The Auraria Cooperative Technology Committee

STANDARDS MANUAL

– DIVISION IV –

NETWORK CONSTRUCTION STANDARDS
FOR
PROJECT MANAGERS, ARCHITECTS, CONTRACTORS
AND
NETWORK PROFESSIONALS

Author
David Schuette
And
ACTC Standards Committee

Version
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NETWORK CONSTRUCTION STANDARDS
Version 2008.01

Table of Contents

I. INTER-BUILDING NETWORK STANDARDS—BETWEEN BUILDINGS

1.1. Access to the Auraria Campus
1.2. Network Routes

2. INTRA-BUILDING CONSTRUCTION—COMMUNICATION ROOM STANDARDS

2.1. Construction of Communication Rooms
2.1.1. Requirements
2.1.2. Location and Dimensions
2.1.3. Power
2.1.4. Lighting
2.1.5. HVAC
2.1.6. Physical Security
2.1.7. Construction that Requires Installation in Older Communication Rooms
2.2. Furnishing Standards For Communication Rooms
2.2.1. Furnishings for All Communication Rooms
2.2.2. Furnishings Specific to Main Communication Rooms
2.2.3. Furnishings Specific to Secondary Communication Rooms
2.3. Fiber Optic Cable Standards
2.3.1. Fiber Optic Standards within Buildings
2.3.2. Fiber Optic Labels in Blueprints
2.3.3. Labels for Fiber Optic Cables
2.3.4. Labels for Fiber Optic Trunk Cables
2.3.5. Labels for Fiber Optic Jumpers
2.3.6. Labels for Fiber Optic Housing
2.3.7. Labels for Fiber Optic Jacks
2.3.8. Laser Safety Procedures
2.3.9. Fiber Optic Restrictions and Issues
2.4. Copper Data Cable Standards
2.4.1. Requirements
2.4.2. Cat 6 Cable Termination in Communication Rooms
2.4.3. Cat 6 Cable Termination at User Jacks
2.5. Voice Cable Standards

3. INTRA-BUILDING CONSTRUCTION—PATHWAY STANDARDS

3.1. Construction Standards for Cable Pathways within Buildings
3.2. Cable Standards for Cable Pathways within Buildings
3.3. Fiber-specific Standards for Cable Pathways within Buildings
3.4. Copper-specific Standards for Cable Pathways within Buildings

4. INTRA-BUILDING CONSTRUCTION—JACK STANDARDS

4.1. Copper Data Cable Termination in User Locations
4.2. Jack Standards for All User Locations
4.2.1. Discussion
4.2.2. Labels for User Jacks in Blueprints
4.3. Labels for Network Jacks in Communication Rooms
4.4. Panel Labels and Jack Assignments for User Jacks
4.4.1. Voice jack
4.4.2. Data jack

4.4.3. Institutional Label
4.4.4. Examples of User Jacks

5. APPENDIX

5.1. Auraria Maps and Graphics
5.1.1. Maps
5.1.2. Graphics
5.2. Material Standards for Network Construction
5.2.1. Inter-Building Cable Transport Materials
5.2.2. Communication Room Materials
5.2.3. Intra-Building Cable Transport Materials
5.2.4. Copper Network Materials
5.2.5. Fiber Optic Network Materials
5.3. Equipment Standards for Testing and Analysis of Networks and Electronics
5.3.1. Software
5.3.2. Electronics
5.4. Industry Standards for Network Construction–Relevant References
5.4.1. Construction
5.4.2. Telecommunications
5.4.3. Voice / Telephone
5.5. Industry Web Sites
5.5.1. Construction
5.5.2. Telecommunications
5.5.3. Voice / Telephone
5.6 Construction Forms and Check Lists
5.6.1. Project Proposal Preparation Check List
5.6.2. Amendment Application to the ACTC Standards Manual
5.7 Standard Exceptions
5.7.1 Plaza Annex
5.7.2 Science 3rd Floor
5.7.3 St. Cajetans, Rectory, and Golda Meir House
5.7.4 St. Francis
5.7.5 9th Street Buildings
1015, 1020, 1027, 1024, 1033, 1041, 1045/1047, 1050, 1051, 1056, 1059, 1061, 1068, Child Care, Child Development

6. FAQS – FREQUENTLY ASKED QUESTIONS ABOUT CONSTRUCTION PROJECTS
6.1. Designing a Project Proposal
6.2. A Project that Is Already Funded
6.3. An Approved and Funded Project with a Major Omission

NETWORK CONSTRUCTION STANDARDS

Version 2008.01

I. INTER-BUILDING NETWORK STANDARDS—BETWEEN BUILDINGS

See documentation called “ACTC Outside Plant Construction Standard for Information Technology Section 16666”

1.1. Access to the Auraria Campus

1.2. Network Routes

All Auraria campus manhole covers should be labeled "Auraria Telecommunication"

2. INTRA-BUILDING CONSTRUCTION—COMMUNICATION ROOM STANDARDS

2.1. Construction of Communication Rooms

2.1.1. Requirements

2.1.1.1. All construction work must meet UBC/NEC and NFPA requirements (the Uniform Building Code / National Electrical Code, and the National Fire Protection Association code)

2.1.1.2. ACTC should assign a representative to every construction project to review drawings and to meet with the architect and the user to determine needs and to gain an understanding of the use that a project will require

2.1.2. Location and Dimensions

2.1.2.1. All Communication Rooms

2.1.2.1.1 One communication room should be centrally located on each floor with the maximum distance to the farthest jack less than 90 meters (approximately 295 cable feet required by copper data network standard). If a room is beyond these limits, no alternate routing that will expose cable or conduit will be acceptable Important: Cable feet and cable pathways follow hallways and run parallel or perpendicular to building lines. Do not measure cable feet or transport cables diagonally across a room or space

2.1.2.1.2. Multiple closets per floor may be required in large buildings or if the farthest jack is over 295 cable feet away

2.1.2.1.3. Doors open outward (if possible). The door should be placed on a short side of the room. That is, the communication room should extend length-wise away from the door

2.1.2.1.4. Walls are covered with ¾" plywood and are painted white with fire-proof paint. Plywood should be secured directly to metal studs, fastened at 16" oc (on center) each way, plywood to begin 12" aff and to stop 7'0" aff (above finished floor) and extend the full width of the

wall. (Only the wall that is to receive the knock-down panels is to receive this treatment.)

2.1.2.1.5. No hanging ceilings. Hard, fire-rated ceilings are required

2.1.2.1.6. Conduits and Penetrations

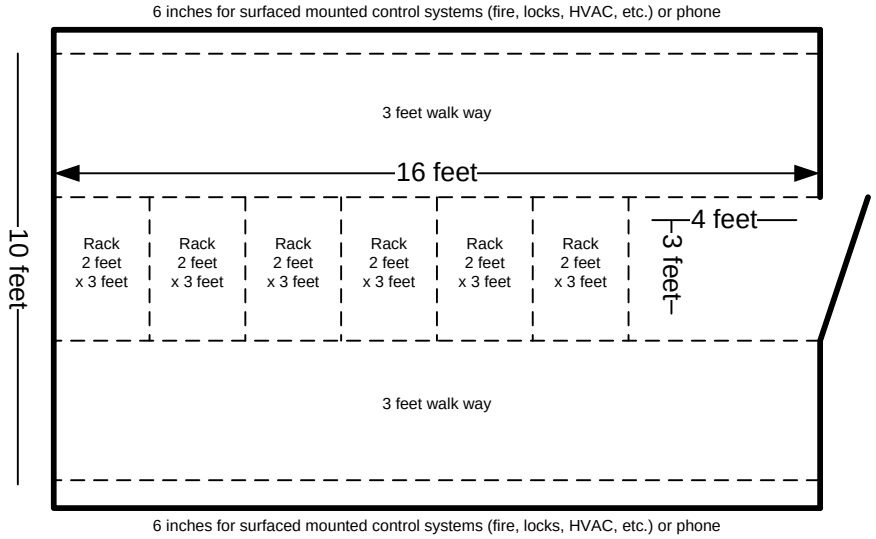
- There will be no core drilling of floors without prior approval of the AHEC architect
- All penetrations require fireproofing systems
- Core drilling may require the floor slab to be x-rayed for the location of post-tensioned cables
- All penetrations of floors and walls should require only one hour of construction
- Three to four 6-inch conduits should be installed in the corner next to the hinge-side of the door. If the support structure of the building prevents drilling at this precise location, the conduits should be located where they provide the least amount of obstruction for easy management access to the racks and equipment. This includes allowing adequate, unobstructed floor space clearance for an open ladder or for dolly wheels to transport heavier electronics to the electronics rack
- Group all conduits together
- When conduits are drilled through floors, 6-inch sealed sleeves should be permanently installed and mounted

2.1.2.1.7. Remodels and renovations–see section 2.1.7.

2.1.2.1.8. Exception: 9th Street Historic Park buildings
No work that may alter the existing conditions of a 9th Street historic house shall take place without prior approval of the AHEC architect

2.1.2.2. Main Communication Room

2.1.2.2.1. Minimum floor dimensions are 10 feet by 16 feet



2.1.2.2.2. There is one Main Communication Room per building. All building trunks (feeds) are terminated here and Network Distribution Centers are located here

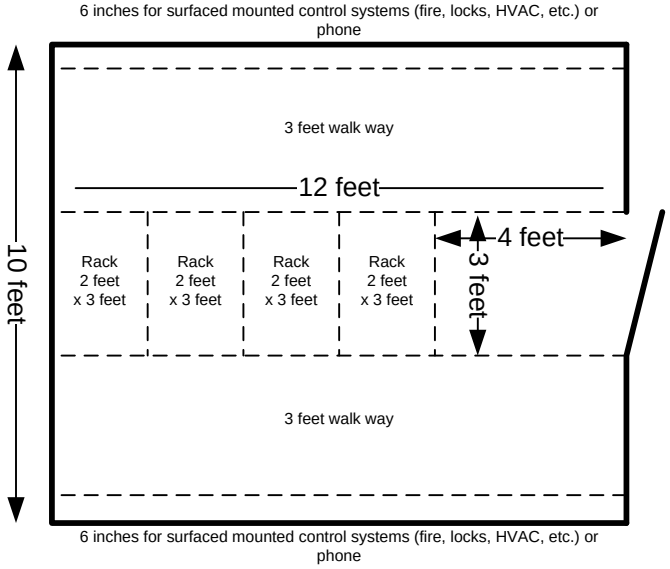
2.1.2.2.3. Main communication room cable trunks should include

– a minimum of 100 Cat6 data cables for each secondary communication room that it supports
– 24 strands of MM fiber

