

Army Reserve IT Manual

Information Technology Design and Construction Guide



Army Reserve IT Manual

15 February 2008
With Change 1, 20 October 2008

FOREWORD

This Manual is a living document and will be periodically reviewed, updated and made available to users as part of the Army Reserve's responsibility for providing technical criteria for facility design and construction. The proponent for Army Reserve Information Technology is USARC G2/6. Development and maintenance of this Manual and its technical content is the responsibility of ACSIM-AR, in coordination with USARC G2/6 and Information Systems Engineering Command, Ft. Detrick Engineering Directorate. For ARNET users, lessons learned and recommended changes with supporting rationale may be submitted to the following website:

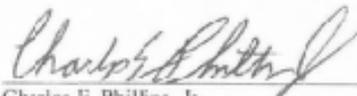
<https://xtranet/organization/DCGUSARC/CoS/Coordinating/DCSG-26/G26Pand/>

For those without access to ARNET, lessons learned and recommended changes with supporting rationale may be submitted to the following e-mail address:

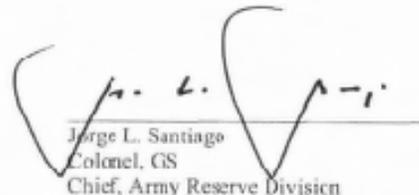
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Recommended changes received and other anticipated changes to Army Reserve Information Technology will be reviewed in a quarterly conference call involving USARC G2/6, ACSIM-AR, and the Louisville District Corps of Engineers Reserve Support Team

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Change 1 Summary Sheet

Subject: Army Reserve IT Manual

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- Editorial and typographic corrections throughout
- Various updates, clarifications and additions throughout

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Chapter 1 – Introduction and General Overview

1.1 Purpose of this Manual

- 1.1.1 The Army Reserve has a large inventory of facilities throughout the country, and continues to acquire additional facilities. The purpose of this Manual is to define current Army Reserve standards and requirements for telecommunication systems, and especially standards and requirements for new facilities and facility revitalization. The Manual's goal is to encourage consistent and efficient design and construction of Army Reserve IT provisions.
- 1.1.2 Army Reserve telecommunication strategy will evolve over time, and individual facilities may have unique requirements. This Manual is intended to present the "80% solution" for the moving target of telecommunications strategy – it presents the preferred Army Reserve strategy that should apply 80% of the time, and does not resolve every issue for every project. The Manual will be updated periodically to reflect Army Reserve telecommunication strategy evolution. The Army Reserve Project Officer has the responsibility for authorizing individual project criteria updates, and additions to or variations from the information in this Manual.
- 1.1.3 This Manual is intended to document and explain the Army Reserve telecommunication strategy to the Army Reserve's design and construction agent, the Corps of Engineers. Additionally, the Manual will provide guidance to individual project designers developing individual project designs or design/build requests for proposal.
- 1.1.4 USARC G2/6 is the proponent for Army Reserve Information Technology, and will participate in individual project Pre-Design and Charette Meetings to define the project IT requirements and implementation plan.
- 1.1.5 The Manual does not supersede any contract for design of an individual Army Reserve project; if conflicts exist between the Manual and a contract, the conflict must be brought to the attention of the Corps Project Engineer/Architect for resolution.

1.2 Overview of strategy for telecommunication services for Army Reserve facilities

1.2.1 ARNET Concept

- 1.2.1.1 ARNET is an enterprise network hosting all enterprise applications from a centralized location.

1.2.2 Telecommunication service provider

- 1.2.2.1 When a Reserve Center is located off of an Installation, out in the community, the Army Reserve will obtain voice and data service from a public service provider.

- 1.2.2.2 On any military Installation, the Army Reserves prefers to obtain telecommunications service through the Installation, if the Installation can provide the services the Army Reserve requires. If the Installation cannot provide the services the Army Reserve requires, the Army Reserve Project Officer will provide direction on whether to pursue service through a public service provider. The Army Reserve will obtain data services from a public service provider to be delivered to the Installation Demarcation Point. The service will then be extended over existing/new OSP fiber optic cable to the entrance facility of the building/campus.
 - 1.2.2.3 The Army Reserve envisions a single service provider for all Army Reserve data service (Verizon as of the date of this Manual), but this should not affect facility or infrastructure requirements. Single service provider for voice service is not planned. Thus there will likely be two service providers for the “last mile” of service to any facility – one for voice and one for data. If some discrepancy with this strategy arises on an individual project, or if multiple providers offer voice service, the Project Development Team must present the issues and their recommendations to the Project Officer.
 - 1.2.2.4 Provide both copper and fiber service for Reserve Centers, if such service is reasonably available.
- 1.2.3 Information Technology service and distribution spaces
- 1.2.3.1 Provide each Army Reserve Center (ARC) and Armed Forces Reserve Center (AFRC) with a single Entrance Facility (EF).
 - 1.2.3.2 Provide a TER for each Service (Army Reserve, Army National Guard, USMC, etc) occupying a joint-use AFRC. Refer to 1.2.7 and Figure 3-12. No encryption/decryption devices are located in the TER.
 - 1.2.3.3 Provide Telecommunications Rooms (TR, formerly known as IT closet), at a minimum, at each floor above the ground floor in a building with a TER, and at each floor of other buildings. No TR is required in buildings with minimal telecommunications provisions, such as Unheated Storage (UHS). Provide a TR for each Service (i.e. Army Reserve, Army National Guard, USMC, etc) occupying a joint-use Reserve Center (AFRC) as described above. Refer to 1.2.7 and Figure 3-12.
 - 1.2.3.4 Additional TRs may be required in larger buildings to maintain compliance with TIA/EIA 568-B.1 295 ft. (90 m.) horizontal link distance limit.
 - 1.2.3.5 There is to be a TR for every 10,000 sq. ft. of usable floor space.
- 1.2.4 Telephone switch
- 1.2.4.1 Each Reserve Center will have a GFGI telephone switch or soft PBX solution.
 - 1.2.4.2 No switch is typically necessary for on-Installation Reserve Centers, if the Installation can provide Army Reserve-desired switching capabilities. However, some Installation systems may require the Army Reserve facility to provide a switch or Remote Telephone Unit (RTU).

- 1.2.4.3 When not located on a military Installation, if the service provider cannot support a local switch on their system, the Army Reserve will accept remote switching provided by the local service provider as a last resort.
- 1.2.5 Mission IT requirements
- 1.2.5.1 The following are the general mission IT requirements for Army Reserve facilities, regardless of unit type. Specific User IT requirements for individual projects will be determined by USARC G6 in coordination with the Command/Unit G6.
- 1.2.5.2 Regional Support Command (RSC), Brigade, Operational and Functional Command, and major Subordinate Command facilities
- Video-teleconferencing (VTC) and secure VTC (SVTC)
 - Sensitive But Unclassified (SBU) Network or NIPRNET
 - Secure or Classified Network, or SIPRNET
 - Community/Cable Access Television (CATV)
 - Industry standard voice Private Automatic Branch Exchange (PABX)/interface switches and data communication connections
- 1.2.5.3 Battalion Headquarter facilities
- VTC (SVTC may be required for mobilizing or deploying units)
 - SBU Network or NIPRNET
 - Secure or Classified Network, or SIPRNET
 - CATV
 - Industry standard voice PABX/interface switches and data communication connections
- 1.2.5.4 Company and below facilities
- VTC
 - SBU Network or NIPRNET
 - Secure or Classified Network, or SIPRNET
 - CATV
 - Industry standard voice PABX/interface switches and data communication connections
- 1.2.6 Secure communications
- 1.2.6.1 Presently, the Army Reserve Installation Management Directorate (ARIMD) Project Officer must validate User requests for secure communication provisions not documented in the project 1391 or Functional Space Detail backup to the 1391. In the future, individual project secure communication requirements should be fully described in the project 1391.
- 1.2.6.2 Provide each Reserve Center with a "SIPRNET Café" room cabled and ready for secure communications to be installed by USARC G2/6 action. The Army Reserve's shift from a Strategic Reserve to an Operational Reserve dictates that this increased capability is needed to support the Army Force Generation (ARFORGEN) training and deployment requirements.
- 1.2.6.3 The necessary equipment for secure communication capability noted immediately above will be provided to the Reserve Center at the appropriate point in the ARFORGEN cycle. New Army Reserve Centers will only have this secure communications capability when the "secure"

equipment is provided. Secure communications equipment is funded and provided by the USARC, not the facility project.

- 1.2.6.4 At this time, SIPRNET to individual office or workstation desktops is authorized only for General Officers (G.O.). USARC G3 must authorize any exceptions for ARIMD approval, subject to funding. It is unlikely that a G.O. office or suite will be constructed or operated as a Controlled Access Area (CAA), so SIPRNET cabling to the G.O. space will require a hardened protective distribution system (PDS) as described in NSTISSI 7003, Protective Distribution Systems. Designers may want to contact Information Systems Engineering Command, Fort Detrick Engineering Directorate (ISEC-FDED) for creative suggestions on how best to accomplish this with minimal visual and operational impact to the G.O. space.
 - 1.2.6.5 At this time, provisions for SVTC will be provided to one space in each facility only. Provide one classroom or conference room for each Army Reserve facility with a SIPRNET data drop to allow for SVTC use on an as-needed basis. The space will not need to be constructed as a Secure Room; it can be guarded on the occasions when being used for SVTC. It must have either provisions for light-tight window blinds or no windows.
 - 1.2.6.6 A Secure Compartmented Information Facility (SCIF), when authorized for an Army Reserve project, must comply with appropriate Director of Central Intelligence Directive No. 6/9 Physical Security Standards for Sensitive Compartmented Information Facilities.
- 1.2.7 Joint-use facilities
- 1.2.7.1 Project authorization documents will determine whether any Service (i.e. Army Reserve, National Guard, etc) has authorization for its own separate IT spaces or other telecommunication provisions. When separate spaces are authorized, they will be provided, preferably collocated to be able to utilize common HVAC systems.
 - 1.2.7.2 Infrastructure to each Service's exclusive space will be exclusive. In joint-use spaces with telecommunications drops (classrooms, Assembly Hall, etc.), separate drops for each service with separate IT provisions will be provided.
 - 1.2.7.3 While Services may have separate IT provisions, components of a single service (i.e. units) will not.
 - 1.2.7.4 When the Army Reserve is the host in a joint-use facility, it is responsible for providing other Service tenants with telecommunications service, operations and maintenance, but not separate equipment. When separate IT spaces and other provisions are authorized for other Services, any required separate equipment remains the responsibility of the other Service. For example, the Army Reserve will provide telephone switching for a facility – if another Service requires their own telephone switch, it is their responsibility to either fund it, or provide and install it.
 - 1.2.7.5 The Army Reserve Project Officer will determine joint and separate IT provisions for individual projects.
- 1.2.8 Funding of IT provisions

- 1.2.8.1 The following installed equipment and provisions are designed, constructed and funded through the individual project design and construction authorization. Project funding is further divided into Military Construction Army Reserve (MCAR) funding and Operations and Maintenance Army Reserve (OMAR) funding.
- Infrastructure (MCAR): this includes cabling, conduit, cable trays, equipment racks, backboards, patch panels, and Protective Distribution Systems (PDS), if required.
 - Power and HVAC provisions (MCAR)
- 1.2.8.2 The following installed equipment and provisions are designed, installed and funded by other sources.
- Computers, servers, data switches, routers, and network setup
 - Uninterruptible Power Supply (UPS) systems
 - Secure communications devices (KIV equipment, secure telephones, safes, etc.), including ARFORGEN equipment provided during the training cycle
- 1.2.8.3 For MCAR projects, starting in FY08, the OMAR IT Tail funding associated with MCAR projects will no longer be sent to USARC. It will now be provided to the (ISEC-FDED) Construction Team, and will be dispersed appropriately after validation of requirements.
- 1.2.8.4 For Base Realignment and Closure (BRAC) projects, all OMAR IT Tail funding will be programmed by the ISEC BRAC Office. ISEC must see all requirements and solutions and be able to recommend to Headquarters, Department of the Army, Chief Information Office (HQDA CIO/G-6) for validation of BRAC requirements prior to programming these funds through ARIMD. When the requirement is validated, and the funding is required, the ISEC BRAC office will request the funds from ARIMD, and it will forward to U.S Army Reserve Command (USARC) for their distribution to the appropriate execution vehicle.

1.2.9 Future developments

- 1.2.9.1 Army Reserve G6 has authorized a 500-day plan to transition to voice over Internet protocol. Scheduling and implementation of this plan is subject to funding.
- 1.2.9.2 The Army Reserve standard for horizontal cabling is CAT 6. CAT 6a will not be utilized at present for voice or data even though an industry standard for CAT 6a has been ratified.

1.3 Applicable criteria

- 1.3.1 Army Reserve design and construction criteria, and telecommunications terminology will move toward compliance with industry standards, with limited Government criteria being cited, except in the case of secure communications provisions.
- 1.3.2 The current versions of the following Government criteria are applicable to telecommunications design for Army Reserve facility projects, except for specific deviations noted in this Manual:

- 1.3.2.1 UFC 4-171-05; *Army Reserve Facilities* (Design Guide or DG)
 - 1.3.2.2 AR 380-5; *Department of the Army Information Security Program - Chapter 7, Section III*
 - 1.3.2.3 Military Handbook (MIL HDBK) 1013/1A, *Design Guide for Physical Security of Facilities*, for protection of openings into secure areas such as SIPRNET Café, COMSEC, and Army Global Command and Control System (AGCCS).
 - 1.3.2.4 *Technical Criteria for Installation Information Infrastructure Architecture* (I3A).
 - 1.3.2.5 If on an Installation, any Installation design and construction guidance (bring any conflicts with Army Reserve requirements in this Manual to the attention of Project Officer for resolution)
 - 1.3.2.6 The documents listed above (except for Installation design guidance) may be accessed at the Louisville District Corps of Engineers website for the Army Reserve.
 - 1.3.2.7 For clarification on relationship between the I3A and the Army Reserve IT Manual the following is to be adhered to:
 - The I3A Criteria is the governing document to which all inside and outside plant cabling is designed and constructed to.
 - This manual (Army Reserve IT Manual) modifies the I3A for Army Reserve specific requirements.
 - If there are conflicts between the I3A and the Army Reserve IT Manual, these are to be addressed by the Project Delivery Team.
 - For items not covered in the Army Reserve IT Manual, the I3A must be followed.
- 1.3.3 The current versions of the following are industry, national and local criteria applicable to telecommunications design for Army Reserve facility projects:
- 1.3.3.1 ANSI/TIA/EIA-568-C.0 *Generic Telecommunications Cabling for Customer Premises*
 - 1.3.3.2 ANSI/TIA/EIA-568-C.1 *Commercial Building Telecommunications Cabling Standard*
 - 1.3.3.3 ANSI/TIA/EIA-568-B.2-4 Addendum 4 *Solderless Connection Reliability Requirements for Copper Connecting Hardware*
 - 1.3.3.4 ANSI/TIA/EIA-568-C.2) *Balanced Twisted Pair Telecommunications Cabling and Components Standards*
 - 1.3.3.5 TIA-568-C.3 *Optical Fiber Cabling Components Standard*
 - 1.3.3.6 ANSI/TIA/EIA-569-B *Commercial Building Standard for Telecommunications Pathways and Spaces*
 - 1.3.3.7 ANSI/TIA/EIA-526-7 *Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant*
 - 1.3.3.8 ANSI/TIA/EIA-526-14B *Measurement of Optical Power Loss of Installed Multimode Fiber Cable Plant*
 - 1.3.3.9 ANSI/TIA/EIA-606-A *Administrative Standard for the Telecommunications Infrastructure of Commercial Buildings*
 - 1.3.3.10 ANSI-J-STD-607-A *Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, Telecommunications Industry Association (TIA)*
 - 1.3.3.11 NFPA 70 *National Electrical Code*

- 1.3.3.12 Local codes and regulations for individual project locations
- 1.3.3.13 Service provider requirements

1.4 Telecommunications Qualifications

1.4.1 Telecommunications Design and Drawings

- 1.4.1.1 The telecommunications design and drawings are to be approved by a Registered Communications Distribution Designer (RCDD) and indicated such with the RCDD's stamp and signature on each telecommunications sheet.

1.4.2 Telecommunications Infrastructure Installation

- 1.4.2.1 Supervisors and installers assigned to the installation of this system or any of its components shall be Building Industry Consulting Services International (BICSI) Registered Cabling Installers, Technician Level. Documentation of current BICSI certification for each of the key personnel must be provided.

