3.12 WORK AREA TELECOMMUNICATION OUTLET

3.12.1 General

Telecommunication outlets shall be provisioned with double gang back-boxes and faceplates. Each telecommunication outlet shall have one (1) 1-1/4 inch trade size conduit that extends from the back box to the accessible ceiling space. Telecommunication outlets shall not be daisy chained.

Telecommunication outlet locations shall be coordinated with the furniture layout. In offices and conference rooms, typical outlet placement is +18 inches above the finished floor (AFF) and within three feet of a general-purpose single-gang electrical outlet. This may be altered based on the proposed furniture design. Desks that have modesty panels placed against the wall will obstruct access to the electrical and telecommunication outlets; as such, outlets should be located to the right or left of the desk location or at +6" above the desk surface.

In rooms with built-in counters, work surfaces and cupboards, telecommunication outlets shall be placed at +6 inches above counter/surface height and coordinated with placement of the electrical outlets.

In office spaces with built-in work surfaces, computers can be tower or floor standing. Telecommunication and electrical outlets may still be located at +18 inches AFF so as to preserve a clean wall surface. However, this will require the Architect to arrange for the drilling of routing holes in the work surface (installed with grommets) to facilitate the clean routing of patch cords and electrical cables. The grommet will be:

- a minimum of two inches in diameter.
- made of plastic or rubber.
- oval or circular in shape.
- fitted to the hole drilled in the work surface with a replaceable cover that will hold the cabling snug after routing.

Outlets will not be placed such that they are located inside of cupboards and cabinets unless this specific purpose is desired (such as for a concealed fax machine, printer, TV or computer).

3.12.2 Single-Person Office

A single-person office shall have a minimum of two (2) telecommunication outlets installed, with each outlet installed on opposing or adjacent walls. Outlets should be located to maximize the flexibility of furniture placement and outlet placement shall be coordinated with all furniture plans. In fixed configuration offices or if built-in furniture is to be constructed, it is preferred that electrical and data outlets be located at +6" above the height of the desk surface or +36 inches AFF. If the office is large enough to support a visitor/conference table, an additional telecommunication outlet shall be installed, typically at +18 inches AFF. Height of electrical outlets shall be consistent with data outlet height.

3.12.3 Two-Person Office

A two-person office shall have a minimum of four (4) telecommunication outlets installed, with each outlet installed on opposing or adjacent walls. Outlets should be located to maximize the flexibility of furniture placement and outlet placement shall be coordinated with all furniture plans. In fixed configuration offices or if built-in furniture is to be constructed, it is preferred that electrical and data outlets be located at +6" above the height of the desk surface or +36 inches AFF. If the office is large enough to support a visitor/conference table, an additional telecommunication outlet shall be installed, typically at +18 inches AFF. Height of electrical outlets shall be consistent with data outlet height.

3.12.4 Conference Rooms

Conference rooms require one (1) telecommunication outlet for every 10 feet of wall space on three sides of the room; an electrical outlet shall be placed at same height and location of each telecommunication outlet. The wall that is considered to be the "front" of the room shall have one (1) telecommunication and one (1) power outlet where the whiteboard is located. In addition, provisions shall be made to have a power and telecommunication outlet flush-mounted to the ceiling for possible use by a projector or wireless access point.

3.12.5 Instructional Classrooms

Instructional classrooms that have a specific teaching wall orientation will be provided with a one (1) telecommunication outlet every 10 feet on each of the three non-teaching walls; one (1) electrical outlet shall be placed at the same height and location. On the teaching wall, a telecommunication outlet shall be located under or in close proximity to the classic or electronic whiteboard. If an instructor's podium is provided, an electrical and telecommunications outlet will be required. Telecommunication outlets shall be provided flush to the ceiling to support wireless access points and video projectors; electrical outlets shall be provided for video projectors but not wireless access points. AV systems for classrooms shall be installed in a three-gang box with one (1) 1-1/4 inch trade size conduit. The quantity and type of network cables included in each outlet will be defined by the District IT Group for each standard and smart classroom. In-wall conduit pathways are preferred, but surface mount raceway may be used with prior approval from the District IT Group.

At the main entrance to the classroom, a telecommunication outlet for a wall mounted telephone will be provided. This outlet shall be positioned such that it does not interfere with light switches or access to the door. The mounting height shall be +42 inches AFF to ensure compliance with ADA requirements.

