

**Forest Service Handbook
National Headquarters - Washington Office
Washington, DC**

**Forest Service Handbook 6609.14 – Telecommunications Handbook
Chapter 80 – Universal Wiring**

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Approved by: Jack Ward Thomas, Chief

Date approved:

Responsible Staff:

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Digest: Following is an explanation of the changes throughout the directive by section.

01: Incorporates authorities into FSM 6640.1 and adds cross reference to that section.

02: Incorporates objectives into FSM 6640.2 and adds cross reference to that section.

03 & 04: Establishes code for Policy and Responsibility.

05: Adds the definitions for the terms: Compressed Video Transmission Service (CVTS); Emergency; Frequency Management; Local Access Transport Area (LATA); Local Area Network (LAN); Metropolitan Area Network (MAN); T-1; Telecommunications; Ultra High Frequency (UHF); Very High Frequency (VHF); and, Wide Area Network (WAN);

Removes the definitions for the terms: Answering Device; Answering Service; Auto Dialers; Business Line; DB4; Dedicated Line; Features; Key Telephone System; Operational Plan; Pager

Service; Speakerphone; and, Subsystem. These terms were removed because they are no longer specifically addressed in this handbook.

Revises the term Radio Frequency Authorization (RFA) to Radio Frequency Assignment (RFA) and Voice Mail to Voice Processing to more accurately reflect their application.

06: Removes section on Program Management.

10.3: Removes policy direction from this section and incorporates it in FSM 6640.6-6640.62.

11: Revises caption from Strategic Plan Format to Strategic Plan.

12: Revises caption from Tactical and Operational Plan Format to Tactical Plan.

12.1: Incorporates and revises direction on guidelines (formerly found in section 13.1).

13: Revises caption from Planning to Telecommunications Systems Planning.

13.1: Revises caption from Guidelines to Radio Communications Planning.

13.12: Removes direction on voice communications planning. (This direction is incorporated into section 13.2).

13.13: Removes direction on data communications planning. (This direction is incorporated into section 13.3).

13.2: Incorporates direction on voice communications planning (formerly found in section 13.12).

13.3: Incorporates direction on data communications planning (formerly found in section 13.13).

13.4: Establishes direction on video communications planning.

13.41: Establishes direction on cost analysis.

14: Establishes section for exhibits.

20.42: Revises responsibilities of the Washington Office, Director of Information Systems and Technology to include annual delegation of technical approval authority and thresholds.

20.62: Revises technical approval levels and removes technical approval authority thresholds which has been incorporated into section 20.42.

21.1: Corrects terms in radio frequency assignments section.

22: Revises direction on voice to reflect usage of FTS2000.

22.8: Establishes direction for voice processing.

22.9: Establishes direction for shared voice services.

24: Establishes direction for video conferencing.

25: Incorporates ID 6609.14-95-1, revises exhibit numbering, and adds exhibits on documentation requirements for cost thresholds (ex. 02) and local area network (LAN) requirements (ex. 05).

30.1: Revises and updates authority references.

31: Revises caption from Forest Service Standards to Standards.

31.1: Revises caption from Data Communications to Radio Communications and adds related direction.

31.11-31.14: Establishes pertinent direction on radio communications and incorporates direction formerly provided in sections 31.21-31.24d.

31.2: Revises caption from Radio Communications Equipment to Voice Communications which is reserved for use by field offices for supplementation purposes.

31.21-31.24d: Removes codes and captions concerning radio communications equipment. This direction has been incorporated in sections 31.11-31.14.

31.3: Revises caption from Telephone Equipment to Data Communications and adds related direction.

31.4: Establishes direction on video communications.

40: Incorporates ID 6609.14-95-2.

41: Revises direction throughout on frequency management.

41.3: Revises direction on national frequencies. Changes authorizations listed in exhibit 01.

41.31: Incorporates direction on air safety guard, air tactics, local air, and aeronautical multicom (formerly set forth in sections 41.31a-41.31d).

41.31a-41.31d: Moves direction on air safety guard, air tactics, local air, and aeronautical multicom, formerly found in these sections and incorporates it in section 41.31.

41.32: Revises caption from National Fire Radio Cache to National Incident Radio Support Cache (NIRSC). Incorporates direction on command, tactical I and II, and incident tactical (formerly set forth in sections 41.32a-41.32c).

41.32a-41.32c: Moves direction on command, tactical I and II, and incident tactical formerly found in these sections and incorporates it in section 41.32.

