9001 Certified Manufacturer.

2.4.2.6.6. UL Verified for EIA/TIA electrical.

2.4.2.6.7. Compliance with Federal Communications Commission (FCC) Part 68.

2.4.3. **Environmental Controls and Specifications.** Ensure environmental controls; heating, ventilation, and air conditioning (AC/HVAC), maintain an ambient temperature within the manufacturers recommended parameters at all times within the communications closet. This is necessary to ensure the proper cooling of the communications equipment.

2.4.3.1. Recommended temperature of a communications closet/room is 20° to 30°C. The switch can run at up to 50°C for up to 72 hours. The humidity must not exceed 85% relative humidity, non-condensing. (**T-2**)

2.4.3.2. Output (heat) of a single rack/node enclosure:

2.4.3.2.1. An alternating current (AC)-powered node dissipates up to 14,300 British Thermal Unit (BTUs) (4200W).

2.4.3.2.2. A direct current (DC)-powered node dissipates up to 12,300 BTUs (3600W).

2.4.3.3. Install one (1) duplex wall mount communications outlet in the HVAC control room at the electrical panel location, as specified in paragraph 2.11.2.; terminate the outlet (as specified in paragraph 2.11.)

2.5. Communications Rack Types and Installation Requirements.

2.5.1. **Unclassified Data Service.** Install one (1) free standing, secure-cabinet type 19-inch equipment rack, secured to the floor, with a minimum three (3) foot clearance in front and

behind nearest wall. Additional rack requirements are at the discretion of the Base CSO.
Note: Refer to paragraph 3.3. for Classified Data Service Rack requirements.

2.6. Telephone Backboard Requirements.

2.6.1. Install two (2) 8'x4' 3/4-inch thick TBB with two (2) coats of insulating fire-retarding varnish. Mount the backboard in a horizontal position two (2) feet above finished floor (AFF).

2.6.2. Ensure availability of one duplex 20-amp AC service (as mentioned in paragraph 2.4.2.2.) beneath each TBB.

2.6.3. Install one (1) duplex communications wall outlet, as specified in paragraph 2.11.2.

2.7. Building Service Entrance Ducts (Conduit). Provide at minimum:

2.7.1. Install four (4) each, 4-inch, schedule 40 or 80 PVC conduits (1-conduit for Tel, 1-conduit for local area network (LAN), 2-Spare for future requirements/considerations) from the floor with a 90 degree sweep to the servicing manhole. Stub out six (6) inches above finished floor. Fit ends of incoming conduit with nylon bushings to prevent damage to the incoming cable.

2.8. Additional Communications Closets. Install four (4) 4-inch, schedule 40 or 80 conduits between communications closets with no more than two (2) 90-degree sweeps. Concrete encase conduit servicing additional main floor communications closet(s) within the foundation at a minimum of eight (8) inches below finished floor (BFF).

2.8.1. Ensure secured access (preferably cipher lock) for each communications closet.

2.8.2. Ducts will be buried at a minimum of 36-inches. Tie all entrance ducts into nearest usable manhole as directed by Base CSO. **(T-2)**

2.8.3. Validate all conduits for serviceability by passing a test mandrel through the conduit run. The test mandrel will be 1-inch less than the inside diameter of the conduit. (Ref: FM 11-486-5/T.O. 31W3-10-22). **(T-2)**

2.8.4. Provide four (4) 1-inch max-core innerducting in one 4-inch conduit for each conduit run (to the tie-in manhole and between communications closets).

2.8.5. Provide 1/4-inch thick nylon pull ropes in all communications service conduits and innerducts.

2.8.6. Ensure concrete encasement of conduits from the originating manhole to the communications closet point of entry, with metal reinforcement sufficient to prevent collapse from above ground traffic or facility loads (based on the location/route of the conduits).

2.8.7. Concrete encasement is not required in unimproved areas. In this case, ensure 12-inches of compacted sand above and below conduit bank, and back fill with native soil. Specific conduit encasement and reinforcement requirements will be determined by Base CSO on a case-by-case basis. **(T-2)**

2.8.8. Ensure a minimum one-foot linear distance between concrete encased communications conduit bank and electrical service conduit bank; ensure minimum 3-foot linear distance between an un-encased conduit bank and the electrical service bank.

