# Section 27 05 00
## Communications

## Table of Contents

**PART 1 — GENERAL** .............................................................. 2  
1.1 SUMMARY ................................................................................. 2  
1.2 DESIGN ENGINEER AND ARCHITECT QUALIFICATIONS ......................... 2  
1.3 COMMUNICATION SYSTEM COMPONENT DEFINITIONS .......................... 2  
1.4 TELECOMMUNICATIONS SERVICES ............................................ 3  

**APPLYING DESIGN GUIDELINES TO SYSTEM COMPONENTS:**............. 9  
1.5 BUILDING ENTRANCE ................................................................ 9  
1.6 TELECOMMUNICATIONS ROOM .................................................. 9  
1.7 BACKBONE .............................................................................. 12  
1.8 HORIZONTAL CABLING ............................................................ 13  
1.9 RACK EQUIPMENT LAYOUT ....................................................... 14  
1.10 CABLE SUPPORTS/CABLE RACEWAY ....................................... 16  
1.11 NAMING CONVENTIONS & LABELING STANDARDS ....................... 16  

**PART 2 — PRODUCTS** .............................................................. 21  
2.1 FACEPLATES ............................................................................ 21  
2.2 MODULAR INSERTS ................................................................. 21  
2.3 HORIZONTAL CABLE ............................................................... 21  
2.4 DATA PATCH PANELS (COMMUNICATIONS ROOM) ......................... 21  
2.5 FIBER OPTIC TERMINATION HARDWARE (COMMUNICATIONS ROOM) 22  
2.6 VOICE TERMINATION HARDWARE (COMMUNICATIONS ROOM) ......... 22  
2.7 INTRA-BUILDING BACKBONE CABLES ....................................... 22  
2.8 INTER-BUILDING BACKBONE CABLES ........................................ 23  
2.9 EQUIPMENT RACKS .................................................................. 23  
2.10 EDGE NETWORK ELECTRONIC (SUPPLIED BY CIS) ..................... 24  
2.11 WIRELESS DEVICES (SUPPLIED BY CIS) .................................... 24  
2.12 UNINTERRUPTIBLE POWER SUPPLY (UPS) ................................. 24  
2.13 OUTSIDE EMERGENCY PHONES ............................................. 25  
2.14 ELEVATOR EMERGENCY PHONES ............................................ 25  
2.15 WHEELCHAIR LIFT PHONES .................................................... 25  
2.16 CONFERENCE PHONES (SUPPLIED BY END USER TENANT) ........... 26  

**PART 3 — EXECUTION** .............................................................. 27  
3.1 PLANNING .............................................................................. 27  
3.2 DESIGN ................................................................................... 27  
3.3 CONSTRUCTION ....................................................................... 29  
3.4 CLOSEOUT ............................................................................... 31
Part 1 — GENERAL

1.1 SUMMARY
A. Communications infrastructure must be designed to allow replacement of cable infrastructure during the life of the building. The life time 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.

B. 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.

C. 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.

D. 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 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.

1.3 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 CIS 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. 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 CIS.

   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.

3. Backbone: A facility (e.g., pathway, cable, or conductors) between any of the following spaces: telecommunications rooms, entrance facilities, and equipment rooms.

4. 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.

5. 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.

6. Telecommunications Outlet: A connecting device in the tenant work area on which horizontal cable terminates. Telecommunications outlets are also referred to as work area outlets or drops. Each work area outlet has one to six jacks dedicated as either Voice or Data (network) jacks.

7. 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 CIS.

8. 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.

1.4 TELECOMMUNICATIONS SERVICES

A. Work area outlets should be as plentiful as power outlets. Each must be named and labeled according to CIS labeling standards (Section 1.13). 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 are two types of communications jacks that may be in a telecommunications outlet: voice (V) and data (D)
27 05 00 - 4 Communications

a. VOICE: Voice cable is terminated at the telecommunications room on a Cat6 patch panel in sequence with DATA cables. A patch panel is provided in the network rack and is connected to the category 3 TDM riser. The VOICE service may be for TDM voice for emergency phones and alarm dialers, bridged-VoIP for FAX machines and conference phones, or network services. Service for voice jacks are provided only on request. The ivory jack and cable color distinguish the jack as VOICE service. The tap list, the schedule of communication outlets, must include VOICE along with DATA locations at the patch panel.