2.1.2.2.4. Examples: King Center first floor, Arts 191

2.1.2.3. Secondary Communication Rooms

2.1.2.3.1. Minimum floor dimensions are 10 feet by 12 feet



2.1.2.3.2. One secondary communication room should be centrally located on every floor
Exception: 9th Street Historic Park buildings

2.1.2.3.3. Secondary closet cable feeds should include a minimum of 100 Cat6 data cables and 24 strands of MM fiber

2.1.2.3.4. Multiple communication rooms may be required per floor in very large buildings where the distance to the furthest jack equals or exceeds the maximum of 295 cable feet

2.1.2.3.5. Examples: King Center, second through fifth floors; CCAC / Open Lab

2.1.2.4. Special Use Communication Rooms

2.1.2.4.1. Location and floor dimensions are determined by the focus and usage of the facility, and are typically larger than main communication rooms. Prior approval must be obtained from the ACTC

2.1.2.4.2. Raised floors may be used in special use communication rooms
– They are typically 12 inches above the hard surface of the floor. They conceal cable pathways and power conduits, and are part of the ventilation system associated with the environmental control of the site by the HVAC system
– EZ Tray cable management and/or 2-inch conduit should be used for both copper and fiber data cables under the 12-inch raised floors.
– The cable management should be elevated a minimum of 6 inches above the floor to avoid entanglement with and damage from power whips, conduits, and electrical boxes

2.1.2.4.3. All designs and blueprints, except for voice equipment, require specific approval by the ACTC Committee
- The ACTC Committee meets the first Tuesday of each month
- All proposals should be submitted the ACTC by the 21st of each month (to allow for distribution to members and review before the next meeting)
- The ACTC Committee should provide a written response to the project director before the 15th of the following month (the week after the ACTC meeting)

2.1.2.4.4. Examples of Special Use Communication Rooms:
- The AHEC Telecommunications Center, Arts 191, is the primary termination / interface site for regional telecom providers and campus trunks for all of the Auraria institutions
- The Network Operations Center and Test Laboratory, Central 306, is the main MSCD network distribution center and contains the core electronics
- The Network Applications and Data Center with Test Laboratory, Admin 480, contains the MSCD application and data storage servers
- The Auraria Media Center, Library 015, contains the video creation, transmission, and distance education facility for all institutions

2.1.3. Power

2.1.3.1. All power issues must be reviewed by the AHEC Electrical Supervisor during the initial stage of project design, prior to project approval because

2.1.3.1.1. Building power resources must be evaluated for adequacy and availability before any construction or installation of electronics and electrical equipment. [There may not be enough power available from current resources for your renovation or project.]

2.1.3.1.2. Electrical standards are specific to different types of buildings and cannot be estimated or presumed from similar projects

2.1.3.2. All installations need to meet NEC and NFPA codes

2.1.3.3. Transformers should not be installed in data communication rooms. If it is necessary to do so, install them a minimum of 3 feet away from the nearest electronics or copper cables, and upgrade the HVAC equipment to maintain the environmental requirements of the room. Funds for this work should come from the renovation project budget, not from AHEC

2.1.3.4. Four duplex 15 Amp outlets located on a wall 3 feet above the floor for the UPS

2.1.3.5. Eight duplex 20 Amp IG outlets located on a wall 7½ feet above the floor

2.1.3.6. There should be a separate, dedicated circuit for each outlet

2.1.3.7. Prefer one 2-socket outlet per school; maximum of 2 power strips to an outlet; each institution to use its own power source

2.1.3.8. Closets with core electronics must use a UPS. All other closets may use power strip surge protectors

2.1.3.9. Additional power requirements for the Main Communication Room

2.1.3.9.1. One four-plex 20 Amp outlet located 3 feet above the floor for the UPS (in addition to 2.1.3.5. for voice)

2.1.3.9.2. One 30 Amp L620 locking outlet (ex: remote G3 models)

2.1.4. Lighting

2.1.4.1. All lighting issues must be reviewed by the AHEC Electrical Supervisor during the initial stage of project design, prior to project approval

2.1.4.2. Provide ample lighting for the room to allow detailed work free from shadows

2.1.4.3. Minimum of one florescent light above the door with a protective cover

2.1.4.4. Lights must be installed by hanging them from the hard, fire-rated ceilings that are required in communication rooms

2.1.5. HVAC

2.1.5.1. All HVAC issues must be reviewed by the AHEC HVAC Supervisor during the initial stage of project design, prior to project approval

2.1.5.2. Temperature range: 65 - 75 degrees
HVAC should be capable of maintaining a temperature between 65 - 75 degrees Fahrenheit (18 - 24 degrees Centigrade) at all times regardless of building air or other environmental conditions such as power units and network electronics

2.1.5.3. Communication rooms must be independent of the cooling and heating cycles for the rest of the building. This means that the required temperature range must be maintained 24 hours per day, 365 days per year, even when the rest of the building's HVAC system may be shut down or diminished for semester breaks

2.1.5.4. All project proposals that include the installation of additional power or network equipment in an active communication room must include the appropriate HVAC modifications / plans necessary to maintain the required temperature and environmental controls for that room (see 2.1.3.1.)

2.1.5.5. An HVAC input vent must be installed directly into each communication room and must be more than 10 feet above the floor

2.1.5.6. Communication rooms must have their own HVAC circuit, cannot be cross-vented with electrical and power rooms, and should meet UBC and NFPA requirements

2.1.6. Physical Security

2.1.6.1. Communication rooms should have controlled access via keys or electronic card systems

2.1.6.2. Communication rooms must be keyed differently than the janitorial and electrical room keys

2.1.6.3. Communication rooms should be directly accessible from a hallway. However, if access to the communication room requires passage through another locked room, then the communication room key must provide access to the outer room also, i.e. a dual access key

2.1.6.4. The responsibility for installation, maintenance, ownership and payment for door security should be determined by the ACTC Committee

2.1.6.5. Door closing equipment should meet UBC and NFPA requirements

2.1.7. Construction that Requires Installation in Older Communication Rooms

2.1.7.1. The networking methods and designs seen in older communication rooms are not acceptable for new installations or renovations

2.1.7.2. Construction standards for remodels or new installations in older communication rooms should adhere to the standards defined in this ACTC Standards Manual. However, some older, active communication rooms may have unique characteristics that render them incapable of meeting all of the standards, even with remodeling. Proposals containing such documented exceptions will receive full consideration by the ACTC Committee

2.1.7.3. All electronics should be mounted on a 9-foot or a 7-foot Seicor rack that is bolted down

2.1.7.4. Cabling should be carried in approved rack and wall cable management systems

2.1.7.5. All project proposals must include provisions for HVAC requirements (see section 2.1.4.)

2.1.7.6. The ACTC project representative should provide written jack information to the AHEC architect identifying the exact location of all user jacks and power outlets. The Telecommunication Division, AHEC, or the Network Division of each institution should be responsible for providing the relevant information regarding the number, type, and labeling of user jacks. If this information is not provided, the project will have to incur the cost of providing a consultant to the architects

2.2. Furnishing Standards For Communication Rooms

Communication rooms are technical facilities that provide a secure, environmentally-controlled location for voice, data and video equipment. Acceptable furnishings include only that equipment necessary for the support of these electronics. All other contents are prohibited. This includes electrical panels, storage, janitorial equipment, water pipes, or items belonging to any other category.

2.2.1. Furnishings for All Communication Rooms

2.2.1.1. AHEC requires that a layout of the ceiling space be provided with the initial plans so that contractors will know where to install lights and vents so that they will not interfere with the communication equipment

2.2.1.2. Racks

2.2.1.2.1. The standard is a Seicor-style 9-foot by 19-inch rack that is bolted to the floor. It should have vertical cable management on both sides, horizontal cable management below each fiber optic housing and RJ45 panel, and overhead management at the top of the rack

2.2.1.2.2. The rack's location must allow a minimum clearance of 3 feet on all sides (NEC standard) from all objects on the rack and from the nearest mounted objects on the walls (National Electrical Code)

2.2.1.2.3. The ACTC representative for the project should inform the architects regarding what equipment will be on each rack and their sizes. This must be communicated during the initial design stage of the project

2.2.1.3. Cable Ladders and Raceways

2.2.1.3.1. There should be a minimum of two to three overhead cable ladders, both mounted 1 inch above the top of the rack. That is, mount them 9 feet 1 inch from the floor to the bottom of the raceway edge for rooms with 9-foot racks, and mount them 7 feet 1 inch from the floor to the bottom of the raceway edge for rooms with racks that are 7 feet high (or shorter)

2.2.1.3.2. One overhead cable ladder will run the length of the room parallel to and immediately above the top of the rack(s)

2.2.1.3.3. The second ladder will be perpendicular to the middle of this ladder and run to the wall with the power outlet. It will terminate at the wall surface.

2.2.1.3.4. A third ladder may be installed for voice cables

2.2.1.3.5. Flexibility in location of cable ladders and raceways is acceptable within the above guidelines

2.2.1.3.6. It is preferred that the overhead ladder which carries the copper data cables from the conduits to the rack(s) is not the same ladder that carries the power cords. However, if necessary, the data cable ladder may be used for power cords also if a power cord management system is mounted permanently to the outside edge of the ladder. This system must extend the power cords far enough from the data ladder to prevent EMI

2.2.1.3.7. Fiber optic cables may occupy either ladder if contained within a 2-inch conduit for protection from the heavier cabling and power cords

2.2.1.4. Cable Trays

2.2.1.4.1. Communication Rooms

EZ cable wall management trays and/or conduit will be used to transport data cabling from the room's entry conduits to the end of the overhead ladders above racks

2.2.1.4.2. Special Communication Rooms with Raised Floors

EZ cable management trays will be used to transport data cabling from the entry conduits to the cable pathways under raised floors. EZ trays will be used for all fiber optic pathways under raised floors (see section 2.1.2.4.2.)

2.2.1.5. Active Analog Phone Jack

2.2.1.5.1. An active analog telephone jack is required in each communication room

2.2.1.5.2. An active telephone is required in the main communication room of each building. This voice line will provide the on-site technician with access to consultation for diagnostic and repair procedures with each institution's Network Operations Center or with manufacturers during trouble-shooting crises and repairs.