3.12.6 Cubicle/Partitioned Offices (Modular Furniture)

Cubicle and partitioned offices will require feed points. A *feed point* is a large (typically a 2-inch trade size conduit or 4-gang box) used to route communication cables into the raceway system of modular furniture. The mounting height and exact location of the feed points will depend upon the modular furniture system to be installed. The type of furniture system to be used shall be conveyed to both the Electrical and Telecommunication Consultants. Splicing of voice and data cables is not permitted and cabling that routes through modular furniture will be installed as home runs from the

faceplate to the serving Information Technology Room. Each modular furniture location will be provisioned with at least one communications outlet consisting of up to four (4) Category 6A cables (two (2) voice and two (2) data). One additional telecommunication outlet with up to four (4) cables shall be added for every four (4) cubicles. Conduits routing to the feed points and the raceway system within the modular furniture must be able to hold sufficient cables for each cubicle in the modular furniture system at a fill ratio of 25%. Conduits will typically be 2-inch trade size in diameter. Multiple conduits shall be installed to provide sufficient space for the required number of cables.

When laying out a modular furniture system it is very important to consider how power and communication cable will be connected to the furniture system. If adjacent to the modular furniture, the use of solid walls and columns to route cables to the feed point are encouraged. Using walls with windows should be considered as a last resort because of the difficulty of routing cables to outlets beneath windows. In walls with windows, feed points and outlets should be placed on the solid section of the walls.

Furniture pathways may be entered from building walls, columns, ceilings, or floors. The interface between buildings and furniture requires careful planning and may require special products or furniture options. Modular furniture systems with integral raceways for data/voice cables are preferred. Safety, reliability, and aesthetic concerns all favor concealment of the building-pathway to furniture/pathway interface while maintaining future accessibility. These pathway interfaces shall not trap access covers or otherwise block access to building junction boxes or pathways. Pathways used to interconnect the furniture with building horizontal pathways shall be provided with a cross-sectional area at least equal to the horizontal pathways, cross-sectional area for the floor area being served. The Electrical and Telecommunications Consultants shall coordinate with the Furniture Consult and the District IT Group when planning cabling and pathways to service modular furniture.

3.12.7 Floors

A metallic raceway shall be provided between furniture pathways and horizontal floor pathway terminations (end of conduit, flush junction boxes, and recessed junctions boxes, etc.). Alignment of furniture with building module, duct locations and other cable delivery means will be considered as part of the layout planning. Furniture shall not be arranged such that pathway interfaces are in aisle spaces, where people walk or place their feet, or other places where such obstructions could create a hazard.

3.12.8 Wall Mounted Telephones/Payphones/Text Telephones

In order to comply with ADA Accessibility Guidelines, the mounting height of the outlet box for wall-mounted telephones shall be +42 inches AFF. If a wall-mounted telephone is to be installed above a countertop, the clearance for the box shall be +8 inches above the countertop.

The mounting height of the outlet box for wheelchair accessible payphones shall be +42 inches AFF. If a Text Telephone (TTY) is required, it shall not be mounted to the wheelchair-accessible telephone position. The Text Telephone unit will require a power outlet positioned next to or behind the TTY device.

3.12.9 Workrooms

Faculty or administrative workrooms will vary in size and function. These workrooms may be equipped with shared departmental resources including:

- Facsimile machines
- Laser printers
- Desktop computers
- Copiers

A variety of supplemental office devices, such as pencil sharpeners, laminators, electric staplers, etc. may also be located in the workroom.

To facilitate the use of these devices, numerous communication and power outlets are needed. Workrooms are typically configured with counters and storage cupboards. Along countertops where facsimile and printers may be placed, telecommunication outlets, with an appropriate quantity of electrical outlets, will be distributed every six feet. These will be placed at +6 inches above counter height. For self-standing copier machines, a telecommunication outlet will be provided with appropriate dedicated electrical outlets. At the entrance to the workroom, a wall-mount telephone outlet will be required. This outlet shall be placed to avoid space conflict with door swings, cupboards, fire extinguishers, water coolers, panels or any other fixture or device that could interfere with accessibility of the telephone.

3.12.10 Computer Labs

Computer lab layouts vary depending on the type of activity conducted in the lab. Since computer labs may be rearranged, it is important that computer lab telecommunication outlets provide as much flexibility as possible. There are many possible computer lab layouts. Computer labs will be custom designed with the participation of the District IT Group staff. Typical configurations are described below. At the entrance to any lab, a wall-mount telephone outlet will be provided.

3.12.11 Computer Lab – Raised Floor

In new buildings with rooms designed for permanent computer labs, the computer lab design shall include a raised floor environment. For ground floor implementations, a depressed slab is preferred to allow for the raised floor environment without losing room space due to ramps or stairs. The raised floor environment will provide the following:

- Removable floor tiles to grant unhindered access to the floor space. Depth of the raised floor will be determined during design,
- A matrix of telecommunication and power outlets in sufficient quantities to computer tables. The quantity and location of telecommunication and power outlets will vary in accordance with room size and orientation; the Telecommunication Consultant shall work with Campus IT and/or the District IT Group to determine outlet requirements on a case-by-case basis. Each matrix will be custom designed with District (IS) and Campus (ACT) according to room requirements.