For small renovations the VOICE cable may be terminated on a telephone punchdown, BIX block only with written permission from CIS.

b. DATA: Data cable is terminated at the telecommunications room on a Cat6 patch panel in sequence with VOICE cables.

C. Administrative Work Areas Offices and Work Partitions
1. A minimum of one telecommunications outlet per workstation (per person).
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 administrative outlet consists of 1 voice and 2 data jacks (1V 2D).

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

E. Wireless Service

A. General


b. Wireless service must cover all occupied spaces including hallways. Wireless for non-occupied spaces such as mechanical spaces must be requested separately.

c. Two considerations for locating APs are: Coverage & Utilization
• Coverage — signal strength through the coverage area must be a minimum of 65 db on both 802.11g and 802.11a bands.
• Utilization — 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.

d. A minimum of (1) AP is required for each 25 seats in any classroom or auditorium.
e. Access points must be symmetrically spaced to provide complete coverage within the area.
f. Access points may also be purposely placed to isolate coverage to areas within the space.

2. Interior Wireless Installation
   a. Surface mounted:
      • 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 one female data jack (1D) coiled inside. The AP radios are installed by CIS using the single gang ring.
      • Mounting heights on exposed ceiling must be below any signal obstructing materials, such as metal ductwork.
      • Wall mounted - 8” below ceiling and no higher than ten feet AFF.
   b. Orientation matters — ceiling mount, is strongly preferred over wall horizontal mount (only permitted by written waiver by CIS where ceiling mount is not feasible).
   c. Brown uses the Aruba AP-105 (or AP-135) radio with directional integrated antennae.
   d. Wall mounting requires different equipment.

3. Exterior Wireless Installation
   a. The antenna is mounted to the exterior of the building —on a single gang J box.
   b. Conduit size for antennae cable – ¾ “
   c. The radio is mounted in the interior space on a small backboard (2’x2’). The radio must be accessible either above a drop ceiling or by way of an access hatch.
   d. Brown uses the Aruba AP-124 radio typically connected to ANT-17 antennae.
   e. The distance between the antennae and AP-radio matters — the shorter the distance the greater the signal.
   f. Minimum distance is one foot (12”); the maximum distance is five feet (60”).

F. DAS
1. Although a Distributed Antennae System (DAS) is not required at this time, adding raceway in new construction is recommended to accommodate any future DAS implementation. Architects/Designers should balance the use of low “E” glass with the need for cellular and 800MHz signals within the building.

G. Voice over IP
   1. AVAYA 1140E and 1120E handsets are specified to work with the Campus PBX. These devices operate on NorTel proprietary VoIP.
   2. VoIP phones have a data jack, which may be used for a desktop computer.

H. Student Rooms
   1. Require 1 network jack per occupant, (1D)
   2. 1 voice jack per room or suite (1V)
   3. Wireless coverage in all spaces.

I. Laboratories
   1. Require 1 communication outlet for each workplace along the bench (1D)
   2. One voice per lab (1V)
   3. Workstation locations (1V 2D) (typically one at end of bench)

J. Reception and Waiting Areas, Study Spaces, and Lounges
   1. Convenience Outlets (2D) every 100 sq. ft.
   2. Infrastructure for flat panel displays (1D)

K. Emergency RED phones
   1. One per floor in an accessible location
   2. Signage with instruction must be mounted adjacent as shown below:
IN CASE OF EMERGENCY
Police
DIAL 3-4111

NON-EMERGENCY
Police & Public Safety
DIAL 3-3322

SAFERIDE
3-2322

SAFEWALK
3-1079

CAMPUS SWITCHBOARD
DIAL 0

THIS PHONE'S LOCATION
GRANOFF CENTER
154 ANGELL ST
1st FLOOR
Room 100D
L. Special Use Outlets

Outlets for special devices require a demarcation point adjacent to the device
(location where operational responsibility changes.)

1. Analog emergency telephones (1V). Also known as blue light phones.
2. Analog wall phone (1V). Typically used in laboratories and mechanical rooms.
3. Energy management, HVAC, BAS (2D each)
4. 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.
5. POS Cash-Net (Food Services cash registers) (1V 2D)
6. Time and Attendance (1D). Also know as time clocks.
7. Card access controllers (1D)
8. Vending machines (washer/dryer per controller, coke & chips per vending machine) (1D) or vending machine. These outlets must be enclosed in a tamper proof enclosure. See section 2.17.

