Board of Regents of
The University System
of Georgia

Facilities Guidelines For Instructional Technology

DECEMBER 2001

(This is a separate document available, for downloading, off the 'web based' version of these guidelines. It contains 'rough drafts' of data and specifications provided by various sub committees of the Task Force)

PREFACE

as a model and a guide. Within this context, it should be noted that these guidelines are written using the concept

first-time costs associated with the installation of the technology, associated maintenance and upkeep costs, and importantly, flexibility to respond to future requirements.

These guidelines should accommodate the academic objectives of the USG Board of Regents which include:

"... technology to advance educational purposes, including instructional technology, student support services and distance education".

"... providing and maintaining superior facilities, funded by innovative mechanisms which increase the speed with which they are usable".

The intended outcome is a baseline for facilities guidelines that provide for electronic technology in all USG buildings. The guidelines will form the minimum standards for various room types, together with a suggested room diagram. They include the development of standards for the following types of spaces:

Classrooms
Laboratories

distance learning, etc. are more properly addressed elsewhere, including the

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GENERAL CONSIDERATIONS

This section will provide an overview of the issues that should be considered when incorporating modern technologies to support programmatic requirements (instruction, student support, research, etc) and allow for the incorporation of evolving technologies in a cost-effective manner. It highlights the considerations that should be addressed in order to realize the goals of the Task Force guide.

There are profound considerations to the use of Internet and computers. The information explosion of the last several decades has made the Internet one of the instruments that must be integrated into the instructional delivery system of an institution. Through this, and other instruments, the educator can expand the topics and

PROCESS

This section outlines a general process for reviewing the technology needs for a capital project. Content of this section is:

Set Up
Participants
Topics
Work Flow

Set Up

The design and construction of a facility will require retaining consultants. The consulting team will be contracted following the standard format set by the University System of Georgia Board of Regents. The USG office of facilities Building Project Procedure includes an outline of this process.

Participants from each one of these areas should be considered:

Institution:
Office of the President representative (s)
Office of Business representative (s), including one for Physical Plant
Office of Instructional Technology
Office of Academic Affairs representative (s)
Student (s)
Faculty (s)
Staff (s)

BoR:
Office of Facilities
Other

It is suggested that the participants be organized into two basic groups:

Core User Group
This is a small group of people charged with the authority to provide overall direction during the process. They are to review the progress at key decision points, make decisions, and keep the project on track.

Extended User Group
This group can be much larger. Its make-up is much broader and includes staff, faculty and students. These people bring information on various areas of specific interest, whether an instructional unit, the physical plant or the users.

A third group may be considered if circumstances merit extensive involvemTc0.0n 1

Internal

It is extremely important to set the stage for a physical improvement project. In doing so, each institution must identify key participants and initiate some pre-planning tasks to outline the scope.

administrative staff. It is important that this analysis include an assessment of the cost of construction and installation of the technology equipment as well as the impact on maintenance, operations and staffing.

This information can include room by room evaluations, building codes evaluation, including ADA, building repair and maintenance information, and model program analysis. This analysis compares existing sizes of rooms to a model of appropriate sizes for those rooms. The model program is developed to meet projected curriculum, strategies, and population. During the presentation and discussion of this material it generally becomes clear that new teaching strategies require more flexible learning [Image] physical settings, and immediate and long range adaptability will be important.

In larger institutions, tours and presentations can have several meetings. It is important to share all appropriate information prior to the needs assessment activity.

Meeting 2

Needs are prioritized utilizing the same process. Each improvements to be recommended to the Board of Regents. This usually takes two to four meetings.

At the end of this process, it is clear to all participants that the process was an open one and that they had real input into the results. The committee not only is well informed; it also has developed a sense of ownership regarding problems facing the institution and the proposed solution. Throughout the entire process key information technology staff must be involved.

It is important that both technology and instructional issues be discussed with staff representing these areas.

External

In order for an educational facility to be successful in meeting the needs of learners, a process of planning, design and construction must be followed. As such, the

Other obvious 'external' groups are the project planners and/or architects on the project. These individuals should not be perceived as telling educators how to educate. Fortunately, systemic change is a hot topic within most educational circles, and most educators will welcome the participation of the planner and designer in the process of applying new teaching and learning strategies to criteria for facility design.

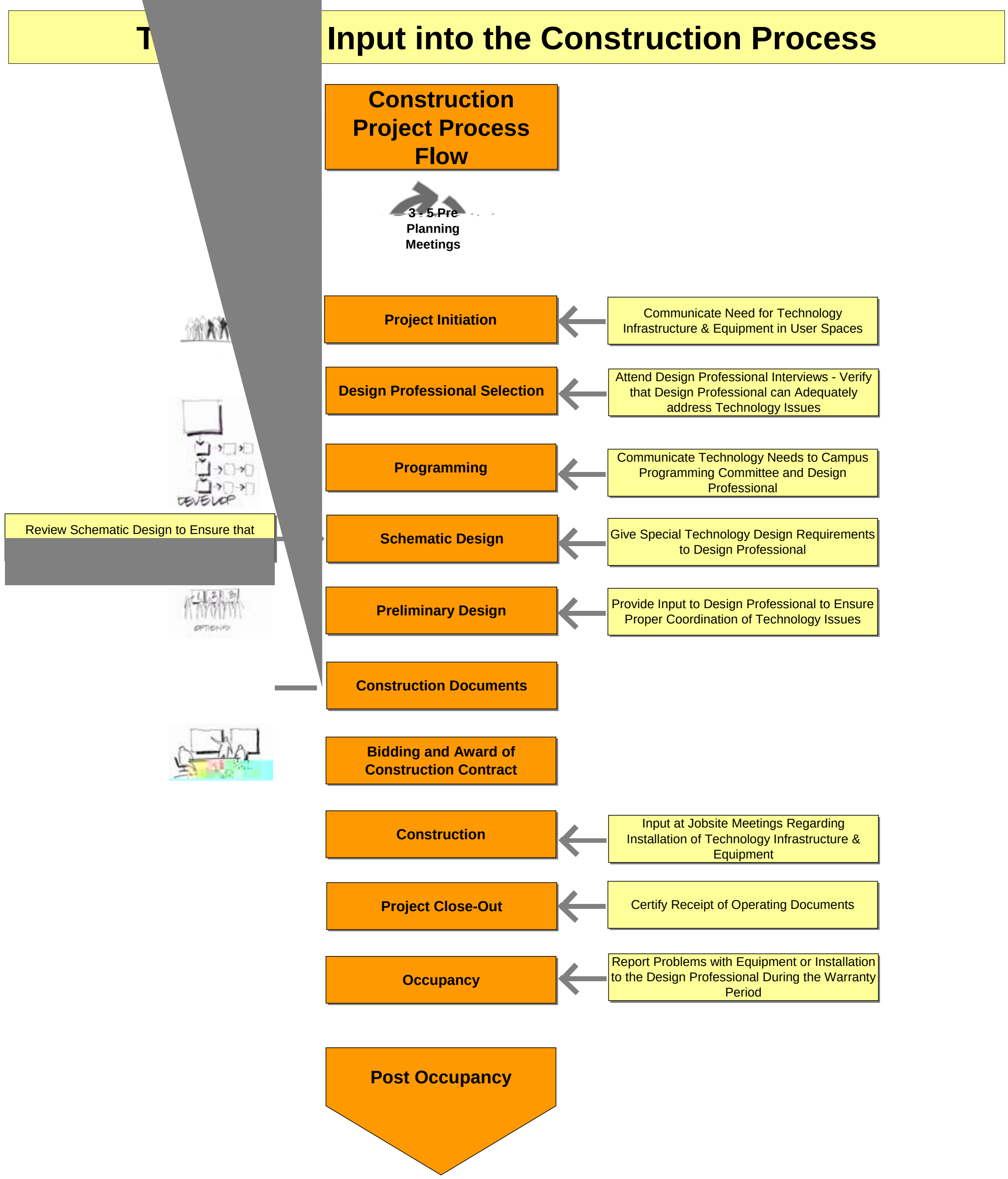
Topics to Consider

The institution should consider the role of the proposed physical improvements within the context of the overall campus' technology plan. Part of this includes an attempt to at least describe innovations that are foreseen. Plan that the core technology goals of the institution are met.

Track the budgetary needs for all technology related items in the building. Specifically, identify a Network/technology line item as part of the total project budget.

Note: IT staff participation must remain constant throughout the process. It is important they be active participants.