2.8.9. Provide metallic locator tape atop the entire length of the installed conduit run.

2.9. Servicing Cable Plant.

2.9.1. The installation activity will provide, install, and terminate all required Unshielded Twisted Pair (UTP) and single-mode, 62.5/125 micron (μm), fiber optic (FO) cable from the nearest usable manhole to the communications closet demarcation points and between communications closets as a provision of the Military Construction (MILCON) or Add/Alteration (ADAL) (typically, the AF Form 1391, *Military Construction Document*.) (T-2)

2.9.1.1. As a baseline, all mission (operations) facilities will include a minimum twenty-five (25) pair of copper UTP and twelve (12) strands of single-mode FO cable from the servicing manhole. The Base CSO will determine the route, specific cable type and count during the facility design review phases. (T-2)

2.9.1.1.1. All FO terminations must be fusion spliced (T-2). Mechanical splicing of FO cable is prohibited. Only one splice at the point-of-presence (PoP) is permitted. (T-2)

2.9.2. Provide a minimum 15-foot service loop at each end for every cable type. Additional cable requirements and solutions are at the discretion of the Base CSO.

2.10. Internal Cable Distribution and Vertical Conduits (for Unclassified Use).

2.10.1. All facilities will utilize telecommunications cable ladders and troughs for internal distribution of unclassified LAN and phone cabling (and for cable distribution in certified Open Storage Areas or Sensitive Compartmented Information Facilities) (T-2). The ladder originates at the unclassified LAN rack location and the TBB, continuing throughout the facility (typically above the ceiling) providing distribution service points, with a maximum 20 ft. horizontal linear distance between the ladder/trough to the servicing LAN/Phone conduit. (T-2)

2.10.1.1. Bundle station wiring with plastic ties snugly, but not as to deform the cable geometry.

2.10.2. Use 3/4-inch galvanized conduit within the vertical wall sections for each LAN/Telephone outlet location. Ideally, this will include a single 90 degree sweep at the stub out location, with a continuing horizontal run back to the servicing ladder/trough. Fit ends of conduit with nylon bushings to prevent damage to the servicing cable.

2.10.2.1. Conduit runs will not exceed 40 feet linear distance, or contain more than two 90° broad sweeps without utilizing appropriately sized and located pull boxes. (T-2)

2.10.2.2. Provide 1/4-inch thick nylon pull rope for each internal conduit run.

2.11. Communications Service Outlets (for Unclassified Use Only).

2.11.1. **Standard outlets.** Install one (1) quad-plex communications service outlet 18-inches AFF in designated work locations. Ensure installation of a telephone/data modular outlet within 1 foot of an electrical 110 VAC outlet (or host country VAC equivalent) or every six (6) feet of linear wall space, whichever is greater. **Note:** Communications outlets are required in common areas, except for washrooms, bathrooms and hallways).

2.11.2. **Wall phone outlets.** Install one (1) duplex communications service outlet 48-inch above finished floor (AFF). Ensure installation of modular outlet within 1 foot of an electrical 110 VAC outlet (or host country VAC equivalent). Outlets will be single modular, eight-position/eight pin (RJ-45) with a push-in/slide-down type back plate (Ref: EIA/TIA 570-1991, Figure 9) (T-2). Terminate first two pairs, sparing remaining pairs. Data service is not required at these locations. (T-2)

2.11.3. **Cover plates and connectors.** Install modular RJ-45 covers and connectors in compliance with Federal Communications Commission (FCC) Regulation Part 68, Subpart F, Rural Electrifications Administration (REA) specification PE-76: Modular Telephone Set Hardware, as well as International Standards Organization (ISO) and United Laboratories (UL) requirements. Covers will be flush mounted, plastic, and ivory in color (also see paragraph 2.15., Systems [Modular] Furniture). (T-2)

2.11.4. Ensure dual color-coding on outlet to reflect communications service type (e.g. blue for unclassified data; grey for Plain Old Telephone Service [POTS].)

2.11.5. Ensure each communications outlet is systematically numbered and labeled, to include a corresponding label at the applicable communications service delivery point within the communications closet.

2.11.6. Ensure installation location of outlets is in keeping with the proposed room layout and furniture design (also see paragraph 2.15., Systems [Modular] Furniture).

2.12. Internal Facility Communications Cable Types (Unclassified Telephone and Data Only).

2.12.1. **Mission (Operational) Facility Telecommunications Cabling.** Install plenum-rated, four-pair, 100 OHM (unit of electrical resistance) Category 6 (CAT 6) copper cabling, color coded in contrast to other facility cabling with an overall insulated vinyl jacket for all data (LAN) and telephone service outlet connections. Use EIA/TIA 568B Cable Termination Guidelines for cable terminations at the servicing outlet and demarcation locations. **Note:** multi-mode fiber optic cable will NOT be used for internal facility unclassified data/voice requirements at any time. (T-2)

2.12.1.1. Renovated mission operational facilities may continue to use pre-existing CAT 5e cable, provided re-terminated cable pass quality assurance testing (see paragraph 2.12.5.). Remove and replace all existing CAT 3 cable in all occurrences.