9. MFD (copy, fax machine) (1V 1D)

10. Power meters (1D)

11. Gas meters (1V 1D)

12. Alarm panels (1V 1D)

13. Wireless access points (1D)

14. Fire alarm panel (1V 1D)

15. Elevator rooms (1V per car, 1D per room) – Must install the communications outlet outside and adjacent to the elevator control enclosure.

16. Special event locations for commencement, conferences, or temporary set ups for registration and presentations (2V 2D).

**Applying Design Guidelines to System Components:**

**1.5 BUILDING ENTRANCE**

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

**1.6 TELECOMMUNICATIONS ROOM**

A. 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:

1. Location
   a. There should be a minimum of one TR per floor serving a maximum radius 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.

2. 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.
### 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 backboard 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 an anti-static material and 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. Room 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/ft²).

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.

4. 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 18ºC (64ºF) to 24ºC (75ºF) 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 centerline.

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

e. Pressurization can be achieved with transfer air and adequate air filters. Air filtration should be provided at MERV #7.

5. Electrical

a. All communications equipment must be supplied by generator stand by power.

b. Building wide UPS

   Two 20A quad outlets per network equipment rack. A building wide UPS is recommended for any project with four or more network equipment racks.

b. Rack mounted UPS

   Branch circuits for equipment power must be protected and cabled for 30A capacity. Circuits must be dedicated to electronic equipment and must be isolated from cyclic power loads.

   A minimum of two dedicated per network equipment rack (L5-30R) on standby power, non switched 3-cable 120-volt (V) alternating current (AC) electrical outlets for network equipment power, each on separate branch circuits.
In addition, one 20 amp quad outlet on the rear of each rack for none network equipment.

c. 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.

d. 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.

e. 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.

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

g. Dedicated power distribution to TRs is recommended.

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

6. Lighting

   a. Shall be a minimum of 500 lx (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.

7. 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.

1.7 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 to 96 strands of single mode fiber.

C. The minimum strand count for riser fiber between TRs within a building is one 12 strand single mode and one 12 strand 50-micron OM3 multimode from each TR to the building entrance facility.

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

E. The minimum pair count for copper inside plant (ISP) riser for telephone is 25 pair.

F. All backbone cable must be protected and supported.

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

H. OSP fiber and copper is typically specified in the Facilities Utility memo issued by Facilities Management.

1.8 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 provided 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 (Earthing) 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.

1.9 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. six (6) sets of:
         i. 48-port Cisco 3750 PoE Edge Switch and 1U blank filler panel
      d. one (1) 3U rack-mounted UPS
      e. one (1) or two (2) 3U Battery Packs.
   2. The patch panel field begins with the top patch panel mounted at RUs 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 RUs, with the sixth panel mounted at RUs 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.
   8. Additional filler panel/edge switch pairs are added in order immediately below switch one (1), up to the rack maximum of six (6) pairs with the sixth switch mounted at RU 20.
   9. Empty rack units will be filled as necessary by panels sized to fit the rack switch count.

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. Rack UPS Layout (One Battery Pack) — For one to three switches per rack
   1. The first 3U Battery Pack is placed through the rack until the front of the pack is even with the leading edge of the front angle support and rests directly on the front and rear angle supports.
   2. Above the battery pack, the 3U UPS is mounted using the set of rack rails ordered with the UPS.
   3. Total height of the UPS and Battery pack is 6U.
   4. Blank filler panels are installed between the top of the UPS and the bottom of the lowest 3750 edge switch.

D. Rack UPS Layout (Two Battery Packs) — For four to six switches per rack (see picture following)
   1. The first 3U Battery Pack is placed through the rack until the front of the pack is even with the leading edge of the front angle support and rests directly on the front and rear angle supports.
   2. The second 3U Battery Pack is placed through the rack and rests directly on the first battery pack.
   3. Above the second battery pack, the 3U UPS is mounted using the set of rack rails ordered with the UPS.
   4. Total height of the UPS and Battery pack is 9U.
   5. Blank filler panels are installed between the top of the UPS and the bottom of the lowest 3750 edge switch.
1.10 CABLE SUPPORTS/CABLE RACEWAY

A. The Consulting Engineer shall specify Cable raceway and supports subject to approval by CIS.

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)

1.11 NAMING CONVENTIONS & LABELING STANDARDS

A. Work Area Outlet Names

1. All Work Area Outlets (WAOs) must be assigned a unique name. The following method is used to assign a name to any communications outlet. This includes all voice/data outlets in offices, laboratories, and classrooms, voice only outlets such as wall phones, and data only outlets such as wireless outlets. This naming standard does not include audio/visual outlets, however.