2.2.1.5.3. These voice lines should restrict access to all long distance numbers except the toll-free "800" and "888" numbers that are needed to contact electronics' manufacturers

2.2.1.6. Access Ladders

There should be a 4-foot, light-weight folding ladder in each communication room to provide management access to the cables, equipment, and power outlets near the top of the 7-foot and 9-foot racks and the fiber panels that are mounted on the walls

2.2.2. Furnishings Specific to Main Communication Rooms

Larger Main Communication Rooms require three or more interconnected racks to manage the large volume of data communications and electronics needed for the building. This grouping of racks is the Network Distribution Center (NDC) for that building. The NDC has specific installation standards

designed to reduce EMI, improve network performance, and facilitate long-term network management. Network Distribution Centers typically contain

2.2.2.1. Three racks arranged in a straight line, with the side vertical management trays flush to each other, bolted to the floor

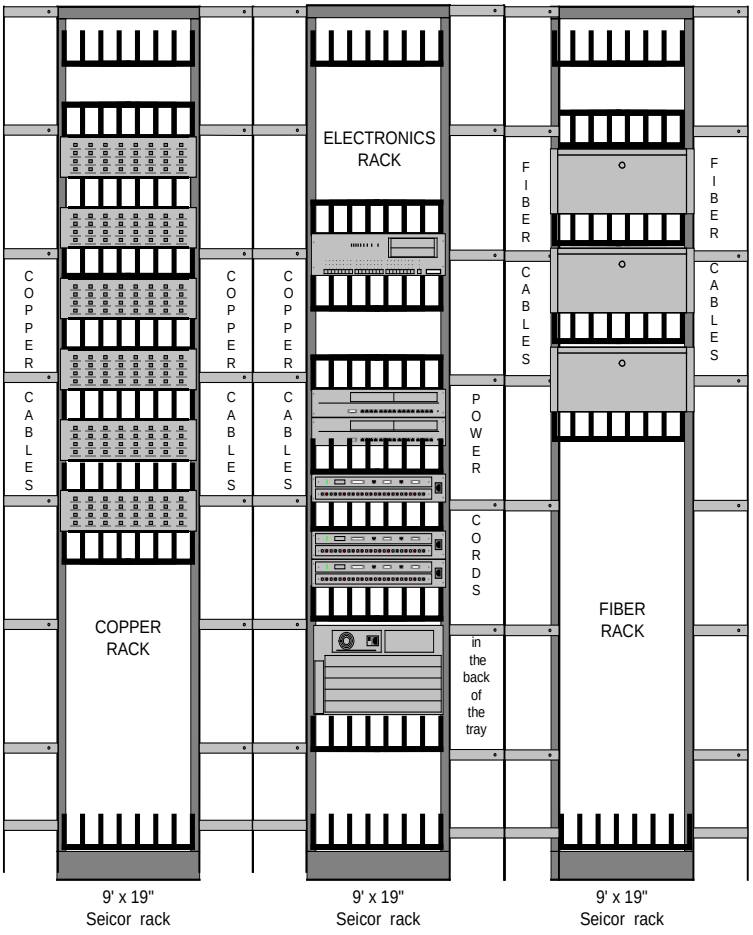
2.2.2.2. Copper RJ45 panels are installed in the left rack, electronics are installed in the middle rack, and fiber panels are installed in the right rack (as viewed from the front of the panels and the electronics)

2.2.2.3. Seicor racks are the standard: 9 feet high and 19 inches wide with vertical management trays and top and bottom horizontal trays

2.2.2.4. Installation requirements for NDCs that contain four or more racks adhere to the same technical guidelines but may use individualized floor plans to accommodate their extensive distribution requirements

2.2.2.5. Racks should be installed a minimum of 4 feet away from an electrical box or transformer to allow 3-foot clearance with rack electronics

2.2.2.6. Power cords must be on the back tray of the fiber or electronics racks



Main Communication Room

Network Distribution Center

3 – Rack Installation

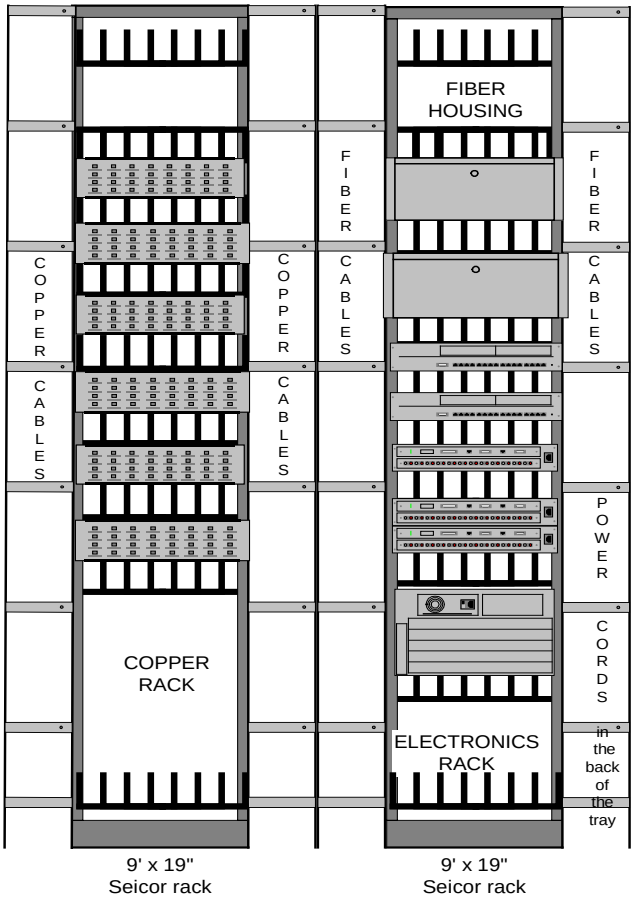
2.2.3. Furnishings Specific to Secondary Communication Rooms

Secondary Communication Rooms have two connected racks. These smaller communication rooms contain the electronics and cabling that provide the final link between the network and the users' jacks on one floor. The requirements for these smaller rooms are based on the same standards designed to reduce EMI, improve network performance, and facilitate long-term network management. Secondary Communication Rooms typically contain:

2.2.3.1. Two racks arranged in a straight line, with side vertical management trays) flush to each other, bolted to the floor

2.2.3.2. Copper RJ45 panels are installed in the left rack, electronics are installed in the right rack, and fiber panels are installed at the top of either rack. [This is the configuration when viewed from the front of the RJ45 panels and the electronics.]

2.2.3.3. The standard is a 9-foot by 19-inch Seicor rack



Secondary Communication Room

2 – Rack Installation

2.3. Fiber Optic Cable Standards

2.3.1. Fiber Optic Standards within Buildings

2.3.1.1. Seicor is the standard for both single mode and multi-mode fiber optic cable. Single mode and multi-mode may be installed as hybrid fiber in one sheath (cable) or in separate sheaths

2.3.1.2. All fiber optic cables should be fully terminated in fiber housing jacks

2.3.1.3. SC termination is required in new fiber housing. Unicam is the recommended standard for temporary solutions, including ST terminations

2.3.1.4. Ethernet laser circuits use Class 1 laser (IEC825, EN60825, and 21CFR1040). ATM laser circuits for ICG use Class 1 laser

2.3.1.5. Fiber Optic Terminology

Correct fiber optic terminology should be used when ordering or describing fiber optic cable needs and designs

2.3.1.5.1. A fiber strand is a single optical fiber that has a protective coating over it

2.3.1.5.2. A fiber jumper is a single thin fiber optic cable that contains two individual fiber optic strands. Each strand is terminated with its own connector

2.3.1.5.3. A fiber cable contains multiple individual fiber strands, i.e. 12, 24, 48, or more

2.3.1.5.4. A fiber jack typically contains two receptacles immediately adjacent to each other.

- An ST jack typically uses two separate ST receptacles that are installed near each other. It is designed to receive the two connectors on the two strands of a standard fiber jumper. The two ST jacks are installed and numbered individually in the fiber housing. Therefore, ST jack identification will list a fiber housing number and two sequential jack numbers, but no alphabet letter representing a panel. (Some users use only on ST strand, and therefore, use only one receptacle with a one-strand jumper or half of a two-strand jumper)
- An SC jack uses two receptacles that are flush with each other and installed as a single module. They are designed to receive the SC single module/dual connector installed on the two strands of a standard fiber jumper

2.3.1.5.5. A fiber pair refers to the two strands of the ST or SC jack

- A jack refers to a pair of fiber strands that are terminated and installed in a fiber housing
- A port refers to a pair of fiber strands that are terminated and installed in a unit of network electronics
- In both cases, they perform the same function: to provide a means for fiber optic circuit connectivity

2.3.1.6. Fiber Optic Termination Coils

2.3.1.6.1. Distribution Fiber Optic Service Loops

Leave 30 feet of extra fiber optic cable coiled in every manhole located between buildings

2.3.1.6.2. Building Fiber Optic Service Loops
Leave 20-30 feet of extra cable coiled at the ceiling of each end of all fiber optic cables that run between communication rooms within buildings for future renovations and remodeling

2.3.1.6.3. All fiber strands are to be terminated in rack-mounted Seicor SC fiber optic housing

2.3.1.7. Jumpers should be custom-made to length for use on fiber panels. The maximum excess length of a fiber jumper is 8 inches

2.3.1.8. Fiber optic circuits should be certified with less than .5 decibel loss per connector before being released to the customer. Any time that fiber is terminated and does not meet the above specification, the vendor will notify the project contact person of the problem to begin negotiation for resolution of the situation

2.3.1.9. All fiber optic strands entering a communication room will be terminated in a fiber housing panel and have a laser warning sign if applicable. Exception: A pass-through cable that is not terminated at this location. However, it should have an easily visible label identifying its ownership, source and destination, contents, and a laser warning sign if applicable

2.3.2. Fiber Optic Labels in Blueprints

2.3.2.1. Architectural blueprints should include the following fiber optic information

2.3.2.1.1. All fiber cable that is routed into a communication room should be designated on blueprints. This includes pass-through cables, laser cables, and cables to be installed for the project

2.3.2.1.2. Terminated fiber cable will be identified in blueprints by a hollow diamond with a capital "F" inside of it. At the base of the diamond, the total number of SM strands will be listed on the left and the total number of MM strands will be listed on the right

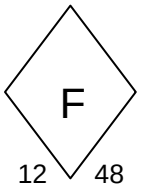
2.3.2.1.3. Pass-through fiber cables may be recorded on the blueprint for that communication room, if relevant

2.3.2.1.4. Non-terminated fiber listings should not appear on blueprints because all fiber strands are to be terminated and mounted in fiber housing

2.3.2.1.5. Relevant information regarding the fiber type, total number of strands, campus pathways and manholes, and number of used vs. available fiber jacks should be provided to the architect by the ACTC representative for the project.