2.12.1.2. Maximum linear distance for all categories of facility copper cable (from communications closet demarcation point to servicing outlet) will not exceed 90 meters (295 feet) (T-2). (See paragraph 2.8., this supplement, for additional communications closet requirements and specifications)

2.12.2. **Residential Facility Telecommunications Cabling.** Standard telephone outlets will consist of 4-pin/4-position non-keyed CAT 3 or better modular USOC RJ-11 jacks (T-2). Ensure wall mounting of all residential communications outlets. (Ref: UFC-580-01, 2-3.5.1.3.) CAT 5e or 6 is an acceptable substitute as required, provided the mission facility guidelines are followed (Ref: paragraph 2.12.1., this instruction.) **Note:** Multi-mode fiber optic cable will NOT be used in residential construction or renovation. (T-2) **Exception:**

General officer's quarters or two-letter office symbols may require secure communications in residence; follow secure communications specifications in these instances.)

2.12.3. Each cable must be continuous in length from the servicing outlet to the terminal backboard (TBB) or LAN demarcation point as indicated on the drawings. Splicing of cables is prohibited. (T-2)

2.12.4. **Copper cable specifications.**

Table 2.1. Copper Cable Specifications.

Termination Type: Insulation displacement, dry, gas tight
Wire Insertion Force (24 AWG): 13-28 lbs. (59-127 Newton's)
Wire Pullout Force (24 AWG): 2.2 lbs (9.7 Newton's)
Wire Retention Force (24 AWG): Horizontal 8 lbs.; Vertical 2 lbs
Design Life: 30 years
Temperature Range: Storage -40° to +70° C; Operational -10° to +70° C
Humidity: 95% Maximum

2.12.4.1. **Mechanical Performance.**

Table 2.2. Mechanical Performance.

Plug insertion life: 750 insertions
Contact Force: 3.5 oz (99.2g) minimum using FCC-approved modular plug
Plug Retention Force: 30 lb (133 N) minimum between modular plug and jack
Temperature Range: -40° to 150° (-40° to 66°C)

2.12.4.2. **Electrical Specifications.**

Table 2.3. Electrical Specifications.

DC resistance per lead: 28.6./1,000 ft (9.38./100 m), maximum
DC resistance unbalanced: 5% nominal
Mutual Capacitance @ 1kHz: not to exceed 20 nF per 305 M (1000 ft)
Characteristic Impedance: 100.± 15%, from 1 to 100 Mhz
Worst Pair Near-End Cross Talk, (NEXT): 2.2dB/1,000 ft (305m)

Table 2.4. Electrical Specifications (Continued).

Frequency (MHz)	NEXT Loss Worst Pair (db @ 1000 ft)
.064	2.2
0.15	54
0.772	43
1.0	41
4.0	32
8.0	28
10.0	26
16.0	23

2.12.5. Testing of Premise Wiring for Shorts, Grounds, and Opens.

2.12.5.1. **Copper Cable.** The installation activity will tone all copper telecommunication cable for continuity and attenuation/loss using industry standard line tester devices and; provide test results to the Base CSO for quality assurance and acceptance. Complete AF Form 1261 actions prior to system cutover. **(T-2)**

2.12.5.2. **FO Cable.** The installation activity will conduct Optical Time Domain Reflect-o-meter (OTDR) or other applicable tests for continuity and signal loss on all FO cable installations using industry standard guidelines and; provide test results to the Base CSO for quality assurance and acceptance. **(T-2)** Complete AF Form 1261 actions prior to system cutover.

2.13. Telephone Demarcation Requirements, Unclassified Service.

2.13.1. **Cross Connect Blocks.** Utilize one or more of the following solutions, as dictated by Base CSO:

2.13.1.1. **CAT 6 Installation.** Install either 1) 66B1-6 type blocks, with 89B standoff brackets for subscriber line terminations, or; 2) 110 type hinge block capable of terminating 25, 50, or 100-pair of incoming base plant cable (as required and specified by Base CSO). Use ICC 110 connecting blocks for intra-facility cable terminations (as specified in TIA/EIA-568-B.2-1).

2.13.1.2. **CAT 5e Reutilization.** Install 66M1-50-C5 type blocks, with 89B standoff brackets for subscriber line terminations.

2.13.1.3. Provide direct connections between multiple communications closets to accommodate telephone service continuity, as specified in paragraph 2.8.

2.13.2. Attach the blocks starting 36-inches in from the left of the TBB, working left to right. Mount in vertical rows spaced approximately six (6) inches apart with all station cabling routed behind the brackets. Leave the last two (2) pins on each side of the block vacant.

2.13.2.1. Terminate all cable conductors in numerical order. Reference to room number is not required. Ensure labeling at each termination point.