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

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

B. Work Area Outlet Cable Names

1. Each cable to each WAO must be named and labeled. WAOs contain two types of cable: voice and data.
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\(^1\).
- All labels not conforming to these requirements must be removed.

C. Telecommunications Rooms: BBBBB-RRRR

Where:

- BBBBB is the Insite number\(^2\) for the building
- RRRR is the room number
- Example: DO45-004

Physical label requirements: None

Pinnacle representation: These are represented as Service Locations.

---

1 Pinnacle is a data base product used to track all telephone and network components.

2 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
- Arial 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
- Arial 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 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-RRR-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

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: None
Part 2 — PRODUCTS

2.1 FACEPLATES
A. All faceplates shall be equipped with labels and label holders.
B. Single gang 6 port faceplate shall be Hubbell P/N IFP16OW (Office White)
C. Wall phone plates shall be recessed Allent Tel P/N AT 219-6

2.2 MODULAR INSERTS
A. Single Modular inserts for the voice port shall be Hubbell P/N HXJ6OW (8-pos office white TIA-568B wired category 6).
B. Single Modular inserts for all data ports shall be Hubbell P/N HXJ6B (8-position blue TIA-568B wired category 6).
C. Blank Modular inserts shall be Hubbell P/N SFB10.
D. Modular inserts shall be positioned in the faceplate as follows:
   1. All voice jacks followed by all data jacks starting at the top left and proceeding down the left column then down the right column.
   2. The first voice jack shall be named V1 in the tap list followed by V2.
   3. Data jacks shall be named D1, D2, D3 and so forth in the tap list. 3

2.3 HORIZONTAL CABLE
A. The UTP Horizontal cable utilized for the distribution of voice shall meet or exceed Category 6 cable standards and shall comply with the Hubbell 25 year Mission Critical Warranty™. Color shall be blue. Manufacturer shall be:
   • Mohawk P/N M57202B (non-plenum) P/N M57193B (plenum).
B. The UTP Horizontal cable utilized for the distribution of data, shall meet or exceed Category 6 cable standards and shall comply with the Hubbell 25 year Mission Critical Warranty™. Color shall be white. Manufacturer shall be:
   • Mohawk P/N M56889B (non-plenum) P/N M56905B (plenum)

2.4 DATA PATCH PANELS (COMMUNICATIONS ROOM)
A. 48-port modular patch panel(s) shall be 8 position, 8 conductor, Category 6, Manufactured by Hubbell P/N P6E48U
B. Horizontal wire management, when required, shall be manufactured by Hubbell P/N HC219ME3N

---

3 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.
2.5 FIBER OPTIC TERMINATION HARDWARE (COMMUNICATIONS ROOM)

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. 12 port fiber connector-housing panel for OM3 Multimode shall be Corning SC duplex panel P/N CCH-CP12-E7
F. Fiber optic horizontal manager shall be Corning P/N CJP-02U.
G. Multi mode connectors shall be 50 micron laser optimized OM3 with SC UNICAM connectors manufactured by Corning P/N 95-050-41-X
H. Single-mode connectors shall be SC UNICAM manufactured by Corning P/N 95-200-41

2.6 VOICE TERMINATION HARDWARE (COMMUNICATIONS ROOM)

A. The 300 pair BIX mount shall be Nordx P/N QMBIX12E
B. The 50 pair BIX mount shall be Nordx P/N QMBIX10C
C. The 25 pair BIX connector shall be Nordx P/N QCBIX1A
D. The 4 pair BIX connector shall be Nordx P/N QCBIX1A4
E. The BIX designation labels shall be Nordx. Label colors shall be:
   - GREEN: Toward switch
   - BLUE: Toward telephone
F. Building Entrance Terminals (BIX connectors IN and OUT with splice chamber): Manufactured by CIRCA
   - 25 pair-P/N-2100SB-25
   - 50 pair-P/N-2250SBP-50
   - 100 pair-P/N-2200SBP-100
G. Surge Protection Modules: Manufactured by CIRCA P/N-C3B1FS

2.7 INTRA-BUILDING BACKBONE CABLES

A. The in-building backbone cables for voice shall be manufactured by ESSEX.
B. The in–building backbone cable for data shall be a minimum of 12 strands single-mode and 12 strands 50 micron multimode manufactured by Corning and installed by a Corning EWP certified vendor.
C. All fiber riser cables shall have an armored sheath.
2.8 INTER-BUILDING BACKBONE CABLES
A. The Inter-building backbone cable for voice shall be manufactured by Essex.
B. The Inter building backbone cable for data shall be manufactured by Corning and installed by a Corning EWP certified vendor.