Chapter 2 – Army Reserve Information Technology Spaces and Requirements

2.1 Army Reserve IT Spaces - General

2.1.1 The Army Reserve IT spaces described below are the spaces in an Army Reserve facility that are dedicated to housing telecommunication service and distribution provisions for the facility, or to providing space solely for User data processing and telecommunications operations. Almost all Army Reserve spaces have some IT provisions to allow Users access to data or communications; the spaces described below have data access and telecommunication as their primary purpose.

2.1.2 Descriptions and requirements for most Army Reserve spaces are found in UFC 4-171-05 *Army Reserve Facilities* (Design Guide or DG). The information for IT spaces listed in this manual are in addition to what is specified in UFC 4-171-05. It is intended to be IT specific and used by the designer of the IT infrastructure for the Army Reserve facility.

2.2 Individual Space Criteria

2.2.1 Entrance Facility (EF)

2.2.1.1 The purpose of this room is to isolate telecommunication service provider equipment and provisions from the remainder of the facility telecommunications infrastructure. Due to Government servers and other equipment in TER, the EF is required to be a separate space to maintain security of TER from service provider personnel

2.2.1.2 Refer to Figures 3-2 and 3-6 for typical EF plan view and elevation drawings.

2.2.2 Telecommunications Equipment Room (TER)

2.2.2.1 This space is provided to house file and print servers, data switches and the telephone switch. It will typically be located in the main building of a multi-building facility, normally the Reserve Center building. It is the main telecommunications distribution point for its building and the facility.

2.2.2.2 In a joint use facility, each component service in the building requires a separate TER space which can be provided by rooms, caging, or locking cabinets separated on the floor space.

2.2.2.3 The TER may serve as the TR for the floor it occupies; larger buildings or building configuration may require additional TRs on that floor.

2.2.2.4 Refer to figures 3-3 and 3-7 for typical TER plan view and rack elevation drawings.

2.2.3 Telecommunications Room (TR)

2.2.3.1 These spaces serve as distribution points for workstation voice and data cables, and other terminations.

2.2.3.2 Refer to Figures 3-4, 3-5, 3-8 and 3-9 for typical TR plan views and rack elevation drawings.

Chapter 3 – Infrastructure

3.1 Pathways

- 3.1.1 Provide a complete telecommunications pathway system that provides a flexible, re-usable, expandable pathway for premises and outside plant distribution of telecommunication services throughout the facility.
- 3.1.2 The preferred pathway for installing service entrance and campus outside plant (OSP) cables is underground conduits. Aerial installation will only be considered when aerial facilities exist and only as a last option.
- 3.1.3 Conduit Design Criteria
 - 3.1.3.1 Service entrance conduit. Provide four 4-inch (10 cm) polyvinyl chloride (PVC) or high-density polyethylene (HDPE) conduits from the EF to the point of connection for separate copper, fiber and CATV services as well as one spare.
 - 3.1.3.1.1 The point of connection on a military installation is normally the nearest suitable maintenance hole or pedestal. The point of connection when not on a military installation is normally the property line.
 - 3.1.3.1.2 Service entrance conduits to stub up in the EF and shall extend between 4 to 6 inches above finished floor (AFF) and be properly sealed or plugged in accordance with I3A.
 - 3.1.3.1.3 Provide direct buried conduits. Encase conduits in concrete where required by the installation, service provider or I3A.
 - 3.1.3.1.4 Provide three 1-1/4 inch (3.2 cm) innerducts in the conduits for fiber and CATV services and in the spare conduit. Plug all innerducts to prevent foreign material from entering innerduct until it is used.
 - 3.1.3.1.5 Provide handholes and/or maintenance holes as described for OSP conduit below.
 - 3.1.3.1.6 Properly fire stop and moisture seal floor, exterior wall penetrations and conduit/innderduct.
 - 3.1.3.1.7 Installation to meet or exceed I3A requirements.
 - 3.1.3.2 Provide 4-inch conduits from the EF to the TER for separate copper and fiber backbone cables. If the cable tray system extends to the corridor immediately outside the EF, then these conduits may be omitted. In this case, provide sleeves through the EF wall and route backbone cable through the cable tray. Properly fire stop all wall penetrations.
 - 3.1.3.3 Outside plant conduit. Refer to *Technical Criteria for Installation Information Infrastructure Architecture (I3A)* for OSP design criteria. Provide a minimum of 2 separate, direct buried 4-inch (10 cm) PVC or HDPE conduits from the TER to TR in other buildings for copper, fiber, CATV services and one spare. Encase conduits in concrete where required by the installation or I3A.

- 3.1.3.3.1 Provide three 1-1/4 inch (3.2 cm) innerducts in the conduits for fiber and CATV services and in the spare conduit. Plug all inner duct to prevent foreign material from entering inner duct until used.
 - 3.1.3.3.2 Provide handholes and/or maintenance holes in accordance with I3A.
 - 3.1.3.4 Sleeves. Provide four 4-inch (10 cm) conduit sleeves stubbed up a minimum of 3" through the floor of each TR to connect to the TR or TER below it. Properly fire stop floor penetrations with removable, modular self-sealing, elastomeric inserts that allow for cable revisions without the need to remove or replace any fire stop materials.
 - 3.1.3.5 Workstation conduit. Provide 1-inch (2.5 cm) conduit from each outlet stubbed out to accessible ceiling space. For connections to modular system furniture, provide flush wall or flush floor mounted junction boxes for each group of furniture of up to six workstations. Provide (2) 1-1/4 inch (3.2 cm) conduits from the box to accessible ceiling space and a 2 inch (5.1 cm) liquid-tight flexible metal conduit from the box to the modular system furniture base feed point for every six workstations.
 - 3.1.3.5.1 When conduit is ran in a concrete slab, this is considered a wet location and therefore the cable must be OSP rated or Indoor/Outdoor rated cable.
 - 3.1.3.6 Provide a non-continuous support system of dedicated independent rods or wires and Category 6 rated J-hooks spaced at intervals that shall not exceed 60 inches from the conduit stub up to the cable tray. J-hooks shall not exceed 24 cables or 50 percent of the fill capacity, whichever is less.
- 3.1.4 Cable Tray Design Criteria
- 3.1.4.1 Provide cable tray with a minimum size of 6 inches x 2 inches (15 cm x 5 cm) and a maximum depth of 6 inches (15 cm). This cable tray is to be used for pathways and horizontal distribution outside of the IT spaces (EF, TER, TR).
 - 3.1.4.2 Design cable tray to be filled with project provided cabling to a maximum of 25% of the physical dimension of the tray. This will provide 100% growth in installed cable before the *National Electrical Code* (NEC) maximum fill of 50% is reached.
 - 3.1.4.3 Design a continuous cable tray system originating in the TER/TR serving the respective area, properly sized/installed to support 90% of the user work areas premise cabling. The linear distance between conduit stub-up and cable tray shall not exceed 40 feet.
 - 3.1.4.3.1 Conduit (shall be bonded per I3A 2.4.4.3) or non-metallic J-hooks (installed a maximum of 5 feet apart) shall be installed between conduit stub-up and cable tray to properly support premise cabling.
 - 3.1.4.4 Provide ladder type cable runway within the TER/TR as shown in the TER/TR typical room and rack diagrams in Figures 3-4 thru 3-9.
 - 3.1.4.5 Mounting style in order of preference - wall mount or trapeze mount. Center hung cable tray is not an option.

- 3.1.4.6 Provide normal access to the cable tray via lay-in ceiling tile. Provide access panels in non lay-in ceilings such that there is no point in the cable tray system that is more than 20 feet from an access point.
 - 3.1.4.7 Provide 12-inch (30 cm) minimum clearance above the top of the tray and 3-inch (7.5 cm) minimum clearance below the tray.
 - 3.1.4.8 Provide rectangular, modular, fire rated wall penetration assemblies using either integral, sliding covers or removable plugs. Provide usable penetration area equal to cable tray cross section.
 - 3.1.4.9 Properly bond and ground per Section 3.7.2 and ANSI J-STD 607-A.
 - 3.1.4.10 All transitions to cable trays must be done in such a way that support is provided so that cable bend radius requirements are met.
- 3.1.5 Cable Runway Design Criteria
- 3.1.5.1 Provide ladder type cable runway in EF, TER and TR above equipment rack and along plywood backboard as shown in the EF, TER and TR typical room and rack diagrams in Figures 3-2 thru 3-9.
 - 3.1.5.2 Cable runway is a heavy duty, flat top, ladder rack style pathway system designed for use in TR and TER spaces. Construct runway of 1-1/2 inch x 3/8 inch (3.75 cm x 1 cm) tubular stringers with 1/2 inch x 1 inch (1.25 cm x 2.5 cm) welded rungs at 9-inch (23 cm) intervals. The minimum width is 18 inches (45 cm). Equip runway with metal cable dropouts where cables feed to equipment racks.
 - 3.1.5.3 Design cable runway to hold premises cabling, including service loops, backbone, and workstation cables according to sizing criteria described for cable tray in Section 3.1.4.
 - 3.1.5.4 Install cable runway 6 inches (15 cm) above equipment racks and fastened to equipment racks with elevation kits and rack to runway mounting kits; fasten to wall with support brackets. Use radius dropouts attached to the ladder rack in order to maintain proper bend radius of the cabling.
 - 3.1.5.5 Properly bond and ground per section 3.7.2 and ANSI J-STD 607-A.
- 3.1.6 IT Racks and Cabinets
- 3.1.6.1 Provide heavy duty, two or four post, standard 19-inch racks with 6-inch channels in quantities sufficient to accommodate the cabling systems and equipment provided for the project.
 - 3.1.6.2 Provide adequate rack space for the Government-furnished, Government-installed network equipment.
 - 3.1.6.3 Provide as a minimum the racks shown in the typical TER and TR layouts shown in Figures 3-7, 3-8 and 3-9.
 - 3.1.6.3.1 Racks shall be located with adequate clearances as specified in TIA/EIA 569-B.
 - 3.1.6.4 In joint use facilities, separate data networks and TER spaces are required for each military service as described under Voice and Data Horizontal Cabling Section 3.2.5.
 - 3.1.6.4.1 The separate data patch panels described under Voice and Data Horizontal Cable Terminations shall be installed in separate racks in TR. In TER, provide separate data racks for each service component in

separate TER spaces. Note that these separate racks will be required to be physically separated by caging, partition walls, or separate lockable data cabinets within the TER and TR.

3.1.6.4.1.1 If separated by caging or a wall there must be separate entries for each space.

3.1.6.5 If lockable data cabinets are used they are to be 30" in depth, have adequate internal ventilation (louvers and fans) and there must be a 20 Amp dedicated Clean Power receptacle located inside of the cabinet.

3.1.6.6 Properly bond and ground per section 3.7.2 and ANSI J-STD 607-A.

3.1.7 Rack Cable Management Design Criteria

3.1.7.1 Provide the following cable management.

3.1.7.1.1 Provide horizontal cable managers installed as shown on the typical rack diagrams in Figures 3-1, 3-7, 3-8, 3-9 and with the following:

3.1.7.1.1.1 Provide 2 RU space between patch panels in lieu of horizontal cable managers on the data rack.

3.1.7.1.1.2 Minimum of two horizontal cable managers at the top of every equipment rack.

3.1.7.1.1.3 Minimum of one spare horizontal cable manager on the bottom section of each rack for management of voice and data network equipment connections.

3.1.7.1.2 Provide double sided, vertical cable managers installed as shown on the typical rack diagram in Figures 3-7, 3-8 and 3-9. Vertical cable managers shall include cable management for patch cables on the front of the rack and backbone cables on the rear of the rack.

3.1.7.1.3 Provide horizontal and vertical cable managers equipped with double-hinged covers.

3.2 Cabling

3.2.1 Provide cable meeting the requirements of the USARC G2/6 and the intended application. Other telecommunication systems, including CCTV, audio-video, security, paging, intercom, fire alarm, energy management or other smart building systems may utilize portions of the cabling system described in this document. However, it is not the intent of this document to describe unique communications cabling systems that may not be required in typical Army Reserve facilities.

3.2.1.1 CATV Service.

3.2.1.1.1 If CATV service is authorized and available, coordinate with the local service provider. The CATV service provider will typically provide a coaxial cable feed into the building. However, an optical fiber cable may be

used for CATV service as an alternate to coaxial cable at the service provider's discretion.

- 3.2.1.1.2 Locate CATV service cabling termination and head-end equipment in the EF.

3.2.2 Campus Outside Plant (OSP) Cable

3.2.2.1 Where an Army Reserve Center consists of multiple buildings, provide OSP campus backbone cable to make connections to the required and authorized communication systems. A typical arrangement is shown in Figure 3-1.

- 3.2.2.1.1 Provide OSP cables rated for outdoor use, filled with a water blocking compound. Bond the cable shield of OSP copper cables to the communications grounding system at both ends.
- 3.2.2.1.2 If CATV service is authorized and available, coordinate installation of this service with the local service provider. The CATV service provider will typically provide a coaxial cable feed into the building. However, an optical fiber cable may be used for CATV service as an alternate to coaxial cable at the service provider's discretion.
- 3.2.2.1.3 Locate CATV service cabling termination and head-end equipment in the EF.

3.2.3 Voice Backbone UTP Cable

- 3.2.3.1 Provide a minimum of 50 pair, voice grade outside plant rated cable for voice backbone from the EF to the Service Provider Point of Connection (e.g. Local Exchange Carrier, LEC, local pedestal, property line maintenance hole).
- 3.2.3.2 Provide a minimum of 50 pair, multi-pair, voice grade cable for voice backbone installed as follows:
 - 3.2.3.2.1 Minimum of 50 pair from the EF to wall mounted punch down blocks on the wall of the TER.
 - 3.2.3.2.2 Minimum of 25 pair from the wall mounted punch down blocks in the TER to wall mounted punch down blocks on the walls of each TR.
- 3.2.3.3 Provide one voice cabling system in a facility even though it may be a joint use facility with separate military components and/or separate military services as tenants.
- 3.2.3.4 If the Service Provider circuit is terminated at the EF of the building or any other location (i.e. another room or building), it shall be extended to the TER where the router and distribution switch will be installed.
- 3.2.3.5 See Figure 3-1 for a typical backbone arrangement.

3.2.4 Optical Fiber Backbone Cable

- 3.2.4.1 Provide optical fiber cable installed in a star configuration from the TER to each TR.

- 3.2.4.2 Provide separate data backbone cables to support separate data networks for each service in joint use facilities as described under Voice and Data Horizontal Cabling Section 3.2.5. Refer to Figure 3-12 for a basic configuration diagram for joint use facility network.
 - 3.2.4.3 Provide optical fiber cable with a minimum of 12 strands of single-mode (SM). Verify applications and requirements with the using agency on a project by project basis. In joint use facilities at this point in time, each military service requires a separate fiber optic backbone.
 - 3.2.4.4 See Figure 3-1 for a typical arrangement.
- 3.2.5 Voice & Data Horizontal Cabling
- 3.2.5.1 Provide Category 6 horizontal voice and data cabling from TER/TR to user workstation locations, including those in modular furniture systems.
 - 3.2.5.1.1 The maximum physical length of the permanent link (cable length from TER or TR termination to user workstation outlet) shall be 295 ft (90 m) and the maximum physical length of the channel (link plus workstation cable and TER/TR patch cords) shall be 328 ft (100 m) in accordance with ANSI/TIA/EIA-568-C.
 - 3.2.5.1.2 Provide one voice cabling system in a facility even though it may be a joint use facility with separate military components and/or separate military services as tenants. Provide white cable jacket color for voice cabling system.
 - 3.2.5.1.3 In Army Reserve facilities, provide blue cable jacket color for data cabling. In joint use facilities at this point in time, each military service component requires a separate data network. For example: The Army Reserve, Army National Guard and Marine Corps sharing a facility would each have a separate data network (refer to Figure 3-12 for a basic configuration diagram for a joint use facility). Provide blue data cable jacket color for Army Reserve, and provide the following cable jacket colors for each service: Army National Guard-Green; Air Force Reserve-Black; Navy Reserve-Grey; Marine Reserve-Tan; USACAPOC-Orange.