2.3.2.1.6. The best sources for this information include the Auraria campus manhole and fiber optic pathway campus maps, and the closet fiber termination information recorded in the ACTC Fiber Optic Database [being compiled by the Network Operations Center, MSCD]

2.3.2.2. Example of a blueprint label for fiber optic cables that terminate in a communication room



This blueprint label (diamond) designates the termination location of fiber cable(s). There are 12 single mode strands and 48 multimode strands terminated in this communication room

This blueprint label (diamond) designates the termination location of a major fiber building trunk because of the large number of strands. There are 96 single mode strands and 96 multimode strands terminated in this communication room

2.3.3. Labels for Fiber Optic Cables

2.3.3.1. All fiber optic cables should be labeled. This includes all fiber optic cables between buildings, cables between communication rooms, jumpers between fiber jacks, all service loops, and all pass-through trunk cables in buildings and manholes

2.3.3.2. Fiber optic labeling will be discernable, manageable, error-free, and documented in a master database accessible by all four institutions

2.3.3.3. Fiber optic tracking software may generate an additional label for each cable and jumper

2.3.3.4. There are fiber bundles, composed of fiber strands, in each cable

2.3.3.4.1. Each fiber strand is distinguishable from other strands by its color. The colors and their installation sequence in fiber housing are regulated by telecommunications industry standards

2.3.3.4.2. Each fiber bundle within a fiber cable is distinguishable from other fiber bundles within the cable by unique bundle color schemes used by the telecommunications industry

2.3.3.4.3. Strand colors and their installation sequence are: 1 – blue, 2 – orange, 3 – green, 4 – brown, 5 – slate, 6 – white, 7 – red, 8 – black, 9 – yellow, 10 – violet, 11 – rose, 12 – aqua

2.3.3.4.4. Bundles are frequently distinguishable by stripes / bars

2.3.4. Labels for Fiber Optic Trunk Cables

2.3.4.1. All fiber optic trunk cables between and within buildings are the property and responsibility of AHEC

2.3.4.2. All cable labels should be clearly visible and readable, whether the cable is in a communication room or in a manhole, without the need for climbing, descending, or the moving of cabling or equipment, unless such a cable location is not possible

2.3.4.3. Termination Labels for Fiber Optic Trunk Cables

Trunk cables should have two clearly visible labels attached to each end of the cable, 5 inches outside of the fiber housing. This includes all campus fiber trunks that connect buildings, main communication rooms, and secondary communication rooms

2.3.4.3.1. There should be two labels at each end of the fiber trunk

2.3.4.3.2. More than one institution may have fiber strands in one are contained within one fiber optic trunk cable. Each with fiber in the trunk should have a label at each end

2.3.4.3.3. The first termination label on the trunk cable should identify the:

- ownership of the trunk cable (always AHEC)
- source and destination locations of the cable (the building, the communication room number, and the alphanumeric numbers that indicate the housing and panels for both the SM and MM strands that are terminated at that location)

2.3.4.3.4. Example of the first label at the termination end of a fiber optic trunk cable: Fiber Trunk Identification

AHEC	24SM / 96MM
NC-P1800C	H11A-B / H11C-K
AR-191	H23C-D / H23E-M

First Cable Termination Label:
Fiber Trunk Identification

This label indicates that this fiber optic trunk cable is the property of AHEC. The cable goes between the North Classroom building and the Arts building. There are 24 single mode and 96 MM multimode strands contained in it.

- One end of this fiber cable is terminated in the North Classroom building, room P1800C
- The 24 SM strands in NC1800C are terminated in the first rack, first fiber housing, in the block of 2 panels A-B
- The 96 MM strands in NC1800C are terminated in the first rack, first fiber housing, in the block of 8 panels C-K
- The other end of this fiber trunk is terminated in the Arts building, room 191
- The 24 SM strands in Arts 191 are terminated in the second rack, third fiber housing, in the block of 2 panels A-B
- The 96 MM strands in Arts 191 are terminated in the second rack, third fiber housing, in the block of 8 panels E-M

Note: Mixed media fiber cable labels record the number of SM strands and the block(s) of SM jack locations on the left side of the "/" front slash. The

number of MM strands and the block(s) of MM jack locations are recorded on the right side of the "/" front slash
Note: SM strands traditionally are terminated in the first panels of the "block" of panels used to terminate a fiber cable, i.e., panels A-B in NCP1800C and panels C-D in Arts 191 for the above cable

2.3.4.3.5. The second label on the fiber optic trunk cable should identify the
- intended institutional user(s) of that trunk cable, if known
- which block of fiber housing panels (A-M) the specific fiber strands are terminated in for that institution
- optional institutional information may be included behind the institution name or on a fourth line (if fourth lines are approved by ACTC)

2.3.4.3.6. Example of a second label(s) at the termination end of a fiber optic trunk cable

MSCD–LABBB	48MM
NC-P1800C	H11C-F
AR-191	H23E-H

Second or Third Cable Termination Label:
Fiber Trunk Cable Identification
Institution Identification

This label indicates that one institutional user of this fiber optic trunk cable is MSCD. This fiber trunk goes between the North Classroom building and the Arts building. There are 48 multi-mode strands allocated for MSCD to use
- One end of this fiber trunk is terminated in the North Classroom building, 1st floor room P1800C, in the first fiber housing on the first rack, in the block of 4 panels C-F
- The other end of this fiber trunk is terminated in the Arts Building, room 191, in the second rack, third housing, in the block of 4 panels E-H
- This institution included optional information to indicate that these 48 strands are part of the MSCD Laboratory Backbone

2.3.4.3.7. Additional pairs label(s) may be placed on each end of this fiber trunk to identify the other institution(s) that use the remaining 24 SM and 48 MM strands of this mixed media cable

2.3.4.3.8. The information on each pair of termination labels

should be identical at both ends of the building trunk cable except that the identification of the source and destination locations may be reversed

2.3.4.4. Pass-through Cable Label

A pass-through trunk cable enters and exits a location without being cut, terminated, or patched into another segment of fiber optic cable

2.3.4.4.1. Labels for pass-through cables should be located directly on the cable

2.3.4.4.2. Pass-through cable labels should be protected from deterioration due to environmental conditions

2.3.4.4.3. The label should be clearly and easily visible in the manhole or the communication room without the need for climbing, descending, or the moving of cabling or equipment, unless this is not possible

2.3.4.4.4. Example of a label for a large fiber optic pass-through trunk cable that is terminated in multiple housings

AHEC–SERVICE-LOOP		96SM / 120MM
AR-191	H11A-F, H12A-B	/ H11G-M, H12C-F
NC-P1800C	H23C-K	/ H23LM, H24 E-M

Fiber Optic Trunk Pass-through Label

This fiber optic trunk cable is the property of AHEC. It has 96 single mode strands and 120 multi-mode strands. One end is terminated at the Arts building, room 191 and the other end is terminated at the North Classroom building, room P1800C

To facilitate the identification of a particular fiber optic cable among multiple fiber trunk cables to the same building, it is preferred that the alphanumeric housing and panel numbers be included on the pass-through label when this information is available

The pass-through fiber optic label above indicates that this fiber trunk cable belongs to AHEC. It goes between the North Classroom building and the Arts building

- One end of this fiber trunk is terminated in the Arts building, room 191
- The 96 SM strands in Arts 191 are terminated in the first rack, first fiber housing, in the block of 6 panels A-F, and in the first rack, second fiber housing, in the block of 2 panels A-B. This is a total of 96 SM strands terminated in 8 panels
- The 120 MM strands in Arts 191 are terminated in the first rack, first fiber housing, in the block of 6 panels G-M, and in the first rack, second fiber housing, in the block of 4 panels C-F. This is a total of 120 MM strands terminated in 10 panels
- The other end of this fiber trunk is terminated in the North Classroom building, room P1800C
- The 96 SM strands in NC1800C are terminated in

the second rack, third fiber housing, in the block of 8 panels C-K. This is a total of 96 SM strands terminated in 8 panels

- The 120 MM strands in NC1800C are terminated in the second rack, third fiber housing, in the block of 2 panels L-M, and in the second rack, fourth fiber housing, in the block of E-M. This is a total of 120 MM strands terminated in 10 panels

2.3.5. Labels for Fiber Optic Jumpers

2.3.5.1. Each fiber optic jumper should have a pair of unique labels identifying institutional ownership, source and destination jacks or ports, and relevant circuit information

2.3.5.2. The label should be mounted near each end of the jumper where the jumper divides into two separate strands with connectors

2.3.5.3. The label for a jack in a SC Seicor fiber housing is alphanumeric and represents two fiber strands. The letter designates the specific panel in the fiber housing and the number represents the specific jack in that panel (the fiber pair)

2.3.5.4. The labeling system for a jack in a ST fiber housing is numeric only and each jack number represents only one fiber strand. Therefore, the two fiber strands for the standard ST jack are represented by two sequential numbers

2.3.5.5. Example of a fiber optic jumper label

UCD–LABBB	AR-191
H11C4	H23E2

Fiber Optic Jumper Label

The circuit is used by UCD and the jumper is a segment in the UCD Laboratory Backbone (LABBB)
The two jacks, for the two Laboratory Backbone cable segments that this fiber jumper connects, are located in the Arts 191 communication room
One jack is located in the first rack, first housing, panel C, jack 4. The other jack is located in the second rack, third housing, panel E, jack 2. The alphanumeric label indicates that these jacks are terminated in Seicor fiber optic housings

2.3.6. Labels for Fiber Optic Housing

2.3.6.1. Each fiber housing will have a unique alphanumeric identifier, whether it is mounted on a rack or wall. These identifiers will have the letter "H" (Housing) in front of a two-digit number

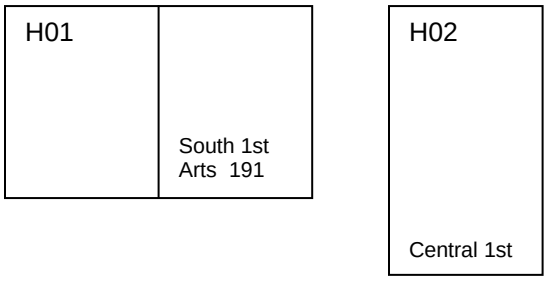
2.3.6.2. Wall-mounted Fiber Optic Housing – External Cover Labels

2.3.6.2.1. The numeric range used for a wall-mounted fiber optic housing is "01 to 09"

2.3.6.2.2. Therefore, each communication room should have a maximum of 9 fiber optic housings

2.3.6.2.3. The external housing labels should include the building name and location of the destination of the fiber trunk(s) or cable(s) that is terminated inside the housing

2.3.6.2.4. Examples of external labels for wall-mounted fiber optic housing



External Labels for
Wall-mounted Fiber Optic Housing

The external labels on fiber optic housing H01 mean that the destinations of the fiber cables that are terminated inside this housing are South 1st and Arts 191. The external labels on fiber optic housing H02 identify the destination of the fiber cable that is terminated inside this housing as Central 1st

