## University of Arkansas at Little Rock

**Policy Name: Infrastructure Cabling and Wiring Standards**
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**Policy:**

## University of Arkansas at Little Rock (UALR)

Infrastructure Cabling and Wiring Standards
The following information is provided to inform and guide University staff, consultants, contractors, and third-party personnel involved in any actions affecting or impacting UALR's telecommunications and network critical physical infrastructure. Use of this Standard, and those codes and standards referenced within this document, is intended to increase the value of the system owner's investment in the infrastructure by reducing the labor expense of maintaining the system, by extending the useful economic life of the system, and by providing effective service to users. Adherence will also ensure UALR is in compliance with national and State of Arkansas legal and regulatory standards, and is capable of supporting UALR's mission and vision for growth.

University of Arkansas at Little Rock (UALR)
Infrastructure Cabling and Wiring Standards

# 1. GENERAL GUIDELINES

## *1.1. Overview.*

The University of Arkansas at Little Rock (UALR) Department of Computing Services is responsible for overseeing installation, maintenance and administration of all UALR campus telecommunications and network critical physical infrastructure. This responsibility includes ensuring that each building's infrastructure is planned to support adequate telecommunications rooms, ductwork, cabling and wiring within the buildings, and cabling between buildings to support UALR's diverse requirements for voice, data, multi-media, surveillance, electronic control, and monitoring systems.

## *1.2. Specification of Criteria, Terms, Acronyms and Abbreviations*

### 1.2.1. Criteria

This document conforms to EIA Engineering Publication, EP-7B language used for criteria. Two categories of criteria are specified; mandatory and advisory. Mandatory requirements are designated by the word "shall". Advisory requirements are designated by the words "should", "may" or "desirable", and are used interchangeably in this Standard.

Mandatory criteria generally apply to protection, performance, administration and compatibility. They specify the absolute minimum acceptable requirements.

Conformance with the additional advisory criteria of this Standard can be expected to enhance the performance and usability of the cabling infrastructure.

### 1.2.2. Definition of Terms, Acronyms and Abbreviations

The definitions of terms, acronyms or abbreviations used within this document can be found in the glossary of ANSI/TIA/EIA-606-A.

## *1.3. Major Renovation and New Construction*

The architect/engineer for major renovation and new construction projects shall work very closely with the end user, the Department of Computing Services and Facilities Management during the initial (Schematic, Preliminary) planning stage. Close coordination between the architect/engineer and these departments is essential to protect the university's initial capital investment and to minimize operating support costs associated with the project.

Ensuring requirements are clear and standards are incorporated in the design phase significantly reduces the risk of costly revisions later. These departments are key stakeholders in helping the end user ensure their requirements are understood and met, that applicable codes and standards

are appropriately reflected in the design phase, and the resulting project is sustainable over the course of its planned lifecycle.

### 1.4. Minor Renovation and New Construction.

Computing Services personnel shall be consulted during the planning stages of any building construction or building renovation. Computing Services can help identify the impact of new uses/requirements on current telecommunications distribution facilities, and assess what needs to be done to accommodate changes in the use of building space.

### 1.5. Telecommunications Room Planning.

Space for connection of the building communication cable to the outside plant must be provided as a separate room and not shared with other utility services, particularly the electrical service. When possible, this room will not be adjacent to the electrical distribution room.


## 2. CODES AND STANDARDS

### 2.1. Adherence to Codes and Standards

The Department of Computing Services recognizes and implements national codes and standards as a means to provide for and administer the critical infrastructure necessary for daily information technology use here at UALR. Contracted personnel hired to develop designs, perform renovations, construction, or any actions impacting UALR's telecommunications and network infrastructure shall be required to adhere to the codes and standards listed in this section.