- 3.2.5.2 Where authorized, provide Cat6 horizontal data cabling from TER/TR to Wireless Access Point (WAP) locations. One WAP location will be placed at the center of each 55 foot x 55 foot square grid on each floor of each facility (excluding Unheated Storage buildings). WAP location outlet height should be 12 inches above finished ceiling height for all drop ceiling locations. If grid location will support less than 20 users, then provide one Cat6 cable. For grid locations with over 20 users, provide two (2) Cat6 cables.
- 3.2.6 Panel System Furniture Communication Cabling
- 3.2.6.1 Provide a minimum of one 2 inch conduit from the floor or wall box to an accessible ceiling space adjacent to the communications cable tray for each group of six workstations.
- 3.2.6.2 Provide 2 inch liquid-tight flexible metal conduit and fittings necessary to connect each floor box or wall box to the acoustic panel raceway.
- 3.2.6.3 One RJ-45 telephone jack and one RJ-45 data jack are to be provided for each panel system furniture workstation.
- 3.2.6.4 Provide and install all conduit, fittings, faceplates, jacks and terminate all cables necessary to complete the communications system installation within the panel systems furniture workstations. Upon completion of the communications system installation, all cable, connections and jacks are to be tested and, if necessary, repaired to assure proper functionality.
- 3.2.6.5 The GFGI furniture package will only provide communication raceways at the base of each acoustic panel for routing communications cables. The raceway covers will be provided to accept the communications jacks and faceplates furnished by the contractor.
- 3.2.6.6 For more information on communications cabling and connections for panel system furniture in common office areas refer to Appendix D for document titled "Army Reserve Standards: Furniture Panel System Electrical/Communication Requirements".
- 3.2.7 Gigabit Passive Optical Networking (GPON)
- Department of the Army (DA) Directive 2010-XXX has directed that all camps, posts, and stations undergoing modernization shall adopt Gigabit Passive Optical Networking (GPON) technologies where feasible. In order to meet that directive, the following guidance is provided for all USAR MILCON projects
- 3.2.7.1 It is the responsibility of USARC G-2/6 to make a final decision on whether to use the GPON design or the SCS design and this decision will be made during the MILCON design process. An IT infrastructure design that will support GPON technology should be considered by the A/E RCDD as an alternative to a standard Structured Cabling System (SCS).
- 3.2.7.2 The following is provided as minimum requirements for GPON IT Infrastructure design
- 3.2.7.2.1 Fiber Optic Outlet Placement
- 3.2.7.2.1.1 One fiber optic outlet shall be provided for each individual office in the facility.

- 3.2.7.2.1.2 For multi-user areas (e.g. open office space, classrooms, assembly halls), one fiber optic outlet shall be provided for a maximum of 24 users and shall be located as needed.
- 3.2.7.2.2 Optical Fiber Cable
 - 3.2.7.2.2.1 Provide 2 strands of single-mode fiber optic cable from each fiber optic cable outlet location to the TER.
 - 3.2.7.2.2.2 Terminate optical fiber optic cables with duplex SC-type connectors.
 - 3.2.7.2.2.3 Fiber optic outlets in individual offices shall be terminated in appropriate faceplates and labeled per TIA/EIA 606-A.
 - 3.2.7.2.2.4 Fiber optic outlets in multi-user areas shall be terminated in rack-mounted enclosures. A lockable cabinet shall be provided to house the fiber optic rack enclosure, Optical Network Terminal (ONT), and copper patch panels.
- 3.2.7.2.3 Horizontal Cabling for Multi-User Areas
 - 3.2.7.2.3.1 Provide category 6 horizontal voice and data cabling from user workstation locations to the appropriate ONT location for that multi-user area.
 - 3.2.7.2.3.2 The maximum physical length of the permanent link (cable length from fiber optic outlet location termination to user workstation outlet) shall be 295 ft (90 m) and the maximum physical length of the channel (link plus workstation patch) shall be 328 ft (100 m) in accordance with ANSI/TIA/ EIA-568-C.2.
 - 3.2.7.2.3.3 Terminate Category 6 cabling on 8-position, 7-contact (RJ45 type) connectors using pin/pair assignments in accordance with the T568A pin-out sequence.
 - 3.2.7.2.3.4 Terminate voice and data horizontal workstation cables at the appropriate fiber optic outlet location for that multi-user area on rack mounted Category 6 patch panels using separate voice and data patch panels.
- 3.2.7.2.4 Electrical Power Outlets
 - 3.2.7.2.4.1 Provide one (1) dedicated, 20 Amp 110 VAC quadruplex receptacle fed from a Clean Power panelboard at each multi-user fiber optic outlet location.

3.2.8 CATV Cabling

3.2.8.1 When CATV service is authorized and available for a facility, provide a 75-ohm broadband coaxial cabling system installed in a “trunk and tap” method.

3.2.8.1.1 Provide RG-11 cables for trunk lines from the EF to taps (or couplers) mounted in accessible ceiling spaces or TR. Provide RG-6 cable routed from taps (or couplers) to CATV outlets. Provide required amplifiers, splitters, taps, outlets, and F-type connectors for a complete and usable system.

3.2.8.1.2 Coaxial cable for CATV is not to be ran in same cable tray that the voice/data cabling system uses.

3.3 Terminations

3.3.1 Service Provider Terminations

3.3.1.1 Service provider copper cables will be terminated on entrance protector terminals or primary protector blocks. The service provider will typically provide the entrance protectors for their cable to serve as the demarcation point.

3.3.1.2 Service provider optical fiber are typically terminated in a wall mounted, lockable enclosure near the entrance protector panels to serve as the demarcation point.

3.3.1.3 If the Service Provider circuit is terminated at the EF of the building or any other location (i.e. another room or building), it shall be extended to the TER where the router and distribution switch will be installed.

3.3.2 Campus OSP Terminations

3.3.2.1 Terminate campus OSP copper cable on 110-type entrance protector terminals or primary protector blocks in the TER and TRs of each building.

3.3.3 Optical Fiber Cable Terminations

3.3.3.1 Terminate optical fiber cables with duplex SC-type connectors in rack-mounted enclosures placed near the top of equipment racks in the TER and TRs of each building.

3.3.4 Voice Backbone Cable Terminations

3.3.4.1 The Army Reserve does not require nor desire the extra level of cross-connection for the voice backbone cable. Provide cross-connection as indicated in Figure 3-1.

3.3.4.2 Terminate multi-pair, ISP voice grade voice backbone cable on wall mounted 110-type blocks.

3.3.4.3 Cross-connect telephones from 110-type block to workstation patch panels with patch cables (8-pin modular to 1-pair 110 clip). Label the 8-pin modular end of the patch cable with the telephone extension number to facilitate relocation of telephone instruments.

3.3.5 Voice and Data Horizontal Cable Terminations

- 3.3.5.1 Terminate Category 6 cabling on 8-pin, 8-conductor (RJ45 type) connectors using pin/pair assignments in accordance with the T568A pin-out sequence.
- 3.3.5.2 Terminate voice and data horizontal workstation cables in the TER/TR on rack mounted Category 6 patch panels using separate voice and data patch panels in different racks or different spaces in a rack for clear separation of voice and data terminations.
- 3.3.5.3 Provide separate data patch panels in separate racks to support separate data networks for each military service in joint use facilities as described under Voice and Data Horizontal Cabling section 3.2.5.
- 3.3.5.4 Voice cable terminations shall occupy a separate section of the racks and not occupy more than half of any rack leaving a minimum on half of the rack space for voice equipment. Data cable terminations shall occupy a separate section of the racks with 2 RU space between the patch panels and not occupy more than two-thirds of any rack leaving the remaining one-third for other data equipment.
- 3.3.5.5 Voice and data terminations shall be done in separate patch panels.
- 3.3.5.6 Terminate voice and data horizontal workstation cables at the workstation on Category 6 jacks (the same color as the cable jacket and manufacturer as the patch panels) mounted in faceplates of the same material, color and style as the electrical receptacle faceplates. Provide the appropriate faceplate or adapter plate for workstation cable terminations in modular system furniture, at wall phones locations, or in floor boxes. Colors to be: Voice-White; Army Reserve-Blue; Army National Guard-Green; Air Force Reserve-Black; Navy Reserve-Grey; Marine Reserve-Tan; USACAPOC-Orange.
- 3.3.5.7 Standard administrative workstation outlets shall consist of a two-gang box with reducer ring and a single-gang faceplate. The faceplate shall have the voice and data jacks mounted side-by-side at the top with two blank knockouts at the bottom for future expansion. Standard wall phone outlets shall consist of a single-gang box with a single-gang, lug-type faceplate suitable for direct wall mounting of a telephone instrument.

3.3.6 Labeling

- 3.3.6.1 Label all cable terminations and both ends of all cables in accordance with TIA/EIA-606-A, including the termination field color coding.
 - 3.3.6.1.1 In joint use facilities, label each faceplate with the appropriate service component (Army Reserve, National Guard, Marine Corps, etc.), in addition to the TIA/EIA-606-A requirements.
- 3.3.6.2 Fiber Optic Tray Label
 - 3.3.6.2.1 The fiber optic connector tray must be clearly marked. Labels must include the type of fiber optic cable, number of strands, and identify the TR fiber tray it is terminated in.
- 3.3.6.3 Cabinet, Rack, Patch Panel and Port Labeling

- 3.3.6.3.1 Each TER and TR, and the offices, classrooms, workstations and other work spaces that they provide network connectivity to must have all punched down ports labeled with a unique identifier.
 - 3.3.6.3.1.1 Each cabinet or rack must be labeled in front to identify the branch of service (i.e. USAR, ARNG, etc).
 - 3.3.6.3.1.2 Each patch panel must be labeled A to ZZ continuously within a TER and TR.
 - 3.3.6.3.1.3 All punched down ports at both ends (at the patch panel and at the data outlet) must be labeled with:
 - 3.3.6.3.1.3.1 Branch of Service (R for USAR, G for ARNG)
 - 3.3.6.3.1.3.2 Type of cabling (D for Data, V for Voice)
 - 3.3.6.3.1.3.3 Patch Panel ID (A to ZZ)
 - 3.3.6.3.1.3.4 Room Number
 - 3.3.6.3.1.3.5 Port Number (01 to 48)
- 3.3.6.4 An Outlet Matrix Worksheet must be completed by the Designer of Record and issued as part of the construction documents. The USARC G6 Telecommunications Outlet Matrix worksheet can be found at: <http://www.lrl.usace.army.mil/ed2/default.asp?mycategory=212> or <ftp://ftp.usace.army.mil/pub/lrl/Army%20Reserve%20-%20LRL%20Design%20Guide%20Files/IT%20Spreadsheets/>
- 3.3.7 Testing
 - 3.3.7.1 Test all cabling in accordance with TIA/EIA 568-C standards, copper and fiber, with the appropriate level tester for copper and OTDR and Power Meter for optical fiber. All testing devices used must have been calibrated/recertified within one year of performing field testing. Proof of calibration/recertification is to be provided with the test results.
 - 3.3.7.2 Test results are to be supplied electronically to the project RCDD and the Corps Project Engineer/Architect in the test program native format. If the test results are supplied in a spreadsheet format, it is a requirement to use the spreadsheets titled USARC_G6_TestResults_Copper_OSP Riser and USARC_G6_TestResults_Fiber found at: <http://www.lrl.usace.army.mil/ed2/default.asp?mycategory=212> or <ftp://ftp.usace.army.mil/pub/lrl/Army%20Reserve%20-%20LRL%20Design%20Guide%20Files/IT%20Spreadsheets/>
 - 3.3.7.3 The project RCDD is required to review and approve the test results and supply the evaluation/approval to the Corps Project Engineer/Architect and be made part of the project documentation package.
- 3.3.8 Documentation
 - 3.3.8.1 Provide as-built documentation including complete test result reports, floor plans showing user workstations with cabling labeling, and backbone cable schematic and labeling in an electronic format (PDF or other acceptable) format and a printed hardcopy.

3.4 Telephone System Requirements

- 3.4.1 The telephone system PABX and handsets are GFGI items. The contractor is responsible to provide and install all supporting cabling and equipment as described in other sections of this manual.
 - 3.4.1.1 Provide one telephone system in a facility even though it may be a joint use facility with separate military components and/or separate military services as tenants.
 - 3.4.1.2 Specify that the Contractor shall initiate the application for telephone service and assist the Government in completing the application for service; accepting installation of service; start-up of service; and activation of specific telephone numbers and dedicated lines for fire alarm, security, and elevator panels.

3.5 SIPRNET

3.5.1 General

- 3.5.1.1 Implementation of SIPRNET in an Army Reserve facility is based on encryption within a SIPRNET Café with a few exceptions for individual SIPRNET lines in specific spaces outside of the SIPRNET Café. SIPRNET shall also be extended outside of the SIPRNET Café per UFC 4-171-05 in a hardened Protection Distribution System (PDS) IAW the SIPRNET Technical Information Criteria (STIC), UFC and UFGS 27-05-39. The USARC G2/6 shall review all SIPRNET designs before construction; this includes the USACTTA technical review of the PDS plan.

3.5.2 SIPRNET Café

- 3.5.2.1 SIPRNET Café are designated as small or large (refer to UFC 4-171-05 for how designations are made) and shall be IAW UFC 4-171-05 section 4-2.27.
 - 3.5.2.1.1 Refer to Figures 3-10 and 3-11 for typical small and large SIPRNET Café layouts and IT requirements.
- 3.5.2.2 Refer to UFC 4-171-05 for room construction criteria.
 - 3.5.2.2.1 If a ceiling is required within the SIPRNET Café (or other protected areas then the following requirements apply:
 - 3.5.2.2.1.1 GWB ceilings shall not have flush mounted or recessed lighting.
 - 3.5.2.2.1.2 ATC ceilings shall have an IDS located above and below the ceiling. ATC may have flush mounted or recessed lighting.
 - 3.5.2.2.2 Utilities and other services that do not service the SIPRNET Café shall not traverse through this area.
- 3.5.2.3 Encryption within the SIPRNET Café will occur in a lockable equipment cabinet provided by the Contractor. The Contractor is responsible for providing infrastructure within the SIPRNET Café to connect to the Government provided equipment.

- 3.5.2.3.1 The lockable equipment cabinet is to be a wall-mounted 30" deep cabinet.
- 3.5.2.4 Sensitive but Unclassified (SBU) (BLACK) system. The BLACK system consists of standard telecommunications pathways, cables, devices, and equipment that are physically separated from the RED system. The BLACK system processes and carries only unclassified and/or encrypted information and is the same system described under Voice and Data Horizontal Cabling and Voice and Data Horizontal Cable Terminations.
 - 3.5.2.4.1 Provide one BLACK standard voice outlet box with three CAT6 cables in the SIPRNET Café with the box mounted at 15 inches (30 cm) AFF.
 - 3.5.2.4.2 Provide a 1-inch (2.5 cm) EMT conduit from the CFCI lockable equipment rack to the EF with one BLACK CAT6 cable necessary to support the encryption equipment.
- 3.5.2.5 RED system. The RED system described below applies strictly to SIPRNET and consists of telecommunications pathways, cables, devices, and equipment that are easily visually inspected and physically separated from the BLACK system. The RED system processes and carries unencrypted classified signals.
 - 3.5.2.5.1 RED data lines shall be a minimum of 6 inches (15 cm) from BLACK lines and 6 inches (15 cm) from electrical feeders and branch circuits.
 - 3.5.2.5.2 RED lines shall be installed from the CFCI locking, wall mount cabinet to each workstation within the SIPRNET Cafe in an exposed surface mounted simple PDS such that the entire pathway is able to be inspected from within the SIPRNET Café.
 - 3.5.2.5.3 Provide one RED data outlet for each desk within the SIPRNET Café. Center the outlets on the desks at 48 to 60 inches (91 cm) AFF depending on furniture height.
 - 3.5.2.5.4 As authorized, provide one RED data line to each desk in the COMSEC Vault, provide one RED data line to a conference room, provide one RED data line for each desk in AGCCS and GO office.
 - 3.5.2.5.5 Red Lines-Provide red jacketed Cat6 cabling, terminated with red standard Cat6 RJ45 jacks.
- 3.5.2.6 Provide a call button on the wall outside of the room adjacent to the door that annunciates by chime or buzzer inside the room.
- 3.5.2.7 Grounding. Provide a TGB mounted at 36" AFF immediately adjacent to the lockable equipment rack.
- 3.5.2.8 Power. Provide a Clean Power 5-20 quadraplex receptacle on a 20 Amp dedicated circuit inside the CFCI lockable equipment rack. Provide a Clean Power receptacle for each workstation with each being on a dedicated 20 Amp circuit.