41.34: Revises caption from Incident Air-to-Ground to VHF/AM Aeronautical Band Frequencies.

41.38: Incorporates direction on law enforcement and wildlife telemetry (formerly set forth in sections 41.38a-41.38b).

41.38a-41.38b: Moves direction on law enforcement and wildlife telemetry and incorporates it in section 41.38.

41.4: Clarifies authorization on coordination for additional Continuous Tone-Controlled Squelch System (CTCSS) tones.

41.5: Revises caption from Cooperative Arrangements to Cooperative Communications.

41.6: Revises caption from Call Signs to International Call Signs.

41.77: Adds direction on use of Form FS-6600-4, Initial Report of Radio Interference.

50: Revises the title of Chapter 50 from Telephone to Voice.

51.1-51.3: Incorporates and adds direction on management tools (formerly set forth in section 51).

52.3: Revises caption from Interexchange Carriers (IC) to Services for Employees with Disabilities (formerly set forth in section 52.4). Adds direction to consider equipment and services to assist employees with disabilities in all plans, installations, or system upgrades. Removes direction for ICs previously set forth in this section.

52.4: Revises caption from Services for the Handicapped to Technical Approvals (formerly set forth in section 52.5) and incorporates direction on services for employees with disabilities in section 52.3.

52.5: Removes direction on technical approvals from this section and incorporates it in section 52.4.

53.4: Removes direction on recording (CDR) records from this section and incorporates it in FSM 6642.2.

60: Removes references to DEPNET contract and establishes local area network specifications in support of the Integrated Information Management Program (Project 615).

62: Adds a cross reference to section 52.3 which requires that services be provided for employees with disabilities.

70: Provides guidelines for the implementation of video conferencing, including shared services (sec. 71); issues and concerns (sec. 72); installation and testing (sec. 73); and training (sec. 74).

80: Incorporates ID 6609.14-94-1, with no substantive changes in text.

81.3: Incorporates direction intermediate distribution facility to work station interface in a local area network environment (formerly set forth in section 81.4) to correct coding.

81.4-81.41a: Incorporates direction on backbones (sec. 81.4), Local area network backbones (sec. 81.41), and local area segmentation (sec. 81.41a) (formerly set forth in sections 81.5-81.51a) to correct coding. Moves direction on intermediate distribution facility to a work station interface in a local area network environment from section 81.4 to 81.3.

90: Provides guidelines for the Federal Telecommunications System 2000 (FTS2000) including the service order process (sec. 91), switched voice services (sec. 92), virtual on-net services (sec. 93), packet switched services (sec. 94), acceptance (sec. 95), trouble handling and escalation (sec. 96), and billing hierarchy (sec. 97).

This Handbook is now available electronically in the National Information Center in the same format as the paper copy.

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80.1 – Authority

(FSM 6640.1)

80.4 – Responsibility

(FSM 6640.4)

80.5 - Definitions

Backbone Subsystem. The backbone subsystem is part of a premise distribution system that includes the pathways, routes, and facilities for supporting the cable and/or fiber from a communications room Main Distribution Facility (MDF) to where it is terminated in an Intermediate Distribution Facility (IDF) telecommunications room. In offices where there is only one distribution point, backbone subsystems may not exist.

Distribution Subsystem. The distribution subsystem is not cable or communications equipment, but is the supporting structure for the backbone and horizontal cable. Included in the distribution subsystem are existing raceways, ducts, plenum spaces, suspended ceilings, and raised flooring.

Horizontal Subsystem. The horizontal subsystem is the cabling from each Intermediate Distribution Facility (IDF) to the work station interface (WSI).

Intermediate Distribution Facility (IDF). The IDF is the point where horizontal cablings are terminated. It provides for cross connects to the backbone assemblies as appropriate. It is usually a communications room and often houses communications equipment such as telephone key systems and local area network hubs/concentrators. In small sites, the main distribution facility (MDF) may also serve as the IDF.

Main Distribution Facility (MDF). The MDF is the entry point for outside service to the Forest Service. It is not necessarily the entry point to the building. The MDF is the common connectivity point for all IDFs. The MDF may be housed in the telecommunications room or the computer room; however, it must comply with the EIA Commercial Building Standard, ANSI/EIA/TIA-568 (sec. 80.6).

Work Station Interface (WSI). The work station interface is the point within the user's work area where communications devices are connected.