2.3.6.3. Wall-mounted Fiber Optic Housing – Internal Jack Labels

2.3.6.3.1. ST non-Seicor wall-mounted fiber optic housings

- Non-Seicor ST housings designate a unique internal number for each fiber strand that is terminated in the panel. Multiple ST housings may continue the jack numbering sequentially into the next ST housing that is mounted flush with and immediately below the previous ST housing
- ST jack identification: numeric-only combination of the wall housing number and the one or two fiber jack numbers (one number per single strand)

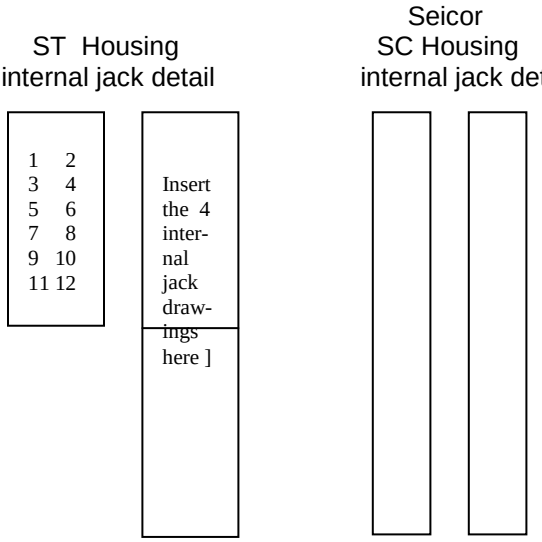
2.3.6.3.2. SC Seicor wall-mounted fiber optic housings

- Seicor SC housings use alphabet letters to designate a unique letter to each internal vertical jack panel. The letters used are A-M (except I)
- Seicor SC housings also designate an internal

number for each fiber pair (two strands) that is terminated on each panel. The range of jack numbers used on a Seicor panel are 1-6

– SC jack identification: alphanumeric combination of the housing number, panel letter, and fiber pair number

2.3.6.3.3. Examples of internal jack labels for wall-mounted fiber optic housing



Internal Jack Labels for
Wall-mounted Fiber Optic Housing

The internal numeric labels of wall-mounted ST fiber optic housing identify the termination location of each strand of fiber in that housing

The internal numeric labels of wall-mounted SC fiber optic housing identify the exact termination location of each pair (two strands) of fiber in that housing

2.3.6.4 Rack-mounted Fiber Optic Housing – External Housing Labels

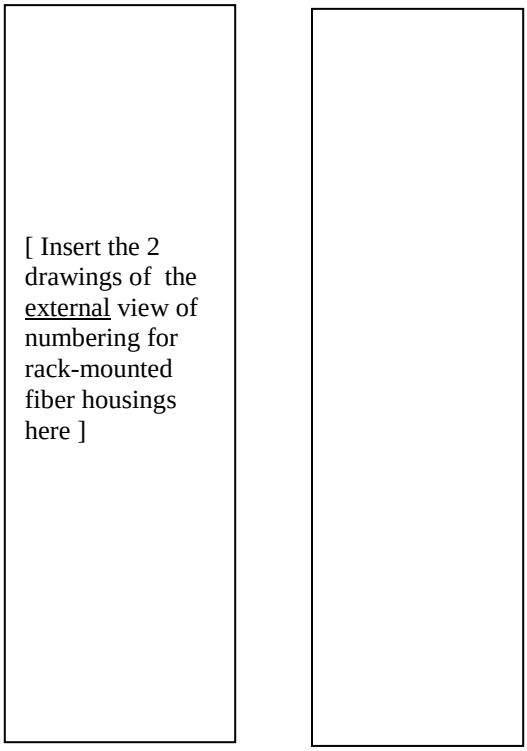
2.3.6.4.1. The numeric range used for rack-mounted fiber housings in each communication room is "11 to 99" (Remember that wall-mounted housings use the numbers of 01-09)

2.3.6.4.2. The numbers assigned to rack housings will increase in increments of ten per rack. For example, the first rack will use H11 - H19, the second rack will use H21 - H29, etc.

2.3.6.4.3. Therefore, each rack in a communication room should have a maximum of 9 housings per rack

2.3.6.4.4. Rack-mounted housings are numbered downward from the top of each rack

2.3.6.4.5. Examples of external labels for rack-mounted fiber optic housing



External Labels for
Rack-mounted Fiber Optic Housing

2.3.6.5 Rack-mounted Fiber Optic Housing – Internal Jack Labels

2.3.6.5.1. The standard for all rack-mounted fiber optic housings is Seicor

- Seicor SC housings assign a unique letter to each vertical jack panel. The letters used are A-M (except the letter I)
- Seicor SC housings also designate an internal number for each fiber pair (two strands) that is terminated in each of these panels. The numbers used are 1-6
- SC jack identification: alphanumeric combination of the housing number, panel letter, and fiber pair number

2.3.6.5.2. Example of internal jack labels for wall-mounted fiber optic housing

[Insert the drawing of the internal view of the jack numbering for a rack-mounted Seicor fiber housing here]

Internal Labels for Rack-mounted Fiber Optic Housing

2.3.6.6 External Labels for Seicor Fiber Optic Housing Cover (Door)

2.3.6.6.1. Fiber optic housing covers (doors) should have labels on the outside cover that rapidly convey the main information about the fiber circuits inside

2.3.6.6.2. The pull-out index card for each housing contains more detailed information about these fiber circuits

2.3.6.6.3. Each cable's / institution's block of jacks should be separated by a vertical line on the housing cover that replicates the internal block divisions

2.3.6.6.4. The external labels for each block of jacks shown on the fiber housing cover should include the institutional owner, the destination building and communication room, and the internal fiber panels contained in that block

2.3.6.6.5. Example of the external labels on a fiber optic housing cover

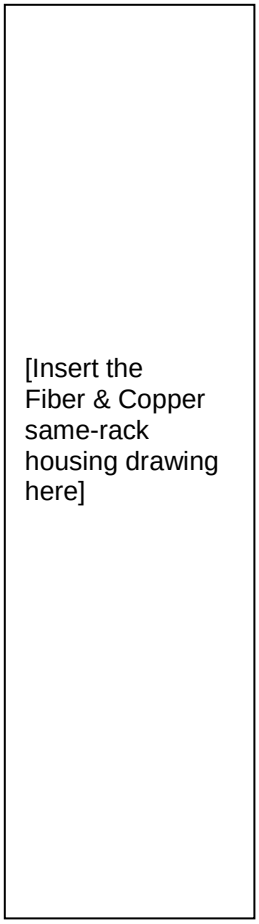
[Draw and insert a drawing of an external housing cover here]

External Labels for the Cover of Seicor Fiber Optic Housing

2.3.6.7. External Labels if Fiber Optic and Copper Jack Panels Occupy the Same Rack

2.3.6.7.1. If fiber housings and copper jack panels are mounted on the same rack, the identification system will be the same as the fiber optic labeling system, with the exception that the letter "P" (RJ45 jack panel) will replace the "H" (fiber housing) for all copper jack panels

2.3.6.7.2. Example of the external label system when both fiber optic housings and copper patch panels are mounted on the same rack



Labels for
Fiber Optic Housings and Copper Jack Panels
that are Mounted on the Same Rack

2.3.7. Labels for Fiber Optic Jacks

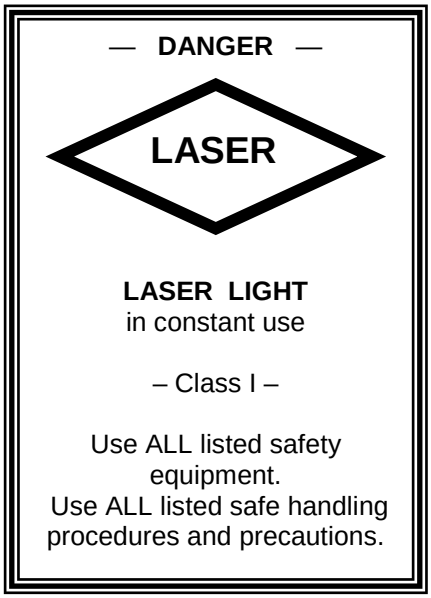
The discussion of labels for fiber optic jacks is discussed in "Wall-mounted Fiber Optic Housing – Internal Jack Labels (see section 2.3.6.3.), and in "Rack-mounted Fiber Optic Housing – Internal Jack Labels (see section 2.3.6.5.)

2.3.8. Laser Safety Procedures

2.3.8.1. Warning labels and signs must be on a yellow background
2.3.8.2. Yellow laser warnings will be placed on racks, panels, jumpers, and on the inside of the entrance door to the communication room
2.3.8.3. Safe Handling requires proper knowledge. A “Laser Safe Handling Instructions” laminated sheet will be posted near racks with laser usage
2.3.8.4. Safe handling requires proper equipment for handling and

maintaining laser circuits, such as laser goggles

2.3.8.5. Example of a laser warning sign



Laser Warning Sign

2.3.9. Fiber Optic Restrictions and Issues

2.3.9.1. No barreling to convert ST to SC or to increase fiber jumper length

2.3.9.2. Do not wrap jumpers around fiber management spools to reduce length

2.3.9.3. Problems are to be red-tagged and an email sent to representatives of all institutions. This includes incorrect installations and temporary items that have expired. Then the institution and ACTC will be notified that it has 30 days to bring the situation up to standards. If the second 30-day period expires without the situation being corrected, the problem fiber cabling will be removed without notification

2.3.9.4. Temporary Situations

2.3.9.4.1. A green tag attached to the jumper indicates a temporary solution. It should include the name of the institution and the date of the temporary work

2.3.9.4.2. Write the situation on the log sheet in the room and include the institution, technician's name, situation, and expected date of solution

2.3.9.4.3. Temporary situations must be corrected within 30 days

2.4. Copper Data Cable Standards

2.4.1. Requirements

2.4.1.1. The standard for copper data cabling is Cat 6 UTP cable that is certified to Cat 6 / 1000BaseT

2.4.1.2. Certification of copper data cable should be done with an industrial grade tester, e.g. HP Scope 155 or better

2.4.1.3. The maximum length for a copper data cable is 295 cable feet

2.4.2. Cat 6 Cable Termination in Communication Rooms

2.4.2.1. All Cat 6 data cables will be terminated in rack-mounted RJ45 panels from the Ortronics Series II product line

2.4.2.2. Copper data cables should be contained within a cable management system from the conduit entry point to the termination panel on the rack

2.4.2.3. Copper data cables should not share or run parallel to the power conduits on the walls, to the power cables or surge protectors for rack-mounted electronics, or to power conduits in building pathways. This is to reduce the possibility of EMI

2.4.3. Cat 6 Cable Termination at User Jacks

2.4.3.1. All Cat 6 data cables will be terminated in Ortronics Series II face plates with RJ45 jacks with 45-degree exit, snap-in modules

2.4.3.2. Termination locations should be recessed so that the jack face plate is flush with the wall, or installed in panduit that is mounted to the underneath side of the computer desktops. Panduit for data cables should not be mounted externally along walls or vertical columns. If it is necessary to use visible external panduit, it will require ACTC approval

2.4.3.3. For a more thorough discussion of ACTC copper cable termination standards at user locations, see Section 4 of this ACTC Telecommunication Standards Manual, "Intra-Building Construction–Jack Standards"

2.5. Voice Cable Standards

Voice or telephone cables are terminated in Communication Rooms. Their installation methods are controlled by telecommunications industry standards committees.

