

Veterans Benefits Administration
Information Technology Design Guide

VBA Regional Office Cabling Design Guideline



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VBA RO Cabling Design Guideline

1. Purpose

This Guideline is intended to assist VBA personnel, A/E firms and cable plant installation contractors in understanding and specifying the requirements of a VBA Cabling Distribution System (CDS) appropriate to the needs of a typical Regional Office. This Guideline adheres to the precepts of structured cable design and so calls out related regulations, standards, and specifications. This guideline is written primarily for new construction but is also applicable for expanding and upgrading existing cable plants.

Proper application of this Guideline will result in design and installation of a structured CDS that is flexible, expandable to allow for future network growth, changing office configurations, and capable of the bandwidths associated with contemporary telephone, video and data networks. Typically, this document is used to develop a "site specific" Requirements Analysis and/or Statement of Work addressing telephone, data and video requirements for a particular VBA Regional Office.

The resulting cable plant, as prescribed in this document, should easily accommodate moves, adds and changes with reduced IRM, Telephone, or Contractor effort and should be easier to administer.

1.1. Typical VBA Network Hardware

The installed CDS will connect:

- Distributed PC Workstations, Printers, Servers
- Distributed Fax, Telephone and Modems, EPABX
- Distributed ISDN Video Teleconferencing equipment
- Local Area Network (LAN) Hubs / Switches / Routers

in a LAN conforming to IEEE 802.3 Ethernet 100 Base-T, 1000 Base-F, and 100 Base-TX standards.

1.2. Applicable Regulations, Standards, And Specifications

The Contractor shall provide the CDS in accordance with the following regulations, standards, and specifications.

Federal Communications Commission (FCC)

- Title 47, Code of Federal Regulations (CFR) Part 68
- Docket 88-57

Wiring System Performance Standards

- ANSI/TIA/EIA 568-A Commercial Building Telecommunications Wiring Standard
- ANSI/TIA-568B.2-1 Transmission Performance Specifications for 4-Pair-100 Ohm, Category 6 Cabling
- ANSI/TIA/EIA 569-A Commercial Building Standard for Telecommunications Pathways and Space
- ANSI/TIA/EIA 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings
- ANSI/TIA/EIA 607 Commercial Building Grounding/Bonding Requirements
- IEEE - 802.3 - 1990 (ANSI/IEEE Std. 802.3-1990 or ISO 8802.3: 1990 - E -) Carrier Sense, Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer.
- EIA/TIA TSB 67 Transmission Performance Specifications for Field Testing of Unshielded Twisted Pair Cabling Systems

Specifications

- Federal Information Standards (FIPS) Publications 174 - Federal Building Wiring Standard
- FIPS Publications 175 - Federal Building Standard for Telecommunications Pathways and Spaces
- PN-3012, Fiber Optic Premises Cabling Guide
- Insulated Cable Engineers Association, Inc. Publication ICEA S-90-661-1997 - Technical Requirements for Individually Unshielded Twisted Pair Indoor Cables for use in Communication Wiring Systems

Safety

- NFPA (National Fire Protection Agency)
- National Electrical Code - (NEC)
- Underwriter Laboratories:
 - UL 444 Standard for Safety, Communications Cables
 - UL 497 Standard for Safety, Protectors for Communications Circuits
 - UL 497B Standard for Safety, Protectors for Data Communications and Fire Alarm Circuits
 - UL 1459 Standard for Safety, Telephone Equipment
 - UL 1863 Standard for Safety Communication Circuit Accessories

The Contractor shall ensure compliance with all applicable local, state, and Federal labor and safety regulations and all guidelines listed above.

2. GENERAL MATERIAL STANDARDS**2.1. Quality**

All equipment shall equal or exceed the minimum requirements of NEMA, ASME, ANSI/EIA/TIA and Underwriters Laboratories (UL). All materials provided, and for which a UL standard is established, shall bear the UL label. All material and equipment provided shall be new, clean, and free from defects.

2.2. Single Manufacturer

Any specified item of equipment or material shall be the product of one manufacturer throughout the facility. Multiple manufacturers of any one item is not permitted, unless specifically noted otherwise and approved in writing by the Government.

2.3. UTP Cables**2.3.1. Electrical Parameters**

Unshielded Twisted Pair (UTP) Backbone and Horizontal cable shall be insulated 24 AWG round, solid copper conductors enclosed in a thermoplastic jacket. UTP patch cables shall be insulated 24 AWG round, stranded copper conductors enclosed in a thermoplastic jacket

2.3.2. Fire Ratings

The insulation and jacketing for cable conductors shall meet the NEC listed fire rated cable insulation requirements in both plenum and non-plenum applications, as required. If the use of plenum rated (CMP) insulation is indicated for the horizontal cable, all four pairs of the UTP cable wires shall be FEP insulated. Backbone cable, if not entirely in conduit, shall be riser or plenum rated as required by code. All innerduct, tie wraps, and related products shall be fire rated as appropriate.