80.6 - Standards and Guidelines

Follow the universal wiring standards set forth in the following publications:

1. ANSI X3.144-1988, ANSI Standard for Fiber Distributed Data Interface (FDDI).
2. EIA/TIA-568 Standard, Commercial Building Telecommunications Wiring Standard (July 1991).
3. EIA/TIA-569 Standard, Commercial Building Standard for Telecommunications Pathways and Spaces (October 20, 1990).
4. Federal Information Processing Standard (FIPS). Commercial (and Government) Telecommunications Cabling Standard (FIPS-PUB 174).
5. The Institute of Electrical and Electronics Engineers. Carrier Sense Multiple Access with Collision Detection (CSMA/CD) Access Method and Physical Layer Specifications. American National Standard ANSI/IEEE Std 802.3, 1985.
6. National Electric Code. Published by the National Fire Protection Association, 1991.
7. REA 345.52 Standard, REA Standard for Service Entrance and Station Protector Installations, Rural Electrification Administration Standard (January 16, 1980).
8. REA PE-89 Standard, REA Specification for Filled Telephone Cables with Expanded Insulation, Rural Electrification Administration (June 1993).
9. TIA/EIA-606 Standard, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

81 - Wiring of Forest Service Facilities

Use universal wiring specifications (sec. 81.2) for voice and data applications when wiring a new facility, upgrading an existing facility, or preparing for a Local Area Network (LAN).

Test and certify that existing wiring meets the minimum standards for voice and Institute of Electrical and Electronics Engineers (IEEE) 802.3 (10Base-T) standard for LANs (sec. 80.6). Where the standard is not met, upgrade the cable plant before installing new systems.

In planning for the number of grid locations which have to be wired and funded, use 100 square feet as a guideline. This size conforms to the Electronic Industries Association (EIA) 569 Standard, "Commercial Building Standard for Telecommunications Pathways and Spaces" (sec. 80.6). Determine the actual size on a site by site basis.

81.1 - Universal Wiring Network Elements

Ensure that the universal wiring network consists of up to the following three elements: the backbone cable subsystem (sec. 81.11), the horizontal cable subsystem (sec. 81.12), and the cable distribution subsystem (sec. 81.13).

81.11 - Backbone Subsystem

(Sec. 80.5) In offices where there is only one distribution point, backbone subsystems may not exist.

81.12 - Horizontal Subsystem

(Sec. 80.5) Ensure that the total distance of any copper run does not exceed 90 meters (295 feet) between the intermediate distribution facility (IDF) and the work station interface (WSI). Ensure that horizontal cables above acoustical ceilings follow pathways and are suspended independently above the acoustical ceilings or the ceiling supports.

81.13 - Cable Distribution Subsystem

(Sec. 80.5). Distribute horizontal cable through existing raceways, ducts, plenum spaces, suspended ceilings, or raised flooring.

Install all cables in pathways. Keep fiber and copper cables in separate bundles.

For protection in ceilings, under floors, and where there is a possibility of damage, fiber optic cable should be placed in innerduct. In plenum areas, ensure that all cables are either plenum rated or placed in conduits. Ensure that local fire codes are met.

81.2 - Universal Wiring Specifications

See exhibits 01-03 for diagrams of the following:

1. Universal wiring building configuration (ex. 01);
2. Universal wiring floor configuration (ex. 02); and
3. Intelligent wiring hub (ex. 03).

81.2 - Exhibit 01

UW Building Configuration

81.2 – Exhibit 01 IS A SEPARATE DOCUMENT.

81.2 - Exhibit 02

UW Floor Configuration

81.2 – Exhibit 02 IS A SEPARATE DOCUMENT.

81.2 - Exhibit 03

Intelligent Wiring Hub

81.2 – Exhibit 03 IS A SEPARATE DOCUMENT.

81.21 - Main Distribution Facility

Maintain an entry point for outside service to the Forest Service in the main distribution facility (MDF). Ensure that the MDF complies with the EIA Commercial Building Standard, ANSI/EIA/TIA-568 (sec. 80.6).

81.22 - Intermediate Distribution Facility

Terminate horizontal wiring on 110 blocks in the intermediate distribution facility (IDF) with one for voice and one for data. Connect the horizontal wiring pair-for-pair, via category 3 twisted pair cross-connect wire to its respective backbone riser cables for voice. This extends the voice work station interface continuity to the main distribution facility (MDF). The IDF may be the control point for each work area grid point. House local area network hub equipment in the IDF. Connect the hub equipment in the IDF to the data services in the MDF via fiber optic cable.