2.9 EQUIPMENT RACKS
A. Ortronics Mighty Mo 10 - Cable Management Rack: P/N OR-MM10716
B. Ortronics Mighty Mo Blank Filler Panels
   1. 1U – P/N OR-401004788
   2. 2U – P/N OR-401004789
   3. 3U – P/N OR-401004790
   4. 4U – P/N OR-401004791
C. Vertical Cable Management System
   1. Single Rack Line-Up:
      a. Two Ortronics Mighty Mo Cable Management Cages with Door are required (P/N OR-MM6VMD706).
         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-MM6VMD706).
         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-MM10VMD712).
         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 EDGE NETWORK ELECTRONIC (SUPPLIED BY CIS)

A. All Research Buildings:
Cisco: P/N WS-C3750X-48P-S
1. Power Consumption:
   3750X-48P - 580 watts, (assumes 30 ports VoIP or AP at 15w per port)
   3750X-24P - 325 watts, (assumes 15 ports VoIP or AP at 15w per port)
2. BTU output:
   3750X with 715W supply - 2465 BTU/hour

B. All Non-Research and Residence Hall Buildings:
Cisco: P/N WS-C3750V2-48P-S
1. Power Consumption:
   3750v2-48PS - 263 watts (50% PoE load)
   3750v2-24PS - 248 watts (50% PoE load)
2. BTU output:
   3750v2 - 1796 BTU/hour

2.11 WIRELESS DEVICES (SUPPLIED BY CIS)

A. Indoor:
1. Aruba AP-105 Access Point (802.11 a/b/g/n)
3. AP-105-MNT - Aruba 105 Access Point Mounting Kit for flat surfaces or wall boxes

B. Outdoor:
1. Aruba AP-124 Access Point
   Mounted inside close to the antenna on exterior.
3. Aruba AP-ANT-17 (specifically for AP-124) requires special cable depending on distance to AP.

2.12 UNINTERRUPTIBLE POWER SUPPLY (SUPPLIED BY CIS)

A. Rack Mounted UPS (Supplied by CIS)
1. American Power Conversion (APC): P/N SURTA3000RMXL3U
   a. APC Smart-UPS RT 3000VA Rack Tower 120V
<table>
<thead>
<tr>
<th>Rack Height</th>
<th>3U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Weight</td>
<td>140 lbs.</td>
</tr>
<tr>
<td>Online Thermal Dissipation</td>
<td>305 BTU</td>
</tr>
<tr>
<td>Input Connections</td>
<td>NEMA L5-30P outlet mounted to back of rack at 18” AFF</td>
</tr>
<tr>
<td>Cord Length</td>
<td>8 feet (2.44 meters)</td>
</tr>
</tbody>
</table>

b. American Power Conversion (APC): P/N SURT192RMXLBP3U
(UPS Battery Pack for use when back up generator is not available)

<table>
<thead>
<tr>
<th>Rack Height</th>
<th>3U</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net Weight</td>
<td>200 lbs.</td>
</tr>
</tbody>
</table>

B. Building Wide UPS (Supplied by the Project)
   1. American Power Conversion (APC) Galaxy model with network management

### 2.13 OUTSIDE EMERGENCY PHONES

A. Manufactured by Ramtel, Johnston, RI ([www.ramtel.com](http://www.ramtel.com))
B. Micro Processor based hands free dual purpose phone with sealed chrome keypad & 4 auto dial buttons, Brown University stencil P/N RR734/3
C. Stainless steel Enclosure P/N 926
D. Heater/clip on P/N 800—1072
B. 24v transformer P/N 600—1011
F. Blinking blue light P/N BL—1A