2.4. Patch Panel Racks

2.4.1. Outline Dimensions

The Contractor will provide and locate equipment racks in the Computer Room and Telephone/Data closets. The racks shall be of open bay type, 84 inches high, with 19 inch mounting rails, suitable for mounting electronic equipment. The rack locations shall be coordinated with the Contracting Officer's Technical Representative (COTR).

2.4.2. Cable Management & Service Clearance

Provision for cable management shall be integral to the rack structure and include horizontal rings, vertical rings, and premise cable routing. The provision shall not block access to the rack mounting holes. In new construction, the spaces housing patch panel racks shall provide a minimum service clearance of 3'- 6" front and rear of the front mounting holes.

2.4.3. Reserved Rack Space

Rack space shall be reserved for mounting Government furnished network device(s). Space requirements shall be coordinated with the COTR.

2.5. UTP Patch Panel Category Certifications & Pin/Pair Assignments

UTP cables shall be terminated in RJ45, insulation displacement contact (IDC) punch down patch panels. For new construction, pin/pair assignments shall be T568A as specified in ANSI/TIA/EIA 568-A, Figure 10-1. If upgrading an existing facility's voice and data cable plant and the voice cable plant has T568B patch panels already in place, pin/pair assignments shall be T568B as specified in ANSI/TIA/EIA 568-A, Figure 10-2. For horizontal terminations, the Contractor shall supply Category 6 certified panels. For voice/video backbone terminations, the Contractor shall supply panels certified at Category 3 or better.

2.6. Telephone, Video, and Data Patch Cables And Equipment Cables

All patch cables and equipment cables shall be stranded copper 24 gauge, certified for Category 6 operation and terminated at each end with RJ-45 connectors. For new construction, pin/pair assignments shall be T568A. If upgrading an existing facility's voice and data cable plant and the voice cable plant has T568B patch panels already in place, pin/pair assignments shall be T568B.

2.7. Fiber Optic Backbone Cable

2.7.1. Electrical Parameters

The Fiber Optic Backbone cable shall meet Fiber Distributed Data Interface (FDDI) bandwidth requirements and multimode wavelength of 850/1300 Nanometers. The cable shall be 62.5/125 micron core/clad diameter, with a buffer diameter of 900 Microns. It shall conform to the attenuation requirements of ANSI/EIA/TIA-568-A. The cable shall contain a minimum of 12 fiber strands and shall not exceed a distance of 2000 meters (6,560 ft.) in a single run.

2.7.2. Protection & Termination

All fiber optic cable runs shall be installed in Contractor-provided one-inch "inner duct." Each 12 strand run shall be terminated at each end with SC connectors. The cables shall be connected to compatible 12 port fiber optic patch panels. Regional Office IRM staff concurrence is required to verify that the SC connectors are compatible with the network equipment to be connected.

3. CONTRACTOR RESPONSIBILITIES

The Government will provide the Contractor with Facility drawings and a Requirements Analysis or Statement of Work which specifies the locations, totals and types of equipment to be connected by the CDS according to Governments workstation (furniture) plan. The Requirements Analysis will also specify horizontal drops in those areas where no workstations

are currently planned to provide contingency for future growth or workstation reconfiguration. Those areas will be provided 1 horizontal drop for every 200 square feet and each horizontal drop shall provide three, 4pair UTP cables.

Using these materials, the Contractor shall be responsible for the design, procurement, installation, and successful testing of a CDS that is compatible with the Requirements Analysis and space & cable pathway constraints (Computer Room and Telecommunication closets, conduits, wireways, cable trays, floor ducts, and interstitial spaces) reflected in the Facility drawings and Requirements Analysis or Statement of Work.

In the event the Contractor, Contracting Officer and COTR agree that a given pathway is inadequate, the Government will increase the number or size of the pathway in a mutually agreed upon manner.

3.1. Coordination Of CDS Installation Activities

All CDS installation activity shall be fully coordinated with the COTR or designate, as well as the General Building Construction Contractor so that coordination of the CDS with its physical interfaces is maintained (e.g.: raised floor, ceiling, HVAC ducts, sprinkler system, furniture installer, electrical, drywall).

3.2. Material Submittals

Within 10 days from date of Notice-To-Proceed, the Contractor shall provide manufacturer's product data. The data may be illustrations, standard schedules, performance charts, instructions, brochures, and diagrams, or other information furnished to illustrate a product, material or intended for some portion of the work.

Physical examples may be requested that represent materials, equipment, or workmanship and establish standards by which the work may be judged.

3.3. Workmanship

NEC approved installation practices must be adhered to, in order to prevent personnel injury and damage to equipment. The cable network shall be installed in accordance with ANSI/EIA/TIA standards to prevent mechanical damage and EMI.