- 3.5.3 IDS. The SIPRNET Café, AGCCS, and COMSEC require an IDS for security. This will include a Balanced Magnetic Switch (BMS) for the door, complete motion detector coverage within the space. The Government will provide the devices and the Contractor is responsible for conduit and box provisions and power. Refer to Chapter 5 for detailed information regarding the provisions for the IDS.
- 3.6 HVAC
 - 3.6.1 General
 - 3.6.1.1 HVAC system is to be designed and implemented for the EF, TER and TR spaces. The systems shall be in accordance with I3A and ANSI/TIA/EIA-569-B-1 and consist of the following:
 - 3.6.1.1.1 HVAC system is only required in the EF if there is active heat generating voice and/or data equipment in this room.
 - 3.6.1.1.2 Design the systems for continuous 24 hours/day, 7 days/week operation, with both temperature and humidity control.
 - 3.6.1.1.3 Size the systems IAW I3A requirements, plus an additional 25% for future growth.
 - 3.6.1.1.4 Maintain positive pressure in relationship to adjoining spaces.
 - 3.6.1.1.5 Separate thermostat with temperature control shall be located in each EF, TER and TR.
 - 3.6.1.1.6 Locate temperature sensors in the space adjacent to the door at 5 feet (1.5 m) above finished floor (AFF).
 - 3.6.1.1.7 No back-up systems are required, but if an emergency power source is available in the facility, connect the HVAC system that serves IT spaces to the emergency power source.
 - 3.6.1.1.8 There shall not be any equipment (piping, ductwork, machinery, etc) that does not serve the EF, TER, TR installed above or in the EF, TER, TR nor will this equipment pass-through or enter the EF, TER, TR spaces.
 - 3.6.2 The Building Automation System (BAS) DDC cannot operate on the Army Reserve network without a Certificate to Operate (CTO) issued by the USARC. The CTO must be current and submitted to the USARC G2/6 along with the MAC addresses of the equipment being installed in order to request IP Addresses. If a CTO does not exist then it must be requested through the USARC G2/6.
- 3.7 Electrical
 - 3.7.1 Clean Power. Clean Power is a term defined for the purposes of this manual to indicate an electrical distribution subsystem dedicated to powering electronic equipment which are classified as non-linear loads.

- 3.7.1.1 Clean Power circuits are those served by a K-rated transformer with the following arrangement:
- 3.7.1.1.1 The feeder serving a Clean Power transformer may also serve additional Clean Power transformers but may not also serve non Clean Power transformers.
 - 3.7.1.1.2 Provide Clean Power transformers with a K-rating adequate for the anticipated harmonic load. Recommend using a minimum of K-4 rating for non-linear loads less than 50% of total load and for non-linear loads 50% or greater of total load use a K-13 rating. Anticipate that all workstations will be equipped with computers and IT racks will be filled with equipment
 - 3.7.1.1.3 Provide a double size neutral and an isolated equipment ground in the feeder from a Clean Power transformer secondary to a Clean Power panelboard.
 - 3.7.1.1.4 Provide Clean Power panelboards equipped with double size neutral buses and standard ground buses. Clean Power panelboards are reserved for electronic equipment and may not serve any type of equipment other than electronic equipment. Transient voltage surge suppression, radio frequency filtering, and harmonic mitigation are not required.
 - 3.7.1.1.5 Clean Power branch circuits shall be served by 20-amp circuit breakers with circuit wiring consisting of standard phase conductors, non-shared full size neutral conductors and equipment grounding conductors. There may not be more than three duplex receptacles or 2 double-duplex receptacles per 20-amp Clean Power branch circuit, except for those in modular system furniture (wired partitions).
 - 3.7.1.1.6 Individual Clean Power circuits serving receptacles in modular system furniture may serve up to six duplex receptacles. There will be three duplex receptacles for each part-time workstation and four duplex receptacles for each full-time workstation. Receptacles in modular system furniture (wired partitions) shall all be served by Clean Power circuits arranged in accordance with NEC Article 605. For more details on panels system furniture workstation electrical requirements refer to document Army Reserve Standards: Furniture Panel System Electrical/Communication Requirements. This document can be found in Appendix D.
 - 3.7.1.1.7 Clean Power receptacles shall be standard grounding type, orange in color. Clean Power receptacles in system furniture are not required to be orange.
- 3.7.1.2 Provide Clean Power for receptacles serving IT equipment at each workstation and desk.
- 3.7.1.3 For all projects, provide (1) dedicated 120V/20 Amp Clean Power circuits with (1) double duplex NEMA 5-20 receptacles for each 19 inch (480 mm) rack or cabinet in the TER/TRs. This receptacle shall be installed 15" AFF on the rear of the rack or at the bottom and rear of the

- inside of the cabinet. Provide (2) dedicated 120V/20 Amp Clean Power circuits with (1) NEMA L5-20 and (1) double duplex NEMA 5-20 receptacles in the EF. These receptacles shall be installed on the plywood backboard at 18" AFF.
- 3.7.1.4 Provide a Clean Power double duplex receptacle on a dedicated 20-amp circuit at the EF.
 - 3.7.1.5 Provide convenience receptacles in EF, TR and TER spaces such that no point along the wall is more than six feet from a receptacle. Convenience receptacles are not to be served from Clean Power circuits or to serve IT equipment.
 - 3.7.1.6 Provide metal multi-outlet assemblies in IT workrooms that extend the full length of the work surface and are mounted above the work surface. Provide duplex receptacles six inches on center served by Clean Power circuits. This multi-outlet assembly may be combined with the data outlet raceway in a dual compartment assembly.
 - 3.7.1.7 Provide a Clean Power receptacle on a dedicated 20 Amp circuit at each desk in the SIPRNET Café centered on the desk and at 15 inches AFF.
 - 3.7.1.8 Provide a dedicated Clean Power electrical panel for each TER/TR with the following minimal requirements: 120/208 volt, 3-phase, panel with a minimum 100 ampere total capacity. All IT loads within the TER/TR shall be fed from the dedicated panel and not from other branch circuits. Loads shall include, but are not limited to, servers, UPS, data switches, and PABX systems. A minimum of 30 Amp spare capacity shall be reserved in each panel with a minimum of four unused spaces for future loads. The designer shall consult with the USARC G2/6 representative to determine the necessary power requirements since the rack or cabinet may contain devices requiring 110 volt and/or 220 volt circuits. If there is a SIPRNET Café adjacent to the TER/TR, the TER/TR Clean Power panel shall also be used and sized for the Clean Power requirements of the SIPRNET Café.
- 3.7.2 Grounding and Bonding. All design and construction for bonding and grounding (earthing) must meet or exceed applicable codes, ANSI J-STD-607-A standards, local and federal regulations.
- 3.7.2.1 Provide a Telecommunications Main Grounding Busbar (TMGB) at the EF in accordance with ANSI J-STD-607-A, with a minimum length of 12 inches (30 cm). Bond the TMGB to the main electrical service grounding electrode system at the main switchboard with a Bonding Conductor for Telecommunications (BCT) conductor using irreversible, high compression or permanent exothermic connections. Provide a BCT with a minimum size of #2 American Wire Gauge (AWG) copper wire for distances of up to 33 feet (10 m) from the main switchboard and sized in accordance with ANSI J-STD-607-A for distances in excess of 33 feet (10 m). For distances in excess of 165 feet (50 m), provide an additional BCT bonded to the nearest effectively grounded building structural steel. Provide such a TMGB in each building's EF served by telecommunications services.
 - 3.7.2.2 Bond TGB within a room together with a minimum size of #6 AWG copper wire. Bond the end TGB to the TMGB with a TBB with a minimum size of #6 AWG copper wire for distances of up to 20 feet

(6 m) from the TER and sized in accordance with ANSI J-STD-607-A for distances in excess of 20 feet (6 m).

- 3.7.2.3 Provide a Vertical Rack Bus on each IT rack. Bond each Vertical Rack Bus TMGB/TGB with a TBB with a minimum size of #4 AWG copper wire for distances of up to 20 feet (6 m) in accordance with ANSI J-STD-607-A.
- 3.7.2.4 Bond TMGB and TGB to structural steel in accordance with ANSI J-STD-607-A.
- 3.7.2.5 Bond ladder runway and cable tray within TER and TR to the TMGB or TGB with a minimum size of #6 AWG copper wire.
- 3.7.2.6 All ground connections are to be made to steel, no connections to aluminum components are permitted. Use only copper wire for ground connections, no aluminum wire permitted.
- 3.7.2.7 Refer for Figure 3-13 for more details.

3.8 Joint Use Facilities Data Network

- 3.8.1 In joint-use facilities, the data networks for each Service (Army Reserve, National Guard, etc) are considered separate from each other. Therefore, each Service's network is to be configured in a Star Topology as defined by EIA/TIA-568-C-1 and BICSI standards.
- 3.8.2 Refer to Figure 3-12 for a basic flow diagram for network configurations in a Joint-use facility. Figure 3-12 is based on a joint use facility that has both the Army Reserve and National Guard. If there are more than these Services in a facility then each additional Service will have its own network as well.
- 3.8.3 Each Service will utilize the facility outside plant cabling supplied as part of the project to provide connection between their network in the facility and their WAN.

Chapter 4 – Access Control System

- 4.1 The Access Control System (ACS) is to be compatible with the Department of Defense (DoD) Common Access Card (CAC).
 - 4.1.1 DTM 09-012, Interim Policy Guidance for DoD Physical Access Control, dated December 8, 2009 establishes DoD access control policy and the minimum DoD security standards for controlling entry to DoD installations and stand-alone facilities.
 - 4.1.2 Components of the ACS are to meet requirements of FIPS-201-01 and required devices are to be on the FIPS 201 Evaluation Program Approved Products List. This can be found at: <http://fips201ep.cio.gov/apl.php>.

- 4.2 The ACS is typically applied to main exterior entrance/exit doors and specific locations are to be determined by the Project Delivery Team during the design process.
 - 4.2.1 Typical applications include:
 - 4.2.1.1 Main Entrance
 - 4.2.1.2 Entrance/exit doors to parking areas
 - 4.2.1.3 Entrance/exit doors to OMS/AMSA/TEMF
 - 4.2.1.4 SIPRNET Café
 - 4.2.1.5 Main facility gates-Card Reader Only
 - 4.2.2 They type and level of card reader is to be determined by the Project Delivery Team during the design process.
 - 4.2.2.1 Card reader can be contact or contactless type.
 - 4.2.2.2 Card reader can be:
 - 4.2.2.2.1 Reader
 - 4.2.2.2.2 Reader + keypad
 - 4.2.2.2.3 Reader + keypad + biometric

- 4.3 The ACS is to be contractor furnished/contractor installed.
 - 4.3.1 System design is to be part of the overall facility drawing package.
 - 4.3.1.1 As a minimum the drawings are to show:
 - 4.3.1.1.1 Location of card readers and symbol to represent the type.
 - 4.3.1.1.2 Location of the Workstation/head-end computer.
 - 4.3.1.1.3 Location of door controllers and main control panels.
 - 4.3.1.1.4 Single Line Diagram for complete system.
 - 4.3.1.1.5 Door details showing conduit, junction box, reader, etc location and installation details.
 - 4.3.1.1.6 Any other details necessary for a complete and functional installation.

- 4.4 The ACS is to operate on its own network. At this time, USARC G2/G6 will not allow the security systems to operate on the facility network infrastructure. Therefore, the ACS contractor is responsible for all wiring, etc to establish connectivity between all components of the ACS including the workstation/head-end computer.
 - 4.4.1 For installations where there is more than one building that the ACS is applied to, there shall be one system for all buildings.
 - 4.4.1.1 The main control of the system (i.e. workstation/head-end computer, main control panel) shall be located in the main building which is typically the Training Center building.

- 4.4.1.2 Connectivity between buildings will be required and can be accomplished using copper cable or fiber optic.
 - 4.4.1.2.1 All cabling must be designed and installed following industry standard practices for structured cabling systems, including I3A, Army Reserve IT Manual and BICSI TDMM Twelfth Edition and other criteria listed in Section 1.3.
 - 4.4.1.2.2 Copper cable can only be used if the length of the run does not exceed 295 feet.
 - 4.4.1.2.3 Any cabling ran between buildings is the responsibility of the ACS contractor and installation must be coordinated with the voice/data system contractor.

- 4.5 For more details on the ACS requirements and operation reference specification 28 13 00.00 48.

Chapter 5 – Intrusion Detection System

- 5.1 The Intrusion Detection System (IDS) requirements are to be applied to the Arms Vault(s) and SIPRNET Café(s) in a facility.
 - 5.1.1 Each Arms Vault and each SIPRNET Café are to have a dedicated IDS.
 - 5.1.1.1 Each IDS is to have separate power, phone and sensors.
 - 5.1.1.2 The location of the control unit for the IDS in the Arms Vault should be as shown in Figure 4-13 of UFC 4-171-05.
 - 5.1.1.3 The location of the control unit for the IDS in the SIPRNET Café should be in close proximity to the equipment cabinet for the data equipment.
 - 5.1.2 The IDS equipment will be GFGI and will include:
 - 5.1.2.1 IDS Control Unit, keypad, balanced magnetic switch and sensors.
 - 5.1.2.2 Siren at building exterior.
 - 5.1.2.3 Cellular backup and exterior cell phone antenna
 - 5.1.2.3.1 The user/RSC is responsible to provide the cell phone service.
 - 5.1.3 Refer to AR190-11 Section 3-6 for more information on IDS.
- 5.2 IDS Provisions
 - 5.2.1 Power for the IDS should be a dedicated tap off of the main switchboard.
 - 5.2.1.1 There does not need to be a separate tap for each IDS, however, each IDS is to have a dedicated disconnect.
 - 5.2.1.2 There is to be a lockable 30 Amp disconnect switch fused for 20 Amps in the Electrical Room where the main switchboard is.
 - 5.2.1.3 There is to be a non-fused 30 Amp disconnect switch located near the IDS control unit location.
 - 5.2.1.4 The IDS control unit requires 120 Vac.
 - 5.2.1.5 The construction contractor is required to provide all the requirements of section 5.2.1.
 - 5.2.2 There is to be a dedicated POTS (Plain Old Telephone System) line for each IDS system.
 - 5.2.2.1 The construction contractor is to run a CAT6 cable in dedicated conduit from the location of the IDS control unit to the TER for connection to the POTS line.
 - 5.2.2.2 The POTS line is to be active when the IDS contractor performs the installation.
 - 5.2.3 Construction contractor is responsible for the following conduit to be installed.
 - 5.2.3.1 Conduit from the IDS control unit location to the building exterior.
 - 5.2.3.1.1 This conduit is to be used for the external siren wiring but can also be used for the external cell phone antenna cable.
 - 5.2.3.1.2 Location of siren to be determined by the Project Delivery Team during the design process.
 - 5.2.3.2 Conduit from the IDS control unit location to building exterior location for cell phone antenna.
 - 5.2.3.2.1 Only required if conduit for external siren wire is not used.
 - 5.2.3.2.2 If the conduit for external siren wire is used, need to provide provisions on the exterior of the building for the IDS installer to transition from the cell phone conduit on the exterior of the building to the siren/antenna conduit.

- 5.2.3.3 Conduit from the IDS control unit to sensors, switches, controllers and alarms.
 - 5.2.3.3.1 Quantity and location of these conduits are to be coordinated with the IDS installer.
 - 5.2.3.3.2 For SIPRNET Café it is preferable the conduit be located behind the wall, with surface mounted acceptable.
 - 5.2.3.3.3 For vaults, conduit is to be surface mounted.
- 5.2.3.4 Conduit types to be used are as follows:
 - 5.2.3.4.1 Inside vaults and SIPRNET Café – EMT
 - 5.2.3.4.2 Outside vaults and SIPRNET Café – Intermediate
 - 5.2.3.4.3 Outside the building – Rigid
- 5.2.3.5 Pull strings are to be installed in all conduits.
- 5.2.4 Sensors
 - 5.2.4.1 Sensor types, quantities and locations will be determined by the IDS installer.
- 5.3 Drawings
 - 5.3.1 As a minimum the drawings are to show:
 - 5.3.1.1 Location of IDS control unit.
 - 5.3.1.1.1 IDS control unit to be noted as GFGL.
 - 5.3.1.2 Location of required conduits and conduit type.
 - 5.3.1.3 Power provisions and required disconnect switches.
 - 5.3.1.4 POTS line provisions and conduit location and type.
 - 5.3.1.5 System single line diagram.
 - 5.3.1.6 Any details necessary for a complete and functional installation.
- 5.4 Refer to Figure 5-1.