Work[illegible]ology Input into the Construction Process



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This section outlines general systems criteria that need

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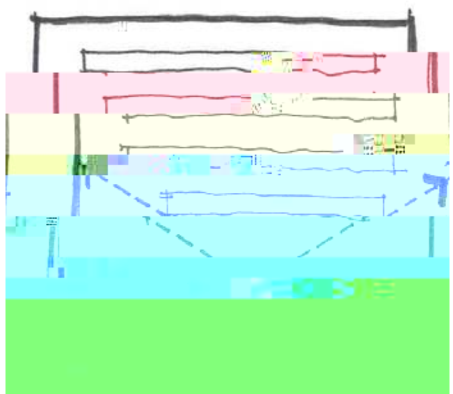
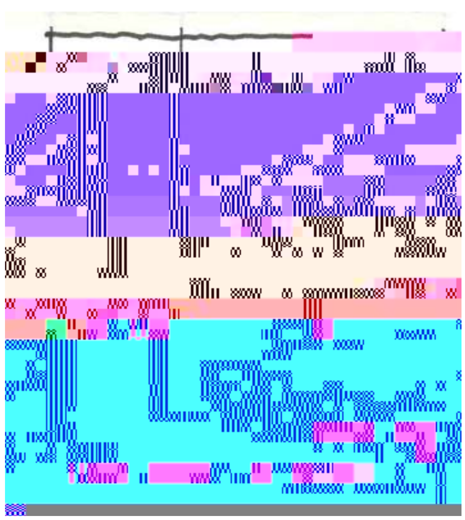
A variety of seating configurations will be needed by the users of these various space types. In some instances, a room may need to be flexible enough that one can adapt it for various seating configurations. This need to provide for a variety of seating arrangements may require multiple options for access to data and power sources. Part of addressing flexible seating involves looking at options for access to data and power through any of the

Sightlines

Sightlines are extremely critical in setting rooms for multi media use. Industry guidelines for the angles that define the cone of vision must be followed both in plan as well as in section. Meeting these guidelines can have an effect on the proportions of the room: length, depth and height. Special attention to the height of the room is required in those gathering spaces with more than 50 occupants. Additional information concerning 'sightlines' is available in Appendix 2 of the *2000 Preplanning Guidelines.*





Guidelines for lighting are described in detail in the *2000 Pre-Planning Guidelines*. Key points from this document include:

> “Control of ambient light becomes critical in front projection environments. This is because ambient light falling on the screen will also be reflected back to the viewers washing out images projected on the screen. Since the area around the projection screen must be able to be darkened considerably while maintaining necessary lighting levels at student and instructor positions, careful control of room lighting and daylight entering through windows is required.
>
> While diffuse indirect lighting is desirable for general classroom use, indirect lighting should not be used during presentations where front projection is required. A direct, controlled lighting component must be provided for use during these presentations.
>
> The lighting fixtures should be grouped in zones to allow various areas of the room to be controlled separately. General direct lighting, wallwash lighting and indirect lighting (if provided) should be in separate zones. Accent lighting, step lighting

Guidelines for sound and acoustics are described in detail in the *2000 Pre-Planning Guidelines*. Key points from this document include:

> "Acoustical characteristics in presentation spaces are particularly important as speech intelligibility can be degraded by excessive reverberation (and/or echoes) and excessive background noise. Traditionally, classrooms have been constructed

Recommend redundant HVAC system in MDR. Typically, the loss associated with overheated systems will be many times the cost of the second HVAC unit.

It is important to establish an ‘optimal’ size for IDR and MDR rooms. In doing so, consideration should be given to the ‘width’ of these rooms, particularly the IDR.

Telecommunications and Cabling

Networking infrastructure should be thorough and comprehensive. If the room is designed for use of laptops, hard-wire data ports should be located at seating location. Otherwise, the appropriate number of wireless transmitters should be considered in place of hard-wire. This is especially critical if retrofitting an existing structure. When using 'wired' design, consideration should be given to the maximum length of cable.

The design of an intra-building backbone between the main entrance room (MER) and the intermediate data room (IDR) the horizontal cross-connect (HC) for the floor distribution is the method of sub-dividing the main entrance facilities and distributing the data/telephone/video facilities to other floors in the building for further subdivision to the users. The two primary design options of intra-building backbones are:

Star, where the intermediate data room (IDR) is connected directly to the building's main entrance room (MER). It is preferred to stack the intermediate data rooms to align the vertical cable pulls.
Hierarchical star, where some or all of the intermediate data rooms (IDR) are connected to an intermediate cross connect which in turn is connected to the building's main entrance room (ME).

In general, the best design is the star design between the buildings' main entrance room and the intermediate data rooms on each floor. However, in some extremely large buildings (e. g., a high- rise), a hierarchical star may be considered. Examine trade-offs between different size cables and labor to determine a suitable cost-effective solution. Applications may influence the decision.

Intra-building Backbone Distribution Systems
A buildings system backbone distribution for voice/data/video/other system should be a vertical star system from the main entrance room of each system to the intermediate data room of each system.

Main Entrance Rooms (MERs) and Network Interface Wiring
Ideally, the main entrance room would be co-located in the data network equipment along with (in some cases) a telephone PBX, security monitoring equipment, and other active equipment serving the building. An intra-building network should have only one main entrance room (MER).

See Appendix for cable types.

Many Colleges and Universities have found it desirable to augment their teaching delivery methods by recording, producing on campus, and receiving satellite feeds from other campus program materials and replaying these class lectures, live broadcast and other materials related to the learning experience to the classrooms and dormitories within a campus. There are several other methods of obtaining program materials:

- Off- the- air antennas may be mounted on a pole or tower.
- CATV feeds are broadband RF signals from a CATV company.
- A videocassette recorder/ player (VCR) can be used to generate local programs.
- A digital versatile disc (DVD) is a compact disc (CD) that contains full- motion video, such as movies.
- Camera inputs form campus locations

It has become desirable to install in new buildings and renovation projects a CATV distribution system to support these academic requirements.

CATV requirements should be continually reviewed with each project.

Elements of a Cable System

A typical cable system consists of three basic elements:

Head-end— An equipment room that contains the electronics for receiving and processing TV programs. The output of the

Standard Classroom
25 to 60 seats

The basic technology package for a classroom must be able to provide support for the use of at least two modes of instruction: writing surface and projecting surface (slides or overhead). The room should be able to accommodate flexible seating configurations. There should be enough building infrastructure to provide **future** access to power and data at **every other** desk as a minimum. Consideration should be given to extending this capability to every desk.

There should be a multimedia podium, an instructors' desk that has room for a networked personal computer, a laptop, overhead projection equipment and a control touch panel. This room will typically have windows. Duplex outlet will be provided 6 feet on center along three walls. Fourth wall will accommodate the needs of the instructor.

Standard Classroom
20 to 30 asf/seat
25 to 60 seats

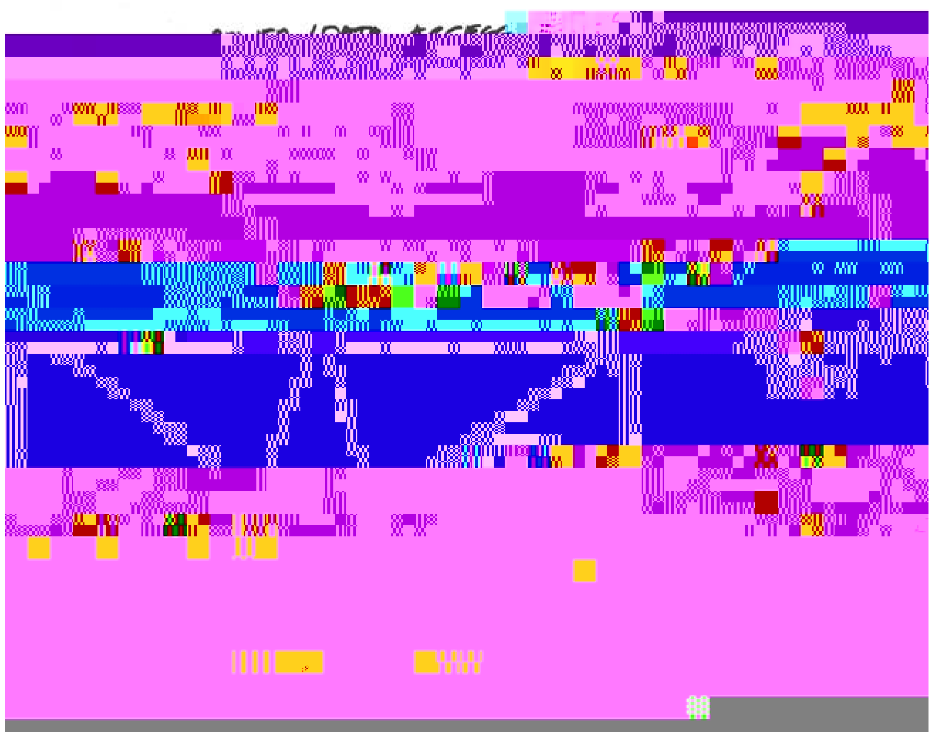
Equipment	Writing Surface Projection Surface (If screen, manual) Overhead projector for transparencies Personal Computer Projector with remote control Network Personal Computer Blinds
Systems	Zoned lighting system Built-in infrastructure for FUTURE: 1 data and power outlet per every other student station. Data and power at instructor's workstation. Data and power in ceiling for wireless. Satellite connectivity (through CATV) Intra-building and inter-building connectivity (Option for renovations. Provide when feasible) Data and power in cabling for wireless options
Shared Equipment	Document Camera 35mm slide projector TV/VCR
Options	Fiber optic data communication for instructor station. (can be extended) Instructor's workstation's task light Classrooms are to be Advanced ready by means of the A/V Input-Output based video distribution system (camera mounts are also to be provided)

Advanced Classroom
20 to 30 asf/seat
25 to 60 seats

The technology package for an advanced classroom must be able to provide all that the standard room provides plus:

- Video Projector/DVD
- Document Camera
- VCR
- Audio Playback
- Multi media switch box

The room should be able to accommodate flexible seating configurations. There should be enough building infrastructure to provide **future** access to power and data at **every** other desk as a minimum. Consideration should be given to extending this capability to every desk.
This room will seriously consider having windows.
Provide power along three walls, for every other station.
Fourth wall will accommodate the needs of the instructor.