### 2.2. List of Relevant Codes and Standards

This document is intended to raise awareness of these codes and standards and to provide additional guidance on their implementation here at UALR. This Standard does not replace any code, either partially or wholly. The reader shall consult the Authority Having Jurisdiction concerning applicable codes that may impact the use of this Standard. In all cases, the following installation, documentation, component and system industry specifications shall be met or exceeded:

**2.2.1. ANSI/TIA/EIA-568-B.1 and addenda**

*"Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements"*

**2.2.2. ANSI/TIA/EIA-568-B.2 and addenda**

*"Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components (December 2003)", updates, and accepted drafts*

**2.2.3. ANSI/TIA/EIA-568-B.3 and addenda**

*"Commercial Building Telecommunications Cabling Standard - Part 3: Optical Fiber Cabling and Components Standard"*

**2.2.4. ANSI/TIA/EIA-569-B and addenda**

*"Commercial Building Standard for Telecommunications Pathways and Spaces"*

**2.2.5. ANSI/TIA/EIA-606-A and addenda**

*"Administration Standard for the Telecommunications Infrastructure of Commercial Buildings"*

**2.2.6. ANSI/NEMA Standards Publication No. WC 66-2001**

*"Performance Standard for Category 6 and Category 7 100 Ohm Shielded and Unshielded Twisted Pair Cables"*

**2.2.7. ANSI-J-STD-607-A and addenda**

*"Commercial Building Grounding and Bonding Requirements for Telecommunications"*

**2.2.8. ANSI/TIA/EIA-526-7**
*"Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant"*
**2.2.9. ANSI/TIA/EIA-526-14A**
*"Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"*
**2.2.10. BICSI TDMM**
*"Telecommunications Distribution Methods Manual, 11th Edition"*
**2.2.11. CENELEC EN 50173:2000 and amendments**
*"Information Technology - Generic Cabling Systems"*
**2.2.12. IEC/TR3 61000-5-2 - Ed. 1.0 and amendments**
*"Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling"*
**2.2.13. ISO/IEC 11801:2002 Ed 2.0 and amendments**
*"Information technology - Generic cabling for customer premises"*
**2.2.14. NFPA70 National Electric Code – Article 645 and Article 800**
**2.2.15. NFPA 70E**
"*Standard for Electrical Safety in the Workplace, 2004 Edition*"
**2.2.16. NFPA 75**
*"Standard for the Protection of Information Technology Equipment, 2003 Ed."*
**2.2.17. NFPA 76**
*"Standard for the Fire Protection of Telecommunications Facilities, 2005 Edition"*
*2.3. Professional Workmanship*
The above codes and standards have specific applications to the planning, design, development and maintenance of UALR's infrastructure. It is not all inclusive.
Personnel acting in any professional capacity have a responsibility to comply with and perform their work in accordance with all applicable national, state and local codes governing their profession.
*2.4. Standards Precedence and Conflict Resolution*
The latest edition of these referenced standards shall be the controlling document. In the case of proposed standards, the latest available draft shall be the controlling document.
Where the standards appear to conflict with one another, the one with the most stringent requirements shall be applicable. If recommended vendor's standards conflict with these standards, then industry standards will apply.
*2.5. Applying the Standards*
There is latitude within the standards to expand or vary implementation, apply more stringent criteria, and to specify organizational guidance on how these standards shall be applied and administered. The remaining sections of this document provide amplifying information on how these standards are to be followed at UALR.


**3. SPECIFIC GUIDANCE.**
*3.1. General Planning Guidance for UALR Work Areas*
This section is intended to convey the most current information technology infrastructure guidelines for the work areas typically found at a university. These are the minimum initial planning requirements to design and build the appropriate infrastructure to support the foreseeable use of the intended facility. For each type of work area listed in this section, the end user shall consult with Computing Services to help determine the specific configuration necessary to meet work area requirements. The use of a Multi-Use Telecommunications Outlet

Assembly (MUTOA) and multi-use cabling is encouraged wherever it is possible to consolidate data and voice wiring into one location.