This section regarding Auraria voice cable and construction standards is to be completed by the Telecommunications Division, AHEC.

In the interim, contractors are referred to the Telecommunications Division of AHEC for current information regarding voice standards and their application to all construction on the Auraria campus.

3. INTRA-BUILDING CONSTRUCTION—PATHWAY STANDARDS

Intra-building pathways are the raceways that transport cabling from the main communication room to all of the secondary communication rooms within a single building

3.1. Construction Standards for Cable Pathways within Buildings

- 3.1.1. Hallway cable pathways should run parallel or perpendicular to building lines. Do not measure cable feet or transport cables diagonally across a room or space
- 3.1.2. There should be one cable tray or cable ladder per hallway. It must have a minimum 4-inch clearance above the hanging ceiling grid. If the raceway transports copper data cables, it should not carry power cables. However, if it is necessary to transport power cables on the same cable ladder, the power cables must be transported on a management extension system that is mounted permanently on the side of the ladder in a manner that extends the power cables a sufficient distance from the ladder to prevent EMI (electromagnetic interference) in the data cables
- 3.1.3. Raceways should enter the communication room through the conduits that are permanently installed in the floor or ceiling structure of the room
- 3.1.4. EZ Tray cable management or cable ladders may be used
- 3.1.5. The ACTC project representative should review all plans and submittals, and use a punch list to assure compliance

3.2. Cable Standards for Cable Pathways within Buildings

- 3.2.1. All cabling should be plenum-rated
- 3.2.2. Cabling should not be tied to supports and should not touch other suspension systems

3.3. Fiber-specific Standards for Cable Pathways within Buildings

- 3.3.1. Fiber optic cables require a minimum 2-inch bend radius in all cable pathways
- 3.3.2. Fiber optic cables may run parallel to or share a copper or power pathway.
- 3.3.3. It is preferred that the more fragile fiber optic cables be kept separate from the heavier data and power cables by placing them in a separate fiber raceway or within a 2" conduit on a shared raceway for protection of the fiber cables

3.4. Copper-specific Standards for Cable Pathways within Buildings

- 3.4.1. Copper data cables should not be parallel and within 6 inches of power cables or pathways
- 3.4.2. Copper data cables should not cross-over within 2 inches of power cables or pathways

4. INTRA-BUILDING CONSTRUCTION—JACK STANDARDS

4.1. Copper Data Cable Termination in User Locations

4.1.1. A voice line should be terminated on the left side of the top panel of a user jack

4.1.2. A data cable should be terminated on the right side of a jack panel that has a voice line installed on the left side

4.1.3. All data lines must be certified for 1000 BaseT

4.1.4. Termination Coils for Copper Data Cables

4.1.4.1. Distribution Service Loops
Thirty feet of extra copper data cable should be coiled in every manhole located between buildings

4.1.4.2. Building Service Loops
Twenty to thirty feet of extra copper cable should be coiled at the ceiling of each end of all copper data cables that run between communication rooms within buildings to allow for future renovation and remodeling

4.1.4.3. All copper data cables should be terminated in rack-mounted, Seicor RJ45 panels

4.1.4.4. User Jack Service Loops

4.1.4.4.1. Ten feet of extra copper data cable should be coiled one foot above the ceiling at user jack locations

4.1.4.4.2. One foot of extra copper data cable should be coiled behind each user jack for maintenance

4.2. Jack Standards for All User Locations

4.2.1. Discussion
Blueprints are concerned with representing implementation. Jack labels are concerned with identifying specific use. The intended use or the service that will be provided by a room generally determines the telephone and data requirements for each jack located there. However, reference to the intended use of a facility is not included on blueprints but can be obtained from the project manager or ACTC project representative

4.2.2. Labels for User Jacks in Blueprints
The ACTC project representative should provide written jack information to the AHEC architect identifying the exact location of user jacks and power outlets. The telecommunication or network departments will provide information to the ACTC project representative or to the project director regarding the number, type, and labeling of user jacks. If this information is not provided to the architects during the design phase, the project will have to incur the cost of a consultant.

The jack identification system designates the number of voice lines on the left (1-6), whether the jack requires a single or double gang mud ring in the middle (S or D), and the number of data lines on the right (1-12). This designation must be included on blueprints, listed immediately below each jack (a hollow triangle). This simple, short label is capable of handling all previous blueprint and labeling identification needs.

4.2.2.1. The “S” label designates a 4x4 electrical box with a 2x4 mud ring, also known as a Single gang mud ring

4.2.2.2. The “D” label designates a 4x4 electrical box with a 4x4 mud ring, also know as a Double gang mud ring

4.2.2.3. Examples of user jack notations in blueprints

4.2.2.3.1. 
1S0

indicates 1 voice line, a 2x4 mud ring, and no data line, e.g., a wall phone, mounted 48" from the floor

4.2.2.3.2. 
2S3

indicates 2 voice lines, a 2x4 mud ring, and 3 data lines, e.g., a phone, a FAX, two computers, and a network printer

4.2.2.3.3. 
1S1

indicates 1 voice line, a 2x4 mud ring, and 1 data line, e.g., the default office jack

4.2.2.3.4 
0D12

indicates no voice lines, a 4x4 mud ring and 12 data lines, e.g., a computer laboratory jack

4.2.2.3.5. 
1S0

1S4

indicates two jacks: the upper jack has 1 voice line, a 2x4 mud ring, and zero data lines (e.g., a wall phone); the lower jack has 1 voice line, a 2x4 mud ring, and 4 data lines (e.g. a typical classroom jack)

4.3. Labels for Network Jacks in Communication Rooms

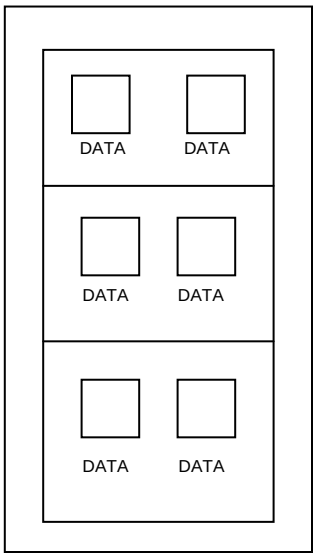
Information regarding the design, installation, and labeling standards for network jacks installed in communication rooms can be obtained from:

4.3.1. AHEC for wall-mounted patch panel and rack panel terminations. These labeling standards will be listed here upon the completion of this section by the Telecommunication Division of AHEC
4.3.2. The Copper Standards section of this manual (this section)
4.3.3. The Fiber Optic Standards section of this manual

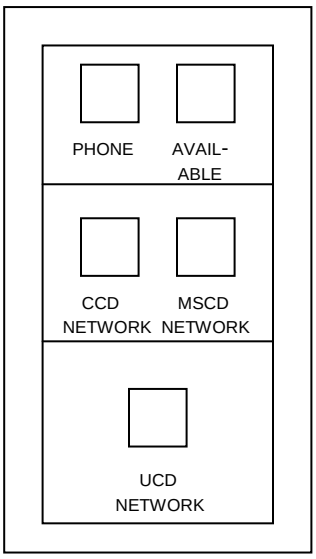
4.4. Panel Labels and Jack Designations for User Jacks

4.4.1.	Voice jack	White-colored tab with a telephone symbol. Place a white tab on the jack plate above the voice jack (left side of a panel only, top panel first)
4.4.2.	Data jack	Rose-colored tab with a computer symbol. Place a rose tab on the jack plate above all data jacks (right side of any panel with a voice jack, and all other data jacks in the middle and lower panels)
4.4.3.	Institutional Label	Later, each educational institution will add a label at its designated jack to identify its network access point for users

4.4.4. Examples of User Jacks
There are primarily three styles of user jack. They all have three panels with a potential of 2 jacks per panel



Computer Lab Jack

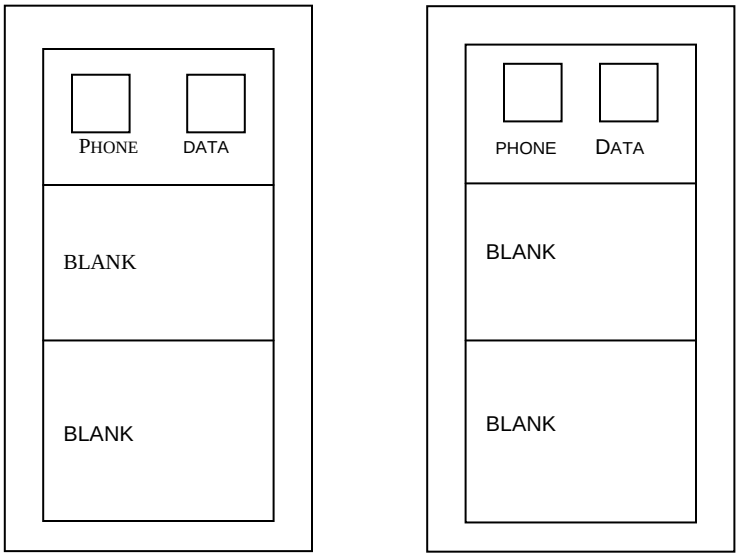


CIP Classroom Jack

4.4.5. Examples of the blueprint designations for the user jacks shown above are:

0S6

1S4



Office Jack (left side) Office Jack (right side)
(one each on opposite walls)

4.4.6. Example of the blueprint designation for the user jack shown above is:

1S1 1S1
(opposite wall)