3.3.1. UTP Cable Terminations

Six inch excess cable lengths shall be provided at all UTP cable terminations. The amount of untwisting in a pair as a result of termination to connecting hardware shall be no greater than 0.5 inches.

3.3.2. Fiber Optic Backbone: Terminations & Bend Radius

Twenty foot service loops shall be provided at all FO cable terminations. The loops shall include "inner-duct" and shall be located neatly in interstitial space directly adjacent to the patch panels. Fiber optic manufacturer's recommended bend radius shall not be exceeded.

3.3.3. Temporary Cabling

If temporary cable and wire pairs are used, they shall be installed so as to present no pedestrian safety hazard. The Contractor shall be responsible for all work associated with temporary installations and for removal when no longer necessary.

3.4. CDS Labeling & Documentation

The Contractor shall devise a cable labeling and records management system in accordance with ANSI/TIA/EIA 606. The system shall include a numbering scheme for the Government provided cable pathways (trays, conduits, etc.) and shall label all cables at each exposed end with a unique identifier to ease individual cable tracing.

Using this system, the Contractor shall establish, maintain, and provide to the Government, a 3.5 inch computer diskette or Compact Disk containing a Microsoft Excel formatted database and provide a hard copy of cable and wire records. The database shall identify each circuit by Work Station Interface designation, origin and destination, and routing through Government provided pathways.

3.4.1. Cable Records

All cable records shall identify each cable as labeled, used cable pairs and bad cable pairs. All cable records must be available at acceptance testing and this master record shall be thereafter maintained in the Computer Room. A duplicate set shall be provided to the VARO IRM staff to maintain the data cable records in the Computer Room. The Contractor shall post all future telephone changes (used pair, bad pair, moves, adds, and changes, etc.) in the master record as the change occurs.

3.4.2. As-Built Drawings

The Contractor shall provide as-built floor-plan drawings illustrating all telephone and data drop locations and cable pathways, and drawings illustrating equipment rack configurations. Drawings shall be available on site for each location. These drawings shall be stored in the Telephone/Data closets for that particular floor.

3.5. Test Records

All cables, including connectors shall be tested as per the standards called out in Section 1.2 of this Guideline. All test measurements shall be entered as part of the cable records. All cable records must be available at acceptance testing and thereafter maintained in the Computer Room.

3.6. Completion Of Work

The Contractor is responsible for completing the installation, testing and acceptance of the entire CDS at least four (4) weeks prior to the scheduled occupancy of the facility. The Contractor shall provide all materials, tools, and test equipment necessary to complete the work.

4. Structured Cabling System - Subsystems

This section describes the CDS subsystems found in a typical VBA Regional Office and specifies the minimum requirements imposed on the CDS design and installation.

4.1. Building Entrance

The Local Exchange Carrier will provide the telephone trunk lines to a designated point within the Facility (the Building Demarc). The Contractor shall provide the cables, connecting hardware, protection devices, and other equipment needed to connect the trunk lines to the telephone system Electronic Private Automated Branch Exchange (EPABX) and to connect the EPABX to the premises cabling Main Distribution Frame.

Gas Tube Protection is required on all metallic cable pairs that enter the building. If the cable pairs are not protected, the Contractor shall provide the protection.

4.2. Telephone - Main Distribution Frame

The Telephone Main Distribution Frame (MDF) is located in Computer Room. This area contains the Entrance Demarcation cross-connects or patch cords, the EPABX, the MDF patch cords, and the Operator's Console.

The MDF is used as the central distribution point for telephone backbone cables routed to each of the Telephone/Data closets. The MDF is also the point where the EPABX is cross-connected or patched to the CDS risers. If the CDS is to provide video teleconferencing connectivity, the video source signals should also be connected to the backbone in the MDF.

4.3. Computer Room - Data Distribution Facility

The Computer Room is used as the central distribution point for data backbone cables routed to each of the Telephone/Data closets. A portion of the Computer Room may also function as a Telephone/Data closet for horizontal cables routed to service workstation outlets in the vicinity of the Computer Room.

4.4. Backbone - Telephone / Video

A Category 3 or better multi-pair UTP telephone/Video backbone and a single Category 5 or better 4 pair UTP cable shall be installed in Government provided conduits and riser sleeves between the Telephone MDF and the Telephone/Data closets. All cables provided shall be listed as being suitable for this purpose and marked accordingly per Article 800 of the NEC.

Multi-pair copper conductors shall be formed into units of unshielded twisted pairs. Units shall be assembled into binder groups of 25 pairs following the standard industry color code (ANSI/ICEA S-80-576). The groups shall be assembled to form the core, which shall be enclosed with a thermoplastic outer jacket. The outer jacket may contain an underlying metallic shield and one or more layers of dielectric material over the core. The contractor shall provide each closet with a voice backbone sized to provide one pair per phone switch port. To allow for future growth, each backbone sized shall include a 20% contingency.