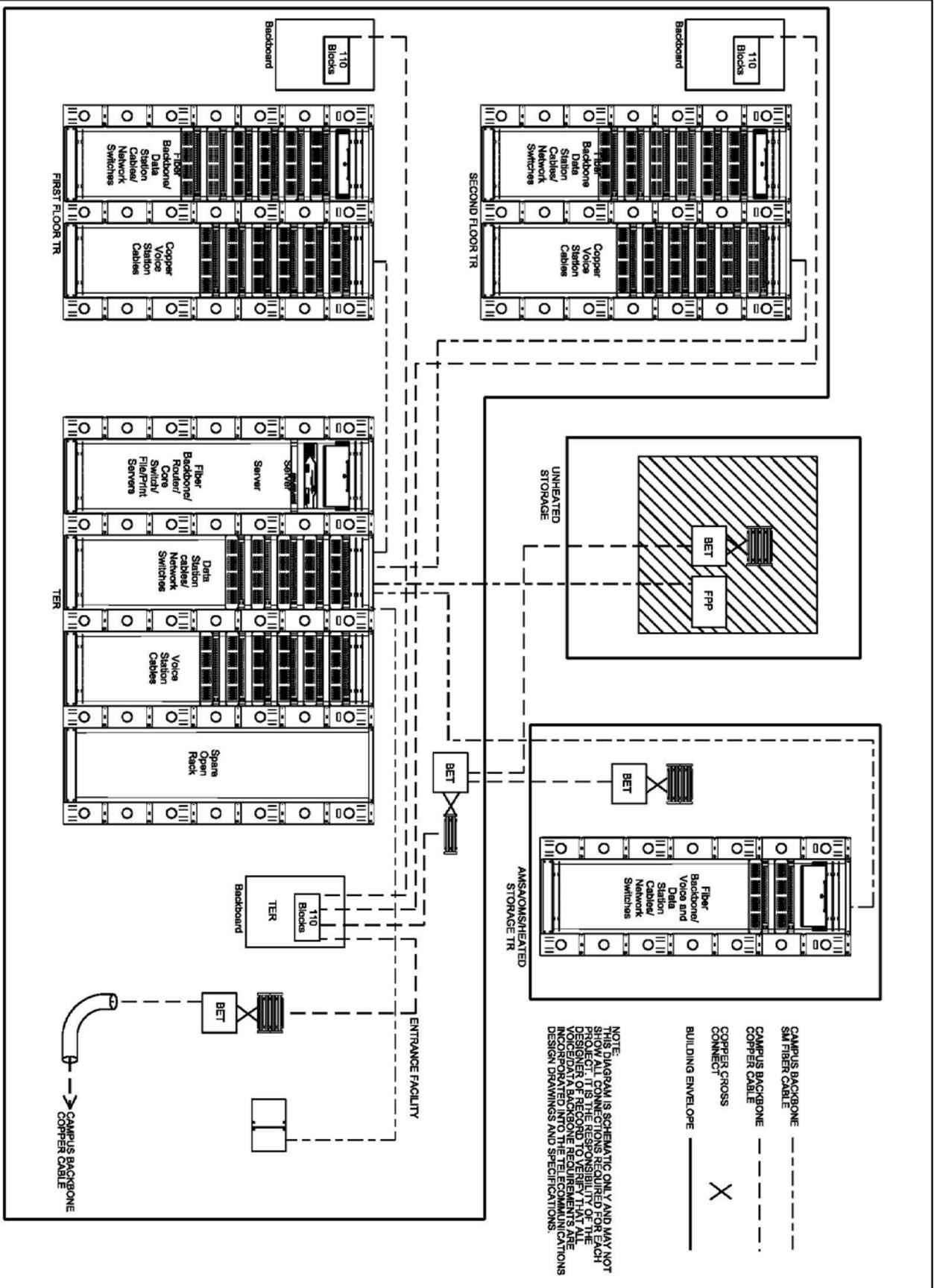
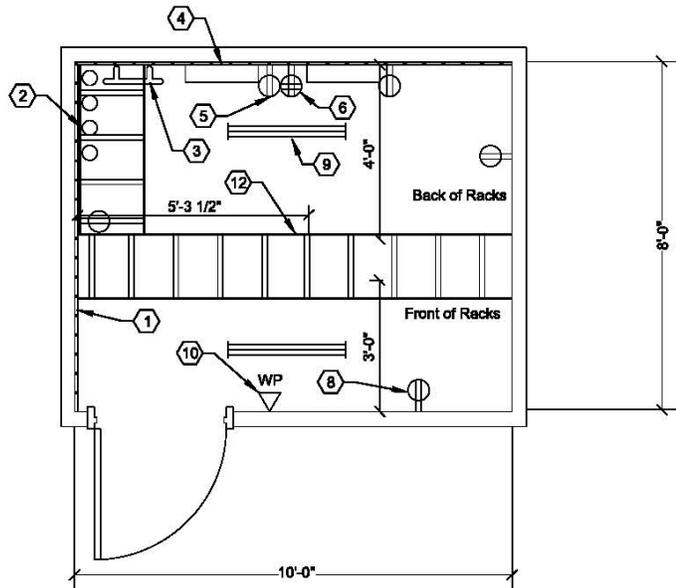


FIGURE 3-1 Typical Voice/ Data Backbone Cabling Diagram
NOT TO SCALE

KEY NOTES

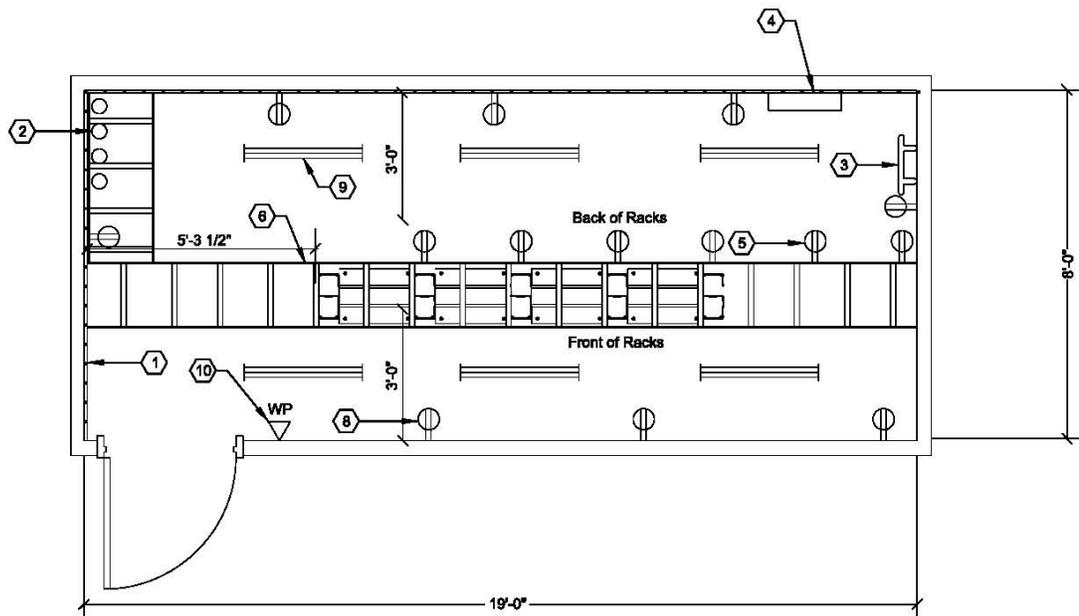
1. 8'H x 3/4", AC grade, void free, fire rated plywood backboard covering two walls, with two coats of white or light grey paint. Do not paint over fire rating stamp. Plywood is to be installed 8" AFF. Typical.
2. Four 4" conduits with three 1-1/4" (3.2 cm) innerducts in 3 of 4 conduits to MH/HH1 at the property line. Conduits are to be stubbed up 4'-6" AFF.
3. Telecommunications Main Ground Bus bar (TMGB) mounted at 7'-6" AFF.
4. Building Entrance Terminal (BET) and CFCI Wall mounted, 110-type connector blocks with C-5 clips for copper backbone terminations. Typical.
5. NEMA L5-20 receptacle with a dedicated 120V/20AMP circuit for Service Provider equipment. Coordinate exact location with the Service Provider. Typical.
6. Two NEMA 5-20 duplex receptacles with a dedicated 120V/20AMP clean power circuit for Service Provider equipment. Coordinate exact location with the Service Provider. Typical.
7. Not used.
8. NEMA 5-20 duplex receptacle convenience outlet spaced at 6' intervals around the perimeter of the room. Typical.
9. Light Fixture. Provide the appropriate number of fixtures to achieve 50 foot-candles. The illumination levels are measured at 3 feet AFF at the front and back faces of IT racks. Typical.
10. Wall mount phone outlet with (1) Category 6 cable mounted at 48" AFF. Typical.
11. Not used.
12. Ladder type, cable runway, made of 3/8" x 1-1/2" x .085" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2' 119.5". Typical.



**FIGURE 3-2 Typical Entrance Facility (EF) Plan View
 NOT TO SCALE**

KEY NOTES

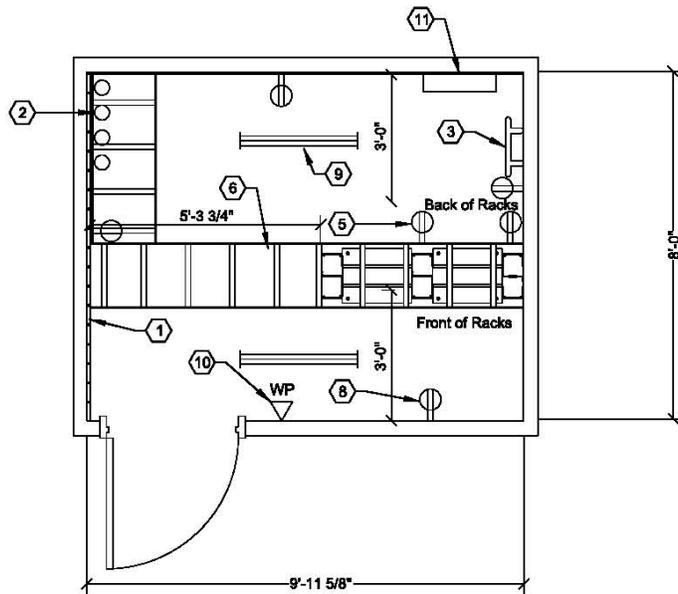
1. 8'H x 3/4", AC grade, void free, fire rated plywood backboard covering two walls, with two coats of white or light grey paint. Do not paint over fire rating stamp. Plywood is to be installed 8" AFF. Typical.
2. Four 4" conduits with three 1-1/4" (3.2 cm) innerducts in 3 of 4 conduits. Conduits are to be stubbed up 4'-6" AFF.
3. Telecommunications Ground Bus bar (TGB) mounted at 7'-6" AFF.
4. CFCI Building Entrance Terminal (BET) and wall mounted, 110-type connector blocks with C-5 clips for copper backbone terminations. Typical.
5. NEMA 5-20 receptacles. Each receptacle has a dedicated 120V/20AMP clean power circuit for GFCI telecommunications equipment. Outlets will be located on the bottom and side of the racks. Typical.
6. Ladder type, cable runway, made of 3/8" x 1-1/2" x .065" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2" / 119.5". Typical.
7. Not used
8. NEMA 5-20 duplex receptacle convenience outlet spaced at 6' intervals around the perimeter of the room. Typical.
9. Light Fixture. Provide the appropriate number of fixtures to achieve 50 foot-candles. The illumination levels are measured at 3 feet AFF at the front and back faces of IT racks. Typical.
10. Wall mount phone outlet with (1) Category 6 cable mounted at 48" AFF. Typical.



**FIGURE 3-3 Typical Telecommunications Equipment Room (TER) Plan View
NOT TO SCALE**

KEY NOTES

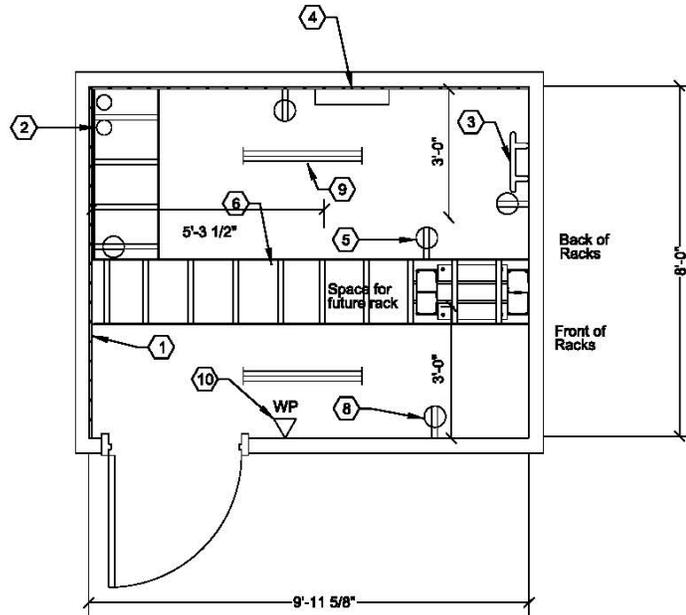
1. 8'H x 3/4", AC grade, void free, fire rated plywood backboard covering two walls, with two coats of white or light grey paint. Do not paint over fire rating stamp. Plywood is to be installed 8" AFF. Typical.
2. Four 4" EMT sleeves down to TER/TR. Sleeves are to be stubbed up a minimum of 3" and sealed between floor and sleeve to prevent moisture seepage.
3. Telecommunications Ground Bus bar (TGB) mounted at 7'-6" AFF.
4. Not Used
5. NEMA 5-20 receptacles. Each receptacle has a dedicated 120V/20AMP clean power circuit for GFCI telecommunications equipment. Outlets will be located on the bottom and side of the racks. Typical.
6. Ladder type, cable runway, made of 3/8" x 1-1/2" x .065" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2" / 119.5". Typical.
7. Not used
8. NEMA 5-20 duplex receptacle convenience outlets spaced at 8' intervals around the perimeter of the room. Typical.
9. Light Fixture. Provide the appropriate number of fixtures to achieve 50 foot-candles. The illumination levels are measured at 3 feet AFF at the front and back faces of IT racks. Typical.
10. Wall mount phone outlet with (1) Category 6 cable mounted at 48" AFF. Typical.
11. CFCI wall mounted 110 type connector blocks with C-5 clips for copper backbone terminations.



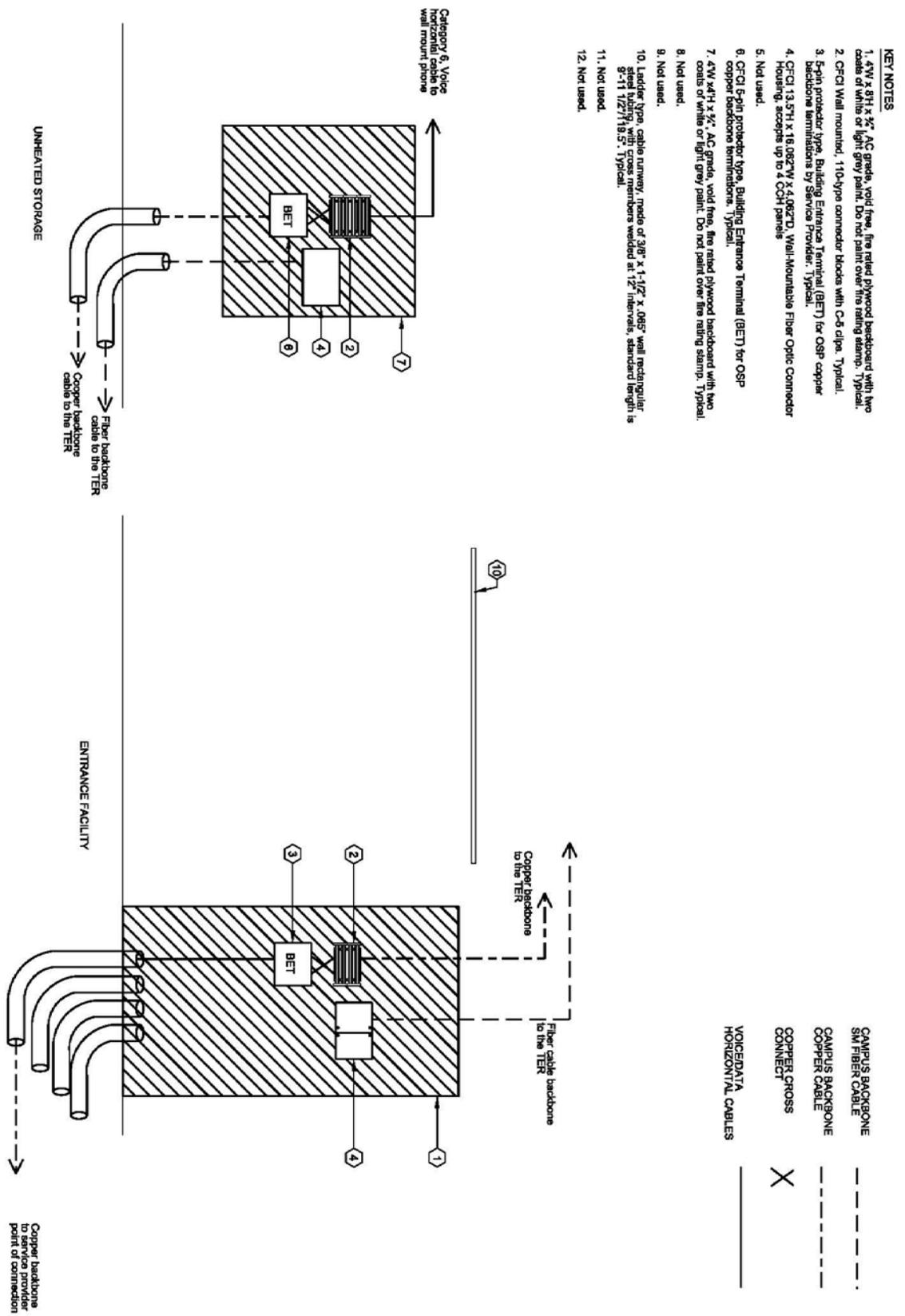
**FIGURE 3-4 Typical Training Center Telecommunications Room (TR) Plan View
 NOT TO SCALE**