Advanced Classroom
20 to 30 asf/seat
25 to 60 seats

Equipment	Writing Surface Projection Surface (if screen, motorized) Overhead projector for transparencies (option) Personal Computer Projector with remote control Personal Computer Video Projector/VCR/DVD Document Camera Audio Playback TV Blinds Multi media switch box
Systems	Zoned lighting system Built-in infrastructure for FUTURE: 1 data and power outlet per every other student station. Data and power at instructor's workstation CATV connectivity Intra-building and inter-building connectivity Telephone Wireless
Shared Equipment	
Options	Fiber optic data communication for instructor station. (can be extended) Instructor's workstation's task light. Classrooms are to be *Advanced* ready by means of the A/V Input-Output based video distribution system (camera mounts are also to be provided) Satellite connectivity (down and up link)

Writing Surface
Projection Surface (if screen, motorized)
Overhead projector for transparencies (option)
Personal Computer Projector with remote control
Personal Computer
Video Projector/VCR/DVD
Document Camera
Audio Playback
Microphone(s)
Camera(s)
Monitor(s)
Multi media switch box

Dimmable lighting system

.

Writing Surface
Screen, sized for two images
Overhead projector for transparencies
Personal Computer Projector with remote control
Personal Computer
Video Projector/VCR/DVD
Document Camera
Audio Playback
Microphone
Camera
Speakers
Monitors
Multi media switch box

Dimmable lighting system
Built-in infrastructure and cabling: 1 data and power outlet per every other student station.
Data and power at instructor's workstation.
CATV connectivity
Intra-building and inter-building connectivity
Wireless**
Telephone
Satellite connectivity (down and up link)
Input / Output based video distribution system
Sound amplification
Intercommunication to Control Room

35 mm slide projector

Fiber optic data communication for instructor station. (Can be extended)
Instructor's workstation's task light
Electronic marker board

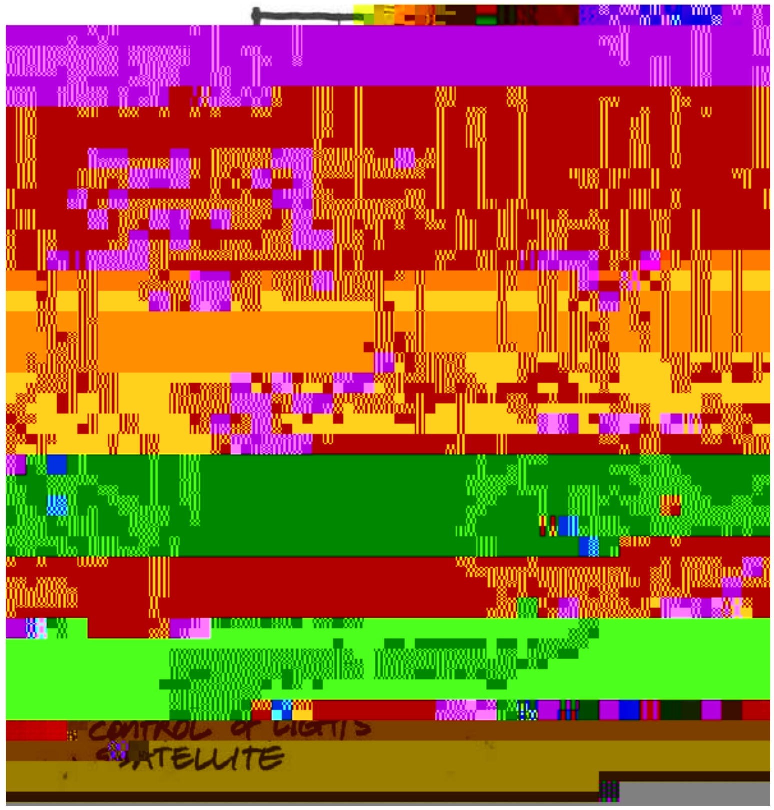
** Validate the viability of this against the number

Writing Surface
Projection Surface (If screen manual)

Laboratories

If colleges and universities are to build the kind of natural sciences communities that succeed in attracting and sustaining student interest in science and mathematics, spaces must encourage daily interaction between student and faculty, and between student and student. The relationship of offices, laboratories, common areas, as well as the traffic patterns, has to promote such with experts. They are obtaining an in-depth analysis of the functioning of the human body and chemical reactions through interactive computer programs. Telecommunications connect classrooms with other classrooms, universities, and scientific facilities worldwide.

The technology package for a Wet Lab must be able to provide all the hi-tech classroom provides. Serious consideration should be given to the option of recording in the laboratory.



Writing Surface
Projection SuTf9Gdd1 i D7aeace

Writing Surface

Computer Lab - Open

Equipment	Writing Surface Projection Surface (if screen, motorized) Overhead projector for transparencies (option) Personal Computer Projector with remote control Personal Computer Video Projector/VCR Document Camera Audio Playback
Systems	Zoned lighting system Built-in infrastructure for FUTURE: 1 data and power outlet per every other student station. Data and power at instructor's workstation CATV connectivity Intra-building and inter-building connectivity Telephone Wireless
Shared Equipment	35mm slide projector
Options	Fiber optic data communication for instructor station. (can be extended) Instructor's workstation's task light. Satellite connectivity

Office Spaces Office spaces should be designed such that there is

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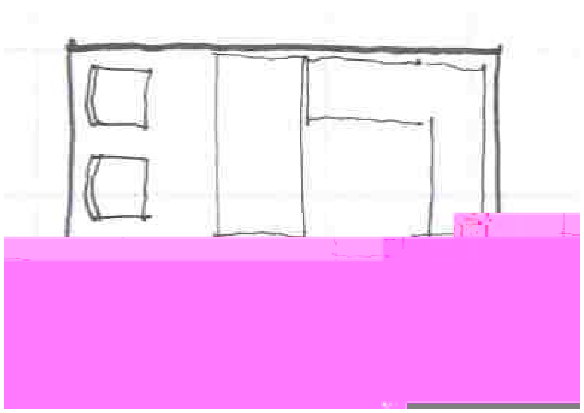
Faculty and Administrative Offices

Office:

Department Head or Administrator

Office:

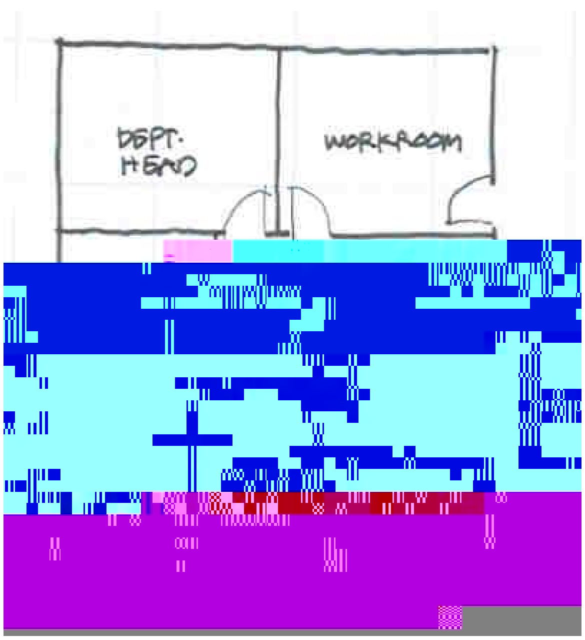
Faculty



Faculty Administrative Suites

Office:
Open Space

Office:
Suite



Informal Collaborative Collaborative spaces should be designed such that there is connectivity between related service-support spaces, including conference rooms, work rooms, copy rooms and spaces for electronic support equipment.

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Writing Surface
Projection Surface (If screen manual)

Zoned lighting system

35mm slide projector
Personal Computer Projector
TV/VCR

Hub A network device that provides a centralized point for LAN communications, media connections, and management activities of a physical star topology cabling system. It is used to control and direct the flow of data through a structured cabling network.

I

Infrastructure Permanently installed cable plant.
inter-building (campus) backbone A backbone network providing communications between more than one building.
Internet A worldwide network of computers (servers) that links the user to businesses, government agencies, universities, and individuals.
intra-building backbone A backbone network providing communications within a building.
Intranet A collection of Internet-based technologies designed to provide content to users on an internal network. The content is viewed using a Web browser.

J

Jack See modular jack.

K

kilowatt (kW) A unit of electrical power equal to 1000 watts.

L

ladder rack A device similar to a cable tray but more closely resembles a single section of a ladder. It is constructed of metal with two sides affixed to horizontal cross members.
local area network (LAN) A geographically limited data communications system for a specific user group consisting fo a group of interconnected computers sharing applications, data, and peripheral devices such as printers and CD-ROM drives intended for the local transport of data, video, and voice.

M

main terminal room See main terminal space.
Master Plan for Information and Instructional Technologies
megahertz (MHz) A unit of frequency equal to one million cycles per second (hertz).
multiple access In satellite communications satellite from a number of ground stations.

N

National Fire Protection Association (NFPA ®) Association that writes and administers the *National Electrical Code ® (NEC ®).*

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Descriptions

1. A strategic direction as regards data communications For most USG campuses should be to consider the campus wireless networking “radio space” to be part of a mandate to provide campus wide n(id)4.Tart

a SHARED bandwidth technology (like old 10BaseT hubs). As such, technologies that rely on *keys will be published to the campus population. Communication links will not be encrypted. Access may be restricted to selected services. Public Access systems will not be used to host servers; however users entering the network through a Public Access would be able to use servers hosted on the cabled infrastructure.*

All Wireless systems whether Public or Private will be registered with UCCS. As a minimum UCCS will retain information on frequency assignment, physical location, zone key and responsible department contact. New wireless systems must be reviewed by UCCS before purchase or implementation. Registration of wireless user devices will be centrally managed by UCCS. Frequency allocation will be managed by UCCS to ensure recommended industry separation. Wireless hubs that are interfering with property registers production hubs will be disconnected until the device can be setup in a non-interfering configuration."