81.23 - Work Station Interface

The work station interface (WSI) should consist of 2 RJ45 jacks in each outlet. Clearly identify and label the outlet for voice and data, and use line 1 for voice and line 2 for data. Wall mounted and/or access floor mounted WSIs can be provided in a universally wired facility. See section 81.26 for direction on termination hardware.

81.24 - Main Distribution Facility to Intermediate Distribution Facility

Use copper, 24 American wire gage (AWG), unshielded twisted pair (UTP) cable for voice and fiber for data.

Ensure that the fiber optic (data) backbone cable consists of a minimum of six 62.5/125 multimode strands between the MDF and each IDF. If there is only one telecommunications closet (MDF), an interconnection facility should not be needed.

81.25 - Intermediate Distribution Facility to Work Station Interface

Install two station cables (one voice and one data) to connect the work station interface (WSI) to the intermediate distribution facility (IDF). Use 4-pair unshielded twisted pair (UTP), 24 American wire gage (AWG), category 3 cables. Higher grade UTP may be used for special requirements where data throughput of more than 10 megabits per second (Mbps) is required to the work station.

1. Voice Grade Cable. Ensure that the horizontal voice grade cable meets the transmission performance of Category 3 cable as defined by ANSI/EIA/TIA-568 (sec. 80.6)

2. Data Grade Cable. Ensure that horizontal data grade cable meets the data transmission performance of Category 3 cable as defined by ANSI/EIA/TIA TSB-36 (ch. 30).

See section 81.4 for direction on wiring from IDF's to WSI's in a local area network environment.

81.26 - Termination Hardware

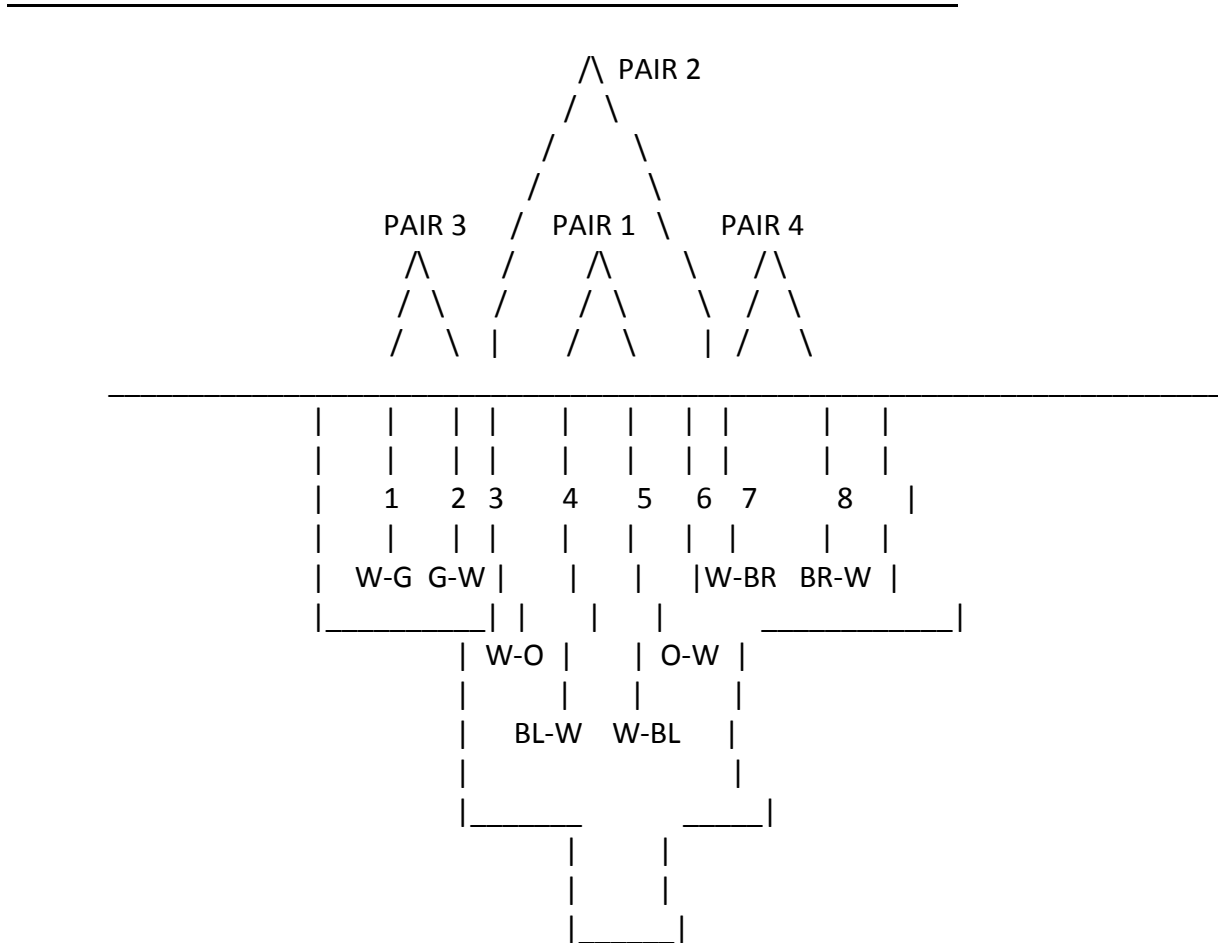
Terminate all cables, wires, and jumper wires by pairs in accordance with the applicable EIA/TIA, IEEE, and ANSI standards (sec. 81.2, ex. 01-03). Ensure that all termination blocks comply with EIA standards. Ensure that cross-connects at the IDF and the MDF comply with EIA/TIA standards. Use 110 type hardware for the wiring blocks.