4.5. Backbone - Data

The fiber optic (FO) backbone cable shall be installed, between the Computer Room and the Telephone/Data closets, in 1" innerduct. The pathways are the Government provided conduits and pull boxes in the ceiling plenum space and sleeved holes in the ceiling/floor slabs. Twelve fibers (one twelve strand or two 6 strand cables) shall be provided to each Telephone/Data closet.

4.6. Telephone/Data (T/D) Closets

T/D Closets provide the facility where backbone cabling and horizontal cabling are cross-connected. There will be at least one T/D closet on each floor. Closets on successive floors will be stacked vertically and connected by sleeved holes through the floor slab. To determine the number and location of Government provided T/D closets and sleeves, reference the Government provided materials identified in Section 3 of this document.

4.7. Horizontal Cabling - Telephone / Video / Data

Horizontal cabling shall run between the T/D Closets and the Work Station Interface (WSI) outlets. Category 6, 4 pair UTP cabling shall be provided for this purpose. There will also be horizontal cabling runs terminating on network equipment in the Computer Room. Reference the Government provided materials identified in Section 3 of this document for detailed requirements.

4.7.1. Pathways

Horizontal cabling shall be installed in Government provided cable trays suspended in the ceiling, or under raised access floors, or be installed in concrete imbedded floor ducts. The Contractor shall not use under carpet flat wiring.

4.7.2. Maximum Cable Length

The cable length from a T/D closet to its furthest WSI outlet shall not exceed 295 feet (including service loops).

4.7.3. Terminations

In the T/D closets, all horizontal cables shall be terminated in Category 6 compliant, rack mounted RJ45, IDC punch down patch panels. Each horizontal drop consists of three, 4 pair UTP cables. These cables shall be punched down on the backside of the rack mounted patch panel.

4.7.4. Color Conventions

The outer jacket color of the horizontal cable shall be consistent throughout the installation.

4.7.5. Special Horizontal Telephone Cabling

To provide access to the EPABX for Computer Room modem and telephone circuits, a number of 4 pair UTP Category 6 horizontal cables shall be installed directly from the MDF to designated telephone outlets in the Computer Room. The Government provided, materials identified in Section 3 of this document, shall determine quantities. These cables shall be labeled, terminated, and separated from Backbone cables on the MDF.

4.8. Work Station Interface

For each horizontal drop to be activated, the Contractor shall provide an appropriate WSI outlet and Category 6 Equipment cables.

5. TELEPHONE / VIDEO MAIN DISTRIBUTION FRAME (MDF)

5.1. Contractor Provided Equipment

The Contractor shall provide the MDF, all interconnections, cross connects and patch cables of the EPABX, CO trunks, CDS risers and other cabling to the MDF to meet the requirements of the CDS as determined by the materials identified in Section 2 and the Requirements Analysis or SOW identified in Section 3 of this document.

The MDF provided shall be stand-alone, self-supporting, and free standing - it will be housed in Computer Room. It shall be optimally positioned for ease of maintenance and equipment access in accordance with ANSI/EIA/TIA-569. The MDF shall be equipped with Category 3 or better patch panels.

5.2. Cable Termination & Labeling

The Contractor shall terminate all multi-pair telephone / video backbone pairs at the Telephone MDF and EPABX. The Contractor shall label all cable pairs terminating at the Telephone MDF and EPABX as well as both ends of patch cords. All telephone jacks and cable pairs shall be labeled in accordance with ANSI/TIA/EIA-606. The Contractor shall not terminate the 4 pair UTP riser cables but shall leave a 20 foot excess at each end - MDF and Telephone/Data Closets. The 4 UTP cables are provided for, and will be terminated by, the Phone Switch installer.

6. COMPUTER ROOM DATA DISTRIBUTION FACILITY (MDF)

6.1. Contractor Provided Equipment

The Contractor shall provide the following equipment in quantities as determined by the materials identified in Section 2 and the Requirements Analysis or SOW identified in Section 3 of this Guideline.

6.1.1. Backbone Patch Panel Racks

The Contractor shall furnish and install rack(s) to house the fiber optic backbone patch panels. The rack(s) may also house a hub or switch and patch panel terminating Horizontal cables serving those Work Stations in the vicinity of the Computer Room. The patch panel rack(s) shall be securely mounted on the raised flooring with anchor bolting attaching the racks to the slab in accordance with standard industry practice and manufacturer's specifications.

6.1.2. Patch Panels - Fiber Optic Backbone Termination

Each fiber optic backbone shall be terminated in one "twelve port" or two "six port" fiber optic patch panels mounted on pre-threaded 19-inch panels. The Contractor shall terminate all strands of the fiber optic backbones using connectors as specified in Section 2.7.2 of this Guideline. Connectors shall be mounted on the fiber optic patch panel.