APPENDIX

USG Guidelines/ Requirements/ Resources

- USG approved enrollment targets (approved annually through the Office of Academic & Fiscal Affairs
- USG Building Project Procedures and Design Criteria
- USG Environmental Evaluations for Projects within the University System of Georgia
- USG Facilities, Curriculum and Room Utilization Annual Summary
- USG Faculty Information Report
- USG Information Digest and Fact Book
- USG Institutional Strategic Planning Guidelines
- USG Instructions for Preparation of Five-Year Capital Outlay Funding Requests
- USG Physical Master Planning Template Reference Guide
- USG Principles for Capital Resources Allocation
- USG Real Property Inventory System (institution data)
- USG Comprehensive Plan
- USG Environmental Health and Safety Policy

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3.1 Fiber Optic Cable Markings

– Building codes and regulations.
  – Firestopping.

4.3 Main Entrance Cable Guidelines

OSP cables are typically unlisted because of the sheath material and filling compounds used within the cables. In the United States, the NEC allows the use of exposed OSP cable for the first 15.2 m (50.0 ft) at the building entrance.

OSP cables routed inside a building are influenced by fire codes. Often a choice must be made between:

- Planning a splice point at the building entrance to transition from outdoor non- listed to indoor listed cable designs. The added loss of the splice is small and usually not significant in the link loss budget, or
- Either enclosing conductive outdoor cables in rigid or intermediate conduit that is properly grounded, or running non- conductive outdoor cables in a raceway.

Underground facilities are cables placed in subsurface conduits, using maintenance holes (MHs) and/ or pull boxes. Splices may be used in MHs for telephone systems only. Splices for fiber systems are prohibited in manholes. Underground pathways use conduit to provide out- of-sight facilities. The conduit:

Á Is usually provided by the building owner.
Á Runs between building entrance locations and also to a pole, pedestal, or MH.

The advantages of underground conduit are that they:

Á Preserve the aesthetic appearance of the premises.
Á Are adaptable for future facility placement or removal.
Á Are economical over a long life.
Á

5.1 Trench Depth

The minimum depth of a trench should allow 600 mm (24 in) of cover from the top of the cable to final grade.

5.2 Locating and Identifying Subsurface Facilities

Identify all subsurface facilities (e. g., power, gas, water, outdoor lighting, etc.) before trenching to avoid damaging them while trenching for a buried cable. Always call the local underground utilities call center before digging. Required install a #6 ground wire along conduit path terminate and ground in each handhold and pull box and terminate before entrance of any building with a 8 ft deep ground rod. This is used to bleed off static charges and to provide a signal path to locate non-metallic systems.

5.3 Warning Tape/Cable Requirements

To minimize any chance of an accidental dig- up, place plastic warning tape a minimum of 450 mm (18 in) above the cable. Warning tape is either:

- Non- detectable, (e. g., containing no metallic elements).
- Detectable, (e. g., containing metallic tracings).

The American Public Works Association has adopted the color orange for telecommunications and CATV cables.

5.4 Conduit Guidelines

1- Regulating Bends

All bends must be long, sweeping bends with a radius not less than:

- Six times the internal diameter of conduits 50 mm (2 in) or smaller, or
- Ten times the internal diameter of conduits larger than 50 mm (2 in). Reaming Conduit All ends of metallic conduit must be reamed. All protruding ends must be fitted with bushings at both ends.

2- Preventing Conduit Shearing

Such backfill is susceptible to load- bearing tension. Metal sleeves through walls must extend to undisturbed earth to prevent shearing, particularly where

3- Minimum Depth

Top of conduit must be buried at least 600 mm (24 in) below the ground surface.

Coaxial cables installed in buildings must meet the same code requirements as telecommunications cables. Cable markings and identification are given to coaxial cable in much the same manner that telecommunications cables are identified.

Cable Marking Type NEC Section Reference
CATV CATV cable 820- 50
CATVP CATV plenum cable 820- 50
CATVR CATV riser cable 820- 50
CATVX CATV cable, limited use 820- 50

Signal Loss in the Network
There are four factors that must be considered when calculating losses in designing a network:
• Cable loss
• Splitter loss
• Insertion loss
• Isolation loss

Cable loss is calculated based on the distance that a signal must travel along with the lowest and highest frequency transmitted on the system. When calculating cable loss, consider the:
• Cable manufacturer’s loss value, which is generally given as a dB value per 100 m (328 ft), or per 100 m (328 ft) at several frequencies.
• Transmission frequency of the signal. Because losses are greater at higher frequencies, calculate the loss for the lowest and highest frequency that the system will deliver. This characteristic of coax cable is called cable tilt. Most cable loss values are based on a temperature of 20 °C (68 °F) and will vary slightly under different conditions. Like other current-carrying cables, CATV cables show increased resistance and loss at higher temperatures. However, it is usually safe to disregard temperature compensation calculations when dealing with intrabuilding systems.

Insertion loss is a measure of the attenuation of a signal between the input and output of a passive device. The unit of measure for insertion loss is the dB. The insertion loss for directional couplers and tap- offs is determined by the tap value. The lower the tap value the higher the insertion loss. The insertion loss for a splitter is a direct function of the quantity of output ports.

2. Determine the location of all WAs that will be equipped for CATV.

3. Identify the location of the headend.

4. Determine the system topology or combination.

5. Determine the appropriate fire rating for the coaxial cable sheath. Plan on installing conduit if the local building code requires it.

6. Decide on the routing of the trunk cables from the headend to each area to be served. Routing of the trunk cables should be such that taps can be centrally located within their serving area. It is common for multiple trunk cables to be used in a system.

7. Place all taps in the IDR. Taps typically serve from two to eight outlets. Unlike a traditional voice and data network, a CATV network in a private building seldom has any moves, adds, changes (MAC) activity; therefore, ease of access for cross-connects is not a concern.

8. Determine the routing of the subscriber drop cables.

9. Type of coax that will be used for the drop cable. RG6Q for runs up to 200 feet and RG11Q for runs from 200 to 300 ft

10. Calculate the loss of each subscriber drop that will attach to a tap. Unlike telecommunications cables, the length of the coaxial cables has an impact on the distribution network design. The loss difference between the shortest and longest drop cables from a tap should be no more than 7 dB. This will provide the recommended signal level at the outlet of 3 dBmv to 10 dBmv. The loss should be calculated for the

Proof of performance testing involves two steps:

16. Aligning/ balancing the system.
17. Testing the system and its components.

Aligning and balancing the system involves adjusting the gain or sensitivity of the system's amplifiers to match the specified signal levels in the system design. The system's performance cannot be analyzed until this aligning and balancing is completed.

The test equipment used should include signal level meters (SLMs) and time domain reflectometers (TDRs). The tests should ensure that the system and its components meet the specifications for:

18. Distortion.
19. Signal uniformity.
20. Signal- to- noise ratio (SNR).
21. Signal ingress.
22. Hum modulation.

Generally, impedance, time domain, and structural return loss tests are performed as a pre-installation check of the cable. Testing for distortion, signal uniformity, and SNR is performed on installed cable using a SLM unit. Final quality test should be preformed by providing a video signal from a VCR and viewing that signal with a color TV on the low band channels and the VHF channels.

If a campus owned telephone switch is utilized. It shall have power UPS back for a minimum of 8 hours such that telephone service can be maintained under emergency conditions for life safety.

Network Operation Centers and distributed router locations should have some form of UPS support. Normally individual 1200 VA @ 15 minutes are utilized for each router to ride over the short nuance voltage dips, surges and short outages. These types of interruptions can cause major problems with the network equipment.

Switches and hubs do not normally require UPS support.

The most common configuration is to have small local UPS systems with a building emergency generator. The small UPS systems will bridge the time until the generators come on line. More detail discussions below on this subject.

1.4 Engine Generator

An engine generator is a unit that uses a fuel- powered engine (Regents require natural gas powered) to drive a rotary generator. It is usually used as a standby power source when long-term backup is required. However, startup time is slow (nominally, 15 seconds), and an engine generator does not provide any conditioning or protection when not running. Engine generators are generally used with automatic transfer switches to provide power during extended outages.

1.5 Static Uninterruptible Power Supply (UPS) Units

Static UPS units are solid state devices designed to protect critical loads from most types of power aberrations. There are several different types of static UPS units, and some work better than others. A brief explanation of each basic group follows. The UPS should have a sine wave output with a total harmonic distortion of 5 percent or less.

- Because certain non- linear loads can develop a leading power factor, the UPS should have the ability to support these power factors.
- The UPS should provide continuous (no- break) power during momentary or complete blackouts.
- The UPS should have the ability to recharge the battery to 90 percent capacity within a reasonable period of time (5 to 10 times the discharge time).
- The UPS output should be regulated with maximum deviations from nominal of +6 percent to -13 percent over the full input range, both ac and dc. This meets

APPENDIX

Sample Telecommunications & Multimedia Design Guide

Telecommunications

1.01 General

Telecommunications is to be considered as a prime utility with the same status as electrical power, water and sewer in new construction and renovations projects. The College/University, when developing its project program budget, is to include telecommunications infrastructure (by Architects and Engineers) and basic electronics budgets.

The development of design and construction documents for telecommunications infrastructure should be included in the full scope project construction documents as prepared by the design professionals for the project.

The following are minimum design guide lines for use in all state facilities.