2.13.3. **Auxiliary Devices.** Installation activity will provide any additional auxiliary devices, such as D-rings, A-rings, mushroom spindles, wire ties, etc. as required during the installation process. **(T-2)**

2.14. Data (LAN) Wiring Demarcation Requirements, Unclassified Service.

2.14.1. **General.** Performance of LAN cabling systems installations will be in accordance with the EIA/TIA 568-B.2 (copper) or EIA/TIA 568-B.3 (fiber) guidelines utilizing a star topology. **(T-2)**

2.14.2. **Patch Panels.** Install FO/RJ-45 distribution panel within the enclosed rack for the termination of servicing cable plant. Mount the patch panel a minimum of five (5) rack units (RU) from the top extent of the rack (this space is reserved for the switch). Interconnect FO distribution panel with premise wiring patch panels. **Note:** Interconnect the FO distribution panels to secondary communications closet panels (as required) to accommodate a "bus and ring" configuration (for continuity); for additional information, see paragraph 2.9.1.1.

2.14.2.1. Where node requirements exceed the program capacity of the switch, interconnect switches in a "collapse backbone" topology using multi-mode 8 count 62.5/125 micron FO with SC-type connectors (mounted in a fiber optic distribution panel).

2.14.2.2. Install premise wiring patch panels within the enclosed rack cabinets and terminate all unclassified data distribution cables. Specifications will comply with EIA/TIA 568B wiring patterns and provide supports for a minimum of 48-ports per panel (T-2). Provide additional patch panels as node requirements dictate. The modular RJ-45 will comply with all FCC, ISO, UL and CSA requirements. Install a retaining trough (for cable management) between every 100 pair termination panel. (T-2)

2.15. Systems (Modular) Furniture.

2.15.1. **General.** All systems furniture must meet UL and NEC specifications (T-2). Include the pre-wiring of system furniture for electricity, telephone/LAN connectivity in the service contract. The Installation Activity will: (T-2)

2.15.1.1. Ensure grounding of all systems furniture installations (in accordance with paragraph 2.4.2.).

2.15.1.2. Ensure availability of furniture communications cable tray suitable for the routing of all communications cable while maintaining a minimum eighteen (18) inch separation from VAC service cables.

2.15.1.3. Ensure furniture includes "punch out" or open bottom panels for access to wall mounted communications outlets.

2.15.1.4. Ensure furniture provides 110-style block communications outlets (in the quantity required by the using activity), terminated in accordance with paragraph 2.11.3.; augmentation of modular furniture with additional "external" communications outlets is not recommended.

2.15.1.5. Ensure availability of duplex 110 VAC outlet (or host country VAC equivalent) for each communications service outlet.

2.15.2. **Power Poles.** When required, communications cable will utilize a dedicated power pole from the above-ceiling communications ladder/trough (T-2). Terminate station cables directly to the provided communications outlet. Maintain cable lengths equal to the farthest distance in the section slated for installation. This is measured as the distance from the cable point of presence (within the communications closet) to the farthest servicing outlet within the furniture. (T-2)

2.15.2.1. Co-location of communications cable with AC power service is not permitted.

2.15.3. The Base CSO retains authority regarding augmentations/additions of communications cable and terminations within systems furniture.

Chapter 3

CLASSIFIED (SECRET) COMMUNICATIONS INFRASTRUCTURE SPECIFICATIONS

3.1. Description. The installation of SECRET level communications infrastructure requires additional provisions to safeguard information. SECRET level communications systems include Secure Internet Protocol (SIPRnet), VoSIP (voice over SIPRnet) and SCAMPI (SOCOM specific secure operations protocol). The following guidance applies for all MILCON/ADAL activities.

3.1.1. The designer/architect will use all applicable National Electric Code (NEC) and Electrical/Telecommunications Industry Association specifications for residential and light commercial purposes (specifically, EIA/TIA 568-1991) (T-2). Additionally, the installation must adhere to all current and applicable physical and information security criteria (T-2). Examples include AFI 33-201V8, *Communications Security: Protected Distribution Systems*; AFI 33-201V9, *Secure Voice Devices*; AFI 33-202V1, *Network and Computer Security*; AFI 33-202V6, *Identity Management*; AFI 33-203V1, *Emission Security*; AFI 33-203V3, *Emission Security Countermeasures Reviews*; AFSSI 7010, *Emissions Security Assessments*; NSTISSI 7003, *Protected Distribution Systems*. Contact Wing Information Assurance or Security Forces for more information. (T-2)

3.2. Qualification Requirements for System Designers and Installers.

3.2.1. All telecommunication designers/installers must have a minimum two years' experience with certification credentials and proof of regular engagement in communications systems installation (T-2). The Contracting Officer may reject any installer who can't show evidence of qualification. (T-2)

3.2.2. BICSI RCDD Certification. The entire completed installation will be certified by a Building Industry Consulting Service International (BICSI) Registered Communications Distribution Designer (RCDD). (T-2)

3.2.3. Classified installations in Residential Facilities. Installation of classified voice and network devices within residential quarters is prohibited. **Note:** Exceptions for General Officer, Wing and Vice Commander's quarters is permitted provided all physical, EMSEC and information security guidelines are met.