6.1.3. Fiber Optic Patch Cables

Contractor shall obtain, appropriately terminate and install FO patch cables in accordance with Section 2 and the Requirements Analysis or SOW identified in Section 3 of this document. Patch cables shall be neatly dressed and routed through approved pathways and cable management hardware.

6.2. Labeling

All Contractor labeling shall be in accordance with ANSI/TIA/EIA-606. Patch panels, jacks, horizontal cable and each end of patch cords shall be expressly included. The Contractor shall label the individual connectors on the patch panels or breakout boxes if used (not preferred).

7. TELEPHONE/DATA CLOSETS (IDF)

7.1. Contractor Provided Equipment

The Contractor shall provide the following equipment in quantities as determined by the materials identified in Section 2 and the Requirements Analysis or SOW identified in Section 3 of this document.

7.1.1. Patch Panel Racks

The Contractor shall furnish and install patch panel racks in each of the T/D closets. The patch panel rack(s) shall be securely mounted on the raised flooring with anchor bolting attaching the racks to the slab in accordance with standard industry practice and manufacturer's specifications. If two or more racks are needed, they shall be mounted side-by-side. The Contractor shall provide and install protective devices that incorporate a circuit breaker device and modular plug-in, solid-state surge-limiting device in each rack – "surge suppressor".

7.1.2. Patch Panels

7.1.2.1. Fiber Optic Backbone Termination

The fiber optic backbone for each T/D closet contains twelve strands. The Contractor shall furnish and install a 12 port, rack mounted patch panel for each T/D closet. They shall be mounted in the uppermost rack position. All fiber optic connectors shall be as specified in Section 2.7.2 of this Guideline. At least 18 inches (approximately 10 single panel positions) shall be reserved just below the fiber optic patch panel for mounting of Government-owned network electronics.

7.1.2.2. Horizontal Cabling Termination

The Contractor shall furnish and install rack mounted, Category 6 certified, RJ45, IDC punch down patch panels to terminate each horizontal cable routed to a specific WSI outlet. Each horizontal drop consists of three, 4 pair UTP cables. These cables shall be punched down on the backside of the rack mounted patch panels - one, 4 pair cable per RJ45 front panel plug using the T568A pin/pair assignment. If upgrading an existing facility's voice and data cable plant and the voice cable plant has T568B patch panels already in place, pin/pair assignments shall be T568B as specified in ANSI/TIA/EIA 568-A, Figure 10-2. These panels shall be located in the Rack middle section.

7.1.2.3. Telephone / Video Backbone Cabling Termination

The Contractor shall furnish and install rack mounted, Category 3 certified or better, RJ45, IDC punch down patch panels to terminate the UTP backbone pairs routed to each T/D Closet, 1 backbone pair shall be punched down per RJ45 front panel plug. These panels shall be located in the Rack bottom section. The 4 UTP riser cable shall not be terminated by the Contractor, it is provided for, and will be terminated by the Phone Switch installer.

7.1.3. Patch Cables

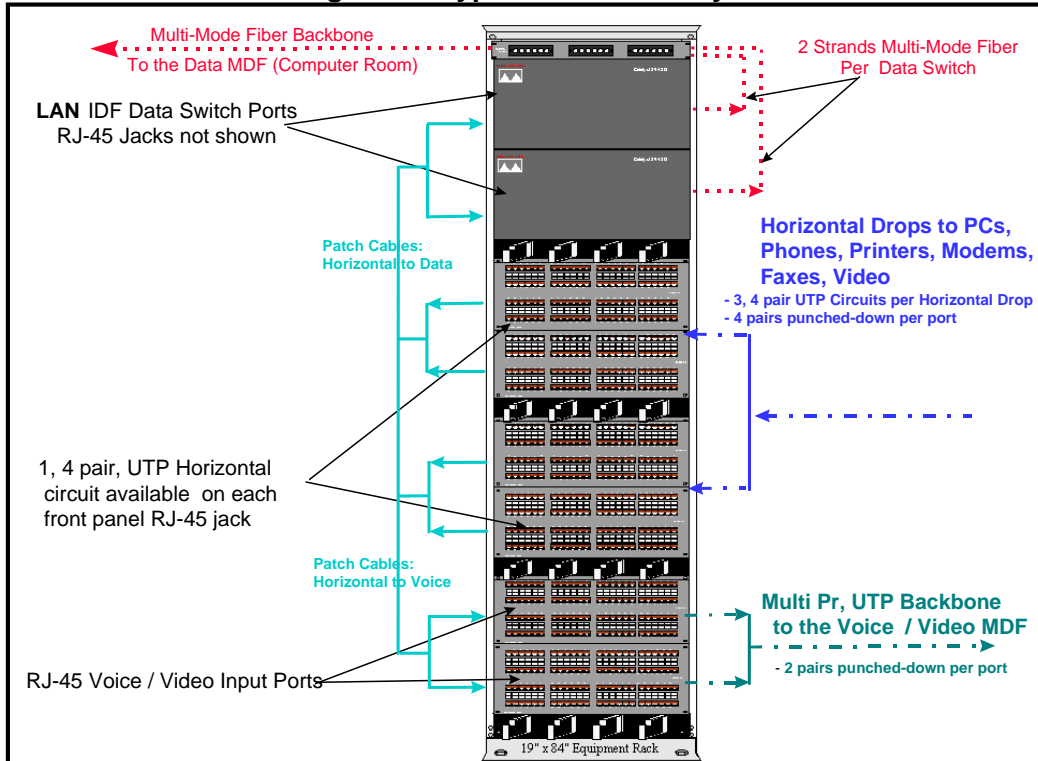
All horizontal cables identified as active shall be provided with T568A pin/pair assignment, RJ45 patch cables. If upgrading an existing facility's voice and data cable plant and the voice cable plant has T568B patch panels already in place, pin/pair assignments shall be T568B as specified in ANSI/TIA/EIA 568-A, Figure 10-2. Category 6 certified patch cables shall be provided and installed for connection to the Government furnished network electronics. Category 3 certified or better cables shall be provided and installed for connection to the Contractor provided telephone / video backbone ports. The numbers of each type are indicated by the materials identified in Section 2 and the Requirements Analysis or SOW identified in Section 3 of this document.

These patch cables shall be of sufficient length and neatly dressed from the horizontal cable patch panel RJ45 jack to the assigned LAN network electronics or telephone / video RJ45 jack.

7.2. Typical IDF Rack Layout

Figure 1 is an example of the intended IDF Rack layout - actual patch panel counts will vary in proportion to the number of horizontal drops serviced by the rack.

Figure 1 - Typical IDF Rack Layout



7.3. Labeling

The Contractor shall label the following components as per Section 3.4 of this Guideline:

- Patch panels and/or breakout boxes,
- Individual connectors on the patch panels and/or breakout boxes,
- Individual fiber optic Backbone cables,
- RJ45 jacks on the Horizontal patch panels and/or breakout boxes,
- RJ45 jacks on the Telephone / Video Backbone patch panels and/or breakout boxes,
- The individual Horizontal cables, and
- Each end of patch cables.

8. Work Station Interface (WSI) Requirements

8.1. Wall and Floor Mounted WSI Equipment

Work Stations may be designated for one or more voice/video/data cables, although a triplex is the VBA standard. The horizontal drop that provides the service may terminate in a wall

mounted, raised floor mounted or Walker duct mounted WSI. This information is identified on the facility Furniture and Electric floor plans called out in Section 3. The Contractor shall provide the following equipment in quantities as determined by these materials and Section 2 and the Requirements Analysis or SOW identified in Section 3 of this document.

8.1.1. WSI Jacks and Faceplates

WSI interfaces shall provide for one or more Category 6 RJ-45 jacks in flush mounted faceplates as needed. Unless otherwise specified in Section 2 and the drawings, Requirements Analysis or SOW identified in Section 3 of this document, a WSI shall provide three jacks - one for each cable in a horizontal drop.

8.1.2. WSI Outlet Box

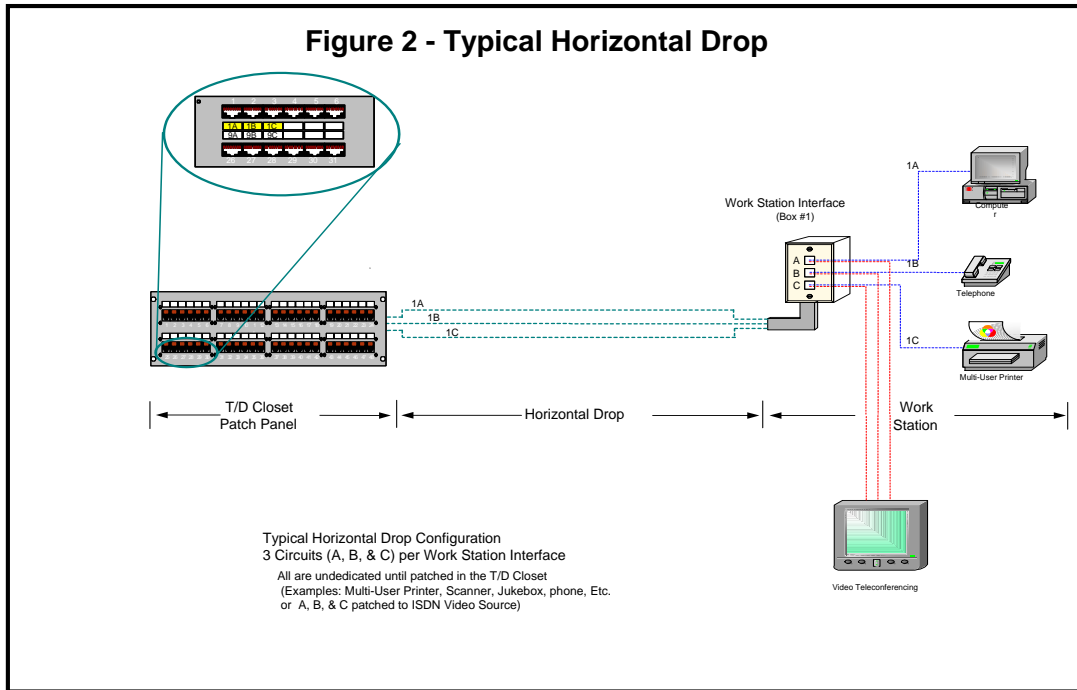
Where there are no existing outlet boxes installed, and the new installation point is either on a hollow wall, walker duct or a raised floor, the Contractor shall provide and install a recessed box with the appropriate jacks, cable and faceplate such that the faceplate is flush mounted. The box shall be UL approved for its intended purpose and application and VA shall approve submittals. For surface mounted installations, the Contractor shall provide neutral colored wire mold outlet boxes and associated hardware. Surface mount shall be used only when a flush mounted installation is not possible.