### 3.1.1. Faculty/Administrative Offices, Clerical/Staff Offices, Secretary/Administrative Assistant Offices

Two duplex data communications outlets (jacks) for offices with fixed walls of 100 square feet or more are required. One additional duplex data outlet for each additional 100 square feet of office space or each additional occupant is required. For offices designed with modular furniture, each cubicle or workstation will be provided with one duplex communication outlet per designated occupant. Additionally, a set of station wires (one voice and one data) will be installed as a spare to each cluster of six (6) office cubicles.

### 3.1.2. Classrooms/Lecture Halls/Auditoriums

In classrooms, lecture halls and auditoriums, four communication outlets (one on each wall) are required. The need for a cable TV outlet will be considered during the planning process. The cable TV outlet is not intended to solve all audio/video needs in classrooms, lecture halls and auditoriums. Classrooms may be designed to be subdivided, by adding or removing walls, in the future. If this is a design consideration, the number and location of communication outlets will be adjusted accordingly. **The recommended location for outlets is as follows:**
- Chalkboard area
- Projection booth/rear wall
- Lectern area
- Remaining sides

### 3.1.3. Laboratories

As a minimum, install one single wall phone outlet and one duplex data communication outlet. Since laboratories requirements are diverse, coordinate with the end user and Computing Services at the onset of design for renovation and new construction projects, and prior to the initiation of work orders, contracts, or other installation action for other types of projects.

### 3.1.4. Graduate Student Offices

One duplex communication outlet for every 75 square feet of space.  Above 200 square feet one duplex data/voice communication outlet on each wall is required.

### 3.1.5. Residence Halls

Install one voice jack per room, one data jack per student, and one cable TV outlet in each room.

### 3.1.6. Libraries

Libraries will be wired in accordance with the size of the room and need for communication. A minimum of one (1) duplex data/voice communication outlet is recommended.

### 3.1.7. Conference Rooms

Install one duplex data/voice communication and one cable TV outlet in each room. Rooms with more than 500 square feet should have two duplex communication outlets.

### 3.1.8. Storage Areas

One wall-phone communication outlet for each room over 500 square feet and one  additional phone outlet for each additional 2000 square feet are required.

### 3.1.9. Patient Care Rooms

Install one duplex data/voice communication and one cable TV outlet for each occupant.

### *3.2. CABLE AND WIRE INFRASTRUCTURE*

This section addresses intra-building cables between telecommunication spaces, station (or premise) wiring from these telecommunication spaces to the user's wall outlets, and their wiring paths.

### 3.2.1. Cable Facilities Planning

Telecommunications rooms and cabling facilities (conduit, cable trays, raceways, equipment cabinets/racks, etc.) are required for connecting laboratory, classroom, and office pod areas with the building communications equipment room main (or intermediate) cross-connect. Previously, main and intermediate cross-connects were called main distribution frames (MDF) and intermediate distribution frames (IDF), respectively. This document will use the term cross-connect to represent either the main or intermediate cross-connect.

### 3.2.2. Equipment Cabinet Requirements

Enclosed cabinets shall have a rack mount width of 19 inches, with a height dependent on space and mounting constraints. Enclosed cabinets shall have a roof mounted cable fan and cable entry. Enclosed cabinets must be at least 32 inches deep to accommodate a rack mounted uninterruptible power supply (UPS). Computing Services shall work with end users and planners to identify equipment cabinet requirements.

### 3.2.3. Existing Intra-Building Wiring

There are currently five different types of legacy network infrastructure cabling that exists within campus buildings. These are:
• Fiber for Distance Education and any multi-media auditorium/rooms
• RG-59U video surveillance system (within building)
• Shielded and Unshielded Twisted Pair (UTP) Ethernet cabling for data
• Shielded and UTP cabling for voice/telephone
• Multi-Media cabling within Ottenheimer Library (5th Floor)

### 3.2.4. Backbone cabling requirements

The main building wiring closet will have single mode fiber originating from and distributed to each of the other wiring closets on each floor in the building. Fiber cabling from the first floor main wiring closet to and between each of the building floors shall be a minimum of twelve strands (12) single-mode optical fiber. Fiber optic cable shall have at least 30 feet of additional cable (slack) on each end upon entering the cross-connect room.