1.02 Programmatic Design Stage

A. The design professional will meet with the College/University Information Technology staff along with the Telecommunications Division of Georgia Technology Authority (GTA) to determine the following site-specific issues:

Establish a contact team for the College/University and GTA Information Technology representative.

Using College/University's preferred data and telephone topology for the wiring infrastructure and electronic methodology.

Develop a preliminary budget for the cabling infrastructure for data, telephone and video as part of the project construction cost.

Develop a preliminary budget for the data electronics (hubs, routers, etc) necessary to meet the minimum requirements. The data electronics budget shall be included as a sub line item in the loose equipment budget of the project budget.

Telephone sets and installation of telephone dial tone shall not be part of the project budgets.

1.03 Preliminary Design Stage

1. Site specific requirements for local telephone service routes to site, service and backbone cable, raceway requirements and data service for the site.

2. Establish any College/University deviations from the telecommunications minimum requirements.

1.04 Fundamentals of Design

1. In all cases of new construction and renovation, projects shall include a

data/telephone network connection in each classroom, office (selected offices for video only), laboratory, conference room, and dorm room. Video distribution system shall be included to service classrooms, lecture halls and auditoriums when required by the Using Agency.

2. The design for these networks should be complete enough to provide fundamental data network communications to each port typically located at a telephone location.

3. All of the equipment selected and designed by the College/University shall meet or exceed national accepted standards of IEEE 802.3 or 802.5 or other national standards. The College/University may enhance the telecommunications requirements for their project, but may not deviate below the minimum requirements as specified by this document.

4. In the case of renovations, it is the removal of existing communications cables is required.

1.05 General Building

A. Create a central entrance for all communications for a building. This space will be known as the Main Distribution Frame (MDF) room. Locate the telephone and data entrance in this location. Reference the BICSI TDMM manual latest edition for details and specifics.

1. Terminate all fiber in a wall interconnect centers or stand alone cabinets/rails

2. For data services in buildings which are located in a campus environment, interconnect all buildings with a minimum of 12 strand multimode and 12 strand singlemode fiber optic cables with their network center. Refer to the following list for recommended fiber counts based on building use/occupancy:

Residential or Small Admin	12mm/12sm
Small Admin	12mm/12sm
Large Admin	24mm/24sm
Academic	12mm/12sm
Large Academic	36mm/36sm
Research	12mm/12sm
Large Research	48mm/48sm

Multi-mode Fiber: - Outer Jacket shall be orange or gray

Wavelengths	850nm	1300nm
Attenuation (max.)	3.5 dB/km	1.1 dB/km
Bandwidth (min.)	200 MHZ-km	500 MHZ-km

Single-mode Fiber: - Outer jacket shall be yellow

Wavelengths	1310nm	1550nm
Attenuation (max.)	0.4 dB/km	0.3 dB/km
Bandwidth (min.)	N/A	N/A

without any additional wiring.

6. The contract documents shall provide for testing every cable. The test results shall be subject to review and verifications by the College/University and/or GTA.

7. The Professional Design Team will interview the tenants for any additional networking requirements.

1.09 Network Equipment

1. All network equipment should be located in the network closets. Do not allow active equipment to be placed in hidden or ceiling spaces.

2. Provide a minimum 2 each dedicated 20 amp 120 volt duplex receptacles, each on their own circuit, with an isolated ground in each network closet.

3. If required, provide one 700VA UPS and one 8 plug strip per closet for network equipment power supply.

4. Provide sufficient network electronics to activate one data port per office, lab and work space. Each activated data port shall be 10/100 Mbps switched Ethernet. The electronics in each IDF shall be linked back to the MDF via ATM over MM fiber. At the MDF there shall be an ATM switch with enough capacity to activate each stack of switched hubs in the data closets, provide LAN emulation services, and provide an ATM link back to the main computing or network center.

1.10 Standards

1. EIA/TIA 569A Commercial Building Telecommunications Cabling Standard

    1. Horizontal Cabling
    2. Backbone Cabling
    3. Work Area
    4. Telecommunications Closet
    5. Equipment Room
    6. Entrance Facility
    7. 100 OHM Cabling System, TSB-67 and EIA/TIA 569A

2. ANSI/EIA/TIA-569 Commercial Building Standard for Telecommunications Pathways and Spaces.

    1. Horizontal Pathways
    2. Backbone Cabling
    3. Work Station
    4. Telecommunications Closet
    5. Equipment room
    6. Entrance Facilities
    7. Separation from Electromagnetic Energy Sources

A. In all cases if new construction and renovation, projects shall include the minimum standard multimedia infrastructure cabling in each classroom, and should be considered for each conference and training room. Speech reinforcement should be considered for rooms with a capacity greater than 70.

B. The design of the multimedia infrastructure should be complete enough to provide fundamental local electronic presentation with appropriately installed component electronics.

C. All of the equipment selected and designed by the College/University shall meet or exceed all applicable UL, NEC, and NEMA standards and requirements. The College/University may enhance the multimedia requirements for their project, but may not deviate below the minimum requirements as specified by this document.

D. In the case of renovations, it is recommended that the removal of all existing cables be reviewed, if appropriate. OIT/ET should be part of this review.

1.05 General Building

A. One 20-Amp circuit per room should be dedicated for classroom multimedia use.

1. One duplex outlet at equipment cabinet location to provide power for Audio/Control Module (see 1.06, B, 3).

2. One duplex outlet at Input Plate Module (see 1.06, B, 1) location to provide power for instructional source equipment (Laptops, VCR's, etc).

3. One duplex outlet at projector location to provide power to the projector and switching equipment.

4. One junction box at screen location to provide power for motorized screen.

B. Two network connections per room should be dedicated for classroom multimedia use.

1. One connection at equipment cabinet location to provide network connection for Audio/Control Module (see 1.06, B, 3).

2. One connection at Input Plate Module (see 1.06, B, 1) location (in most cases this connection can be made with a patch cable from the Input Plate Module to a connection paired with above connection).

1.06 General Classroom

A. Pathways of sufficient capacity should be planned between the various components. Distance should not exceed 50 feet.

B. Standard Module Components

1. The Input Plate Module is placed in two 3-gang electrical housings typically at outlet height. Standard location is in the front of the room to the left of the

black/white boards. All connections to the input plate must be designed for quick

C. Any applicable trade and industry standards.

D. State and National Electrical codes.

1.08 Contact Information

A. OIT/ET Director

B. OIT/ET System Support Specialist

END of SECTION

Organization How to Contact

ANSI American National Standards Institute
11 W 42nd St, 13th Flr
New York, NY 10036 USA
212- 642- 4900; fax: 212- 398- 0023
e- mail: info@ ansi. org
Web site: www.ansi.org

ASTM American Society for Testing and Materials
100 Barr Harbor Dr
W Conshohocken, PA 19428- 2959 USA
601- 832- 9585; fax: 610- 832- 9555
e- mails: service@astm.org
infoctr@local.astm.org
Web site: www.astm.Org

ATIS Alliance for Telecommunications Industry Solutions
1200 G St NW, Ste 500
Washington, DC 20005 USA
202- 434- 8837; fax: 202- 393- 5453
e- mail: atispr@atis.org
Web site: www.atis.Org

Bellcore See Telcordia TM Technologies

BOCA Building Officials and Code Administrators (BOCA)International, Inc.
4051 W Flossmoor Rd
Country Club Hills, IL 60478- 5795 USA
708- 799- 2300; fax: 708- 799- 4981
e- mails: info@bocai.org
boca@aecnet.com
Web site: www.bocai.Org

CSI Construction Specifications Institute
99 Canal Center Plaza, Ste 300
Alexandria, VA 22314
800- 689- 2900 or 703- 684- 0300
fax: 703- 684- 0465
Web site: www.csinet.Org

EIA Electronic Industries Alliance
2500 Wilson Blvd
Arlington, VA 22201- 3834 USA
703- 907- 7500; fax: 703- 907- 7501

e- mail: publicaffairs@eia.org
Web site: www.eia.Org

FCC Federal Communications Commission
445 12th St SW
Washington, DC 20554 USA
888- 225- 5322 or 202- 418- 0190
fax: 202- 418- 0232
e- mail: fccinfo@fcc.gov
Web site: www.fcc.Gov

ICEA Insulated Cable Engineers Association, Inc.
PO Box 440
S Yarmouth, MA 02664 USA
508- 394- 4424; fax: 508- 394- 1194
e- mail: icea@capecod.net
Web site: www.icea.Net

IEEE ® Institute of Electrical and Electronics Engineers, Inc.
445 Hoes Ln
PO Box 1331
Piscataway, NJ 08855- 1331 USA
732- 981- 0060; fax: 732- 981- 9667
e- mail: customer. service@ieee.org
Web site: www.ieee.Org

ISO International Organization for Standardization
1, rue de Varembé
Case postale 56
CH- 1211 Geneva 20, Switzerland
41- 22- 749- 01- 11; fax: 41- 22- 733- 34- 30
e- mail: central@iso.ch
Web site: www.iso.Ch

NEMA ® National Electrical Manufacturers Association ®
1300 N 17th St, Ste 1847
Rosslyn, VA 22209 USA
703- 841- 3200; fax: 703- 841- 3300
e- mail: webmaster@nema.org
Web site: www.nema.Org

NFPA ® National Fire Protection Association ®
1 Batterymarch Park
PO Box 9101
Quincy, MA 02269- 9101 USA
617- 770- 3000; fax: 617- 770- 0700
e- mails: custserv@nfpa.org
library@ nfpa. org

Web site: www.nfpa.Org

OSHA Occupational Safety and Health Administration
200 Constitution Ave NW
Washington, DC 20210 USA
800- 321- 6742 or 202- 693- 1999
fax: 202- 219- 5986
Web site: www.osha.Gov

SBCCI Southern Building Code Congress International, Inc.
900 Montclair Rd
Birmingham, AL 35213- 1206 USA
205- 591- 1853; fax: 205- 591- 0775
e- mail: info@sbcci.org
Web site: www.sbcci.Org

TIA Telecommunications Industry Association
2500 Wilson Blvd, Ste 300
Arlington, VA 22201- 3834 USA
703- 907- 7700; fax: 703- 907- 7727
e- mail: tia@tia.eia.org
Web site: www.tiaonline.Org

- IEEE 802.11b— Specifications for a high- speed physical layer extension in the 2.4 GHz frequency band IEEE 802.14— Cable Modem (Cable- TV) Working Group

The IEEE 802.14 working group is responsible for developing standards and recommended practices for access control and physical signaling to be used on networks operating over cable TV infrastructures.

International Organization for Standardization/ International Electrotechnical Commission Joint Technical Committee Number 1 (ISO/ IEC JTC1)

ISO/ IEC JTC1 produces standards that affect telecommunications. The most relevant are:

- ISO/ IEC 11801, Information Technology— Generic Cabling for Customer Premises, 1995. Refer to Comparison Between ANSI/ TIA/ EIA, ISO/ IEC, and CENELEC Standards in this chapter.
- ISO/ IEC 11801 Amendment 1, 1995. Refer to Comparison Between ANSI/ TIA/ EIA, ISO/ IEC, and CENELEC Standards in this chapter.
- ISO/ IEC 11801 Amendment 2, 1995. Refer to Comparison Between ANSI/ TIA/ EIA, ISO/ IEC, and CENELEC Standards in this chapter.
- ISO/ IEC 14763- 1, Information Technology— Implementation and Operation of Customer Premises Cabling— Administration, 1999.

U. S. National Fire Protection Association ®(NFPA ®)

The NFPA develops and produces the following fire and safety codes relating to telecommunications:

- NFPA- 70, National Electrical Code ® (NEC ®).
- NFPA- 70E, Standard for Electrical Safety Requirements for Employee Workplaces.
- NFPA- 71, Installation, Maintenance, and Use of Signaling Systems for Central Station Service.
- NFPA- 72, National Fire Alarm Code.
- NFPA- 75, Protection of Electronic Computer/ Data Processing Equipment.
- NFPA- 101, Life Safety Code.
- NFPA- 297, Guide on Principles and Practices for Telecommunications Systems.
- NFPA- 780, Standard for the Installation of Lightning Protection Systems.

Telecommunications Industry Association/ Electronic Industries Alliance (TIA/ EIA)

TIA/ EIA produces several documents and standards that affect telecommunications. Among the most important are:

- ANSI/ TIA/ EIA- 568- A, Commercial Building Telecommunications Cabling Standard, 1995.
- ANSI/ TIA/ EIA- 568- A- 1, Propagation Delay and Delay Skew Specifications for 100- Ohm 4- Pair Cable, 1997.
- ANSI/ TIA/ EIA- 568- A- 2, Corrections and Additions to ANSI/ TIA/ EIA- 568- A, 1998.
- ANSI/ TIA/ EIA- 568- A- 3, Hybrid Cables, 1998.
- ANSI/ TIA/ EIA- 568- A- 4, Production Modular Cord NEXT Loss Test Method and Requirements for Unshielded Twisted- Pair Cabling, 1999.
- ANSI/ TIA/ EIA- 568- A- 5, Transmission Performance Specifications for 4- Pair 100- Ohm Category 5e Cabling, 1999.
- ANSI/ TIA/ EIA- 569- A, Commercial Building Standard for Telecommunications Pathways and Spaces, 1998.

- ANSI/ TIA/ EIA- 569- A- 1 Addendum 1, 2000. Replaces Section 4.7, Perimeter Pathways, 1999.
- ANSI/ TIA/ EIA- 569- A- 2 Addendum 2, 2000. Replaces Section 6.3.3, Furniture Pathways, 1999.
- ANSI/ TIA/ EIA- 569- A- 3 Addendum 3, 2000. Revision to Subclause 4.3, Access Floors, 1999.
- ANSI/ TIA/ EIA- 569- A- 4 Addendum 4, Poke- Thru Devices, 2000.
- ANSI/ TIA/ EIA- 570- A, Residential Telecommunications Cabling Standard, 1999.
- ANSI/ TIA/ EIA- 606 (1993), Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, 1993.
- ANSI/ TIA/ EIA- 607, Commercial Building Grounding and Bonding Requirements for
- Telecommunications, 1994.

NOTE: Both the ANSI/ TIA/ EIA- 606 and 607 standards are in process of revision at the time of this publication.

- ANSI/ TIA/ EIA- 758, Customer- Owned Outside Plant Telecommunications Cabling Standard, 1999.

STATE OF GEORGIA ADOPTED CODES
The Uniform Codes Act is codified at chapter 2 of title 8 of The Official Code of Georgia Annotated. O.C.G.A. Section 8-2-20(9)(B) identifies the Fourteen “state minimum standard codes”. Each of these separate codes typically consist of a base code (e.g. The Standard Building Code as published by the Southern Building Code Congress International) and a set of Georgia amendments to the base code. Georgia law further dictates that eight of these codes are “mandatory” (are applicable to all construction whether or not they are locally enforced) and six are "permissive" (only Applicable if a local government chooses to adopt and enforce one or more of these codes). These codes are as follows:

Mandatory Codes

SBCCI Standard Building Code,1994 Edition, with Georgia Amendments
SBCCI Standard Gas Code (International Fuel Gas Code), 2000 Edition, with Georgia Amendments
SBCCI Standard Mechanical Code (International Mechanical Code), 2000 Edition, with Georgia Amendments
SBCCI Standard Plumbing Code (International Plumbing Code), 2000 Edition, with Georgia Amendments
National Electrical Code, 1999 Edition, with Georgia Amendments
SBCCI Standard Fire Prevention Code, 1994 Edition, with Georgia Amendments
CABO Model Energy Code, 1995 Edition, with Georgia Amendments
CABO 1 and 2 Family Dwelling Code, 1995 Edition, with Georgia Amendments

Permissive Codes

SBCCI Standard Housing Code, 1994 Edition, with Georgia Amendments
SBCCI Standard Amusement Devise Code, 1985 Edition
SBCCI Excavation and Grading Code, 1975 Edition
SBCCI Existing Building Code, 1994 Edition
SBCCI Swimming Pool Code, 1994 Edition, with Georgia Amendments
SBCCI Unsafe Building Abatement Code, 1985 Edition

S SBCCInnd siar6Ciamn,O.C.G.ool CoA. S

APPENDIX

References

Georgia Institute of Technology Architectural and Engineering Design Requirements. 2001, Section 16720

State of Georgia Office of Management and Budget Telecommunications Design Guidelines 1998

TDM Manual on CD- ROM, 9th edition © 2000 BICSI ® Chapter 4: Horizontal Distribution Systems

ANSI/EIA/TIA 569-B

Simon Cabling Systems Training Manual IS-1821-01, Rev H

Corning Landscape Consultant Linkup Program “Emerging Technologies Fiber Optic Design TR-Consultant Training Course USA.LKU-129/ September 2000/2001

ANSI/ TIA/ EIA- 568- B. Commercial Building Telecommunications Cabling Standard Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, October 1995.

VANSI/ TIA/ EIA- 569- B. Commercial Building Standard for Telecommunications Pathways and Spaces. Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, February 1998.

ANSI/ TIA/ EIA- 604- 2FOCIS 2— Fiber Optic Connector Intermateability Standard Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, November 1997.

ANSI/ TIA/ EIA- 604- 3 FOCIS 3— Fiber Optic Interconnector Intermateability Standard Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, August 1997.

Corning Landscape Consultant Linkup Program “Emerging Technologies Fiber Optic Design TR-Consultant Training Course USA.LKU-129/ September 2000/2001

ANSI/ TIA/ EIA-568- B. 1, B. 2

State OF Georgia, Sectary of State, Department of Community Affairs

TDM Manual 9th edition © 2000 BICSI ® Chapter 2: Codes, Standards, and Regulations

Georgia Institute of Technology Architectural and Engineering Design Requirements. 2001, Section 16720

State of Georgia Office of Management and Budget Telecommunications Design

ANSI/ TIA/ EIA- 606 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, February 1993.

ANSI/ TIA/ EIA- 758 Customer- Owned Outside Plant Telecommunications Cabling Standard. Arlington, Va.: Telecommunications Industry Association/ Electronic Industries Alliance, February 1999. Telcordia Technologies, Inc. (Bellcore). TR- TSY- 000100 Issue Bulletin. Morristown, N. J.: Telcordia Technologies, Inc. Replaced by GR- 421- CORE, Generic Requirements for Metallic Telecommunications Cables, December 1998.

TR- TSY- 000107 Issue 2 Bulletin. Morristown, N. J.: Telcordia Technologies, Inc. Replaced by GR- 421- CORE, Generic Requirements for Metallic Telecommunications Cables, December 1998.

Ortronics Certified Installer Training Course 2001

Simon Cabling Systems Training Manual IS-1821-01, Rev H

Corning Landscape Consultant Linkup Program “Emerging Technologies Fiber Optic Design TR-Consultant Training Course USA.LKU-129/ September 2000/200

Georgia Institute of Technology Architectural and Engineering Design Standards, January 29, 2001

American National Standards Institute. ANSI T1.311. American National Standard for Telecommunications— DC Power Systems— Telecommunications Environmental Protection New York: American National Standards Institute, 1998.

ANSI T1.313. American National Standard for Telecommunications— Electrical Protection for Telecommunications Central Offices and Similar Type Facilities. New York: American National Standards Institute, 1998.

ANSI/ IEEE Standard 142. Recommended Practice for Grounding of Industrial and Commercial Power Systems. New York: Institute of Electrical and Electronics Engineers, Inc., 1991. Also known as the IEEE Green Book.

ANSI/ IEEE Standard 241. Recommended Practices for Electrical Power Systems in Commercial Buildings. New York: Institute of Electrical and Electronics Engineers, Inc., 1990. Also known as the IEEE Gray Book.

ANSI/ IEEE Standard 446. Recommended Practice for Emergency and Standby Power Systems for Industrial and Commercial Applications. New York: Institute of Electrical and Electronics Engineers, Inc., 1987. Also known as the IEEE Orange Book.

ANSI/ IEEE Standard 1100 Recommended Practice for Powering and Grounding

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"Campus Network Strategies: A small College Perspective

http://www.educause.edu/ir/library/html/cenm9916.html

Georgia Technology Authority
"2001 telecommunications Design Guide"
http://

California State University
"Telecommunications Infrastructure Planning Guidelines"

http://www.calstate.edu/tier3/PPD/AE/Design_STDS.html

Printed Reference Materials

Moving the Vision into Practice, Elementary School Edition. Arlington, Va.: National Science Teachers Association. Maryland State Department of Education. 1994. Science Facilities Design Guidelines. Baltimore, Md.: Maryland State Department of Education. National Research Council, National Committee on Science Education Standards and Assessment. 1995. National Science Education Standards. Washington, D.C.: National Academy Press. http://books.nap.edu/catalog/4962.html.

4. National Science Foundation. 1999. “National Science Foundation Wireless Field Test for Education Project, Old Colorado City Communications.” http://wireless.oldcolo.com .

5. National Science Teachers Association (NSTA). 1990. Science Education for Middle Level Students. http://www.nsta.org/handbook/midlev.htm.

6. National Science Teachers Association (NSTA). 1999. NSTA Guide to School Science Facilities. Arlington, Va: National Science Teachers Association. Office for Civil Rights. 1999. Compliance with the Americans with Disabilities Act: A Self-Evaluation Guide for Public Elementary and Secondary Schools. U.S. Department of Education. http://www.edlaw.net/service/guidcont.html.

7. Rakow, Steven L., ed. 1998. NSTA Pathways to the Science Standards: Guidelines for Moving the Vision into Practice, Middle School Edition. Arlington, Va.: National Science Teachers Association. Texley, Juliana and Ann Wild, eds. 1996. NSTA Pathways to the Science Standards: Guidelines for Moving the Vision into Practice, High School Edition. Arlington, Va.: National Science Teachers Association.

The Georgia Library Learning Online (GALILEO) is available at
http://galileo.gsu.edu/Homepage.cgi

To order one copy of the University System of Georgia documents listed in the Template's Materials Checklist, contact Robby Pinder, Administrative Secretary for Facilities Planning, University System of Georgia Board of Regents at 404.656.2246 (tel) or
rpinder@mail.regents.peachnet.edu

To obtain electronic (ArcInfo format) plan graphics of each college/university including building footprints, hydrology, sidewalks, streets, building name and number, contact
Craig Tomlinson, GIS Project Manager, University of Georgia
at craig@itos.uga.edu

Questions related to environmental safety may be directed to Mark Demyanek, Director of Environmental Safety, University System of Georgia Board of Regents at
mdemyane@mail.regents.peachnet.edu

A list of campus buildings, which are included on or have been nominated for the National Historic Register may be obtained by contacting Sheila Kelley, OIIT, University System of Georgia
Board of Regents at 706.369.6436 (tel) or
skelley@mail.rath.peachnet.edu

Questions related to posting final master plan documents on the Internet should be directed to the OIIT representative at the college or university. Additional questions may be directed to Brad Bacon, Webmaster, OIIT, University System of Georgia Board of Regents at
brad_bacon@oit.peachnet.edu

Template formatting is explicitly outlined in both the Physical Master Planning Template and the Physical Master Planning Template Reference Guide documents. Graphic details specific to the college or university such as logos, images, etc., should be obtained from or authorized by the college or university media and publications office. Questions related to graphics for the University System of Georgia may be directed to the University System of Georgia Office for Media and Publications at 404.656.2250.

C. Georgia Technology Authority References

1. EIA/TIA 568-A 1998 Commercial Building Telecommunications Cabling Standard
2. Horizontal Cabling
3. Backbone Cabling
4. Work Areas
5. Telecommunications Rooms
6. Equipment Room
7. Entrance Facilities
8. 100 OHM Cabling System, TSB-67/95 and EIA/TIA 568-A Annex E

1. EIA/TIA-606 1995 Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.

A

access point (AP) The central or control point in a wireless cell that acts as a bridge for traffic to and from wireless devices in the cell. The AP also connects wireless devices to the wired portion of the LAN.
access provider (AP) A company, such as a telephone company, that provides a circuit path between a service provider and the client user. An access provider can also be the service provider.
administration* The method for labeling, documentation, and usage needed to implement moves, additions, and changes of the telecommunications infrastructure.
American wire gauge (AWG)
A system used to specify wire size. The greater the wire diameter, the smaller value (e.g., 24 AWG [0.51 mm (0.020 in)].
American Society of Heating, Refrigerating, and Air- Conditioning Engineers (ASHRAE) An international society organized for the sole purpose of advancing the arts and sciences of heating, ventilating, air conditioning, and refrigerating for the public's benefit through research, standards writing, continuing education, and publications.
Americans with Disabilities Act(ADA) U. S. Department of Justice regulations and guidelines under civil rights law that ensure individuals with disabilities have access to, or may use, public entities and government buildings.
ampere (A) Unit of electric current. One ampere is equal to the current produced by one volt acting through a resistance of one ohm.
Amplifier An electronic device that takes an incoming signal and increases the signal strength so that the signal can transmit a greater distance.
Analog A format that uses variable such as voltage amplitude or frequency variations to transmit information.
Annunciator A signaling device, usually electrically operated, that gives an audible and/ or visual signal when energized.
approved ground A ground that has been approved for use by the authority having jurisdiction. See earth ground and ground.
Armoring Cable protection, usually made of corrugated steel, or PVC for protection against severe outdoor
environments, rodents, or other physical damage.
as- built drawing A final form of drawing in electronic or hard- copy format inclusive of all "record copy" information and notes.

B

badge reader A security system device that reads coded cards or badges. Synonym: card reader.
Backboard A panel (e. g., wood or metal) used for mounting connecting hardware and equipment.
backbone* A facility (e. g., pathway, cable, or conductors) between telecommunications rooms, or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildingsand ther-0.000([(A)83.5(

Bandwidth A range of frequencies, usually the difference between the upper and lower limits of the range, expressed in Hz. It is used to denote the potential capacity of the medium, device, or system. In copper and optical fiber cabling, the bandwidth decreases with increasing length.
bend radius Maximum radius that a cable can be bent to avoid physical or electrical damage or cause adverse transmission performance.
bits per second (b/ s) A unit of measure used to express the data transfer rate. Commonly used rates include kilobit per second (kb/ s), megabit per second (Mb/ s), and gigabit per second (Gb/ s).
Bonding The permanent joining of metallic parts to form an electrically conductive path that will assure electrical continuity, the capacity to safely conduct any current likely to be imposed, and the ability to limit differences in potentials between the joined parts.
bonding conductor (BC) A conductor used specifically for the purpose of bonding.
break- out cable Multifiber cables where each optical fiber is further protected by an additional jacket and optional strength elements.
Bridge An internetworking device used to connect separate LANs or to link two network segments, and to filter information between them as well as traffic, collisions, and other network problems. The transport takes place at the media access control level (Layer 2 in the Open Systems Interconnection model).
Broadband A general term for transmission of signals that have wide bandwidth (e. g., integrated services digital network) or multiple modulated channels (e. g., 10BROAD- 36).
broadband transmission servi1(lated chan)4.4(G)-124 Tw[(i3 94[(netw)5.1(e)-0.9(r protecte)a 0 1(the c T 01437rn aso]T

cable sheath* A covering over the optical fiber or conductor assembly that may include one or more metallic members, strength members, or jackets.
cable terminal An assembly used to access the conductors of a cable.
cable tray (CT) A support mechanism used to route and support telecommunications cable or power

conduit run Multiple sections of conduit.
connecting hardware A device, or combination of devices, used to connect two cables or cable elements.
Connector A mechanical device used to provide a means for aligning, attaching, and achieving continuity between conductors or optical fibers.
cross- connect* A facility enabling the termination of cable elements and their interconnection or cross-connection.
cross- connection* A connection scheme between cabling runs, subsystems, and equipment using patch cords or jumpers that attach to connecting hardware on each end.
Crosstalk The unwanted reception of electromagnetic signals on a communications circuit from another circuit.
Current Flow of electrons in a conductor measured in amperes.
customer premises equipment (CPE) Equipment residing on customer sites (e. g., PBX systems, key systems, data sets, etc.).