Use 568A as the pin-pair assignments in federal offices as identified by the National Telecommunications and Information Administration (NTIA). All terminations at the IDF or WSI should be consistent and in accordance with:

1. Work station interface connector specifications for an 8 position jack pin/pair assignment (ex. 01; EIA/TIA-568A, Figure 11-1) and
2. Color codes for conductors (ex. 02; EIA/TIA-568, Table 10-1).

81.26 - Exhibit 01

Work Station Interface Connector Specifications



Eight Position Jack Pin/Pair Assignments

This illustration is a front view of the connector.

(Diagram excerpted from EIA/TIA-568A, Figure 11-1 (sec. 80.6))

(Designation T568A)

81.26 - Exhibit 02

Color Codes for Conductors

<u>Conductor</u>	<u>Color Code</u>	<u>Abbreviation</u>	<u>Pin Number</u>
Pair 1	Blue-White	Bl-W	4
	White-Blue	W-Bl	5
Pair 2	White-Orange	W-OR	3
	Orange-White	OR-W	6
Pair 3	White-Green	W-GR	1
	Green-White	GR-W	2
Pair 4	White-Brown	W-BR	7
	Brown-White	BR-W	8

(Diagram excerpted from EIA/TIA-568, Table 10-1 (sec. 80.6))

81.3 - Intermediate Distribution Facility to Work Station Interface in a Local Area Network Environment

(Sec. 81.2, ex. 01-03). Wiring from the work area (employee work station) to the intermediate distribution facility (IDF) (telecommunications room) should consist of:

1. A 10Base-T Category 3 (minimum) 4-pair unshielded twisted pair (UTP) for all data wiring.
2. Work station interface (WSI) which has an RJ45 for voice and an RJ45 for data.
3. A WSI voice cable and a WSI data cable which terminate on separate 110 blocks in the IDF.
4. The IDF/MDF which houses hubs, routers, bridges, routers, and/or terminal servers.
5. The IDF which is the patching area (cross-connect) for both data and voice.

81.4 - Backbones

81.41 - Local Area Network Backbones

Use a fiber backbone when there is more than one intermediate distribution facility (IDF). Ensure that the backbone is sized to serve all IDFs and has the capacity for future growth. Traffic on the network should be monitored. When traffic on the local area network (LAN) has been measured to peak at 70 percent, consider segmenting the LAN for performance reasons. Examine this on a site by site basis.

81.41a - Local Area Network Segmentation

If segmentation is required, use devices such as bridges or ethernet switches to interconnect the LAN segments in a way that restricts segment traffic to those packets originating from, or destined to, a device on the segment.

82 - Universal Wiring Systems

The direction in sections 82.1 through 82.12u should be used as a template for statements of work for wiring a facility. Modify these sections when needed to meet local requirements.

82.1 - Technical Specifications

Install copper twisted pair cables for voice and copper twisted pair cables for data with fiber optic backbone cables to allow for ease in future connectivity and flexibility in the network

administration. Use the Electronics Industry Association/Telecommunications Industry Association (EIA/TIA) standards.

82.11 – Standards

(Sec. 80.6).

82.12 - Copper Wire and Cable Requirements

82.12a - General Universal Wiring Specifications

The universal wiring (UW) specifications consist of two subsystems: the backbone/riser subsystem and a horizontal wiring subsystem

1. Backbone/riser subsystem. This subsystem is a bulk cable that connects the main distribution facility (MDF) located in the telecommunications room to the intermediate distribution facility (IDF) located in the telecommunications closets throughout the building.