### 3.2.5. Fiber Termination – Connector Specification

The type of termination used for all fiber optic cabling shall be LC type connections and conform to requirements of the specified fiber manufacturer.

### 3.2.6. Outlet Cable Path Requirement

All communication outlets will have conduit, wire mold, or other suitable path provided to the nearest cross-connect or to a cable tray that provides a path back to the nearest cross-connect. Cables shall be secured at every corner. If cable ties are used, they must be trimmed off cleanly at the locking hole. Cables shall be run in a uniform fashion and shall not be woven among other utilities. Each wiring run must be individually labeled.

### 3.2.7. Conduit Specifications

Conduits to communication outlets are to be a minimum of one inch. A dedicated conduit will serve each outlet box. Pull boxes, if needed, must be accessible. Do not place pull boxes above fixed ceilings, HVAC ducts or piping.

### 3.2.8. Conduit Maximum Lengths without Pull Boxes

No conduit run, without a pull box, is to be longer than 100 feet and have no more than two 90-degree bends.

### 3.2.9. Pull Strings

The electrical contractor will provide a pull string in all empty conduits.

### 3.2.10. Horizontal cabling

This is also called station or premise wiring. Emerging requirements are currently driving two potentially different types of cabling for data/network and for voice/telephone. The UALR data/network requires a minimum TIA/ISO Category 6A/class EA F/UTP (or better) plenum rated cabling to support data/network bandwidth requirements. While this cabling will also support voice/telephone applications,

Category 5e UTP plenum rated cabling (or better) may still be used for strictly voice applications. These are the two minimum standards for all new or replacement data and voice horizontal wiring in campus buildings.

### 3.2.11. Horizontal Cabling Support to UALR Spaces

For new construction, each room shall have horizontal cabling to support a minimum of two (2) data ports and one (1) telephone port.

### 3.2.12. Horizontal Cabling Distance limitations

Sufficient wiring closets must be located on each floor so that horizontal wiring to each office/floor location shall remain within wiring distance limits specified in industry standards.

### 3.2.13. Voice/Telephone Cabling and Termination

Cabling distribution to each office, conference room and classroom will be Category 5e plenum rated wiring (or better) from the wiring closet on that floor or main wiring closet.

At the outlet end, provide at least 15 inches additional cable (slack) for termination. The wiring will be terminated with type 110 blocks in the wiring closet. At the cross-connect end, at least 10 feet of additional cable (slack) must be provided past the center point of the appropriate telephone or data rack.

### 3.2.14. Splicing and routing

Splicing in station wire is not permitted. Wire must be continuous from the cross-connect to the outlet (jack). Cables shall not be tie-wrapped to or routed along electrical or gas conduit. For renovation projects when it is necessary to have exposed interior wiring runs, the wire shall be enclosed using wire molding or conduit. Cable shall not be installed below ceiling in an exposed fashion, i.e., all surface mounted cable should be placed in conduit.

### 3.2.15. Drop Ceilings

A cable wire tray may be placed above drop ceilings with the 1-inch communication outlet conduits stubbed to the cable tray from individual room outlets. This tray will provide a path back to the cross-connect. The tray will have a maximum of 8-inch spacing between cable supports and 4-inch sides. Width of the tray will be determined by the quantity of cables in the tray, and projected growth. Cable trays and conduits must be properly grounded. All NEC codes for grounding of cable trays will be adhered to.

Basket tray is now acceptable, as long as, it has 4 inch sides.

### 3.2.16. Access to Cross-connects

Access to the cross-connect is acceptable by either extending the cable tray or providing conduit.

### 3.2.17. Paths for Cabling between Cross-connects

A path between cross-connects in separate communications rooms is required. Cable tray, conduit(s), or sleeved holes that provide this path are acceptable. The volume of cable and predicted expansion determines the size and quantity of the trays, conduit(s), or sleeved holes that make up the path.

### 3.2.18. Fire Stops

Approved UL fire stops must be used when penetrating fire rated walls or floors.

### 3.2.19. Removal of Wiring

Computing Services Office of Telecommunications (CSOT) shall be consulted before removal of telephone wire and communications equipment, i.e., when office partitions are relocated. All wiring must be removed all the way back to the cross-connect source.

### 3.2.20. Electrical Requirements

Although the electrical load is minimal (most devices draw less than 1 amp), every component requires electrical service: modems, terminals, printer, etc. Each communication outlet should be located in proximity to a duplex electric outlet to accommodate the need to plug in the electronic equipment using the communication outlet.

## 4. DOCUMENTATION

### *4.1. Installation, Testing, and Maintenance Records*

All initial installation and modifications to cable paths, backbone cabling, cross-connects, fire stops, horizontal wiring, termination and testing is to be documented in accordance with ANSI/TIA/EIA 606A standards. The Department of Computing Services maintains this documentation.

### *4.2. Cable Plant Records*

All cable and station wiring that is to be connected to, or disconnected from, the campus communication network must be reported to Computing Services for approval. This must be submitted in writing so that accurate infrastructure records can be maintained.

### *4.3. Labeling Requirements*

All the information to label wall plates, horizontal cabling, patch panels and distribution frames shall be included in the Department of Computing Services cable management records system. The naming and labeling conventions in this section identify specific methods of implementing ANSI/EIA/TIA-606-A Standard. The 606-A identifiers are shown in *italics*. Each character in the identifier represents a key piece of information.

The 606-A Standard allows administrative flexibility to accommodate variations in naming conventions format (Sections A2 and A5), such as alpha designations for floors. Alphanumeric designations for spaces, though not addressed in 606-A, are a UALR specific expansion of 606-A to accommodate existing UALR spaces with alphanumeric identifiers. Brackets identify expansions to the ANSI/EIA/TIA-606-A Standard.

*f* = [alpha] numeric character(s) designating the **floor**
*s* = alpha [numeric] character(s) uniquely identifying the telecommunications **s**pace
*a* = one or two **a**lpha characters uniquely identifying … the patch panel/cross-connect
*n* = two to four **n**umeric characters designating the port

### 4.3.1. Wall-plate/jack Labeling and Naming Conventions

Each room's data, telephone, and MUTOA wall plates are to be labeled so as to show the horizontal link identifier (*fs-an*). This consists of the originating telecommunications space (TS), designated by (*fs*) and patch panel port (*an*) where the link originates.

UALR also requires the work area identifier, wall plate, and jack identifier be labeled where the horizontal link is terminated. These are mandatory data elements to be included in cable records systems. See ANSI/EIA/TIA-606-A Section 5.2.1 for a list of horizontal link records requirements.

### 4.3.2. Data Port Labeling

The UALR data port labeling convention is *fsss-ann JP-frrr*, where *fsss* represents the originating TS identifier, *ann* represents the originating patch panel and port number, *JP*

represents the room's data **J**ack and **P**ort location, and *frrr* is the destination floor/room identifier. For instance the label "**202-F04-1A-206T**" would identify TS (wiring closet) Room **202**, patch panel **F**, port **04**, connecting jack location/position **1A** in room **206T**. Note that room identifiers typically use the first character(s) position to specify floor(s). *J* = one to two numeric characters designating jack location within the work space *P* = one alpha character to represent the jack position within the wall plate *frrr* = one to four alphanumeric characters to uniquely identify the work space

### 4.3.3. Voice Jack Labeling

UALR's stand-alone voice jack labeling conventions are *fsss-Vnnn* JP-*frrr*, where the *fsss* represents a TS room identifier, *Vnnn* specifies the unique voice 110-block identifier and the pair position, *JP* represents the room's voice **J**ack and **P**ort location, and *frrr* is the destination room identifier. Example: **202-Q45 2C-207.** This label identifies a horizontal wire originating in Room **202** on Block **Q**, pair **45**, going to the second (**2**nd) jack/wall plate, 3rd port **C**, on that wall plate in Room **207.**

### 4.3.4. Jack Identification and Naming

Jack locations are identified upon entering each room through its main entrance and sequentially numbering them, 1, 2, …n, from left to right (clockwise), and vertically from top to bottom, around the room. Each jack position on every wall plate is sequentially lettered A, B, …, left to right, then top to bottom. Room identifiers *frrr* can be 3 or 4- character unique alphanumeric designators (i.e., 103, 206T, B09) within the building (first character matching floor identifier, i.e. **1**st floor, **2**nd floor, **B**asement, respective to these examples).


### 5. OUTSIDE PLANT

### 5.1. Tunnels, Manholes and Duct System Requirements

All new building construction planning must include a cable path into existing tunnels or manholes, or new manhole/duct system included as part of the new construction. The size of the cable path will be based on the requirements of the facility. This path will be used exclusively for data, voice, low voltage control/alarms, and video cables.

### 5.2. Outside Plant Plan Review

The Department of Computing Services is the control entity for campus telecommunication facilities. Computing Services will review drawings and specifications on construction and renovation projects for compliance with University telecommunications/network infrastructure standards and user specifications.

### 5.3. Funding for Cable Plant Modifications

Any project that requires moving or rerouting of telecommunication cables will bear the cost of said moves.


### 6. QUALITY ASSURANCE STANDARDS

### 6.1. Infrastructure Cable Testing and Standards

### 6.2. Testing Documentation

All infrastructure testing results will be documented. Paper and electronic copies of all testing documentation is to be provided to the Department of Computing Services at the conclusion of testing.

### 6.3. Testing Standards

Testing shall be performed in accordance with the following standards:

### 6.3.1. ASTM D 4566-98
*Standard Test Methods for Electrical Performance Properties of Insulation and Jackets for Telecommunications Wire and Cable, 1998*

### 6.3.2. ANSI/TIA/EIA-568-B.2 and current addenda
*"Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components -- Addendum 1 – Transmission Performance Specifications for 4-Pair 100 ohm Category 6 Cabling - (June 2002)*

### *6.4. Cable Testing Requirements*
This document provides required test values at specific discrete frequencies. The tabulated values are intended for reference only. All UTP cable and patch cordage shall be swept-tested through a prescribed frequency range. University of Arkansas at Little
Rock requires 100% compliance throughout the specified range of frequencies tested. By convention, all values of electrical characteristics, while predominantly negative numbers (representing losses), are expressed as absolute values (positive numbers).

### *6.5. UALR Standardization*
Selection of specific equipment, installation methods and maintenance requirements impact the staff's ability to manage and grow the technical infrastructure. There are many solutions that meet the standards-based compliance requirements mentioned previously in this document, but will not integrate well with UALR's infrastructure. During its requirements review, the Department of Computing Services will base its specific recommendations and approval of proposed projects on compatibility with the existing and planned infrastructure, legal requirements, mandatory use of state contracts, warranty and certification requirements, maintenance and overhead costs and other factors affecting the total cost of ownership.

### *6.6. Warranty and certification*
All wiring is to be warranted for 15 years and certified to EIA/TIA 568 and NFPA standards for Category 6A F/UTP data and Category 5e UPT telephone and plenum-rated cabling.

## 7. WIRELESS INFRASTRUCTURE SUPPORT

### *7.1. Wireless Access Point (WAP) Installation*
Wireless access point installation locations shall be documented on plans. Each wireless access point shall have Category 6 wiring pulled back to the floor's wiring closet.

### *7.2. Appropriate Use of Wireless Networks*
Wireless networks shall be installed only as extensions or additions to hard-wired networks, and not as a replacement for cabled data, telephone, or CATV networks.