3.2.4. The contractor will facilitate periodic inspections by a government representative to ensure compliance with this document and agency instructions (T-2). Corrective measures for improperly or inadequately performed installations are the responsibility of the installation activity, including any liabilities in the procurement of material, time or additional services. (T-2)

3.3. Classified (SECRET) Communication's Closet Requirements.

3.3.1. **General.** All classified telecommunications devices handling "SECRET" and above information require additional physical/information securities beyond the scope of typical unclassified devices. The development of additional physical/information security solutions for classified communications must occur in the earliest stages of facility planning. Responsibility for proper citing and accreditation of classified communications systems is the responsibility of the Base CSO.

3.3.2. Using an unclassified communications closet as a Classified Service Delivery Point (CSDP). A standard facility communications closet can act as a SECRET Service Delivery Point (SDP) under certain conditions:

3.3.2.1. Additional dedicated electrical service. Two (2) duplex 110/120 VAC minimum 20-amp dedicated power utilizing NEMA L-5-20 R receptacles; one (1) duplex 110/120 VAC minimum 30-amp dedicated power utilizing NEMA L-5 30 R receptacle within 6 feet of classified rack/IPS container. **Note:** Filtered power is not required for devices transmitting SECRET or below; refer to AFSSI 7010, or contact Directorate for Intelligence Production (DIA) for information on TOP SECRET power requirements.

3.3.2.2. Installation of an Intrusion Protection System (IPS) container. Floor mount the GSA approved IPS container within the unclassified communications closet a minimum of 18" from the nearest unclassified communications demarcation point. **Exceptions:** One Category 5e or 6 copper cable, and one multi-mode 6-strand fiber-optic cable will connect the SIPRnet rack to the Non-secure Internet Protocol Router (NIPRnet) rack (**T-2**). Floor bolts are not required. Ensure a minimum three (3) feet of space in front and behind the container for maintenance purposes. Ensure size of container meets with user requirements. **Note:** Use of an IPS solution must include provisions for a Protected Distribution System (PDS) system to ensure secure propagation of classified communications connections (**T-2**). Use of an IPS container in alarmed and continually monitored locations is not required. (**T-2**)

3.3.2.2.1. The rear junction box (Hoffman box) must be a minimum of sixteen (16) gauge or thicker steel (within the United States), and twelve (12) gauge or thicker (outside the U.S.), with tamper-proof hinges and hasp. All attached conduit must include a "JB Weld" seal (or similar approved product) at each union. (**T-2**)

3.3.2.3. Installation of IPS containers outside of a standard communications closet. **Note:** This is not a recommended solution. Any proposal for the installation of an IPS container outside of the standard communications closet requires HQ AFSOC/A6 written approval. Additional concerns include:

3.3.2.3.1. Ensure a minimum six foot by six foot (6' x 6') dedicated uncarpeted floor space, with environmental (AC/HVAC) provisions to ensure an ambient room temperature in accordance with paragraph 2.5.

3.3.2.3.2. Provide dedicated electrical service, as documented in paragraph 3.3.2.1.

3.3.2.3.3. Provide One (1) Category 5e, or 6 copper cable connection and one (1) multi-mode 6-strand fiber-optic cable between the IPS container and the NIPRnet rack.

3.3.2.4. Installation of standard communications rack for CSDP within the standard communications closet. Communications rack must be floor mounted, enclosed, and lockable (**T-2**). Install communications rack a minimum of 18" from the nearest unsecured service delivery point with a minimum three (3) feet of space in front and behind rack. Use of an unsecured communications rack requires the installation of surveillance alarms/cameras within the communications closet (alarm/camera requirements vary depending on the facility and construction; contact Physical Security representative for specific requirements.) The alarm must be centrally and continuously

(24/7) monitored by trained security personnel, typically the Security Forces Squadron.
(T-2)

3.4. Internal Cable Distribution and Conduits (for SECRET Classified Use).

3.4.1. **Distribution methods.** Requirements for the distribution of classified communications media and services depend on the certification/accreditation (C&A) of the location. Typical C&As include: Unclassified (See paragraph 2.10.2., this instruction), Controlled Access Area (CAA) (See paragraph 3.8., this instruction); Open Storage SECRET (OSS) (See paragraph 3.9., this instruction); the classification level of facility/location must meet or exceed the classification level of the media. Suitable physical protection and distance criteria of the communications media must be established in all instances. (T-2)

3.4.2. Contact Wing Information Assurance and Physical Security representative for additional information on the C&A processes.