5. APPENDIX

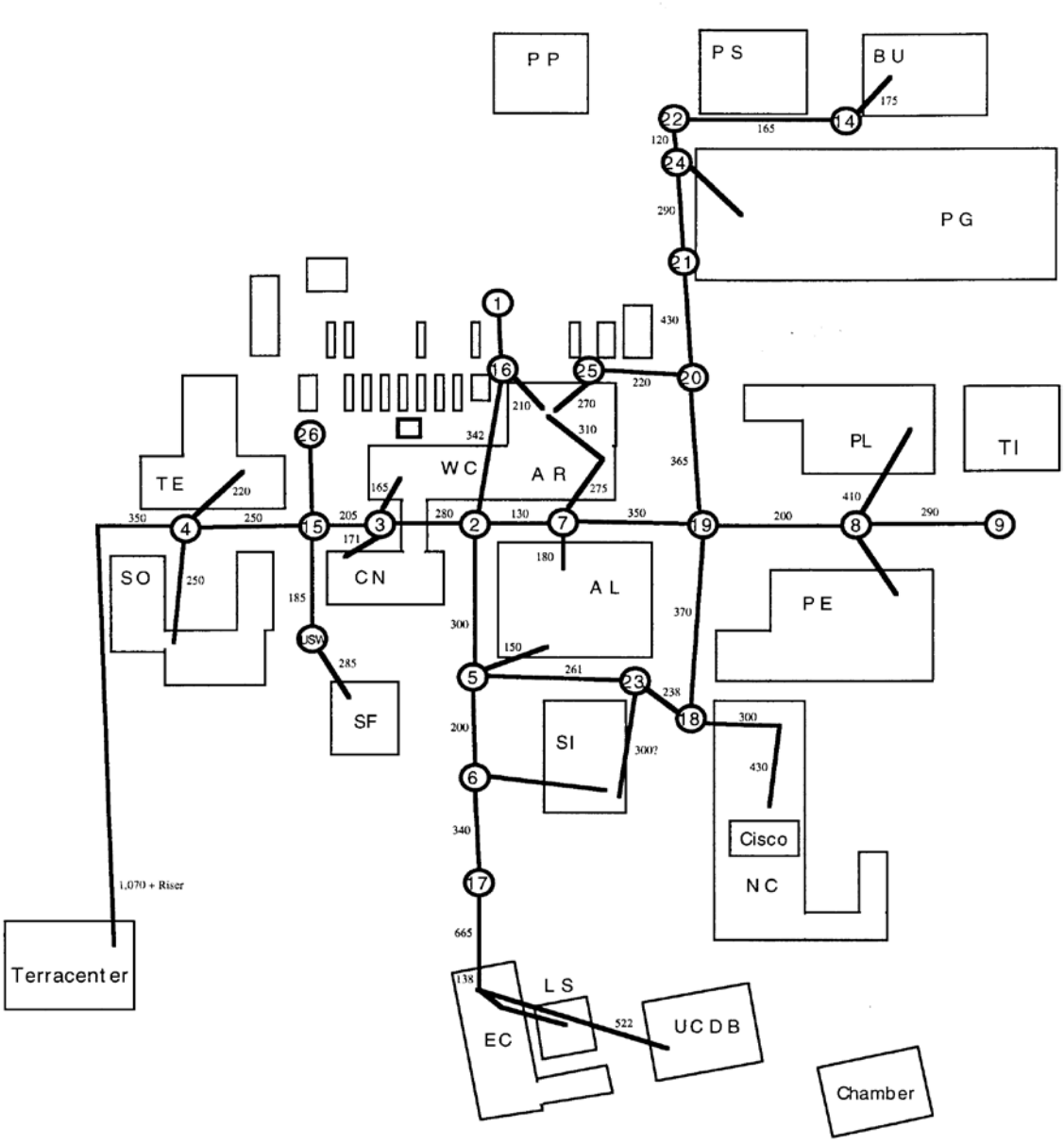
5.1. Auraria Maps and Graphics

5.1.1. Maps

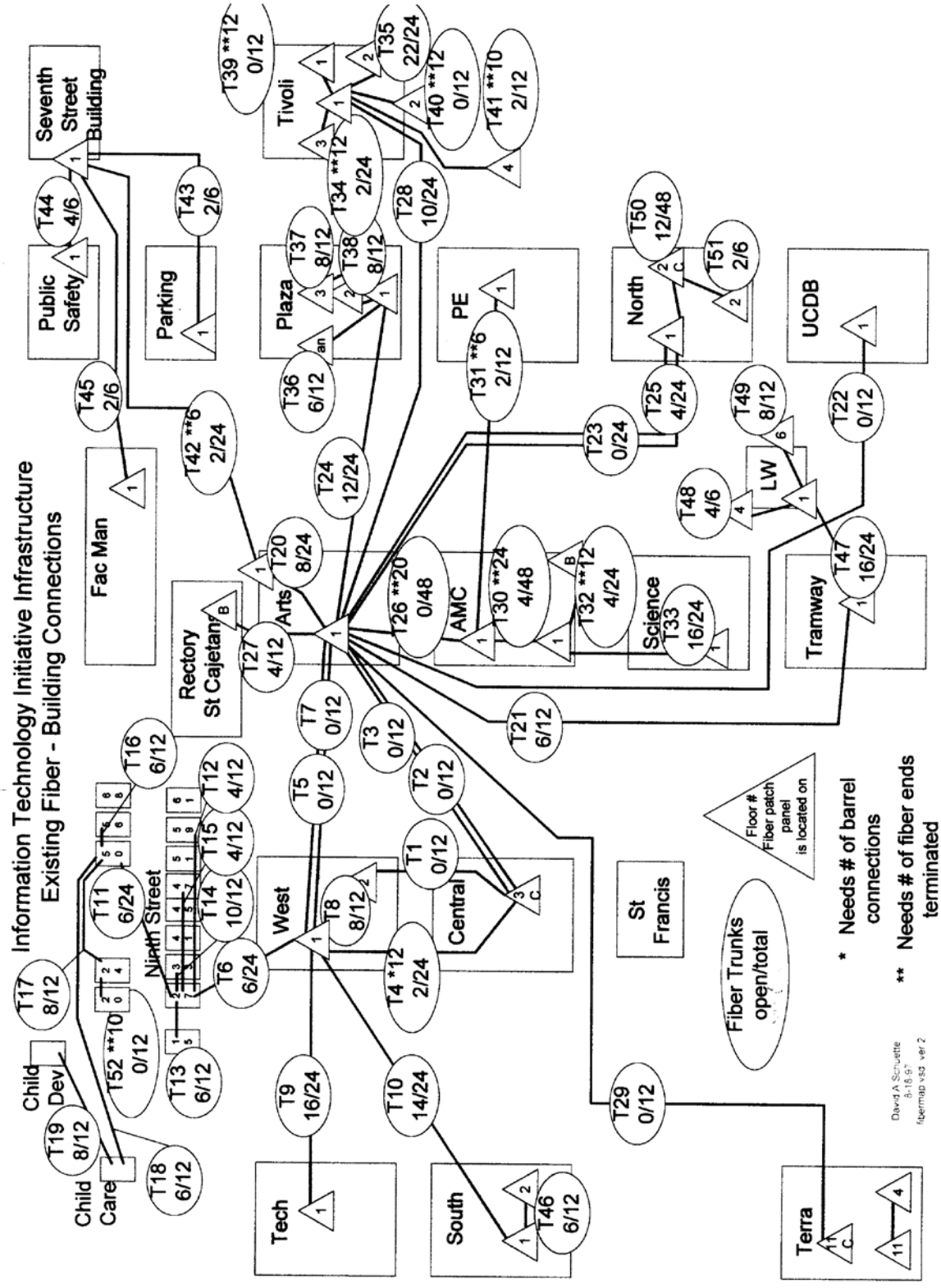
5.1.1.1. Auraria Campus Manholes

Auraria Campus

Manholes

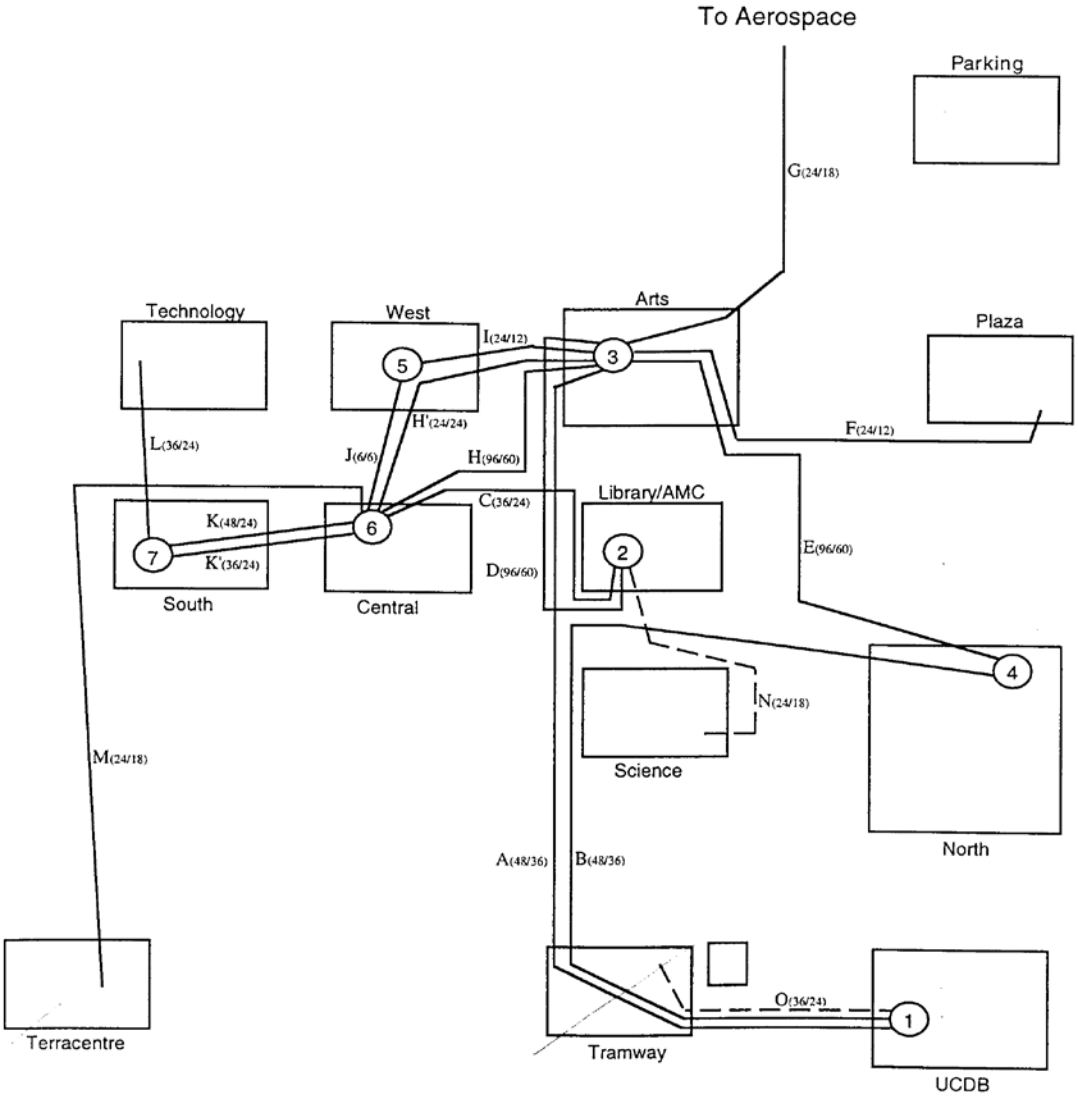


5.1.1.2. ITII Fiber Graph



5.1.1.3. ITII Fiber Building Connections

Information Technology Initiative Infrastructure
New Fiber Installation - Building Connections
ITII