### 2.14 ELEVATOR EMERGENCY PHONES

A. Elevator phones shall be Ramtel P/N RR833
B. (If needed) Phone in Bezel Enclosure Ramtel P/N RR833—906

### 2.15 WHEELCHAIR LIFT PHONES

A. One Button wheelchair assistance phone (on the lift) P/N RR733M
B. Regular phone with Blue button for wheelchair lift (on each end of the lift) — P/N RR734
2.16  CONFERENCE PHONES (SUPPLIED BY END USER)
Manufacturer: Polycom, Part #: xxxxx

2.17  TAMPER PROOF HOUSING
       SECURE IT PLATE FOR LAUNDRY AND VENDING
Manufacturer: Hubbell, Part #: TPF10W

2.18  CEILING HOUSING FOR WIFI RADIOS
       PRE ASSEMBLED HEAVY DUTY BOX TO TBAR FASTENER
Manufacturer: Cooper B-Line, Part #: BA50-SB24
Part 3 — EXECUTION

Part 3 outlines the planning, design and construction process for network and telephone services 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 CIS Project Fact Sheet to initiate a project and to request information from CIS for a project under consideration.

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

C. CIS 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. Facilities Management will update the Project Fact Sheet to notify CIS a project is underway.

B. CIS 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

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

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

E. The passive communication cable system must be completed and delivered before the active electronics equipment is configured and installed.
F. Construction plans must show communications outlet locations, type\textsuperscript{4}, and name.

G. A CIS work order may be submitted for discovery of existing conditions if necessary.

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

\textsuperscript{4} The outlet type is the number of voice and data cables in the communications outlet
3.3 CONSTRUCTION

A. General

1. All data installations must receive the 25-year Mission Critical Warrantee from Hubbell™ Premise Wiring by the installing contractor.
2. All fiber installations must receive an Extended Warranty Program certification from Corning by the installing contractor.
3. Warrantees must be submitted as a project deliverable.

B. Milestones

There are five milestones during the construction phase for CIS:
- Kick off
- Draft Tap List
- Pre-acceptance walk thru
- Acceptance
- Service turn up

Follow the milestone dates shown in the table below:

<table>
<thead>
<tr>
<th>Construction Milestones</th>
<th>Milestone Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kick Off</td>
<td>At mobilization</td>
</tr>
<tr>
<td>Draft Tap List</td>
<td>10 business days after Kick Off</td>
</tr>
<tr>
<td>Pre-Acceptance Walk Thru</td>
<td>20 business days before Service Turn Up</td>
</tr>
<tr>
<td>System Acceptance</td>
<td>10 business days before Service Turn Up</td>
</tr>
<tr>
<td>Service Turn Up</td>
<td>10 business days before In Service date</td>
</tr>
</tbody>
</table>

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. CIS revises both lists annually.
   - Corning Approved Vendor List
   - Hubbell Approved Vendor List.
3. The construction schedule must include a ten-day service turn-up period for CIS prior to substantial completion. (Service turn-up)
4. Milestone Dates: Substantial Completion, Service Turn-up, Move-in all following in close succession.
5. CIS must be notified of any additions or changes to the locations or type of communications outlets during construction.
D. Draft Tap List
   1. Ten business days after kick off a schedule of all voice and data cables must be received by CIS; also known as the Tap List.
   2. The list is used to identify the network and telephone number for all services required on moving day.
   3. During this period:
      • CIS 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 Thru
   CIS 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 CIS two weeks before the In Service date.

   1. Telecommunications Contractor Deliverables by System Acceptance
      a. Final tap list
      b. Construction plans in pdf format showing communications outlet locations and names.
      c. Racks installed & grounded
      d. Backbone cable installed, labeled and tested
      e. Including fiber optic and copper cables for riser and outside plant
      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 CIS via email.
         • All cables: OSP, riser, and station cable.

   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. The turn up of special services such as a card the service owner must schedule access control panel uplink and elevator car phones separately in advance. For example Public Safety is the service owner of card access and surveillance. Facilities owns building automation and metering, etc.

2. The in-service date will be ten business days after receipt by CIS 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, CIS 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 CIS will be performed during normal university business hours.

5. CIS 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, CIS 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 CIS accepts the communications systems as in-service, CIS 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 CIS Help Desk.

3.4 CLOSEOUT

A. The O&M documentation must include:

1. Warrantee 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 locations and names.

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 warrantee application and to CIS prior to service turn-up.

END OF SECTION