3.4.2.1. **Distance criteria.** Baseline minimum distance measurements between classified equipment/media/outlets and unclassified service (contact Wing Information Assurance (IA) for specific solutions and accreditation requirements):

3.4.2.1.1. Between Classified SECRET and unclassified data/phone: eighteen (18) inches. **Note:** FO and copper of differing classification do not require separation, and are permitted within the same conduit bank (ref: NSTISSI 7003).

3.4.2.1.2. Between Classified SECRET and AC electrical power: Eighteen (18) inches. **Exception:** A dedicated AC outlet with the expressed purpose of supplying power to a SIPRnet device has no distance restrictions from SIPRnet outlets. However, these electrical outlets must be clearly marked as SIPRnet equipment only and installed with a separate, dedicated breaker at each location. (T-2)

3.4.2.1.3. Between Classified SECRET and cable Television (Coaxial): Five (5) meters. (ref: AFSSI 7702 A.10.4.23.3)

3.4.2.1.4. Between Classified SECRET and radio antennae/transceivers (non-IP based): Three (3) meters.

3.4.3. **Classified Data Propagation in Unclassified (common) areas (SECRET level only).** Special provisions exist for the physical security of communications media. Consult AFI 33-201V8; *Communications Security: Protected Distribution Systems*; AFI 33-201V9, *Secure Voice Devices*; AFI 33-202V1, *Network and Computer Security*; AFI 33-202V6, *Identity Management*; AFI 33-203V1, *Emission Security*, AFI 33-203V3, *Emission Security Countermeasures Reviews*; AFSSI 7010, *Emissions Security Assessments*; NSTISSI 7003, *Protected Distribution Systems*. Contact Wing Information Assurance and Physical Security representative for more information. The Base CSO is the validating authority for the installation of classified communication services in common user areas.

3.5. **Protected Distribution Systems (PDS).** Install a PDS system of conduit in accordance with AFI 33-201V8 and NSTISSI 7003 in unsecured locations. PDS installations are of two varieties: exposed and concealed. **Note:** Consider the installation of Exposed PDS as a "last resort" due to expense and aesthetics. Contact the Base CSO for further information.

3.5.1. **Exposed PDS Conduits.** Use Electrical Metallic Tubing (EMT) conduit at least ¾-inch in diameter. Mount conduits in plain view, a minimum of 1-inches from all other

surfaces or structures (for inspection purposes). All conduit fittings and joints must be completely sealed with gray colored epoxy (i.e. J.B. Weld) approx. ¼-inch away from the joint. Do not mark or paint the conduit in any other way. (T-2)

3.5.1.1. **Junction/Outlet boxes.** Install 16-gauge steel lock-boxes with tamper-proof hinges and hasp at each SIPRnet termination outlet. **Note:** Use 12-gauge or thicker steel outside the U.S. Junction boxes must be large enough to allow a 1-inch bend radius for the servicing fiber optic cable. Permanently mount outlet drop box to the facility structure at a location convenient to the terminal. The use of junction boxes with pre-punched knock-outs is prohibited. **Note:** Lock boxes are optional in areas meeting DOD Regulation 5200.1R, Appendix G criteria.

3.5.1.2. **Junction/Outlet box locks.** Secure the box cover with a high security padlock meeting GSA FF-P-110 specifications for classified use. Contact the Base CSO or Physical Security representative for more information.

3.5.2. **Concealed PDS.** Use of Concealed PDS is limited to the following situations:

3.5.2.1. **Concrete Encasement under Foundations.** This is the preferred protection solution for SECRET level communications media leaving an Open Service Access (OSA) or secured communications closet/IPS container. Applications of this solution are especially advantageous in new facility construction. Conduits originate at a location near the SECRET equipment rack/IPS container and run under the concrete foundation to the classified outlet location with no more than two (2) 90-degree sweeps. Installation activity and the Project Monitor/Quality Assurance function must verify and document the installation for completeness and accuracy. The Installation Activity must provide a scale floor plan depicting the exact location, size, and material of the conduit. Refer to AFI 33-201V8 for additional information. (T-2)

3.5.2.2. **Conduit types.** Use any combination of schedule 40 to 80 polyvinyl chloride (PVC) conduit. All PVC joints must be sealed with PVC solvent. (T-2)

3.5.3. **Conduit installation.** Conduit under a foundation for the distribution of classified communications must follow one of the following criteria:

3.5.3.1. Six (6) feet under the measured surface of a permanent concrete floor to the top of the conduit bank.

3.5.3.2. Three (3) feet under the measured surface of a permanent concrete floor to the top of the conduit bank and encased in a minimum of eight (8) inches of concrete. The thickness of the concrete foundation may be used to satisfy part or all of the concrete encasement requirements.