2. Horizontal distribution subsystem. This subsystem consists of the following:

- a. Work station interface (WSI),
- b. Intermediate distribution facilities located in telecommunications closets, and
- c. Wiring from the WSI IDFs to each work station interface.

82.12b – Insulation

Ensure that the insulation and jacketing for cable conductors meets the National Electric Code listed fire rated cable insulation requirements in plenum applications (sec. 80.6).

82.12c – Cable

(Sec. 80.6).

1. Building Cable. Use 24 American wire gage (AWG) thermoplastic insulated conductors, enclosed in a thermoplastic jacket for all building cables in accordance with EIA/TIA-568, paragraphs 10.2.1 and 10.3.1 (sec. 80.6).

2. Interbuilding Cable. Use 24 AWG copper for all interbuilding cables and ensure that they conform to the following standards:

- a. EIA 569, section 5.3.

- b. REA 345.52, paragraph 3.2 and paragraph 5.1.
- c. REA PE-89, section 1.

82.12d - Interbuilding Conduit Entrances

Ensure that all interbuilding conduit entrances:

- 1. Comply with EIA/TIA-569, sections 9.3 and 9.4 (sec. 80.6),
- 2. Comply with EIA/TIA-569, chapter 9 (sec. 80.6), and
- 3. Are sealed as specified by EIA/TIA-569, chapter 9 (sec. 80.6).

82.12e - Cross-connects

- 1. Use copper, 24 American wire gage (AWG) for all cross-connect wiring.
- 2. Do not use patch cords and associated connecting equipment.

82.12f – Backboards

Place the backboards for the IDF termination devices in the telecommunications closets and the backboards for the MDF termination devices in the MDF room. Use backboards which are 3/4-inch thick, type CDX fire retardant plywood, as required by the EIA applicable standards (sec. 80.6).

82.12g - Horizontal or Vertical Cables

1. Ensure all horizontal or vertical cables from the WSI to the IDF are continuous and terminate on insulation displacement contact (IDC) type termination devices at the IDF in the telecommunications closet in accordance with EIA/TIA-568, paragraph 12.2.1 (sec. 80.6). Provide service loops or slack wire at the IDF, MDF, and the WSI.

2. Do not place universal wiring cables in the same conduit or raceway with electrical power distribution components according to NEC, article 800-3 (2) (sec. 80.6).

82.12h - Transmission Requirements

1. Ensure that voice and data transmission pairs in both the horizontal and the backbone/riser cables comply with EIA/TIA-568 (sec. 80.6).

2. Ensure that the wire performs as a reliable transmission medium and is electrically continuous and free from short circuits between conductors. To determine the absence of these conditions, use a minimum voltage of 9 volts DC.

82.12i - Main Distribution Facility

1. Install main distribution facilities (MDF) as the termination point for all incoming trunks, IDFs, and individual work stations.
2. Equip MDFs with insulation displacement contact (IDC) type termination devices in accordance with EIA/TIA-568, paragraph 12.2.1 (sec. 80.6).
3. Install the MDF for copper voice connectivity.
4. Install MDFs so that they are co-located with the voice and data switching equipment.
5. Mount the MDFs on the floor or wall in accordance with individual site requirements.

82.12j - Intermediate Distribution Facility

1. Provide and install intermediate distribution frames (IDFs). Mount them on the wall in the telecommunications closets on each floor in accordance with site requirements. Ensure that IDFs comply with EIA/TIA-568, paragraph 12.2.1 for IDC type termination devices (sec. 80.6).
2. Use separate backbone/riser IDF termination devices at each specified location, one for voice connectivity using copper cables and one for data connectivity using fiber optic cables.
3. Terminate the horizontal 4-pair cables on their respective voice and data WSI IDFs. Connect the voice copper terminations pair for pair via jumper wire to the voice (copper) backbone/riser IDF, extending the voice WSI continuity to the MDF which is the management control point for each voice WSI.
4. Use support devices above and below termination devices to support the cross-connects if termination devices are wall mounted on more than one wall.
5. Use support devices for cross-connect routing whenever doorways interfere with normal termination. Avoid routing across doorways whenever possible.