8.1.3. Labeling

The RJ45 plugs provided on each WSI shall be included in the labeling scheme and clearly labeled.

8.1.4. Equipment Cables

For all workstations with horizontals patched to data service, an equipment cable shall be provided for each patch. Each cable shall be properly terminated at each end and shall be 10 feet in length.



8.2. Furniture Mounted WSI Equipment

Many Regional Office modular furniture systems incorporate furniture raceways with “knockout” openings to accommodate communications outlets. When such is the case, the Contractor shall be responsible for providing and installing WSIs compatible with the furniture raceway. Each of these WSIs shall have three plug positions.

When furniture wireways are to be cabled, intermediate transition point outlets at the exit from the wall or floor shall be utilized to increase flexibility and mobility of modular systems furniture.

There shall be a wall or floor mounted workstation interface associated with each furniture mounted workstation interface. From the floor or wall mounted WSI, Contractor shall run and connect equipment cables to interface with furniture mounted WSI if provided. Dependent upon furniture vendor supplied WSI equipment, it may be necessary to punch down or hardwire the furniture end of the equipment cable to this WSI. Contractor shall do so if necessary and additionally provide a standard equipment cable terminated on both ends with RJ-45 connectors for each piece of workstation equipment. Cable shall be neatly routed from wall or floor mounted WSI through workstation wireways in accordance with these specifications, standards and code.

8.3. Terminations

All horizontal cables shall be terminated at each WSI location to provide a minimum of one foot of slack for maintenance or re-termination purposes.

9. GROUNDING AND BONDING

The Government has provided telecommunications grounding bus bars at each T/D closet, the Telephone MDF, EAPBX and the Computer Room to facilitate appropriate rack, conduit, and wireway grounding.

9.1. Safety Standards

Grounding and bonding shall meet National Electric Code (NEC) requirements (except where other authorities or codes impose a more stringent requirement or practice).

9.2. Contractor Provided Equipment

All bonding conductors shall be insulated copper with a minimum conductor size of No. 6 AWG.

9.3. Integrated Telecommunications System Ground

The EPABX, MDF, all IDFs, and metallic sheaths shall be connected to an Integrated Telecommunications System ground reference in accordance with ANSI/TIA/EIA 607.

9.4. Personnel Safety

All frames and cabinets shall be grounded in accordance with ANSI/TIA/EIA-607.

10. CABLING DISTRIBUTION SYSTEM - INSPECTION

The CDS installation shall be subject to inspections by the COTR and/or COTR designated representative. The Contractor may witness these inspections.

10.1. Pre-Installation

A pre-installation inspection of Contractor provided equipment and materials may be performed where selected items will be verified for compliance with the requirements of the Specification, Drawings, and other referenced standards.

10.2. In-Progress

These visual inspections of equipment condition, wiring, splicing, cabling, mounting and placement of equipment, miscellaneous hardware shall assure compliance with the specified installation criteria and adherence to safety procedures.

10.3. Final Inspection

A final inspection shall be conducted to verify all phases of the Contract have been completed according to the Specifications and that proper installation practices have been followed.

10.4. Non-Compliant Items

The Contractor shall correct any areas of noncompliance of requirements that are revealed by these inspections. Following correction, a re-examination of previous non-compliant items may be conducted at the discretion of the Government.