3.5.3.3. Stub out conduits six (6) inches above finished floor at each end. Follow exposed PDS guidance guidelines for completion of the protected conduit path.

3.5.3.4. Validate all conduits for serviceability by passing a test mandrel through the conduit run. The test mandrel will be 1-inch less than the inside diameter of the conduit (See FM 11-486-5/T.O. 31W3-10-22). (T-2)

3.5.3.5. Provide 1/4-inch thick nylon pull ropes in all communications service conduits and innerducts.

3.5.4. **Concealed PDS Conduit between Floors and Within Walls.** Distribution conduit for SECRET communications media between floors and within walls must be surrounded by a minimum of eight (8) inches of concrete, preferably within the facility support pillars. The Project Monitor/Quality Assurance function must verify and document the installation for completeness and accuracy. The contractor must provide a scale floor plan showing the exact location, size and material of the conduit. Conduit must be a minimum of two (2) inches in diameter (preferred diameter is four (4) inches). (T-2)

3.5.5. **Alarmed PDS.** AFSOC does not recommend the installation of alarmed PDS at this time, pending baseline determinations for alarm strand sensitivity in relation to ambient noise levels, and centralized maintenance/monitoring responsibilities. All requests for Alarmed PDS must be submitted in writing to AFSOC/A6 for approval. (T-2)

3.5.6. **Holocom® Modular PDS.** The use of Holocom® Modular PDS systems is authorized for use on Air Force controlled facilities (AFI 33-201V8, Para A6.1.).

3.5.6.1. Due to the systems design, the sealing of joints with epoxy or welding is not required.

3.5.6.2. Holocom® PDS systems must not be used in conjunction with or as an adaptation to typical hardened EMT PDS conduit systems. A facility can have both types of systems installed, but each must remain separate. (T-2)

3.6. Communications Service Outlets (for SECRET level classified Use Only).

3.6.1. **SECRET level communications outlets.** duplex outlets utilizing either line card (LC) or male pinned MT-RJ connections on the face plates for all SECRET level data (as determined by Base CSO). Ensure availability of electrical 110 VAC outlet within eighteen (18) inches of the communications outlet (as specified in paragraph A.2.3.1.). This applies to all installations of classified media, regardless of facility security level certification.

3.6.1.1. Ensure the systematic numbering and labeling of each communications outlet, to include a corresponding label at the applicable communications service delivery point within the communications closet/IPS container. This applies to all classified media installations, regardless of facility security level certification.

3.7. Internal Facility Communications Cable Types (Classified Only).

3.7.1. **Internal Facility Classified Cable (all applications).** Use appropriate count of multi-mode (M-M) plenum-rated fiber-optic cable (62.5/125 micron). Cable must not contain a metal carrier of any sort (i.e. shielding, copper carrier, etc.) (T-2). Utilize either male pinned MT-RJ or LC connectors at each end of the SECRET level connection. Splicing of cable is prohibited. This applies to all classified media installations, regardless of facility level certification. (Note: MT-RJ connectors are scheduled for industry phase-out; all new installations should use LC connectors. Contact HQ AFSOC A6X if connector type is in question.) (T-2)

3.7.1.1. The installation activity will:

3.7.1.1.1. **Cable Tests.** Conduct Optical Time Domain Reflect-o-meter (OTDR) or other applicable tests for continuity and signal loss on all FO cable installations using the industry standard guidelines. Provide test results to the Base CSO for quality assurance and acceptance. Complete AF Form 1261 actions prior to system cutover.

3.7.1.1.2. **Connection between Classified and Unclassified racks.** Provide a minimum of 6-strands FO with a minimum six (6) foot maintenance loop at each equipment rack and all junction boxes. Terminate cable utilizing either LC or male pinned MT-RJ connectors (as specified by Base CSO). Organize cable within the rack in a neat and orderly fashion, as specified in paragraph 2.10.

3.7.1.1.3. **Between CSDP and Junction/outlet box.** Provide a minimum of two (2) strands M-M from each SECRET level communications service outlet to the equipment rack. Terminate cable utilizing either LC or male pinned MT-RJ connectors (as specified by Base CSO). SECRET level communications service outlets within a surface mounted junction/outlet box require an additional 18-inch maintenance loop behind the face plate.

3.7.2. **Communications service Patch Panels (SECRET level all).** Use either LC or male pinned MT-RJ connector type patch panels (at the discretion of the Base CSO). Mount the patch panel a minimum of five (5) rack units (RU) from the top extent of the rack (this space is reserved for the switch). Ensure each communications port on the patch panel is systematically numbered and labeled to correspond with the applicable communications service outlet.