82.12k - Backbone/Riser Cable

1. Use twisted pair multipaired 24 AWG copper backbone/riser cables in accordance with EIA standards (sec. 80.6).

2. Extend backbone/riser cables horizontally and/or vertically from MDFs to IDF in a physical star topology. Connect each telecommunications closet to the MDF in accordance with EIA/TIA-568, paragraph 5.2 (sec. 80.6). Wire each telecommunications closet to a main cross-connect or an intermediate cross-connect then to a main cross-connect, in accordance with EIA/TIA-568, paragraph 5.2 (sec. 80.6).

3. Ensure that the backbone/riser complies with EIA/TIA-568, paragraphs 10.3.1 and 10.3.1.2.9 (sec. 80.6).

4. Provide and/or install a backbone/riser cable for voice.

5. Reserve space for future fiber optic MDFs, IDFs, and associated equipment so that they can be co-located with the copper MDFs and IDFs.

6. Install tie cable (50-pair, 24 AWG), between each IDF location to provide continuity for miscellaneous circuitry. (For example: a location with 3 IDFs would require the tie cable to be installed from the MDF to Number 1 IDF and from the Number 1 IDF to the Number 2 IDF, and from the Number 2 IDF to Number 3 IDF location.)

82.12I - Horizontal Work Station Cable

1. Ensure that the horizontal work station cable is composed of two 4-pair 24 AWG copper unshielded twisted pair in accordance with EIA standards (sec. 80.6). Use category 3 UTP for both voice and data.

2. Extend horizontal work station cables from each WSI IDF to all WSIs within its serving area.

3. Ensure that the horizontal work station cables comply with EIA/TIA-568, paragraph 10.2.1 (sec. 80.6).

4. Ensure that all cable pairs are end-to-end terminated in accordance with EIA/TIA-568, paragraph 10.2.1.1.3, table 10-1 and paragraph 11.2.3, figure 4-1 (sec. 80.6).

5. Use a maximum cable length of 295 feet (90 meters) from the IDF (telecommunications closet) to the WSI in accordance with EIA/TIA-568, paragraph 4.3, figure 4-1 (sec. 80.6).

6. Do not use undercarpet wiring and flat wiring.

7. Ensure that the horizontal wiring is a star topology in accordance with EIA/TIA-568, paragraph 4.2 (sec. 80.6).

82.12m - Work Station Interface Requirements

1. Use dual RJ45 8-pin modular jacks as defined by EIA/TIA-568, chapter 11, figure 11-1, for work station interfaces (WSIs).
2. Mount the WSI on the wall, floor, or power pole.
3. Identify the two RJ45 jacks at each WSI clearly, and label jack number 1 for voice and jack number 2 for data.
4. Terminate all cables at each WSI location to provide a minimum of 1 foot of slack for maintenance or re-termination purposes. Terminate work station cables within each WSI grid location.
5. Ensure that all terminations at the WSI are consistent and in accordance with EIA/TIA-568 chapter 10, table 10-1 and chapter 11, figure 11-1 (sec. 80.6).
6. Do not install WSIs underneath carpet.
7. Provide a unique identification number for each WSI. Ensure that these numbers are composed of the floor number, the serving IDF number, and the WSI station grid number. For example: 5 to designate the fifth floor, 1 or A to designate the serving IDF, and 2A to designate the alpha-numeric WSI location.

82.12n - Termination Devices for Intermediate Distribution Facilities and Main Distribution Facility

1. Ensure that all termination devices comply with EIA/TIA-568, chapter 12 (sec. 80.6).
2. Ensure that cross-connects and patch panel configurations are in accordance with EIA/TIA-568, chapter 12 (sec. 80.6).
3. Ensure that the termination devices are in accordance with EIA/TIA-568, paragraph 12.2.5.1(7) (sec. 80.6).
4. Ensure that all MDF and IDF termination devices are consistent and in accordance with EIA/TIA-568, paragraph 10.2.2.2.3, table 10.1 (sec. 80.6).

82.12o - Wire and Cable Terminations

1. Terminate all wire and cable in accordance with EIA/TIA-568, paragraph 12.2.4 (sec. 80.6).

2. Terminate WSI cable conductors on dual 8-pin RJ45 jacks in accordance with EIA/TIA-568, chapter 11, figure 11-1 and chapter 10, table 10-1 (sec. 80.6).

3. Wire all station locations for voice and data capabilities.

4. Ground all protection devices, frames, and cabinets in accordance with EIA/TIA-568, paragraph B (sec. 80.6).

82.12p - Grounding

1. Ground all MDFs and IDF in accordance with EIA/TIA-568, paragraphs 5.6 and 10.3 (sec. 80.6).

2. Use number 6 AWG ground wire from the MDF to each IDF in accordance with EIA/TIA-568, paragraph 4.6(3) (sec. 80.6).

82.12q - Protection Devices

1. Provide adequate protection against electrical surges and crosses. This should include the installation of devices that incorporate fusible link, modular plug-in, and solid-state surge/spike limiting.