11. CABLING DISTRIBUTION SYSTEM - CERTIFICATION TESTING

The Contractor shall test the CDS in accordance with the minimum performance requirements criteria specified in ANSI/TIA-568B.2-1 and EIA/TIA TSB 67. All cable terminations shall be verified for color code accuracy. The Contractor shall test all grounds and bonds in accordance with the requirements specified in ANSI/TIA/EIA 607 and shall certify, in writing, to the Government that the grounds and bonds meet the specified requirements. The specific components to be tested are identified here. After testing is completed all circuits shall be restored to their pre-test state (reconnected, re-terminated, etc.)

11.1. **Category 6 UTP Horizontal Cabling**

Certification testing of horizontals shall include patch and equipment cables. For those horizontal circuits where no patch cable or equipment cable will be supplied (inactive circuits), the Contractor shall provide a 5 meter Category 6 equipment cable for the WSI outlet and for the T/D patch panel to facilitate connection to the cable tester. This cable may be used for testing multiple outlets (i.e. separate cables are not required for each inactive circuit).

Using an automated Cat 6 cable tester and the criteria specified in ANSI/TIA-568B.2-1 and EIA/TIA TSB 67 the following certification tests shall be performed on all horizontal cables:

- Routing: WSI outlet to T/D punch down position is as per contractor provided documentation
- Correct 4 pair Wire Map
- Cable Length is acceptable
- Attenuation in the specified frequency spectrum is acceptable
- Cross-talk measurements are at or below maximum allowed:
- PSNEXT, ELFEXT, PSELFEXT
- Return Loss measurement is at or below maximum allowed.

11.2. **Category 3 UTP Telephone / Video Backbone**

Certification testing of telephone/video circuits shall start with the equipment cable connected to the WSI plug and end on the telephone MDF punch down block. It is therefore required that the Contractor perform the Category 3 tests after the T/D closet telephone/video patch cords have been installed.

Using an automated cable tester and the criteria specified in ANSI/TIA/EIA 568-A the following certification tests shall be performed on 10% of the pairs of each backbone routed between a T/D closet and the telephone MDF.

- Routing: WSI plug to MDF punch down position are as assigned in the Contractor provided documentation
- Attenuation in the specified frequency spectrum is acceptable
- Near & Far End Crosstalk is at or below maximum allowed.

11.3. **Fiber Optic Data Backbone**

Certification testing of fiber optic backbones shall start on the input connector of a T/D closet patch panel and end on the output connector of a Computer Room patch panel.

Using an Optical Time Domain Reflectometer and the criteria specified in ANSI/TIA/EIA 568A the following certification tests shall be performed on all strands of each backbone routed between a T/D closet and the Computer Room.

- Routing: for each strand, the T/D patch panel connector position and the Computer Room patch panel connector position are as assigned in the contractor provided documentation.
- All strand loss measurements shall include connectors and shall be in units of dB / Km and shall be at or below specified limits.
- Measurements shall include return loss and shall be performed at the 850nm and 1300nm wavelengths.

11.4. **Acceptability**

Tolerance Limits - The Contractor shall be responsible for immediate corrections to the Cabling Distribution System that will bring it into full compliance with these Specifications.

11.5. Additional Testing

The Government or authorized representative or the Contractor may, at his/her discretion, perform tests in addition to those specified herein if there is any reason to question the condition of the material as furnished and installed.

After installation is complete, in addition to any other required testing, and at such times as the Government, and/or authorized representative directs, the Contractor shall conduct an operational test for approval. This test may coincide with testing conducted in A through D above at the discretion of the Government and may include up to 10% of the installed cable. The installation shall be demonstrated to be in accordance with the requirements of this specification. Any defects revealed shall be promptly corrected at the Contractor's expense and the tests re-conducted.

Operational Testing is defined as:

Termination quality, color code compliance, labeling, Computer Room, MDF, and T/D closets jumpers, patch cords, grounding/bonding, workmanship, termination block layout and installation, and correct routing, patch panel connections, any of the above tests, workmanship, splice loss, connector loss, circuit length, and correct routing as shown on drawings, and other documentation.

11.6. Test Reports

The Contractor shall be responsible for recording and providing to the COTR, all test data for review by Hines ITC Engineering. Copies of all test results are to be submitted to the Government or authorized representative for review and remain with the Government for their records. For all fiber optic cables, a printout from an Optical Time Domain Reflectometer shall be provided and correspond to a labeled fiber cable. All Category 6 UTP cable must have a hard and a floppy disk or Compact Disk copy output of the test results with the WSI ID assigned.

12. CDS CONTRACTOR QUALIFICATIONS

All proposals shall furnish proof of bidder's past performance and experience, as a prime cable Contractor, in successfully providing installation services, comparable in scope and complexity, to those described in this document. This proof shall include a list of previous installations and a reference contact for each.

All proposals shall furnish qualifying experience, fiber optic and Category 6 UTP installation training credentials of all employees to be utilized in the design and installation of the CDS described in this document.