5.1.2. Graphics

5.1.2.1. Rack Arrangement
5.1.2.1.1. Main communication room, network distribution center–see section 2.2.2
5.1.2.1.2. Secondary communication room–see section 2.2.3
5.1.2.2. Labels for Blueprints
5.1.2.2.1. Fiber cable label–see section 2.3.2.2
5.1.2.2.2. User jack label–see section 4.2.2.2.3
5.1.2.3. Labels for Cables
5.1.2.3.1. Fiber cable termination, first label–see section 2.3.4.3.4
5.1.2.3.2. Fiber cable termination, second label–see section 2.3.4.3.6
5.1.2.3.3. Fiber pass-through cable, see section 2.3.4.4.4
5.1.2.3.4. Fiber jumper–see section 2.3.5.5
5.1.2.4. Labels for Fiber Housing
5.1.2.4.1. Wall-mounted, external label–see section 2.3.6.2.4
5.1.2.4.2. Wall-mounted, internal label–see section 2.3.6.3.3
5.1.2.4.3. Rack-mounted, external label–see section 2.3.6.4.5
5.1.2.4.4. Rack-mounted, internal label–see section 2.3.6.5.2
5.1.2.4.5. Seicor housing cover, 2.3.6.6
5.1.2.4.6. Labels when both Fiber Housings and Copper Panels Occupy the Same Rack– see section 2.3.6.7.2
5.1.2.5. Laser Warning Sign–see section 2.3.8
5.1.2.6 Labels for User Jacks
5.1.2.6.1. At the user location–see section 4.4
5.1.2.6.2. In blueprints–see section 4.2.2.2.3

5.2. Material Standards for Network Construction

This is a brief summary of the current material standards for all Auraria Network Communications construction and remodeling. Materials already in active use in communication rooms that met prior standards are not acceptable for installation in new construction or remodeling, unless absolutely necessary and approved by the ACTC Committee

This materials list is incomplete. Manufacturer and part numbers will be supplied by the relevant telecommunication departments, network departments, or the ACTC Standards Subcommittee

The list below states the approved manufacturer and part number

5.2.1. Inter-Building Cable Transport Materials
5.2.1.1. Access to Auraria Campus
5.2.1.1.1. Network Conduits, Maps, and Diagrams
– Auraria Manholes Map
5.2.1.1.2. Termination / Interface with campus lines
– Qwest T1 lines – D-marks (vendor installed)
5.2.1.2. Auraria Cables
5.2.1.2.1. Power cable –
5.2.1.2.2. Copper data cable network–maps and database
5.2.1.2.3. Fiber optic cable network–maps and database

5.2.1.3. Provider Cables
5.2.1.3.1. Xcel Energy – power cables
5.2.1.3.2. Qwest – voice cables & T1 lines

5.2.2. Communication Room Materials

5.2.2.1. Electrical
5.2.2.1.1. 20 Amp 4-plex outlet – NEMA 5-20R
5.2.2.1.2. 20 Amp 4-plex IG outlet – NEMA 5-20R (orange)
5.2.2.1.3. 30 Amp (remote G3 Module) – NEMA 240
5.2.2.2. Security
5.2.2.2.1. Key standard – ASSA
5.2.2.2.2. Card standard –
5.2.2.3. Equipment for Electronics
5.2.2.3.1. Racks – Seicor or Seicor-type 9' racks with vertical management trays on both sides and horizontal cross-over management trays at the top and the bottom of the rack

5.2.3. Intra-Building Cable Transport Materials

5.2.3.1. Pathways / Raceways
5.2.3.1.1. Cable trays – EZ Tray Cable Management System
5.2.3.1.2. Cable ladders –
5.2.3.1.3. Cable ladder extensions for power cables –
5.2.3.2. Conduit, interduct, and intraduct
5.2.3.2.1. Trays – EZtray
5.2.3.2.2. Panduit –

5.2.4. Copper Network Materials

5.2.4.1. Cables
5.2.4.1.1. Category 3 plenum cable for voice circuits
5.2.4.1.2. Category 6 plenum cable for data circuits
5.2.4.1.3. Hydra cables for data circuits
5.2.4.1.4. Plenum-rated cable ties for all cabling
5.2.4.2. Connectors
5.2.4.2.1. RJ45 –
5.2.4.2.2. 110 –
5.2.4.3. Termination Hardware (Jacks) – Ortronics II product line
5.2.4.3.1. User jacks (wall-mounted or panduit-mounted)
<u>Face plates</u>
Single gang – Part # OR-40300158
Double gang – Part # OR-403000159
<u>Snap-In modules</u>
1 RJ45 jack, 45 degree exit – Part # OR-60950049
2 RJ45 jacks, 45 degree exit – Part # OR-60950053
Blank module, flush mount – Part # OR-40300164
5.2.4.3.2. Communication room jacks
<u>Rack-mounted</u>
Ortronics Series II rack-mounted RJ45 panels
With hinged cable management –
Part # OR-851045090
Without cable management –
Part # OR-851004038
<u>Wall-mounted</u>
RJ45 wiring blocks with legs –
110 wiring blocks – (no longer installed)
Fiber optic wall housings – Seicor
Voice wiring blocks –

5.2.5. Fiber Optic Network Materials

5.2.5.1. Cables
5.1.5.1.1. SM, Single mode, Class 1 laser – Seicor
5.1.5.1.2. MM, Multi-mode – Seicor
5.1.4.1.3. Plenum-rated cable ties for all fiber optic cabling –
5.2.5.2. Connectors
5.1.5.2.1. SC –
5.1.5.2.2. ST –
5.2.5.3. Termination Hardware (Jacks) – Seicor product line
5.2.5.3.1. Underground access and inter-building transport connections and physical interfaces –
5.2.5.3.2. Communication room jacks
Rack-mounted fiber housing – Seicor
Wall-mounted fiber housing – Seicor

5.3. Equipment Standards for Testing and Analysis of Networks and Electronics

5.3.1. Software
5.3.2. Electronics
5.3.2.1. Certification of cable, wiring and circuit analysis – Hewlett Packard Scope 155 or better. Industrial grade tester required
5.3.2.2. Wiring and circuit analysis – Fluke
5.3.2.3. Network analysis – Hewlett Packard LANalyzer

5.4. Industry Standards for Network Construction–Relevant References

5.4.1. Construction
5.4.1.1. UBC – The Uniform Building Code
5.4.1.2. NEC – The National Electrical Code
5.4.1.3. NFPA – The National Fire Protection Association
5.4.2. Telecommunications
5.4.2.1. ANSI / TIA / EIA – American National Standards Institute / Telecommunications Industry Association / Electronic Industries Association
5.4.2.1.1. 569-A – communication closet standards
5.4.2.1.2. …To be continued…
5.4.3. Voice / Telephone
Relevant voice references will be supplied by the Telecommunications Department of AHEC

5.5. Industry Web Sites

5.5.1. Construction
5.5.2. Telecommunications
5.4.2.1. www.siemon.com/standards/telecom
5.4.2.2. w.w.w.ansi.org
5.4.2.3. w.w.w.ieee.org
5.5.3. Voice / Telephone
Relevant voice standards' web sites will be supplied by the Telecommunications Department, AHEC

5.6. Construction Forms and Check Lists

5.6.1. Projects–Proposal Preparation Check List
5.6.2. Amendment Application to the ACTC Standards Manual

6. FAQS – FREQUENTLY ASKED QUESTIONS ABOUT CONSTRUCTION PROJECTS

6.1. Designing a Project Proposal

6.1.1. *We have an idea for a grant and would like someone to be sure that we have considered every area that needs to be reviewed for this project. Who can review this idea with us or serve as our consultant*?

Answer: [New proposal for ACTC]
In order for a group to learn how to submit a well-reviewed, documented project proposal that is supported by professional consultation in all relevant areas, ACTC should design a "How To Do a Project" booklet and / or web site that will

- list each ACTC institutional project consultant
- list each department and professional that should be consulted regarding any network project proposal
- provide a template of a universal departmental approval form to be used for requirements and as a department sign-off sheet for the proposed project prior to the plan being submitted to ACTC for approval
- provide a checklist of all forms and documents that should be signed and /or included in a project proposal
- perhaps provide a list of suggested readings, web sites, documents, diagrams, etc., that may be helpful in completing a well-researched project proposal that is supported by professional consultation

6.1.2. *Who evaluates our project proposals?*

Answer:

6.1.3. *Do we need anyone's approval or permission for our project if it is totally funded by outside sources and is contained within our department?*

Answer:

6.1.4. *Can you help us work up an itemized list of items we will need to purchase and build to do this project, as well as an estimate of the cost, particularly regarding the computers and plugging them into our school's network?*

Answer:

6.2. A Project that Is Already Funded

6.2.1. *We have received a grant for a project. Who do we contact at our school and at AHEC to get it built on time?*

Answer:

6.2.2. *We already have ACTC approval for our initial project proposal. Now our grant and funding has arrived. Do we need to get permission again to begin building? Who do we notify?*

Answer:

6.3. An Approved and Funded Project with a Major Omission

6.3.1. *We forgot to have a network consultant evaluate our project design before the blueprints were submitted and the grant was awarded to us. Now we realize that the networking plans in our project have several technical and design errors, including some standards violations, that make our network non-functional. What can we do? Is our project salvageable? What do we need to do to make our computer system functional? How much more it will cost and where can we get the funds to pay for this new expense?*

Answer:

6.3.2. *We completed several successful projects before and did an thorough job on this project proposal. We even consulted with our school's network department regarding the installation of jacks in the new lab and what kind of switches were needed in the communication room to run the lab. However, in error, we assumed that there would be enough power available in such a large building to run our small computer lab.*

However, the power department at AHEC has informed us that there is not enough unused power in the building to run our new lab, and that additional equipment at a significant cost to us will be needed to provide the power. We probably could have had this expense included and funded in the original grant if we had known about the situation during our planning and design phase.

So, please provide a check list for Project Proposals that lists all of the items, departments, contact persons, and questions that should be consulted before we propose a project. Then we can submit a more accurate grant proposal and possibly receive funding for everything we need in the first request for funds. This would also help us be more realistic in determining the most practical and appropriate goals in light of the funds and resources available.

Answer: