SECTION 27 05 00

COMMUNICATIONS

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Part 1 — GENERAL

1.1 SUMMARY

A. This standard is from the Brown University Office of Information Technology (OIT) and distributed as part of the Brown University Department of Facilities Management construction standards.

B. Communications infrastructure must be designed to allow replacement of cable infrastructure during the life of the building. The lifetime of a new building is over 80 years, renovations last 30 to 40 years, but advances in communication technology requires cable to be replaced every 7 to 10 years. Pathways must be accessible for non-disruptive installation of new communications cabling without impact to architectural integrity or occupants use of the facility and must allow for growth in port density and cable sizes.

C. The system design must permit replacement and upgrade of system components while supporting present service. Technicians must be able to access the front and rear of electronics and network patch panels. They must be able to add new cable to existing drops without major disruption and expense. The design must anticipate growth by adding capacity for new communications outlets. This includes sizing of telecommunications rooms and raceway at 40% fill.

D. The communications system installed must function for current and near future communications standards for speed, reliability, and security. Transmission of information at higher speeds requires more energy closer to the consumer. The current generation of network equipment is hotter and larger than the previous generation.

E. The system must accommodate applications to new services such as telephone and video. Telephone service will eventually operate on the data network and will require additional power for telephone handsets. New services will require a substantial increase in power consumption in telecommunications rooms. The increased power will generate a corresponding amount of heat, which must be dissipated to maintain operation of the equipment.

1.2 REFERENCE STANDARDS

Work must conform to all applicable national, state, and local standards. All work must follow the Telecommunication’s Industry standards and best practices as defined and/or interpreted by the following agencies and organizations:

- The American National Standards Institute (ANSI)
- Electronic Industries Association (EIA)
- The Institute of Electrical and Electronic Engineers (IEEE)
- The Telecommunications Industry Association (TIA) ANSI/TIA-568-C
- International Organization for Standardization (ISO)

ISO/IEC DIS 11801

- Building Industry Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)

Should there be conflict between University requirements and code or industry standard, the higher quality and/or requirements that are more stringent shall take precedence.

1.3 DESIGN ENGINEER AND ARCHITECT QUALIFICATIONS

A. The Construction and Design Engineer must have a BICSI (Building Industry Consulting Service International) Registered Communications Distribution Designer (RCDD) on staff that is thoroughly familiar with the cabling methods established by the current BCSI TDMM (Telecommunications Distribution Methods Manual).

B. The Design Engineer shall have at least 5 years experience designing telecommunications systems.

1.4 COMMUNICATION SYSTEM COMPONENT DEFINITIONS

A. Modern communication systems are complex and delicate. There are eight major components that make up a communications system within a building. Item 1-6 below are defined by BICSI and are designed, built, and funded by the construction project. Item 7 is purchased and installed by OIT but funded by the project. Finally, number 8 is the responsibility of the end- user and program requirements, which determine the quantity of components for items 1 through 7.

1. Building Entrance: The room or space inside a building where telecommunications cables enter and leave the building.
2. Equipment Room: An environmentally controlled centralized space for locating equipment that provides an essential service to multiple buildings or academic departments.
3. Such equipment has special environmental and security requirements and must be identified early in the design process. Equipment rooms for departments (server rooms) are always separate from space dedicated to central campus services provided by Computing and Information Services (OIT).

   Equipment manufacturers require temperature and humidity control for proper function of the tel/data equipment. Current industry standards must be followed when designing computing equipment rooms. Requirements must be addressed on a space-by-space basis, depending on the equipment being installed.
4. Backbone: A facility (e.g., pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, entrance facilities, and equipment rooms.
5. Telecommunications Room (TR): An enclosed space for housing telecommunications equipment, cable terminations, and cross—connect

cabling for central campus services. This room may also contain other low voltage service such as card access panels as space permits.

6. Horizontal Cable: The part of the cabling system that extends from (and includes) the work area telecommunications outlet/connector to the horizontal cross—connect (floor distributor) in the telecommunications room.
7. Work Area Outlet: A connecting device in the tenant work area on which horizontal cable terminates. Communications outlets are also referred to as communication outlets or drops. Each work area outlet has one to four jacks dedicated as Data (network) jacks. Jacks may also be referred to as taps. BICSI standard term.
8. Network Electronics: Mounted in racks along with patch panels for horizontal data cable in the telecommunications room, each unit of electronics supports multiple data jacks and must be accessible from the front and rear. Adequate space should be provided for airflow on all sides of the electronics. Every data jack installed is connected to a network port in electronics provided by OIT.
9. Work Area Equipment: Computers, printers, telephones, fax machines, copy machines, cash registers, time clocks, electric meters, lab freezers, vending machines, etc. All work area equipment is purchased and configured by the tenant or department service owner.

1.5 COMMUNICATION SERVICES AND SERVICE LOCATIONS

A. Work area outlets for telephone and network services should be as plentiful as power outlets. Each must be named and labeled according to OIT labeling standards (Section 1.11). This is to identify locations for support and security for network traffic. The number of work area drops per floor determines the MEP requirements of the telecommunication room.

B. Jack Types

1. There is one type of communication jack in a work area outlet: data (D). Legacy phone lines are data cables with a voip to pots gateway and may be denoted as (V) outlets. They should be treated as data outlets in all ways.

   Each data cable terminated is at the telecommunications room on a loadable jack patch panel in tap id sequence, room number order.

C. Administrative Work Areas Offices and Work Partitions

1. A minimum of one work area outlet per workstation (per person). Two Data (Dx2)
2. For building areas where it would be difficult to add telecommunications outlets later, a minimum of two separate telecommunications outlets should be provided in the initial design.
3. The outlets should be located to allow maximum flexibility for change in the work area (i.e. on opposing walls).
4. Any office work area over 10 ft. x 10 ft. should receive at least two outlets. There should be at least one work area outlet for every 100

square feet.

5. The maximum length of a computer patch cord is 16 feet from the wall outlet.
6. The work area telecommunications outlet box should be located near an electrical outlet (within 1 m [3 ft.]) and installed at the same height, if appropriate.
7. The building occupants should be consulted for additional outlet locations.
8. An office outlet consists of 2 data jacks (2D).

D. Conference Rooms

1. Conference phone: Supported conference room phones are listed in Section 2:16
2. 1D at the table center
3. 2D on each side of the room

E. Audio Visual Services

AV devices, including but not limited to microphones and speakers, are now connected to the network and must be considered in any space from classrooms to conference rooms. Details are in their standard: AV Design Standards 27_40_00_1

F. Wireless Service

1. General

a. Brown uses wireless Access Points (APs) manufactured by Aruba. Brown recommends Visual RF, a planning tool available from Aruba to model coverage.

Wireless service must cover all spaces including hallways, mechanical rooms, stairwells, and lounges.

b. Two considerations for locating APs are: Coverage & Capacity

- Coverage — signal strength through the coverage area must be a minimum of -65 dB using 5 GHz on 802.11ac.
- Capacity — Wireless APs must be placed at a density that anticipates the degree of utilization required to support the program in the space covered by the service. Classrooms require a denser coverage model.

c. A minimum of (1) AP is required for each 50 seats in any classroom or auditorium.

d. Access points must be symmetrically spaced to provide complete coverage within the area.

e. Access points may also be purposely placed to reduce interference between APs within the space.

2. Interior Wireless Installation

a. Surface mounted:

b. All Access Points (APs) must be mounted to the ceiling using a four inch double gang junction box with a single gang reduction ring, flush mounted to the ceiling, with two female data jacks (2D) coiled inside. The AP radios are installed by OIT using the single gang ring.

- Mounting heights on exposed ceiling must be below any signal obstructing materials, such as metal ductwork.

c. Orientation matters — ceiling mount, is strongly preferred over wall horizontal mount (only permitted by written waiver by OIT where ceiling mount is not feasible).

d. Brown uses the Aruba AP-535 radio with integrated antenna.

e. Wall mounting requires different equipment.

3. Exterior Wireless Installation

a. The AP (Aruba 377 - antenna and radio) is mounted on a bracket to the exterior of the building on a double gang J box

b. Network jacks (Dx2) must be installed just inside the exterior mount in a secure location (such as above the ACT)

c. The outside AP is connected to the network jack with a patch cord through a ¾“ conduit

G. Voice over IP

1. Proprietary handsets are used for VoIP service deployed on campus.
2. All VoIP phones have an output data jack, which may be used for a desktop computer.

H. Student Rooms

1. Wireless coverage in all spaces.

I. Classrooms

a. See section 27 40 00 – Classroom Audio/Visual Guidelines AV Design Standards 27_40_00_1

J. Laboratories

1. Require 1 communication outlet for each workplace along the bench (2D)
2. Workstation locations (2D) (typically one at end of bench)

K. Reception and Waiting Areas, Study Spaces, and Lounges

1. Convenience Outlets (2D) every 100 sq. ft.
2. Infrastructure for flat panel displays (1D)

L. Special Use Outlets

Outlets for special devices require a demarcation point adjacent to the device (a location where operational responsibility changes.)
A list of service may be found at: network service matrix

A description of the installation process may be found at:
SECTION 27 10 00: SPECIAL NETWORK DEVICE INSTALLATION

1. Audio Visual equipment (mics, speakers, occupancy sensors, etc.)
Refer to AV standards on the FM facilities/design-standards web site: 27_40_00_1

2. Energy management, HVAC, BAS (1D each)

3. Emergency telephones (3D). Also known as “blue light” phones.
4. Wall phone (1D). Typically used in laboratories and mechanical rooms.
5. CCTV (closed circuit TV) (1D). Also known as IP cameras. The camera model is not part of this division but may be found in Division 28.
6. POS Cash-Net (Food Services cash registers) (1D)
7. Time and Attendance (1D). Also known as time clocks.
8. Room scheduling (1D). Mounted in the ceiling inside the room that will use the scheduler, where the display is mounted on the outside of the meeting room.
9. People counters
10. Card access panels (varies based on design)
11. Vending machines (washer/dryer per controller) (1D) per controller. These outlets must be enclosed in a tamper proof enclosure. See section 2.17.
12. MFD (copy, fax machine) (2D)
13. Meters such as power meters, automatic transfer switches and BTU meters (1D)
14. Gas meters may require a telephone POTs line (1V)
15. Wireless access points (2D)
16. Elevators (1V per car) — The communication outlet must be installed outside and adjacent to the elevator control enclosure.
17. Special event locations for commencement, conferences, or temporary set ups for registration and presentations.

Refer to 26 09 00 campus central metering system design criteria for further specification of building metering systems.

Applying Design Guidelines to System Components:

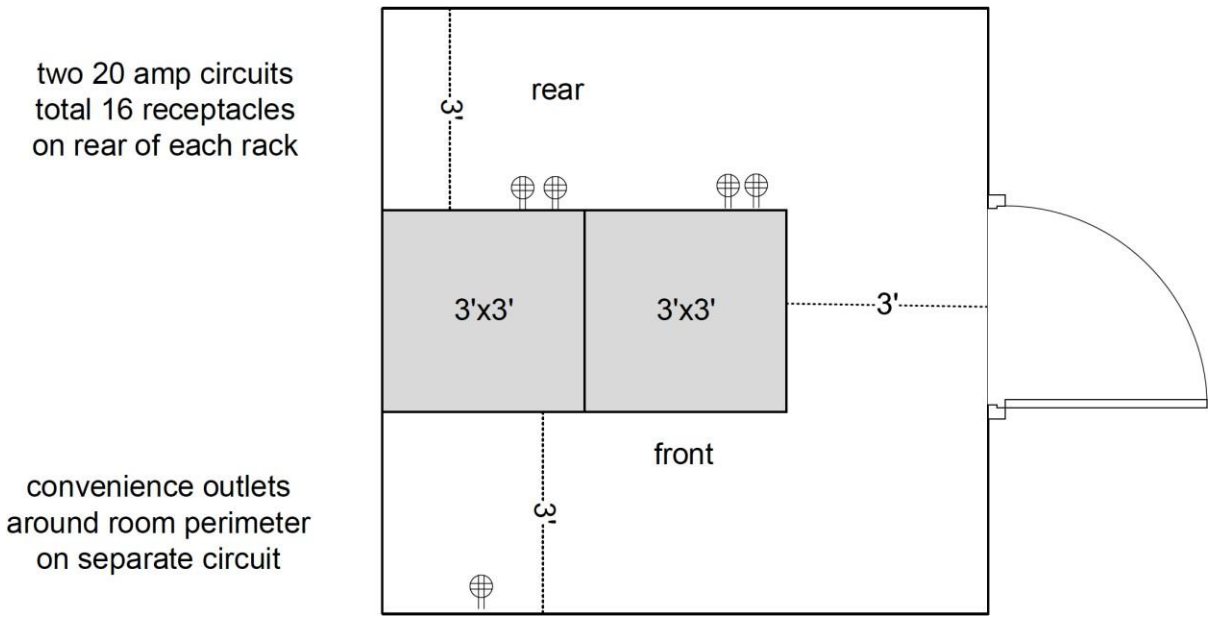
Any deviation from these guidelines must be approved in writing by OIT.

1.6 BUILDING ENTRANCE

Connections between buildings are based on location and building size. OIT must be consulted for the quantity and location of the underground infrastructure.

1.7 TELECOMMUNICATIONS ROOM

1. The room must be clean, secure, and permit maintenance without disruption of services. The number of work area drops per floor determines the MEP (Mechanical Electric Plumbing) requirements of each telecommunication room. In addition, TRs must meet the following requirements:
2. Location
    a. There should be a minimum of one TR per floor serving a maximum cable length of 295 feet.
    b. The location should be selected so that the room may be expanded.
    c. Locate as close as practical to the center core of the building to minimize horizontal cable distances (Maximum cable length is 295’ (90m) from TR to drop location). In multiple floor buildings, TRs shall have all 4 walls vertically stacked.
    d. TRs may not be inside of or be part of a mechanical space, equipment room, washroom, storage area, janitor closet, public space, tenant office or closet.
    e. The room must be accessible off a common public corridor.
    f. The room must be located away from any potential flooding either from ground water or pipes.
3. Size
    a. ER/TR Rooms for new construction projects shall be sized based on the following table and diagram.
    b. Additional rooms should be added if the floor is over 10,000 square feet.



Typical Telecommunications Room
(Additional space must be added for wall-mounted equipment such as card access panels.)

4. Room Parameters
   a. A minimum of two walls (a minimum of 12 linear feet on available interior walls) should be covered with AC grade or better, void-free fire rated plywood backboard, 2.4 m (8 ft.) high with a minimum thickness of 19 mm (3/4 trade size). The plywood should be installed with the grade “C” surface facing the wall. Securely fasten the plywood to wall-framing members to ensure that it can support attached equipment.
   b. Although space on backboards for telephone equipment will migrate to racks, other new systems such as BAS and card access must be mounted on backboards in secure TR spaces.
   c. The height between the finished floor and the lowest point of the ceiling must be a minimum of 8’6”. Equipment racks are 7’, cable tray at 7’6”, lighting at 8’6”.
   d. Cable tray is required inside a TR and must be accessible.
   e. Floors, walls, and ceiling must be treated to eliminate dust.
   f. Finishes shall be light in color to enhance room lighting.
   g. Floor covering shall be sealed to reduce dust.
   h. The room must be secured and accessible only by authorized personnel. Access from the building exterior to all TRs must be permitted 24x7x365 to permit maintenance and repairs.

i. All TRs shall be secured by card access.

j. Rooms shall not have a false ceiling to permit maximum use of cable pathways both vertically and horizontally. In such cases where fire-proofing may be sprayed onto the exposed ceiling, the fire-proofing shall be treated to mitigate airborne dust.

k. The TR shall be located on floor areas designed with a minimum floor loading of 2.4 kPa (50 lb/ft^2).

l. Consideration should be given to the acoustic noise from fans and their proximity to building occupants.

m. Fire suppression shall be dry action type.

n. Telecommunication rooms must be located away from potentially wet environments.

5. Mechanical — Heating, Ventilation and Air Conditioning (HVAC)

a. HVAC shall be available on a 24 hours-per-day, 365 days-per-year basis. A stand- alone unit should be considered for Telecommunications Rooms where central systems are not continuously available.

b. The temperature and humidity shall be controlled to provide continuous operating ranges of 13ºC (55ºF) to 29ºC (85ºF) with 30% to 55% relative humidity.

c. The ambient temperature and humidity shall be measured at a distance of 1.5 m (5 ft.) above the floor level, after the equipment is in operation, at any point along an equipment aisle center-line.

d. Room temperature and humidity shall be monitored by a dedicated temperature /humidity sensor connected to the Facilities Management BAS (Building Automation System) for remote monitoring and alarming of room setpoint excursions.

e. A positive pressure differential with respect to surrounding areas should be provided with a minimum of one air change per hour.

f. Pressurization can be achieved with transfer air and adequate air filters. Air filtration should be provided at MERV #8.

6. Electrical

a. power receptacle standard
   - 1 rack: x2 20 amp quad circuits
   - 2 rack: x2 20 amp quad + 1 L5-30 (50 amps total)

b. Network electronics are modular and have multiple power supplies.
   - Half shall be connected to UPS, A side, and half to separate power, B side, to provide redundancy and to enable maintenance.
   - Both should be connected to standby power.
   - Any UPS must provide a minimum of 30 minutes of run time to support telephone service.

- Network switches provide power to other devices connected over the network. This is power over Ethernet (PoE). Devices include, but are limited to: telephones, wireless access points, surveillance cameras.
- Telephone service must be available during a power outage for a minimum of 30 minutes.
- Power supplies have a capacity that is greater than what is actually used.
- The power required from a switch will vary based on the devices connected. This will increase over time as more devices requiring power are developed. The number of non-PoE jacks may decrease in time.
- The power standard at this time is one 1,100 watt power supply per switch in stacks of four:
  1. one switch has two power supplies: x1 on A & x1 on B
  2. a stack of two has four power supplies: x2 on A and x2 on B
  3. a stack of three has five power supplies: x3 on A and x2 on B
  4. a stack of four has seven power supplies: x4 on A and x3 on B
- The standard rack layout is six switches per rack. A full rack is one stack of four plus one stack of two. Power stacking is NOT shared between equipment racks.
- Each primary A side power supply is connected to UPS. Each B side power is connected to house power. All power feeds are dedicated circuits and not shared.
- Power consumption per switch assumes :
  - minimum power consumption with no PoE draw is 125 watts
  - telephones are connected to half of the switch ports (24 of 48) each telephone draws 6 watts
  - wireless APs are connected to a quarter of the switch ports (12 of 48) each AP draws 30 watts of power
  - AV equipment and surveillance power requirements need to be considered
- The power load, given the above assumptions, would be 850 watts per switch.

c. Building wide UPS

A building wide UPS is recommended for any building with four or more network equipment racks. Two additional 20 amp quad outlets are required per network equipment rack for a total of eight outlets on B side, eight on A side.

Building-wide UPS are to be monitored by the FM Campus metering system. See Design Standards section 26 09 01 for details.

d. Rack mounted UPS

   Branch circuits for equipment power must be protected and cabled for 20A capacity. Circuits must be dedicated to electronic equipment and must be isolated from cyclic power loads.

   Two dedicated circuits per network equipment rack on standby power, non-switched 3- cable 120-volt (V) alternating current (AC) electrical outlets for network equipment power, each on separate branch circuits.

   Two quad outlets on each circuit for A and B side power.

e. UPS are required for all buildings with the exception of residence halls. Each network equipment rack in residence halls requires two 20 amp quad receptacles.

f. Separate duplex 120 volt (V) alternating current (AC) convenience electrical outlets (for tools, field test instruments, etc.), must be placed at 1.8 m (6 ft.) intervals around perimeter walls.

g. All electrical outlets must be on non-switched circuits, not controlled by a wall switch or other device that may lead to inadvertent loss of service.

h. All electrical outlets must be identified as to the location of the upstream breaker panel.

i. Dedicated power distribution to TRs is recommended.

j. Distribution panels that serve telecommunications equipment should be separate from those that serve lighting fixtures or motors.

7. Lighting

   a. Shall be a minimum of 500 lux (50 foot candles) measured 1 m (3 ft.) above the finished floor, mounted 8.5 ft. minimum above the finished floor.

   b. Both the front and rear of any network equipment rack must be illuminated.

   c. Light fixtures must be independently supported from the ceiling to the building structure. Light fixtures shall not be mounted to, or supported by the cable tray.

   d. A wall switch located at the room entrance shall control lights. Coordinate light placement with equipment rack and cable tray/ladder rack locations to maximize lighting and minimize EMI.

8. Bonding and Grounding

   a. The installation conforms with applicable practices and codes (in the United States, ANSI TIS-607-B, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, the NEC, and local building codes

1.8 BACKBONE

A. Backbones must be designed in such a way to protect the cables from damage and to provide redundant communications paths to network equipment installed in telecommunication rooms. Backbone capacity must be sufficient to connect each local telecommunication room in the project to remote network distribution equipment in two remote telecommunication equipment rooms.

   Separate raceway to each network distribution facility, including dual building entrances, is strongly encouraged.

B. The capacity and destination for OSP backbone cable building feed is determined by the location and purpose of the building, typically from a minimum of 24 (maximum of 144) strands of single mode fiber.

C. The minimum strand count for riser fiber between TRs within a building is one 12 strand single mode from each telecommunications room (TR) to the main distribution facility (MDF) room TR .

D. Fiber must be protected. All inside plant fiber cable must be armored.

E. All backbone cable must be protected and supported.

F. 40% fill for new raceway provides for replacement during the lifetime of the renovation.

1.9 HORIZONTAL CABLING

A. Horizontal cable must be protected from damage (crushing or twisting) during and after installation. Supporting raceway must accommodate for growth and maintenance of the cable as well as non-disruptive installation of replacement cabling as cable standards change.

B. The maximum fill is 40% fill for new raceway. This provides for replacement of cable without disruption to users.

C. The requirements in this section are harmonized with the horizontal pathway and related space requirements specified in American National Standards Institute/Telecommunications Industry Association/Electronic Industries Alliance (ANSI/TIA/EIA)—569—B, Commercial Building Standard for Telecommunications Pathways and Spaces.

D. Horizontal cable must be accessible or in conduit over such areas as hard ceilings.

E. When designing a building, the layout and capacity of the horizontal pathway system must be thoroughly documented in floor plans and other building specifications. The designer is responsible for ensuring that these systems have built-in flexibility to accommodate tenant movement and expansion. In addition, the horizontal pathway system should be designed to make the maintenance and relocation of cabling as easy as possible.

F. All design and construction for pathway systems must meet or exceed national and local codes and standards.

G. When grounding telecommunications pathways, ensure that the installation conforms to applicable practices and codes (in the United States, ANSI TIA-607-B, Commercial Building Grounding (Earthen) and Bonding Requirements for Telecommunications) the NEC, and local building codes.

H. Use systematic methods and procedures for labeling and managing horizontal pathways and spaces. For details on guidelines and requirements for the color coding and administration of horizontal cabling systems, ANSI/TIA/EIA-606-B, Administration Standard for Commercial Telecommunications. Refer to section 1.11 Naming Conventions & Labeling Standard in this document.

I. Provide a list of all horizontal station cable with their tap identification, a tap list.

J. All network jacks within a room must be of the same type. All new jacks must be Category 6A or better.

1.10 RACK EQUIPMENT LAYOUT

A. Standard network equipment rack:

1. Standard network equipment rack shall be sized to hold:
    a. six (6) patch panels or filler panels, 2U each
    b. one (1) 2U fiber patch panel
    c. analog telephone gateway
    d. six (6) sets of:
        i. 48-port Cisco Edge Switch
    d. one (1) 2U rack-mounted UPS
    e. one (1) or two (2) 2U Battery Packs as required
2. The patch panel field begins with the top patch panel mounted at RU 43 and 42.
3. Additional patch panels, up to the rack maximum of six (6), shall be mounted immediately below the previous panel, without skipping a RU, with the sixth panel mounted at RU 33 and 32.
4. There are no horizontal cable management or blank filler panels to be placed between the patch panels.
5. The fiber LIU is mounted between the patch panels and electronics.
6. The edge switch field begins with RU 31.
7. Immediately below that filler panel, the first 1U edge switch is mounted at U30.

B. Dressing of Horizontal Distribution Cables

1. All horizontal distribution cables to a single patch panel shall be dressed to one channel of the rack.

2. Cables to the various patch panels shall be dressed to alternate side channels, beginning with the right channel (facing the rear) for patch panel one.

C. UPS are mounted at the bottom of the rack

D. Blank filler panels are installed between the top of the UPS and the bottom of the lowest edge switch.

1.11 CABLE SUPPORTS/CABLE RACEWAY

A. The Consulting Engineer shall specify Cable raceway and support subject to approval by OIT.

B. Snap-in fittings for surface raceway may use a Wiremold adapter manufactured by Hubbell (A22).

C. Furniture adapter plates are available for Steelcase, Haworth, etc. are available from Hubbell (A21).

1.12 NAMING CONVENTIONS & LABELING STANDARDS

A. Work Area Outlet Names

1. All Work Area Outlets (WAOs)[1] must be assigned a unique name. The following method is used to assign a name to any communications outlet. This includes all communication outlets in offices, laboratories, and classrooms, communication outlets such as wall phones, and data only outlets such as wireless outlets. This naming standard includes audio/visual outlets that use network cable.
2. The outlet name has two parts separated by a dash (-). The first part is the same as the signage for the space. These must be the final room numbers as assigned by the Facilities Management Department. This room number may include a letter if it is an anteroom off a main room (sub room). The second part is a sequence number within the room.
3. The sequence number is determined by the position of the outlet relative to the primary entrance door to the room. The outlets are numbered around the room starting with the first outlet on the wall to the left of the primary door and continuing along the wall back to the starting point. For example, the second WAO in room 349 would be named 349-2.
4. The primary door is defined as the entrance off the public corridor. When there is more than one door, the primary door is the door closest to the public elevator.
5. Once the communications outlets along the walls have been numbered,

[1] Work area outlets for communication also may be referred to as drops, jacks or “taps”, hence the “tap list” which is a list of all communication outlets and cables in a project.

outlets within the interior of the room are assigned. These interior outlets may be on laboratory benches or poke through outlets in the floor or modular furniture.

6. After floor outlets are numbered, outlets in the room's ceiling are named. These include wireless outlets and outlets for ceiling mounted projectors.

B. Work Area Outlet Cable Names

1. Each cable must be labeled at each end. The label must show the WAO name followed by a D then the cable sequence number, starting with 1.
2. Fiber cable and electronics located in telecommunications rooms (TRs) are also named and labeled. The following is a list of naming conventions to be used for fiber and electronics deployed on the network. Several general comments apply to all naming and labeling requirements:
   - Capital letters to be used in all cases.
   - Dashes may be removed when the data is represented in Pinnacle[2].
   - All labels not conforming to these requirements must be removed.

C. Telecommunications Rooms: BBBB-RRRR

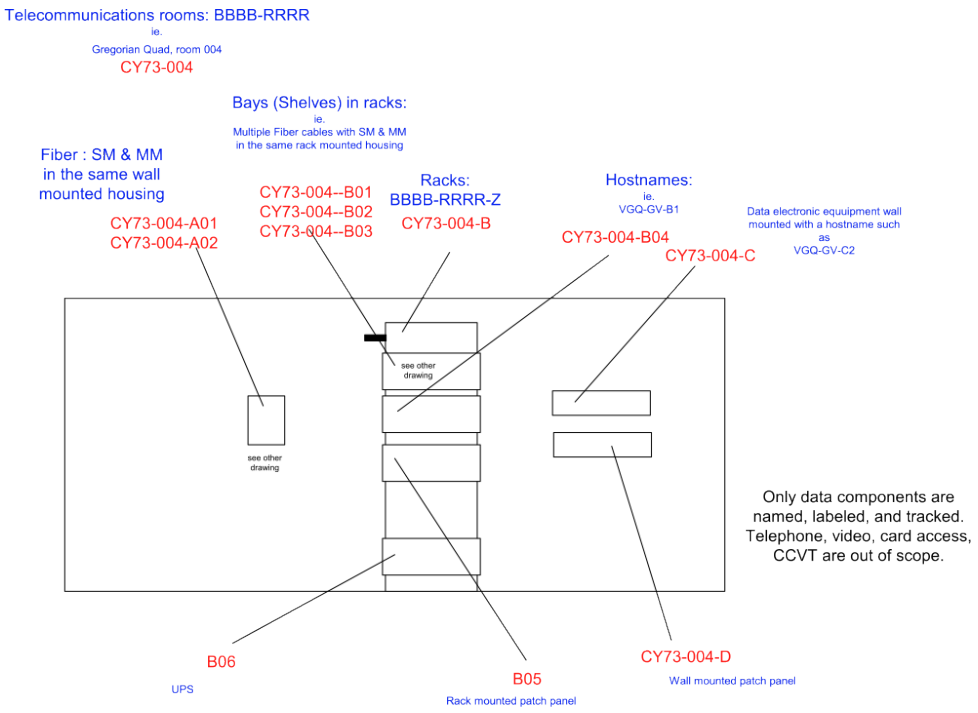
Where:

- BBBB is the Insite number[3] for the building
- RRRR is the room number
- Example: DO45-004

  Physical label requirements: None

  Pinnacle representation: These are represented as Service Locations.

[2] Pinnacle is a database product used to track all telephone and network components.
[3] The Insite number is a unique name defined by Facilities Management for each building and is in the format of two letters followed by two digits.



D. Racks: BBBB-RRRR-Z

Where:

- Z appended to the closet designator is a sequential alphabetic
- Example: DO45-004-A
  Building DO45, room 004, first network rack.

The sequence of designators for racks and/or wall-mounted equipment will be according to the following guideline:

- When entering the room, first designate all floor-mounted racking progressing in a clockwise direction from the door, followed by wall-mounted enclosures progressing in a clockwise direction from the door.

Physical label requirements:

- Position of label is top left of rack
- Ariel 24 pt. Font

Pinnacle representation: Rack letter is location information associated with an interconnect.

E. Bays in Racks: BBBB-RRRR-ZNN

Where:

- NN appended to the rack designator represents the topmost U of the equipment mounting position.

- Example: DO45-004-A03

This would be the equipment mounted in the

third U of the rack. Physical label requirements:

- Position of label is the front of the left rail
- Ariel 12 pt. Font

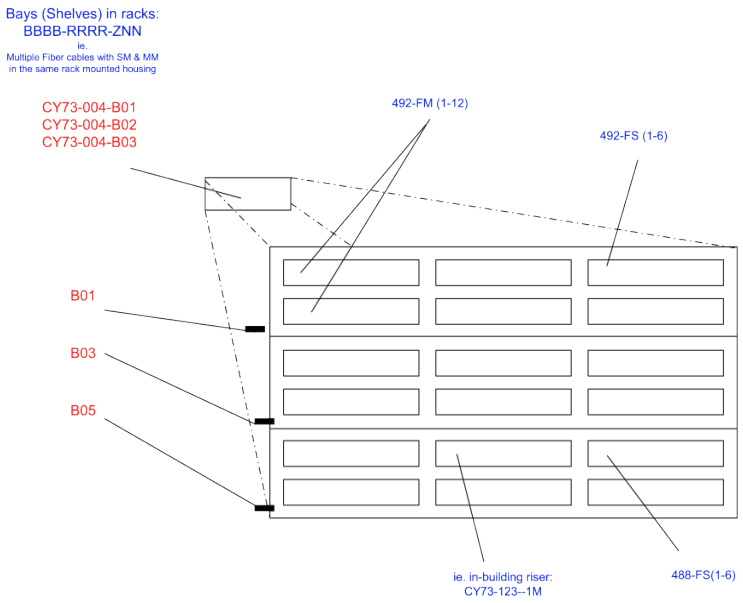
Pinnacle representation: Rack bay is location information associated with an interconnect.

F. OSP fiber: NNN-FZ

Where:

- NNN is a 3 digit number – next sequential number in Pinnacle
- F is “F”
- Z is the media type (S for single mode, M for multimode, X for composite cables)

OSP fiber should be labeled according to the following guidelines taken from the BICSI standards:



- Identify cables at each end with a permanent tag or label
- Label the cable at regular intervals throughout its length
- Label all service loops
- Label inside all junction boxes and man holes
- Label the fiber housing Physical label requirements:

- Handwritten labels are not acceptable.
- Locations as specified above

Pinnacle representation: This identifier is the Run Code.

G. Riser fiber/cable: BBBB-RRRR-TN

Where:

- BBBB is the Insite building number
- RRRR is the number of the IDF space to which the riser runs
- T is the riser media type (S for single mode, M for multimode, and C for copper)
- N is a sequential number (optional)
- Example: DO48-219-S2 (This would be the second single mode riser leading to room 219 in building DO48.)

Physical label requirements: Same as OSP

Pinnacle representation: This identifier is the run code.

H. Fiber Patch Panels: ZNN-X

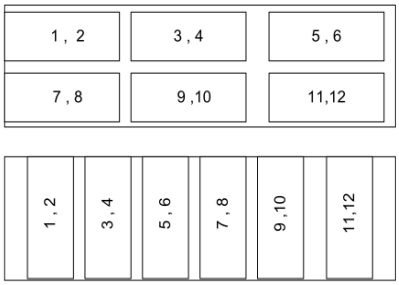
Where:

- Z is the rack letter
- N is the U position within the rack
- X is a sequential number designating the bulkhead plate. Bulkhead plates are numbered top to bottom, then left to right
- Example: A01-2 (This is the second plate in the first U

position of rack A.) Physical label requirements: No

requirement to label individual bulkhead plates

Positioning of strands in connector plates



I. Copper Patch Panels: ZNN

Where:

- Z is the rack letter
- N is the U position within the rack
- Example: B03 (This is the copper patch panel in the third U position of rack B.)

Physical label requirements: Each port on all patch panels must be

labeled with the cable name

Part 2 — PRODUCTS

Substitutions for the products listed are typically not permitted. Any deviation from these standards must be approved in writing through obtaining a waiver from OIT.

2.1 FACEPLATES

A. All faceplates shall be equipped with labels and label holders.

B. Single gang 4 port faceplate shall be Hubbell P/N IFP14OW (Office White)

C. telephone wall plates shall be Hubbell P/N SP10GR

2.2 MODULAR INSERTS

A. Single Modular inserts for all data ports shall be Hubbell P/N HJU6AGN (8-position green TIA-568B wired category 6A).

B. Blank Modular inserts shall be Hubbell P/N SFB10.

C. Modular inserts shall be positioned in the faceplate as follows:

1. All data jacks shall be positioned starting at the top left and proceeding down the left column then down the right column.
2. Data jacks shall be named D1, D2, D3 and so forth in the tap list.[4]

2.3 SURFACE MOUNT BOXES

Hubbell P/N HSB1OW one port (HSB1OWP plenum)

Hubbell P/N HSB2OW two port (HSB2OWP plenum)

2.4 CABLE MANAGEMENT

Hubbell P/N HS23 S-Series Rail Mounted panel

2.5 HORIZONTAL CABLE

The UTP Horizontal cable utilized for the distribution of data, shall meet or exceed Category 6A cable standards and shall comply with the Hubbell 25 year Mission Critical Warranty™. Color shall be green. Manufacturer shall be Mohawk

Mohawk Cat6A small diameter plenum	P/N M59150
Mohawk Cat6A small diameter non plenum	P/N M59160

2.6 DATA PATCH PANELS (COMMUNICATIONS ROOM)

[4] The tap list is a schedule of all cables in the project that lists the name of the communications outlet, the type of outlet, and destination communications room.

A. 48-port modular patch panel(s) HPJ Multimedia Jack Panels, Manufactured by Hubbell P/N HPJ48

B. Horizontal wire management, when approved, shall be manufactured by Hubbell P/N HC219ME3N

2.7 FIBER OPTIC TERMINATION HARDWARE

A. 72 Port Simplex Fiber Optic closet connector housing shall be Corning P/N CCH-04U

B. 48 PORT Fiber Optic closet connector housing shall be Corning P/N CCH-02U

C. 24 PORT Fiber Optic closet connector housing shall be Corning P/N CCH-01U

D. 12 port fiber connector-housing panel for Single Mode shall be Corning SC duplex panel P/N CCH-CP12-59

E. Fiber optic horizontal manager shall be Corning P/N CJP-02U.

F. Single-mode connectors shall be Corning SM Fuselite - P/N SOC-SCU-900-SM

2.8 INTRA-BUILDING BACKBONE CABLES

A. The in–building backbone cable for data shall be a minimum of 12 strands single-mode manufactured by Corning and installed by a Corning EWP certified vendor.

B. All fiber riser cables shall have an armored sheath.

2.9 EQUIPMENT RACKS

A. Ortronics Mighty Mo 10 - Cable Management Rack: P/N OR-MM20716-B

B. Vertical Cable Management System

1. Single Rack Line-Up:

a. Two Ortronics Mighty Mo Cable Management Cages with Door are required (P/N OR- MM20VMD706-B).

i. The two Cable Management Cages for 7-foot racks are mounted at the front on each side.

ii. These Cable Management Cages are attached to the rack directly on their near sides and with end support brackets on their far sides.

iii. The doors open to either side as necessary.

2. Multi-Rack Line-Up:

a. Two Ortronics Mighty Mo Cable Management Cages with Door (6-Inch) are required – one each, on the left and right ends of the rack line-up (P/N OR- MM20VMD706-B).

i. The two 6-inch Cable Management Cages for 7-foot racks are mounted at the front on the left and right sides, respectively, of the left-most and right-most rack in the line-up.

ii. These Cable Management Cages are attached to their respective racks directly on their near sides and with end support brackets on their far sides.

iii. The doors open to either side as necessary.

b. One Ortronics Mighty Mo Cable Management Cage with Door (12-Inch) – is required between each adjoining rack (P/N OR-MM20VMD712-B).

i. The adjoining racks must be set exactly 8.5 inches apart so the 8.5-inch extrusion at the back of the 12-inch cage will fit between them.

ii. The 12-inch Cable Management Cage is mounted directly to the front of the adjoining racks.

iii. The door opens to either side as necessary.

2.10 EQUIPMENT CABINETS

A. Large cabinet
Chatsworth - CUBE-iT 13493-772 (72x27x30)

B. Medium size - deep wall mounted
Chatsworth - CUBE-iT Wall Mount Cabinet 11996-736 (24x26x30)
CUBE-iT Wall Mont Cabinet Technical Data Sheet

C. Shallow wall mounted cabinet
Hubbell - RE4X (42x24x10)

2.11 EDGE NETWORK ELECTRONICS (SUPPLIED BY OIT)

A. All Buildings:
Cisco: P/N WS-C9300-48UXM-E

1. Power Consumption: 750 Watts
2. Heat output: 2,465 BTU/hour

B. PWR-C1-1100WAC=

1. Power Consumption: 1100 Watts
2. Heat output: 3,753 BTU/hour

C. Small form factor:
Cisco: P/N C9200-48P/ C9200-48PXG

1. Power Consumption: 1000 Watts

2. Heat output: 3,412 BTU/hour

2.12 WIRELESS DEVICES (SUPPLIED BY OIT)

A. Indoor:
   1. Aruba AP-535 series Access Point (802.11ac)

B. Outdoor:
   1. radio
      - AP-374 external antennae
      - AP-375 omni antenna
      - AP-377 directional antennae
   2. mount
      - AP-270-MNT-V1 18” arm
      - AP-270-MNT-V2 12” arm
      - AP-270-MNT-H1 articulating
      - AP-270-MNT-H2 non-articulating

2.13 POWER DISTRIBUTION UNIT

APC - Switched Rack PDU Switched, 1U, 15A, 100/120V, (8)5-15 AP7900B

2.14 UNINTERRUPTIBLE POWER SUPPLY

A. Building Wide UPS (Supplied by the Project - maintained by Facilities)

   Used in large buildings where consolidation is cost effective

B. Rack Mounted UPS (Supplied by OIT)
   a. Seven switches or under - no DVR:
      American Power Conversion (APC): Smart-UPS SMX3000, 120V, L5-30, 2U P/N SRT3000RMXLA or equivalent

   b. Five switches or under - no DVR:
      American Power Conversion (APC): Smart-UPS SMX2200, 120V, 2U SMX2200RMXLA. or equivalent

2.15 OUTSIDE EMERGENCY PHONES

A. Manufactured by Code Blue

BU-Code Blue Emergency Phone Standard

B. Wall mount CB 2-e

C. Stanchion CB 1-S

D. Surveillance cameras are required with all blue light phones

2.16 ELEVATOR / LIFT PHONES

A demark jack is required outside of the elevator control enclosure

2.17 TAMPER PROOF HOUSING

SECURE IT PLATE FOR LAUNDRY AND VENDING

Manufacturer: Hubbell, Part #: TPF10W

2.18 DROP CEILING BRACKET FOR WIFI AP RADIOS

PRE ASSEMBLED HEAVY DUTY BOX TO TBAR FASTENER

Manufacturer: Cooper B-Line, Part #: BA50-SB24

2.19 BUILDING ENTRANCE LIGHTNING PROTECTION

Manufacturer: SurgeGate ITW CAT6A 75_PoE RJ45_Cut Sheet (CAT6A 75/POE RJ45)

Part 3 — EXECUTION

Part 3 outlines the planning, design and construction process for network and telephone services, which are part of any Facilities Management project. The intent is to provide a process that is appropriate for any size project. All projects have four phases: Planning, Design, Construction, and Closeout.

3.1 PLANNING

A. Facilities Management completes the OIT Project Fact Sheet to initiate a project and to request information from OIT for a project under consideration.

B. OIT recommends technology appropriate for the project's program.

C. OIT will highlight any conditions that may impact the project budget or schedule.

D. Trends in technology are considered and included in scope as appropriate.

3.2 DESIGN

A. OIT will assist the electrical and telecommunications engineers retained for the project to define the following requirements for the communications system:

- Performance
- Security
- Reliability
- Maintainability

By specifying:

- Cables; type, quantity, and location
- Raceway
- Telecommunications room; location, power, and cooling

B. The general contractor is responsible for installing the passive portion of the communications system: the cable, jacks, patch panels, racks, cable tray, etc.

C. Once the passive portion of the communications system has been delivered, OIT installs the active portion of the system: the electronics.

D. The passive communication cable system must be completed and delivered before the active electronics equipment is configured and installed.

E. Construction plans must show communications outlet locations, type[5], and name.

F. A OIT work order may be submitted for discovery of existing conditions if necessary.

G. At that time OIT will determine which work is appropriate to complete the project. For example, OIT is able to install communications outlets for small projects. On most projects the communications contractor is hired directly by the GC.

H. All abandoned cable must be removed back to within 6 inches of the patch panel.

I. When adding any jack/drop to a room; all jacks in the room must be Cat6 or better.

3.3 CONSTRUCTION

A. General

1. All data installations must receive the 25-year Mission Critical Warranty from Hubbell™ Premise Wiring by the installing contractor.

   NOTE: exposing network cable to moisture of any kind at any time will void the manufacturer's warrantee. This includes paint and spray on insulation.

2. All fiber installations must receive an Extended Warranty Program

[5] The outlet type must indicate the number of data cables in the communications outlet

certification from Corning by the installing contractor.

3. Warranties must be submitted as a project deliverable.
4. All abandoned cable must be removed back to with 6 inches of the patch panel

B. Milestones

There are five milestones during the construction phase for OIT: Kick Off, Draft Tap List, Pre-Acceptance Walk through, Acceptance, and Service Turn Up. Follow the milestone dates shown in the table below:

Construction Milestones	Milestone Date
Kick Off	At mobilization
Draft Tap List	10 business days after Kick Off
Pre-Acceptance Walk Thru	20 business days before In Service Date
System Acceptance	10 business days before In Service Date
In Service	In Service date

C. Kick Off

1. The General Contractor may have the Electrical contractor hire the communications contractor or they may hire the communications contractor directly. Either way the communications contractor must be on the list of approved vendors.

2. There are two lists of approved vendors: one for fiber optic cable installation and one for any copper, telephone or data installation. OIT revises both lists regularly.
   - Corning Approved Vendor List
   - Hubbell Approved Vendor List.
3. The communications contractor must submit proof of Hubbell certification and Corning certification if applicable.
4. The general contractor and communications contractor are encouraged to document existing conditions before starting work.
5. Any network services in operation within the project area must be protected. OIT must be contacted through the FM project manager to remove any equipment such as a wireless access points.
6. The construction schedule must include a ten-day service turn-up period for OIT prior to substantial completion. (Service turn-up)
7. Milestone Dates: Substantial Completion, Service Turn-up, Move-in all

following in close succession.

8. OIT must be notified of any additions or changes to the locations or type of communications outlets during construction.

D. Draft tap list and floor plan

1. Ten business days after kick off a schedule of all data cables must be received by OIT; also known as the tap list. A corresponding floor plan showing communication outlet locations and outlet name must be provided.
2. The list is used to identify the network and telephone number for all services required on moving day.
3. During this period:
    - OIT will finalize the design of the communications system for performance, and security
    - Order network electronics and telephone equipment
    - Complete office and phone assignments
4. The tap list must be accurate.

E. Pre-Acceptance Walk Through

OIT walks through the project to determine if or not the project will meet the system acceptance date.

F. System Acceptance

The communications system, including the telecommunications room and cables, must be delivered to OIT two weeks before the In Service date.

1. Telecommunications Contractor Deliverables by System Acceptance
    a. Final tap list
    b. Construction floor plans in pdf file format showing communications outlet locations and names
    c. Racks installed & grounded
    d. Backbone cable installed, labeled and tested
    e. Test results for fiber optic and copper cables for riser and outside plant Tier 1 & Tier 2 testing — OLTS & OTDR testing
    f. All station cable terminated labeled and tested – must match the tap list
        - This includes installation and testing of jacks into furniture systems
        - All testing must be done after installation of faceplates so that the jacks are not moved or handled after testing
    g. Deliver test results for all cables in the communications system to OIT via

email.

- All cables: OSP, riser, and station cable
- station cable results in room number order

2. Telecommunications Room Readiness Criteria

   All construction in the communications rooms must be completed, including:

   a. Room free of dust and debris (damp mopped)
   b. All plywood on walls painted
   c. Ceilings treated to minimize dust
   d. Lighting installed and powered
   e. Electrical outlets installed, powered and stable
   f. All grounding completed
   g. HVAC installed and working
   h. Floors sealed and finished
   i. Room secure

G. Service Turn-up

1. For the turn up of special services, such as card access or elevator car phones, the service owner must schedule service activation separately in advance. For example, Public Safety is the service owner of card access and surveillance and Facilities owns building automation and metering, etc.
2. The in-service date will be ten business days after receipt by OIT of the service turn-up work order.
3. During the two-week period between delivery of the communications system provided by the contractor and the service turn-up date, OIT will inspect the work, perform random tests of the station and riser cables, and compare the results with those delivered by the communications contractor.
4. All work by OIT will be performed during normal university business hours.
5. OIT will report any failures or deficiencies in the installation in writing to the project manager so the contractor may correct the deficiencies in time for the in-service date.
6. Once the contractor has corrected problems, OIT will install network equipment, any new telephone handsets, and activate telephone lines based on the tap list generated by the architect and end user.
7. Once OIT accepts the communications systems as in-service, OIT will respond according to the Service Level Agreement for each service.
8. Prior to acceptance all calls should be directed to the Facilities Project manager.
9. Once in service, calls from users should be directed to their department’s computing coordinator or the OIT Help Desk.

3.4 CLOSE OUT

A. The O&M documentation must include:
   1. Warranty certificates from Hubbell Premise Wiring Inc. for all data cables installed.
   2. Corning Cable Inc. for any fiber installed.
   3. As-built documentation must include communication outlet names (tap id) and locations.
   4. Punch list completed.
   5. Department declares through the PM that all is working
   6. Checklist completed

B. Printed test results are not required as part of the O&M documentation package, since they are submitted to Hubbell and Corning as part of the warranty application and to OIT prior to service turn-up.

END OF SECTION