KEY NOTES

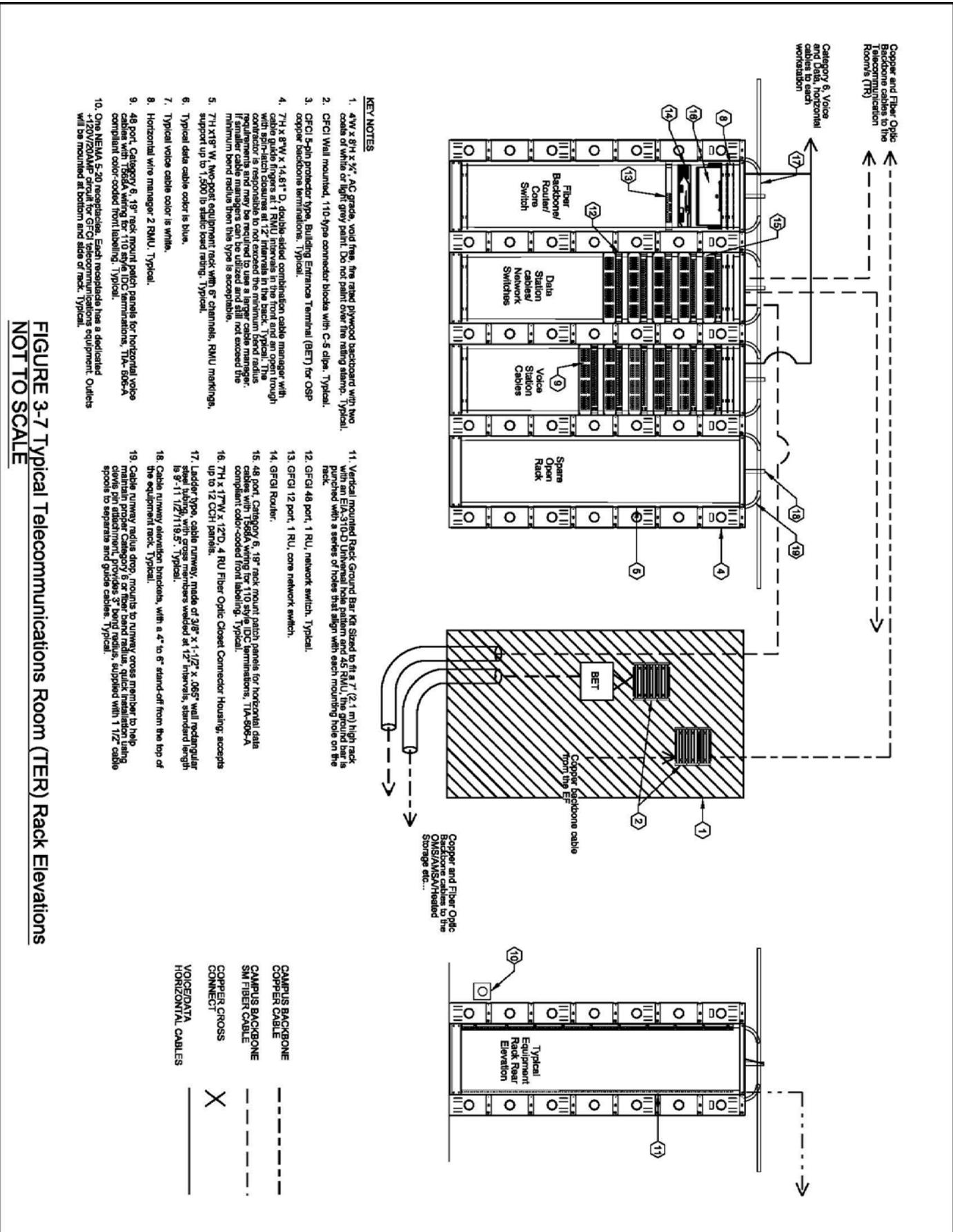
1. 8'H x 3/4", AC grade, void free, fire rated plywood backboard covering two walls, with two coats of white or light grey paint. Do not paint over fire rating stamp. Plywood is to be installed 6" AFF. Typical.
2. Two 4" conduits with three 1-1/4" (3.2 cm) Innerducts in each conduit. Conduits are to be stubbed up 4'-6" AFF.
3. Telecommunications Ground Bus bar (TGB) mounted at 7'-6" AFF.
4. CFCI Building Entrance Terminal (BET) and wall mounted, 110-type connector blocks with C-5 clips for copper backbone terminations. Typical.
5. NEMA 5-20 receptacles. Each receptacle has a dedicated 120V/20AMP clean power circuit for GFCI telecommunications equipment. Outlets will be located on the bottom and side of the racks. Typical.
6. Ladder type, cable runway, made of 3/8" x 1-1/2" x .085" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2" 119.5". Typical.
7. Not used
8. NEMA 5-20 duplex receptacle convenience outlet spaced at 6' intervals around the perimeter of the room. Typical.
9. Light Fixture. Provide the appropriate number of fixtures to achieve 50 foot-candles. The illumination levels are measured at 3 feet AFF at the front and back faces of IT racks. Typical.
10. Wall mount phone outlet with (1) Category 6 cable mounted at 48" AFF. Typical.



**FIGURE 3-5 Typical OMS/AMSA/Heated Storage Telecommunications Room (TR) Plan View
 NOT TO SCALE**

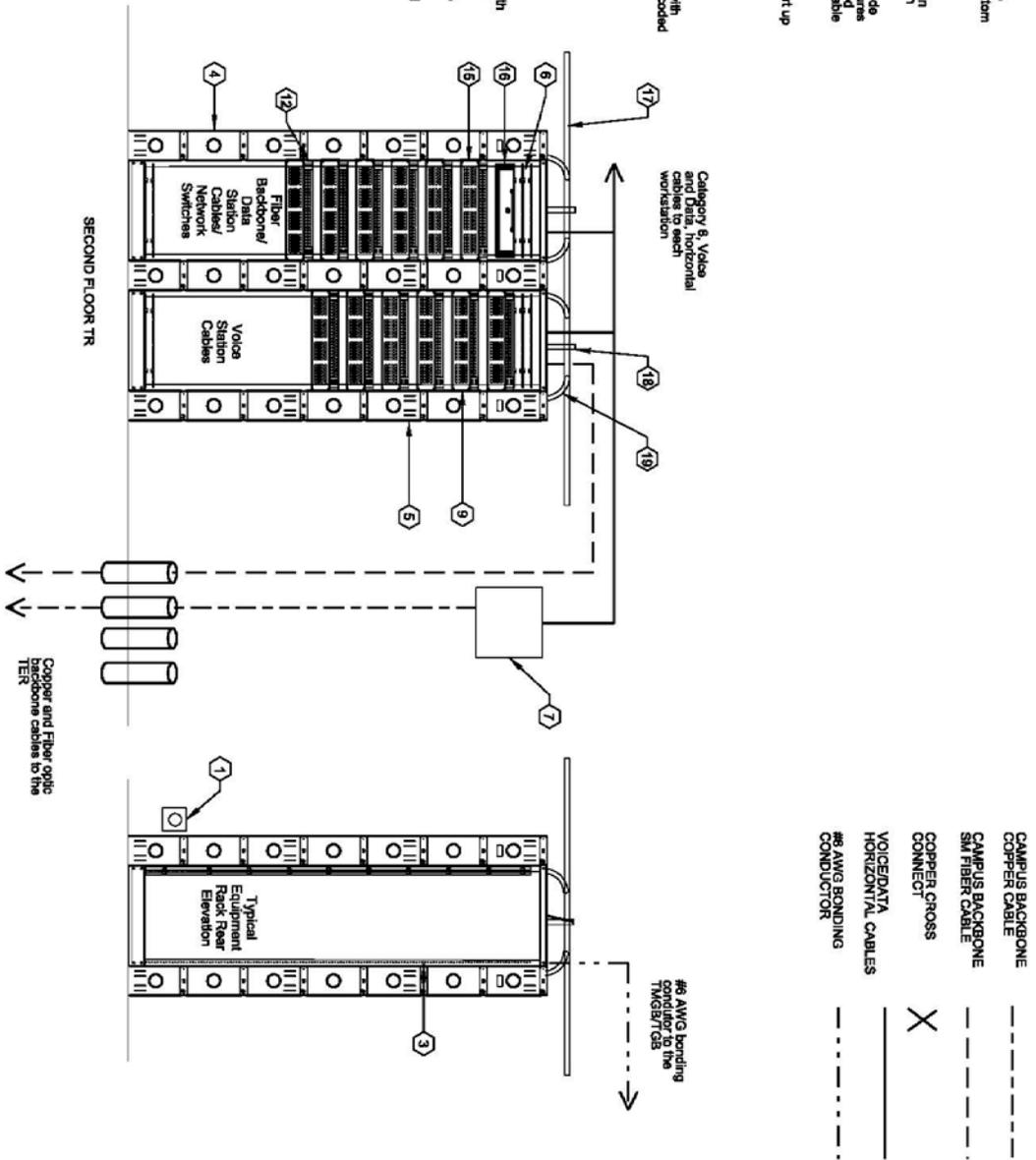


**FIGURE 3-6 Typical Entrance Facility (EF) and UHS Elevations
NOT TO SCALE**



KEY NOTES

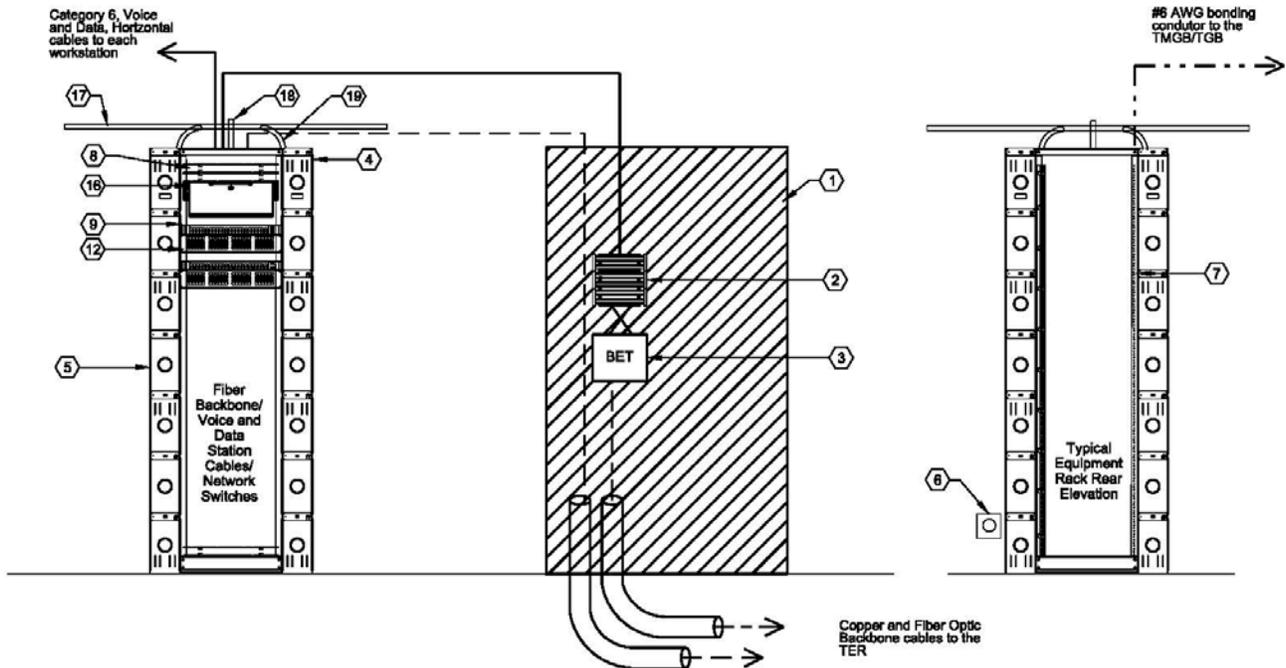
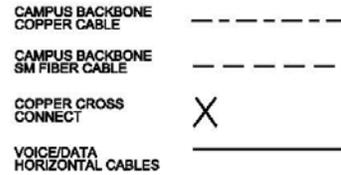
1. One NEMA 5-20 receptacles. Each receptacle has a dedicated +120V/20AMP circuit for GFCI telecommunication equipment. Outside will be mounted at bottom and side of rack. Typical.
2. Not used.
3. Vertical mounted Rack Ground Bar (V) Sized to fit a 7 (2.1 m) high rack with an EMI/RFI shielded front panel. Front panel is punched with a series of holes that align with each mounting hole on the rack.
4. 7H x 8W x 14.8" D, double-sided combination cable manager with cable guide supports at 1 RMU intervals. The front face an open trough with spring-actuated clearances for 1/2" diameter cables. The rear face has a minimum bend radius of 12" and the minimum bend radius requirements and may be required to use a larger cable manager. If smaller cable managers can be utilized and still not exceed the minimum bend radius then this type is acceptable.
5. 7H x 19" W, two-post equipment rack with 6" channels, RMU markings, support up to 1,500 lb static load rating. Typical.
6. Horizontal wire manager 2 RMU. Typical.
7. Wall mounted, 110-type connector block with C-5 clips. Typical.
8. Not used.
9. 48 port, Category 6, 19" rack mount patch panels for horizontal voice cables with T568A and wiring and 110 type IDC terminations, 11A-805-A compliant color-coded front labeling. Typical.
10. Typical data cable color is Blue.
11. Typical voice cable color is white.
12. GFI 48 port, 1 RU, network switch. Typical.
13. Not used.
14. Not used.
15. 48 port, Category 6, 19" rack mount patch panels for horizontal data cables with T568B and wiring and 110 type IDC terminations, 11A-805-A compliant color-coded front labeling. Typical.
16. 3.57H x 1.7W x 12D, 2 RU Fiber Optic Closet Connector Housing; accepts up to 4 CCH panels. Typical.
17. Ladder type, cable runway, made of 3/8" x 1-1/2" x .085" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2"/19.5". Typical.
18. Cable runway elevation brackets, with a 4" to 6" stand-off from the top of the equipment rack. Typical.
19. Cable runway radius drop, mounts to runway cross member to help maintain proper Category 6 cable bend radius, quick install type, using screws pin separate and guide cables. Typical.



**FIGURE 3-8 Typical Training Center TR
NOT TO SCALE**

KEY NOTES

1. 4'W x 8'H x 3/4", AC grade, void free, fire rated plywood backboard with two coats of white or light grey paint. Do not paint over fire rating stamp. Typical.
2. CFCI Wall mounted, 110-type connector blocks with C-5 clips. Typical.
3. CFCI 5-pin protector type, Building Entrance Terminal (BET) for OSP copper backbone terminations. Typical.
4. 7'H x 8"W x 14.61" D, double-sided combination cable manager with cable guide fingers at 1 RMU intervals in the front and an open trough with spin-latch closures at 12" intervals in the back. Typical. The contractor is responsible to not exceed the minimum bend radius requirements and may be required to use a larger cable manager. If smaller cable managers can be utilized and still not exceed the minimum bend radius then this is acceptable.
5. 7'H x 19" W, two-post equipment rack with 6" channels, RMU markings, support up to 1,500 lb static load rating. Typical.
6. One NEMA 5-20 receptacles. Each receptacle has a dedicated +120V/20AMP circuit for GFCI telecommunications equipment. Outlets will be mounted at bottom and side of rack. Typical.
7. Vertical mounted Rack Ground Bar Kit Sized to fit a 7' (2.1 m) high rack with an EIA-310-D Universal hole pattern and 45 RMU, the ground bar is punched with a series of holes that align with each mounting hole on the rack.
8. Horizontal wire manager 2 RMU. Typical.
9. 48 port, Category 6, 19" rack mount patch panels for horizontal voice and data cables with T568A and wiring and 110 style IDC terminations, TIA-606-A compliant color-coded front labelling. Typical.
10. Typical data cable color is blue.
11. Typical voice cable color is white.
12. GFGI 48 port, 1 RU, network switch. Typical.
13. Not used
14. Not used
15. Not used
16. 7'H x 17"W x 12"D, 4 RU Fiber Optic Closet Connector Housing; accepts up to 12 CCH panels. Typical.
17. Ladder type, cable runway, made of 3/8" x 1-1/2" x .065" wall rectangular steel tubing, with cross members welded at 12" intervals, standard length is 9'-11 1/2" / 119.5". Typical.
18. Cable runway elevation brackets, with a 4" to 6" stand-off from the top of the equipment rack. Typical.
19. Cable runway radius drop, mounts to runway cross member to help maintain proper Category 6 or fiber bend radius, quick installation using clevis pin attachment, provides 3" bend radius, supplied with 1 1/2" cable spools to separate and guide cables. Typical.