D

digital signal (DS) A signal with a fixed number of discrete values. Commonly, a binary signal with two values that are used to transmit the two states (0,1) used by digital computers. Most data transmission in optical fibers is by digital optical pulses. Contrast with analog signal.
digital versatile disc (DVD) A compact disc (CD) that contains full- motion video.
direct- buried cable* A telecommunications cable designed to be installed under the surface of the earth, in direct contact with the soil.
direct current (dc) loop resistance Cable conductor resistance with the far end of the cabling shorted. This is the resistance for both conductors of a coaxial cable.
direct digital control (DDC) A control loop used in building automation systems in which a microprocessor- based controller controls equipment (e. g., air handlers, chillers, boilers, etc.) based on sensor inputs and set- point parameters according to a sequence of operations.
direct sound Sound that travels directly from a speaker to a listener.
Dispersion 1. In most materials, the optical propagation parameters depend on wavelength. This causes the optical pulses to be broadened and have longer time duration. The three types of dispersion in optical fibers are modal, material, and waveguide. **2.** The broadening of the input light pulses along the length of the fiber.
distribution cable That part of the loop that connects the customer location to the customer feeder cable. See horizontal cabling.
Downlink 1. Signals transmitted from satellites to ground stations. **2.** In demand priority access method, the communications channel between a repeater and a connected end node or between a repeater and a lower- level repeater.
Duct 1. A single enclosed pathway for conductors or cables, usually placed in soil or concrete. **2.** An enclosure in which air is moved. Generally part of the heating, ventilating, and air conditioning system of a building.
ductbank (DB)* An arrangement of ducts, for wires or cables, in tiers.

E

earth ground An electrical connection to earth obtained by a grounding electrode system. See ground (gnd).
Easement

electromagnetic disturbance Any electromagnetic occurrence that may degrade the performance of a device, unit of equipment, or system. An electromagnetic disturbance may be noise, an unwanted signal, or a change in the propagation medium itself.
electromagnetic emission The phenomenon by which electromagnetic energy emanates from a source. Emissions can be either radiated or conducted.
electromagnetic immunity The ability of a device, equipment, or system to perform without degradation in the presence of an electromagnetic disturbance.
electromagnetic interference (EMI) Any electrical or electromagnetic interference that causes

integrated services digital network (ISDN) A fully digital communications facility designed to provide transparent end- to- end transmission of voice, data, video, and still images across the public switched telephone network. Access to the service is at one of two rates: the basic rate of 144 kb/ s is provided as two B data channels of 64 kb/ s and one D control channel of 16 kb/ s. The second primary rate is 2.048 Mb/ s in Europe and 1.544 Mb/ s in the United States, Japan, and Canada and is ofs8gnrefnrrd So tas

Loop 1. In telephone systems, the wire pair that connects the customer to the switching center. This path is called a loop because it is generally two wires electrically tied together through the customer terminal set when the customer goes off hook. **2.** The OSP facilities that extend from a serving main entrance facility or remote site to the exchange boundary. **3.**

optical fiber cladding The outer layer of glass surrounding the light- carrying core of the optical fiber. It has a lower refractive index than the core, which serves to confine the light to the core.
optical fiber core The central part of an optical fiber that is used to carry the light pulses, made of glass or plastic.

P
Packet A group of bits, including data and control elements that are switched and transmitted together.
packet switching A data communications switching and transmission system in which an input data stream is broken down into uniform data packets. Each packet is transmitted independently between devices through the network without first establishing a dedicated communications path between the devices. At the receiving end, the packets are checked for errors, resequenced as necessary, and combined into an output data stream.
patch cord A length of cable with connectors on one or both ends used to join telecommunications circuits/ links at the cross- connect.
Penetration Opening made in fire- rated barrier (architectural structure or assembly). There are two kinds of penetrations: • Membrane penetration pierces or interrupts the outside surface of only one side of a fire- rated barrier. • Through penetration completely transmits a fire- rated barrier, piercing both outside surfaces of the barrier.
peripheral device Equipment typically externally connected to and controlled by a PC or directly by a
plenum* A compartment or chamber to which one or more air ducts are connected and that forms part of the air distribution system. Because it is part of the air distribution system, cables installed in this space require a higher fire rating.
power pole Correctly termed a utility column. It is a vertical pathway used to house cables that run from above a suspended ceiling to the termination location in a work area.
private branch exchange (PBX) A device allowing private local voice (and other voice- related services) switching over a network.
Protocol A set of rules and procedures governing the formatting of messages and the timing of their exchange between devices on a network covering addressing, transmitting, receiving, and verifying.
pull box (PB) A device to access a raceway used to facilitate placing of wire or cables.
pull cord Cord placed within a cable pathway, used to pull wire and cable. See drag line.
pull wire See pull cord.

Q

R
Raceway Any enclosed channel designed for holding wires, cables, or busbars.
Rack See cable rack.
radio frequency interference (RFI) A disturbance in the reception of radio and other electromagnetic signals due to conflict with undesired signals having components in the radio frequency range.
record copy drawing Set of drawings that are “hand marked” during the construction phase of a project to document changes that have been made that are used as the source for updates to the design drawings to create as- built drawings.
Repeater An internetworking device that consists of a transmitter and a receiver and is used to amplify (analog) and regenerate (digital) a signal to increase the length of a segment. A multiport repeater will extend the overall reach of the LAN.
request for quotation (RFQ) A document that solicits quotes for telecommunications projects or equipment and provides vendors with all the information necessary to prepare a quote.
riser cable See backbone.
riser closet See telecommunications room.
Router An internetworking device operating at the Network layer of the Open Systems Interconnection model, to direct packets from one network to another.

S
Scalability The ability of a network to grow without degradation of quality.

Security Protection against unauthorized activities, generally requiring a combination of access controls, data integrity, and transaction confidentiality.
security and access control (SAC) Equipment associated with systems used to monitor and control devices such as card readers, door alarms, and closed circuit television (CCTV).
Server A network device that combines hardware and software to provide and manage shared services and resources on the network.
service clearance The space encompassing the equipment, or unit, that is required to permit proper working room for operating, inspecting, and servicing equipment.
service entrance* See entrance facility.
service loop A field- configured coil of cable arranged at the point of termination to facilitate future arrangements.
service provider (SP) A company that provides connection to a part of the Internet, or other services such as application programming interfaces. An SP, when reached by the user through an access provider (AP), becomes the AP to the service they provide. See access provider (AP).
shared tenant service (STS) Consolidates former individual- line subscribers using a common premises switch.
Shield Metallic layer placed around a conductor or group of conductors to prevent electrostatic or electromagnetic coupling between the enclosed wires and external fields.
shielded twisted- pair (STP) cable Cable made up of multiple twisted copper pairs, each pair with an individual shield. The entire structure is then covered

telecommunications bonding backbone interconnecting bonding conductor (TBBIBC) A conductor utilized to interconnect two or more telecommunications bonding backbones.
telecommunications closet (TC) See telecommunications room..
telecommunications grounding busbar (TGB)* A common point of connection for telecommunications system and equipment bonding to ground; located in the telecommunications room or equipment room.
Telecommunications Industry Association (TIA) A standards association that publishes telecommunications standards and other documents.
telecommunications main grounding busbar (TMGB)* A busbar placed in a convenient and accessible location and bonded, by means of the bonding conductor for telecommunications, to the building service equipment (power) ground.
telecommunications outlet (TO)* See outlet/ connector (telecommunications).
telecommunications room (TR) An enclosed space for housing telecommunications equipment, cable terminations, and cross-connects. The room is the recognized cross-connect between the backbone cable and horizontal cabling.
telecommunications service entrance* See entrance facility (telecommunications).
terminal (TERM) **1.** A point at which information may enter or leave a telecommunications network. **2.** The input- output associated equipment. **3.** A device that connects wires to each other.
terminal emulation Software application that allows PC stations to emulate mainframe or other non- PC applications. See emulation.
Termination 1. The ending of a transmission or transmission pathway. **2.** The act of connecting a cable/ wire/ fiber to connecting hardware.
termination hardware* This term is outmoded. See connecting hardware.
time domain reflectometer (TDR) A device that sends a signal down a cable, then measures the magnitude and amount of time required for the reflection of that signal to return. TDRs are used to measure the length of cables as well as locate cable faults.
Tray See cable tray.
Trench A furrow dug into the earth for the placement of direct- buried cable, or for the installation of conduit ducts.
trench duct An interior or exterior trough embedded in co

variable air volume (VAV) A self- contained heating, ventilating, and air- conditioning (HVAC) unit that uses a built- in microprocessor- based controller to control environmental air to a specific zone via a damper. The unit is placed near the end of a HVAC duct and can also monitor temperature inputs from local sensors.
Vault A telecommunications space, typically subterranean, located within or between buildings and used for the distribution, splicing, and termination of cabling. These spaces may be established as a maintenance hole in campus environments or they may include active equipment in addition to passive cabling such as in a controlled environment vault (CEV).
virtual circuit A temporary communications link through an internetwork that appears to be a dedicated circuit between two network devices.
virtual LAN (VLAN) A technique, made possible by switching technologies, that permits the logical grouping of any number of network devices into one or more subnetworks, to improve traffic management and/ or security.
wavelength The length of a wave measured from any point on one wave to the corresponding point on the next wave, such as from crest to crest. The wavelength of light is usually measured in nanometers (nm).
Web Used as a noun, it is shorthand for the World Wide Web (www) services found on the Internet.
wire* An individually insulated solid or stranded metallic conductor.
wireway (WW) A supported pathway for cables.
Wiring See cabling.
wiring closet See telecommunications room.
work area (WA) * A building space where the occupants interact with telecommunications terminal equipment.
work area outlet A device placed at user workstation for termination of horizontal media and for connectivity of network equipment.
workstation A telecommunications device used in communicating with another telecommunications device.

References:

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