2. Ground all protection devices, frames, and cabinets in accordance with EIA/TIA-568, paragraph B (sec. 80.6).

82.12r - Identification, Labeling, and Documentation Requirements

1. Stencil and label all termination devices, cable pairs, and wiring pairs in accordance with EIA standards (sec. 80.6).

2. Ensure that the stenciling and labeling at the MDF includes the cable number and the cable pair number.

3. Ensure that the labeling at the backbone/riser IDF includes the floor number, cable number, and the cable pair numbers.

4. Ensure that the labeling at the WSI IDF includes the floor number and the alpha-numeric WSI designation.

5. Ensure that the labeling at the WSI includes the floor number and the WSI alpha-numeric station grid number.

6. Ensure that wire and cable drawings are available on site for each location. Store these drawings in the telecommunications closet for that particular floor.

82.12s - Wire and Cable Records

1. Establish and maintain a database and a hard copy of cable and wire records.
2. Label each work station interface (WSI) with a WSI identification number.
3. Label the cable from the WSI to the intermediate distribution facility (IDF) with identical information at the IDF (telecommunication closet).
4. Ensure that the termination device at both ends can be easily and quickly identified.
5. Use a numbering system for the UW in which a single sequence of numbers does not serve more than one office number. Ensure that this numbering system consists of a unique WSI numbering plan.
6. Use a consistent numbering system throughout the building.

82.12t - Reliability

1. Structure and equip the cable network in accordance with EIA standards to minimize vulnerability (sec. 80.6). Route all wire and cable away from potential sources of mechanical and electrical damage.
2. Ensure that the wire and cable system is accessible to allow rapid detection and diagnosis of network faults so that a maximum degree of reliability and availability can be achieved.

82.12u - Mandatory Fiber Optic Cable Requirements

1. General Systems Requirements.
 - a. Ensure that all fiber optic cross-connects are 62.5/125 multimode according to EIA/TIA-568, paragraph 12.5 (sec. 80.6).
 - b. Ensure that all fiber optic cables installed meet the attenuation requirements of EIA/TIA-568, table 10-9 (sec. 80.6).
 - c. Ensure that all fiber optic cables meet the graded performance specifications of EIA/TIA-568, table 10-9 (sec. 80.6).
 - d. Ensure that all building and interbuilding cables consist of 62.5/125 multimode fiber optic cables conforming to EIA/TIA-568, paragraph 10.2.4.3.

2. Transmission Requirements. Ensure that all fiber optic cables (both horizontal and backbone/riser) that support FDDI standards (ANSI) comply with EIA/TIA-568, paragraph A.2.4 (sec. 80.6)

3. Fiber Optic Main Distribution Facility.

a. Ensure that the fiber optic administration hardware is in accordance with EIA/TIA-568, paragraph 12.5.

b. Ensure that the MDF administration hardware needed to ensure high data-rate fiber optic applications is in accordance with EIA/TIA-568, paragraph 13.1.

4. Fiber Optic Intermediate Distribution Facility. Mount fiber optic light interface unit (LIU) IDF's on the wall or rack in the telecommunications closets at each specified IDF location. Ensure that the IDF's comply with EIA SP 1907 B, paragraphs 12.5.2 and 12.5.3 (sec. 80.6).

5. Backbone/Riser And Horizontal Fiber Optic Cables. Ensure that backbone/riser and horizontal fiber optic cables are in accordance with EIA SP 1907 B, paragraphs 12.5.1 and 12.5.3.

6. Fiber Optic Backbone/Riser Cable.

a. Install separate fiber optic backbone/riser cables in parallel with the copper voice backbone/riser cable.

b. Ensure that the fiber optic backbone/riser cables consist of 62.5/125 multimode riser-rated cable as specified in EIA/TIA-568, paragraphs 10.3.4, 10.3.4.1, 10.3.4.2, and table 10-9 (sec. 80.6).

c. Ensure that all installed fiber optic backbone/riser cables are end-to-end terminated.

d. Ensure that the fiber optic backbone/riser cables comply with EIA/TIA-568, paragraph 10.3.4.2, in accordance with FDDI standards developed by ANSI.

e. Ensure that the fiber optic backbone/riser cable is terminated on its respective MDF and IDF.