**FIGURE 3-9 Typical AMSA/OMS/Heated Storage TR
NOT TO SCALE**

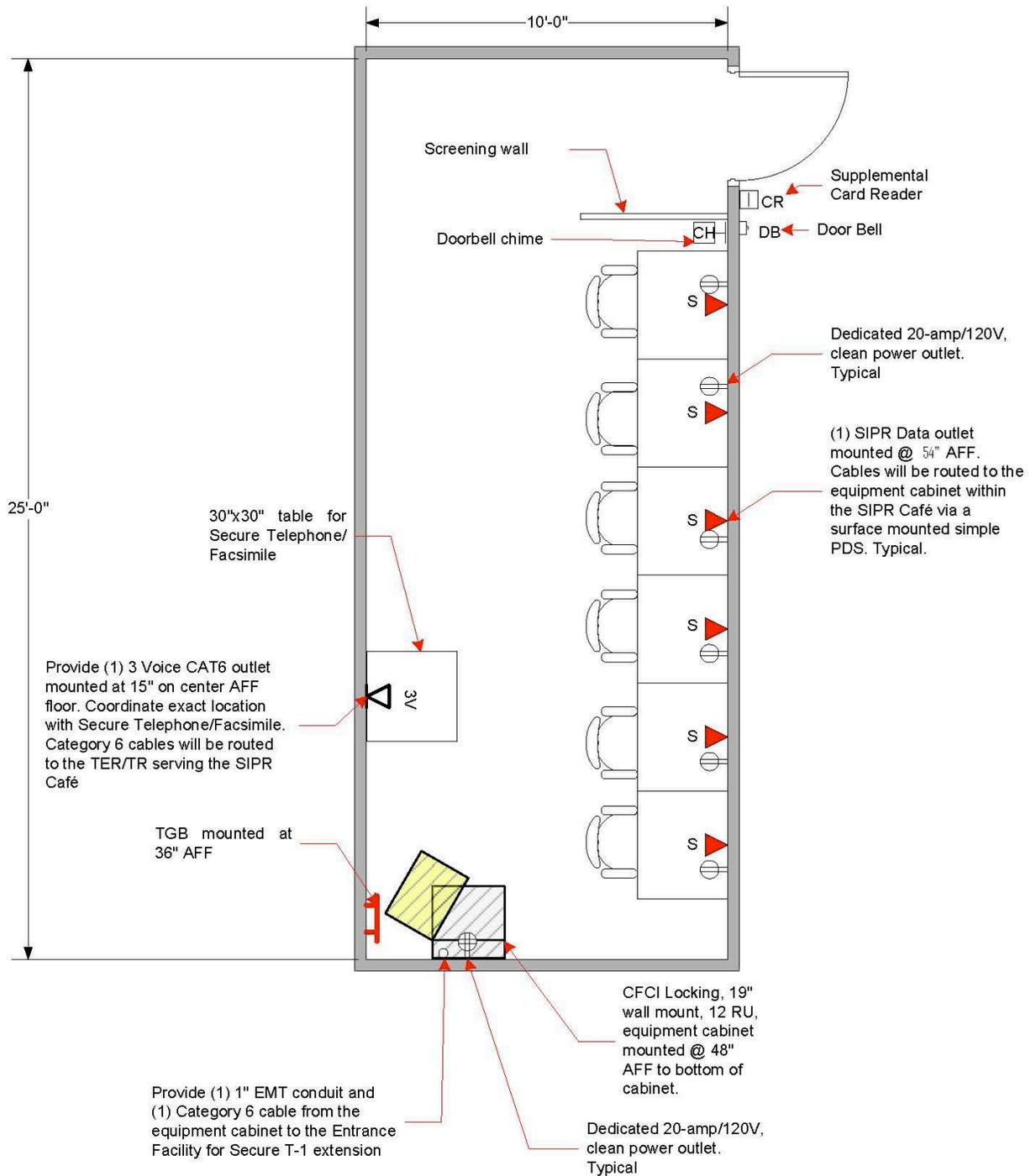


FIGURE 3-10 Typical Small SIPRNET Cafe
 SCALE: 1/4" = 1'-0"

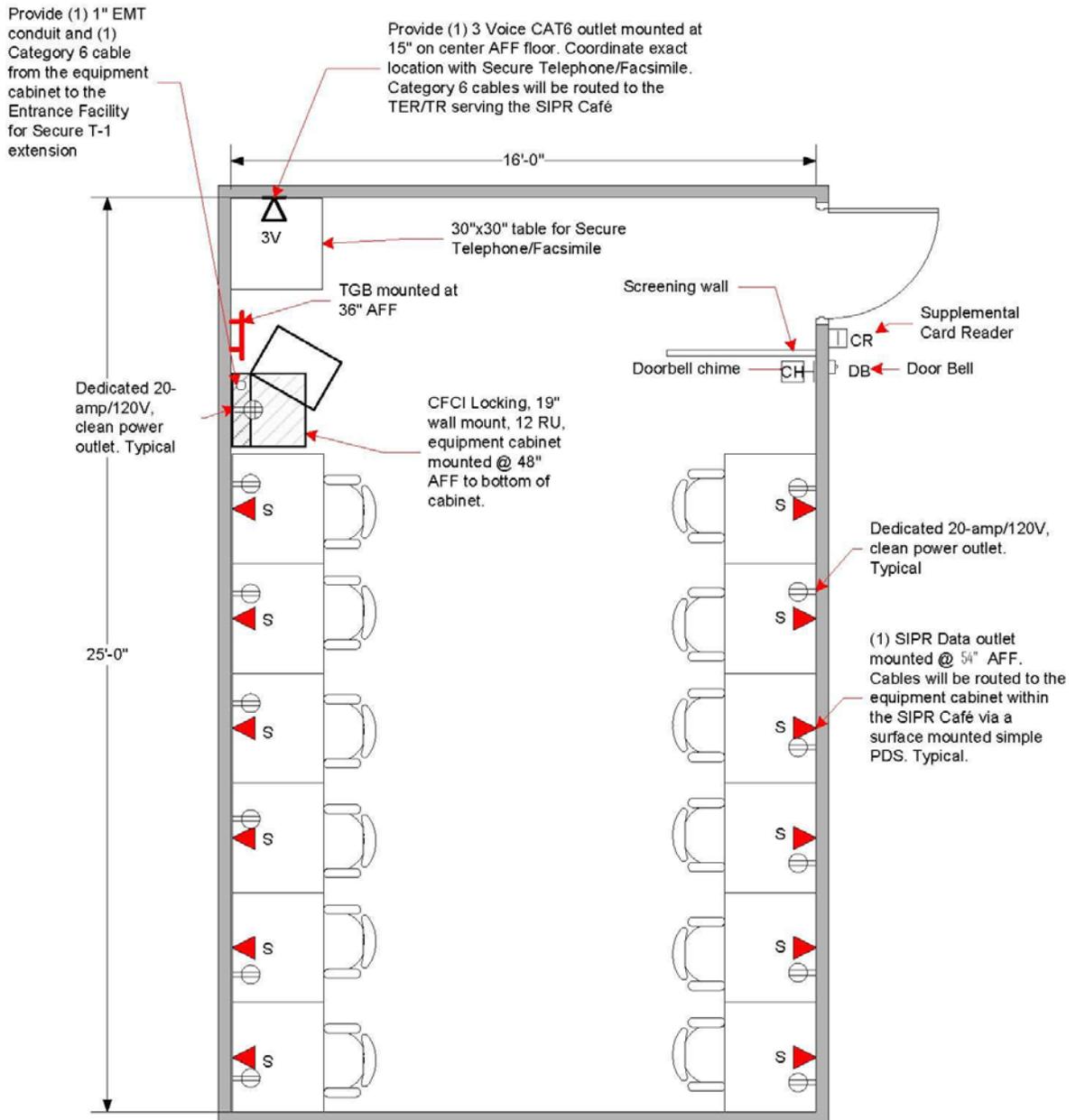


FIGURE 3-11 Typical Large SIPRNET Cafe
 SCALE: 1/4" = 1'-0"

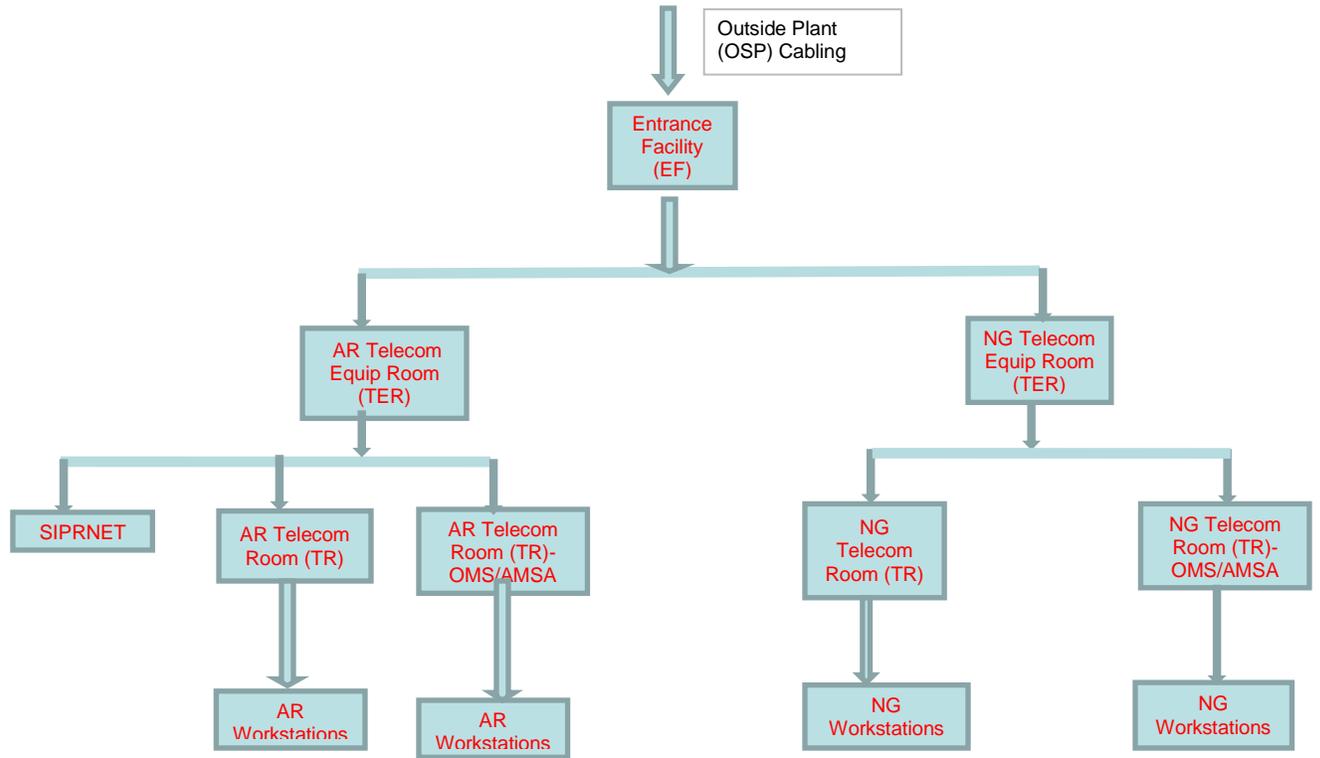


Figure 3-12: Joint-Use Facility- Basic Data Network Topology

- ACEG = Alternating current equipment ground
- BC = Bonding conductor
- BCT = Bonding conductor for telecommunications
- EF = Entrance facility
- ER = Equipment room
- GE = Grounding equalizer
- GEC = Grounding electrode conductor
- TBB = Telecommunications bonding backbone
- TGB = Telecommunications grounding busbar
- TMGB = Telecommunications main grounding busbar
- TR = Telecommunications room