3.7.2.1. **Floor plan documentation.** Attach a drawing of the facility floor plan illustrating the location of each SECRET level communications outlet and all PDS back to the SDP. Include the location of the AC breaker servicing the rack.

3.8. Classified Data Propagation in Controlled Access Areas (CAA) (SECRET level only). Use a "soft PDS" solution of *Panduit* (or similar material) in place of a hardened PDS infrastructure. Contact Wing IA and Physical Security Representative for additional security requirements in CAA development. Consult AFI 33-201V8 for additional guidance. **Note:** Inner duct may be substituted for conduit. Completely seal all connecting joints with epoxy.

3.8.1. Completely wrap the Soft PDS infrastructure with one (1) inch red tape every minimum one- and-one-half (1 ½) meters. Installation of Soft PDS conduits above drop ceilings or below raised floors is approved. Installation of Conduits within walls is prohibited. Lock boxes are not required, however; ensure servicing outlet is clearly marked.

3.8.2. **Cable trays.** Use enclosed and sealed cable trays for large cable runs. Procedure for marking cable trays is identical to Soft PDS systems.

3.8.3. **Inspections.** Provide access capabilities for the periodic inspection of conduit path (install in easily accessible locations through the removal of ceiling tiles or floor panels).

3.9. Classified Data Propagation in Open Storage SECRET (OSS) (SECRET level only). Carrier conduit is not required in facility locations meeting or exceeding the classification of the media. Facility must meet the physical and emissions security requirements listed in chapter summary.

3.10. Systems (Modular) Furniture (Classified SECRET Propagation).

3.10.1. Termination of Classified SECRET communications media within modular or systems furniture is prohibited. Conduit paths (either hardened or soft) must not run within or behind any portion of this furniture. This applies to all classified media installations,

regardless of facility security level certification. See AFI 33-201V8, or contact Wing Information Assurance for additional information. (T-2)

3.11. Adopted and Prescribed Forms.

3.11.1. Prescribed Forms. None.

3.11.2. Adopted Forms.

AF Form 847, *Recommendation for Change of Publication*

AF Form 1391, *Military Construction Document*

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Director, Communications and Information

Attachment 1**GLOSSARY OF REFERENCES AND SUPPORTING INFORMATION*****References***

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AFI 33-202V6, *Identity Management*, 23 May 2006

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AFI 33-203V3 (*Emission Security Countermeasures Reviews*), 2 Nov 2005

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Abbreviations and Acronyms

AC—Alternating Current

AC/HVAC—Heating, Ventilation, and Air Conditioning

ADAL—Facility additions and/or Alterations

AFI—Air Force Instruction

AFF—Above finished floor

AFRC—Air Force Reserve Command

AFRIMS—Air Force Records Information Management System

AFSOC—Air Force Special Operations Command

AMP—Amplification

ANG—Air National Guard

ATM—Asynchronous Transfer Mode
AWG—American Wire Gage
BICSI—Building Industry Consulting Service International
BFF—Below finished floor
BTU—British thermal unit
C&A—Certification/Accreditation
CAA—Controlled Access Area
CAT—Category
CSA—Customer Service Administrator
CSDP—Classified Service Delivery Point
CSO—Communications and Information Systems Officer
DC—Direct Current
DIA—Directorate for Intelligence Production
DOD—Department of Defense
EIA/TIA—Electronic and Telecommunications Industry Association
EMSEC—Emanations Security
EMT—Electrical Metallic Tubing
ETL—Engineering Technical Letter
FO—Fiber optic
FCC—Federal Communications Commission
IA—Information Assurance
IPS—Intrusion Protection System
ISO—International Standards Organization
LAN—Local area network
LC—Line Card
MILCON—Military Construction
NEC—National Electric Code
NIPR—Non-secure Internet Protocol Router
OHM—Unit of electrical resistance
OPR—Office of Primary Responsibility
OSA—Open Service Access
OSS—Open Storage Secret

OTDR—Optical Time Domain Reflect-o-meter
SCAMPI—SOCOM specific secure operations protocol
SDP—Service Delivery Point
SIPER—Secure Internet Protocol
SOCOM—Special Operations Command
PDS—Protected Distribution System
PoP—Point-of-presence
POTS—Plain Old Telephone Service
PVC—Polyvinyl Chloride
RCDD—Registered Communications Distribution Designer
RDS—Records Disposition Schedule
REA—Rural Electrifications Administration
RMS—Root-means-Square
RU—Rack Unit
TBB—Telephone Backboard
UL—United Laboratories
UPS—Uninterrupted Power Supply
UTP—Unshielded Twisted Pair
VAC—Volts Alternating Current
VAX—Virtual Address Extension
VoSIP—Voice over SIPRnet