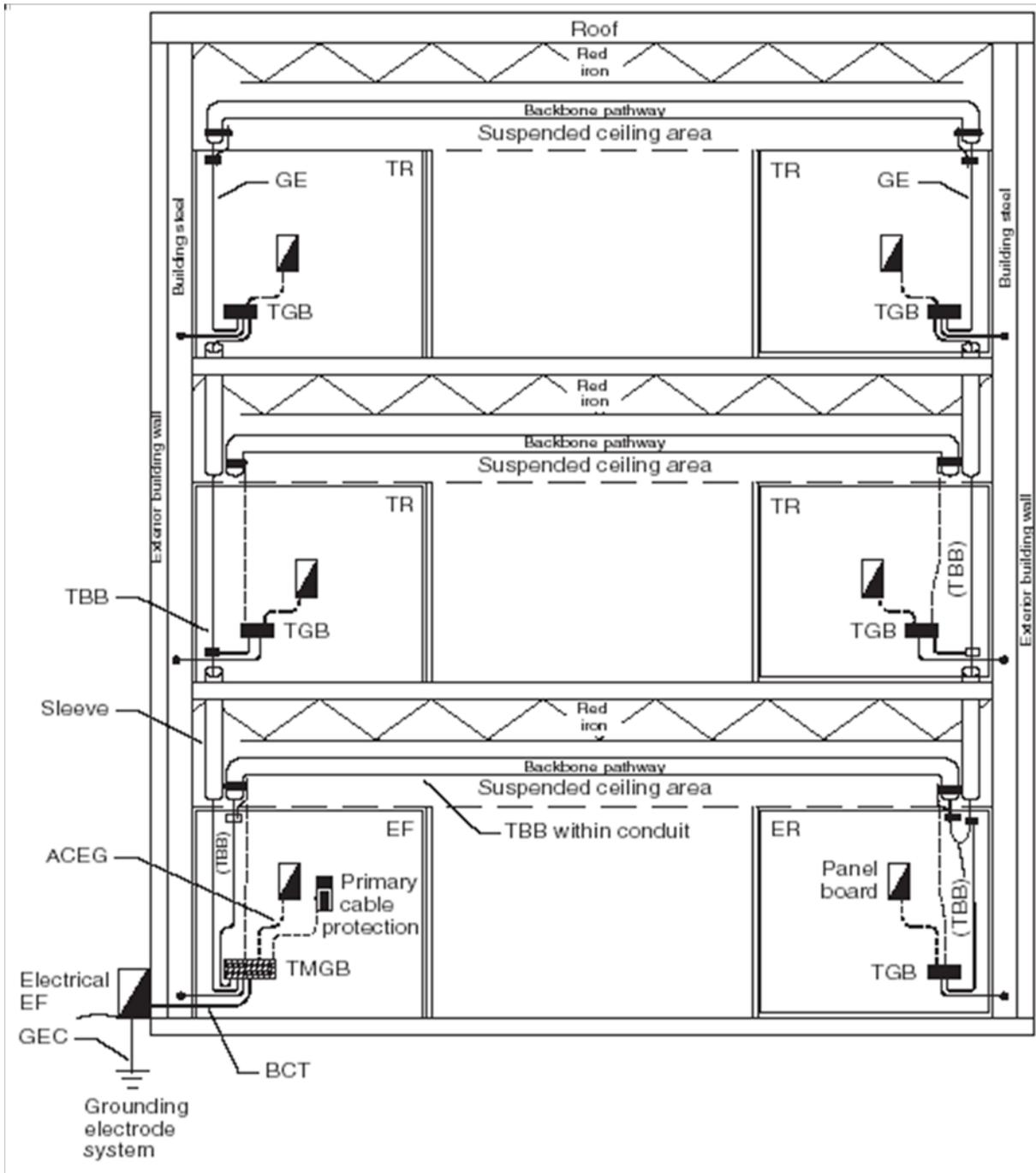


Figure 3-13: Grounding and Bonding Diagram

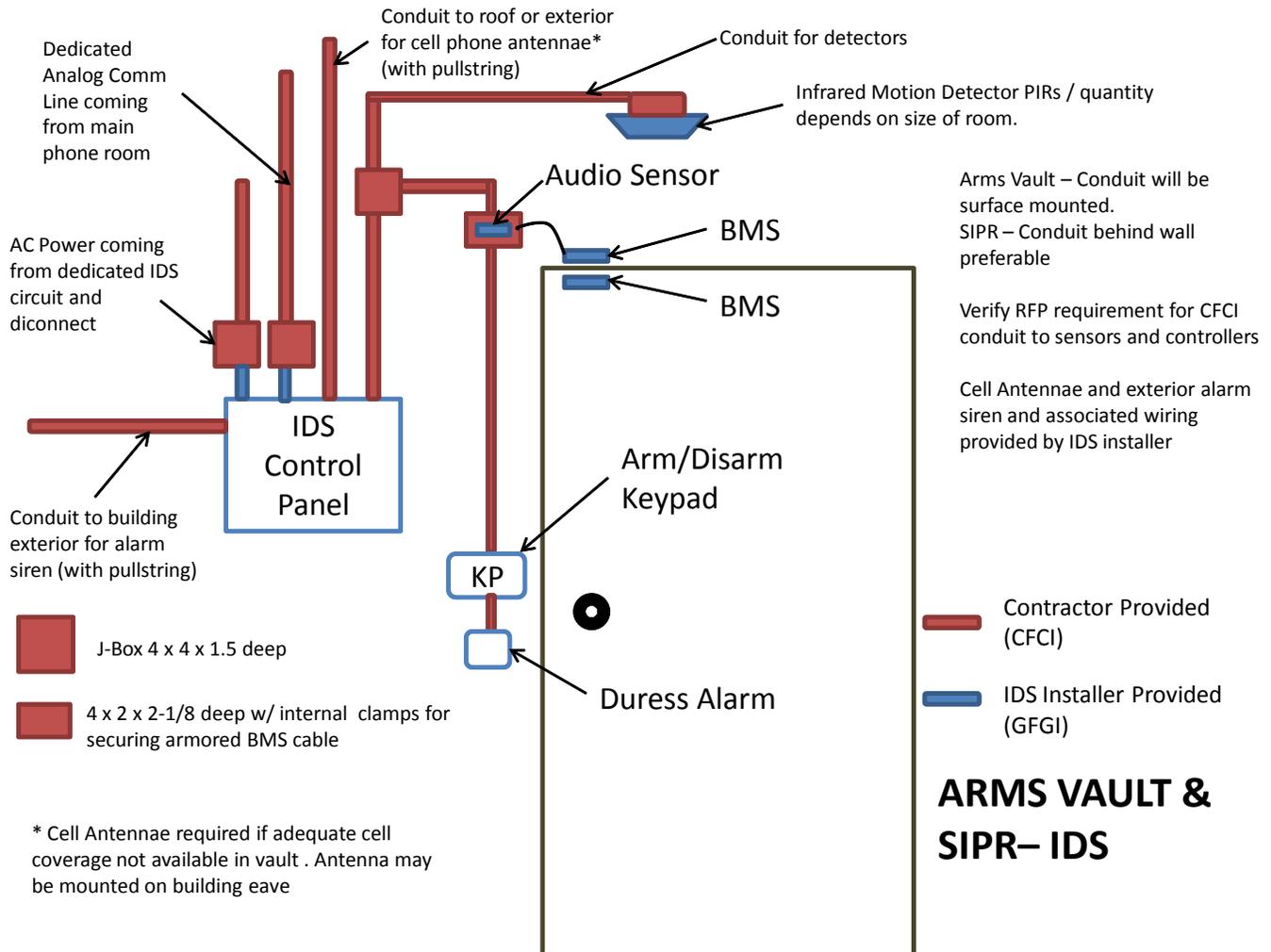


Figure 5-1: IDS Requirements and Responsibilities

Appendix A – Glossary of Terms and Acronyms in this Manual

1391 = Project authorization Form DD 1391
AC = Alternating Current
AFF – above finished floor
AGCCS = Army Global Command and Control System
ANSI = American National Standards Institute
APC = Area Processing Center
AR = Army Reserve
ARFORGEN = Army Force Generation
ARIMD = Army Reserve Installation Management Directorate
ARNET = Army Reserve Network
ASHRAE = American Society of Heating, Refrigerating and Air-Conditioning Engineers
AWG = American Wire Gauge
BDE = Brigade
BLACK = A term applied to equipment and lines that process or carry only unclassified and/or encrypted information. Black equipment and lines are also SBU.
BMS = Balanced Magnetic Switch
BN = Battalion
BRAC = Base Realignment and Closure
CAA = Controlled Access Area
CATV = Community/Cable Access Television
COMSEC = Communications Security
DAA = Designated Approval Authority
D/B = Design/Build
DCID = Director of Central Intelligence Directive
DG = UFC 4-171-05 Army Reserve Facilities (Design Guide)
DISA = Defense Information Systems Agency
DISN = Defense Information System Network
ECS = Entry Control System
EF = Entrance Facility
EOC = Emergency Operations Center
G2 = Military Intelligence Section
G3 = Operations Section
G6 = Information Management Section
G.O. = General Officer
GSA = General Services Administration
HDPE = High Density PolyEthylene
HQ = Headquarters
HVAC = Heating, Ventilating and Air Conditioning
IDS = Intrusion Detection System
I3A = Technical Criteria for Installation Information Infrastructure Architecture
IESNA = Illuminating Engineering Society of North America
ISEC-FDED = Information Systems Engineering Command, Fort Detrick Engineering Directorate
IT = Information Technology
ITU = International Telecommunication Union
JITC = Joint Interoperability Test Command
LAN = Local Area Network
MCAR = Military Construction, Army Reserve

MM = Multi-Mode
MPOP = Minimum Point of Presence
NEC = NFPA 70 National Electrical Code
NEC=Network Enterprise Center
NEMA = National Electrical Manufacturers Association
NIPRNET = Non-Classified but Sensitive Internet Protocol Router Network
NMCI = Navy/Marine Corps Intranet
NOC = Network Operations Center
NSTISSI = National Security Telecommunications and Information Systems Security Instruction
OMAR = Operations and Maintenance, Army Reserve
OSP = Outside Plant
O&F = Operational and Functional
PABX = Private Automatic Branch Exchange
PDS = Protected Distribution System
PDT = Project Delivery Team
POE = Power Over Ethernet
PVC = Polyvinyl Chloride
RED = A term applied to equipment and lines that processes or carry unencrypted national security information
RFP = Request for Proposal
RRC = Regional Readiness Command
RSC = Regional Support Command
SBU = Sensitive but Unclassified
SCIF = Secure Compartmentalized Information Facility
SIPRNET = Secret Internet Protocol Router Network
SM = Single Mode
STE = Secure Telephone Equipment
SVTC = Secure Video Teleconference
TBB = Telecommunications Bonding Backbone
TDM = Time Domain Multiplexing
TER = Telecommunications Equipment Room – equivalent to Equipment Room as defined in TIA 569-B
TGB = Telecommunications Grounding Busbar
TIA/EIA = Telecommunications Industry Association/Electronics Industries Alliance
TMGB = Telecommunications Main Grounding Busbar
TR = Telecommunications Room
UFC = Unified facility Criteria
UHS = Unheated Storage
UPS = Uninterruptible Power Supply
USAR-CIO = U.S. Army Reserve Chief Information Office
USARC = U.S. Army Reserve Command
UTP = Unshielded Twisted Pair
VOIP = Voice-Over-Internet-Protocol
VTC = Video Teleconference

Appendix B – Army Reserve Information Technology Matrix

The Army Reserve IT Matrix on the following pages provides a list of many, but not necessarily all, of the IT provisions for a typical Army Reserve facility. It also indicates typical funding for the various provisions.

The list is maintained by the Louisville District, Corps of Engineers, and may be used as a starting point for a checklist of IT provisions for individual Army Reserve projects.

**ARMY RESERVE
INFORMATION TECHNOLOGY MATRIX**

PROJECT:

PROJECT NO.

DATE:

Pathways and Spaces	FUNDING TYPE	MCAR	OMAR	OMAR	OTHER
Entrance Facility					
Telecomm Equip Room		X			
Telecomm Room(s)		X			
SIPRNET ROOM		X			
SIPRNET Café		X			
COMSEC		X			
AGCCS		X			
SCIF		X			
EOC		X			

ITEMS BELOW CAN BE PROVIDED BY INSTALLATION ~~DOIM~~ NEC, RRC G6, ISEC, OR THE CONTRACTOR. THEY CAN ALSO BE FUNDED BY OMAR, BRAC OMAR, OR PROJECT CONSTRUCTION FUNDED (MCAR OR BRAC). ALL DECISIONS OF WHO PROVIDES INSTALLATION AND WHO PROVIDES FUNDING SHALL BE DOCUMENTED AND PROVIDED TO THE PM. THE PM SHALL PROVIDE LIST AND ASSOCIATED COSTS TO THE ACTION OFFICER.

PROVIDER FUNDING TYPE	CFCI MCAR	CFCI OMAR	GFGI USAR OMAR	OTHER
CENTREX/PABX (MULTILINE) (Switch)			X	
LINE CARDS (May be needed with Switch)			X	
UNINTERRUPTED POWER SUPPLY (UPS) (UPS required with switch)			X	
DISTRIBUTION RINGS	X			
WALL DISTRIBUTION CENTER (located in tel rm) (May or may not need this on every project)	X			
TELEPHONE SETS DESK			X	
TELEPHONE SET WALL			X	
TELEPHONE SET WEATHER PROOF			X	
TELEPHONE ALL WEATHER HOUSING	X			
MODEMS/MUX (part of equipment in rack)		X		
LINE DRIVERS (part of equipment in rack)		X		
CHANNEL BANK (part of equipment in rack)		X		

FIBER OPTIC CABLE SINGLEMODE General Rule for Outside Plant	X			
FIBER OPTIC CABLE MULTIMOLDE General Rule for Inside Plant (Each project should determine which type of fiber optic cable is needed for RRC eqt)	X			
LAN/WAN HARDWARE (usually GFGI) LAN SWITCHES/WAN ROUTERS ANTENNAS (When required, could be new or relocate existing)			X	
			X	
			X	
TELECONFERENCING ISC will fund and install VTC. (Currently not required, however may be required in the future)				
SECURE CIRCUITS (for SCIF)			X	

LAN SYSTEM NORMALLY PROVIDED BY ARMY RESERVE AFTER BOD					
USAR LAN SYSTEM	PROVIDER FUNDING TYPE	CFCI MCAR	CFCI OMAR	GFGI USAR OMAR	OTHER
LAN Servers				X	
LAN UPS				X	
LAN Testing / Operations				X	

ITEMS BELOW NORMALLY INCLUDED IN ALL CONSTRUCTION CONTRACTS. IF NOT, THE DIFFERENCE SHOULD BE DOCUMENTED AND PROVIDED TO PM.					
	PROVIDER FUNDING TYPE	CFCI MCAR	CFCI OMAR	GFGI USAR OMAR	OTHER
IT WITHIN FIVE FOOT LINE					
CONDUIT (BOXES/PULL STRINGS)		X			
RACEWAYS (cable trays)		X			
110/120 BLOCKS		X			
RJ-45 CONNECTORS (FACEPLATES) (Tel / LAN)		X			
BACKBOARD(S)		X			
CABLE CAT 6 (Tel / LAN)		X			
CABLE TEST (Tel LAN)		X			
BACKBONE CABLE (Tel / LAN)		X			
PROTECTED TERMINAL		X			
EQUIPMENT RACK(S) 19 IN. (Tel / LAN)		X			
CABINETS (if used - racks normally used)		X			
SURGE SUPERSESSOR(S) (on incoming cable)		X			
FAX OUTLET		X			

Appendix C: MILCON IT Supply/Install Responsibility Matrix

	Item	Location	Contractor		RCAS		ISEC		NEC		Tenant	
			Prov	Inst	Prov	Inst	Prov	Inst	Prov	Inst	Prov	Inst
1	Voice Cross Connect Blks	EF,TER, TR	X	X								
2	Equipment Racks	EF (2) TER, TR	X	X								
3	Voice Cable Patch Panels	TER, TR	X	X								
4	Fiber Cable Patch Panels	EF, TER, TR Clsrm	X	X								
5	Data Cable Patch Panel	TER, TR Clsrm	X	X								
6	Data Switch	TER, TR, Clsrm			X	X					X	X
7	Router, Component Routers	TER			X	X					X	X
9	PABX											
10	AFRC	TER			X	X						
11	Active Component Installation	Installation TER							X	X		
12	Handsets											
13	AFRC Installation	Workstation			X	X						
14	Active Comp Installations	Workstation							X	X	X	X
15	UPS, Rack Mount only	TER,TR			X	X						
16	Mission Switches	TER, TR									X	X
17	Cable Tray	TER,TR	X	X								
18	Backbone Cabling	EF, TER, TR	X	X								
19	Campus Cabling (OSP)	EF, TER,	X	X								
20	Voice/Data Outlets	Office, Workstation	X	X								
21	SIPRNET/Rack, Wall Mount	SIPR Café					X	X				
22	SIPRNET Encryp, Switch, Router	SIPR Café					X	X				
23	Secure Data jacks/cabling	SIPR Café					X	X				
24	UnClass feed to SIPR Café	SIPRNET	X	X								
25	CATV Horizontal Cabling	As specified in plans	X	X								
26	Servers, Fax, Copiers, Comp	Functional Work Areas									X	X

Appendix D: Army Reserve Standards Furniture Panel System Electrical/Communications Requirements

1. General Electrical/Communication Installation for Panel System Furniture Workstations

Panel system furniture workstations in common office areas shall have all power and communications outlets located in the base of the acoustic panels. All electrical and communications utilities are to be fed from either flush floor boxes, poke through boxes or wall boxes with the exception of renovation projects that may be fed from overhead (power poles). The communications cables shall be fed in conduit and boxes separate from electrical power.

a. Electrical Requirements

- A minimum of one twenty amp circuit is to be provided for every two panel system furniture workstations.
- A maximum of three twenty amp circuits are to be provided for each panel system furniture electrical infeed.
- A multi-pole breaker shall be utilized to protect all circuits supply power to each individual infeed. This will insure that all circuits are de-energized when servicing the electrical system components within the panel system furniture workstations.
- A 5-wire electrical system using a three pole/20 amp circuit breaker, 3-#12 AWG wires (L1-L2-L3), 1-#10 AWG neutral wire and 1-12 AWG ground wire shall be specified for the typical six workstation cluster. Single pole and two pole circuit breakers are to be specified for two workstation and four workstation clusters respectively. Wire sizes are minimum requirements, but may be increased as necessary to compensate for voltage drop.
- Power is to be fed from a dedicated electric panel supplied by a clean power “K” rated transformer of adequate size for the anticipated harmonic load.
- The designer is to specify three duplex receptacles for each part-time workstation and four duplex receptacles for each full-time workstation. Receptacles shall not be located behind drawer pedestals.
- Base feeds are to be used to power all panel system furniture workstations in new construction. Top feeds (power poles) may be used on renovation projects for workstations that cannot be fed from junction boxes located in walls or columns.
- The general contractor is to cut the Government furnished electrical base feed whip to the appropriate length and connect to the building's power per the furniture manufacturer's wiring schematic. (Knoll Morrison circuits A, B and C. UNICOR/FPI Classic XXI and Kimball Cetra circuits 1, 2 and 3.) The general contractor is to provide liquid-tight flexible metal conduit fittings, electrical connectors and cover plate necessary to complete the connection to the power source.
- All panel system furniture electrical components installed as part of the Government Furnished Government Installed (GFGI) furniture

package include; power infeeds and rails, connectors, jumpers, receptacles and raceway covers.

b. Communications Requirements

- The general contractor shall provide, terminate and test all telephone and data cables within the raceways provided at the base of the panel system furniture acoustic panels.
- The general contractor shall provide a minimum of one 1-1/4" conduit from the floor or wall box to an accessible ceiling space adjacent to the communications cable tray for each group of up to six workstations.
- The general contractor is to provide 1-1/4" liquid-tight flexible metal conduit and fittings necessary to connect each floor box or wall box to the acoustic panel raceway
- One RJ-45 telephone jack and one RJ-45 data jack are to be provided for each panel system furniture workstation.
- The general contractor shall provide and install all conduit, fittings, cables, faceplates and jacks necessary to complete the communications system installation within the panel system furniture workstations. Upon completion of the communications system installation, all cable, connections and jacks are to be tested and, if necessary, repaired to assure satisfactory service to the customer.
- The Government Furnished Government Installed (GFGI) furniture package will only provide communication raceways at the base of each acoustic panel for routing communications cables and raceway covers to accept communication jacks and faceplates furnished by the general contractor.