- Cables to data outlets will be fully enclosed in a metallic raceway system that provides sufficient space so that the enclosed cabling does not exceed a 25% fill. The raceway system shall consolidate to suitable junction boxes that route conduits back to the serving Telecommunications Room.
- Raceway system will be suspended from the floor and mounted so that the communication and power outlets face horizontally. This will minimize the possibility of dust, particulate matter, and liquid falling into the network jacks.
- The removable floor tiles will be provided with notched access so that patch and power cords can be routed from the raised floor to the computer tables. Floor tiles will be re-locatable so that as room configurations change, cable notches can be positioned underneath tables and away from circulation paths.

3.12.12 Instructional Lab – Slab Floor

In an Instructional Computer Lab, student computers will be oriented towards a whiteboard or teaching wall upon which the Instructor's workstation may project images and perform demonstrations. This lab is typically sized for 30 student computers and an instructor's computer. The lab may also contain 3 to 4 printers, scanners and other network devices. Tables are typically arranged to allow the students to all face in one direction and not need to twist around to watch the instruction. Tables are usually positioned against the walls. Printers, scanners and other network devices are distributed around the room as space permits.

The preferred outlet arrangement for this layout is to provide a divided metal raceway around the periphery of the room with outlets at intervals corresponding to table spacing. Tables will be situated flush against the walls to prevent the stretching of power or data cables across aisles or walkways. Telecommunication and electrical outlets shall be provided at the front of the classroom on either side of the whiteboard.

3.12.13 Computer Lab – Student Self-Study

In a computer lab where students go to work on assignments, there is typically no formal instruction. As such, the lab layout is oriented to provide the highest number of student stations, with little space reserved for an instructor's workstation or whiteboard. The layout of this type of computer lab will vary with room dimensions and shape. In an arrangement of long tables, typically one computer workstation is provided for every 2.5 feet of tabletop. Circular computer kiosks vary in size with 6 to 8 stations per kiosk, typically. Outlets for these computer labs should follow the general design guidelines:

- All outlets on walls should be provisioned in metal raceway at a height of +6 inches above the tabletop, typically +36 inches AFF.
- Outlets will be provisioned in intervals corresponding to table spacing. Outlet placement must be coordinated with the District IT Group.
- All rooms that support islands of tables or kiosks will be configured with flush-mount floor boxes. Dual purpose floor boxes (communication and power) are acceptable,

provided that adequate separation is maintained so that all power outlets and communication jacks can be used simultaneously without the cords interfering with one another. The preferred design is a flush-mount brass floor box with brass covers that can be accessed when an outlet is used. All floor outlets will be provisioned in the floor slab. No cabling will extend across the floor. Floor mounted raceway (pancake raceway) is not acceptable.

- A sufficient quantity of floor boxes shall be provided to support the required number of computers, printers, scanners and other networkable devices.

3.12.14 Specialty Locations

The campus will have specialty locations that shall require custom configuration at the time of building design. These locations include but are not limited to:

- Theatres
- Lecture halls (seating capacity > 200)
- Auditoriums
- Athletic broadcasting control rooms
- Scoreboards, electronic advertising boards, etc.

At the time of design, the requirements for each of these locations will be individually determined with the District IT Group.

3.12.15 Maintenance Spaces

A maintenance space is defined as any room that houses materials, supplies, equipment or tools used for the performance of maintaining systems on campus. These can include but may not be limited to:

- Electrical rooms
- Security rooms
- Mechanical rooms
- Control rooms
- Boiler rooms
- Garages

In these spaces, the minimum telecommunication outlet shall be an outlet for a wall-mount telephone. The estimated size of the wall-mount telephone is 10” H x 12” W, centered on the outlet. This outlet will be located on the same wall as the doorway to the space, with sufficient clearance so that the outlet is not obstructed by light switches, equipment or storage shelves. If the door swings into the room, the outlet shall be located on the wall beside the door lock (i.e., not beside the door hinges), so that the door can swing open without damage to the telephone.

If the maintenance space will also be used as an office for maintenance personnel, the space will be equipped with additional telecommunication outlet(s) located on the wall within three (3) feet

of a general-purpose electrical outlet. One (1) telecommunication outlet will be provided for each desk area assigned to the maintenance space.

If the maintenance space contains panels, control systems or other devices that need to remotely communicate status and operation via modem or network connection, each of these devices will be separately equipped with a dedicated data station cable. Determination of which devices/panels require cabling will be performed in conjunction with engineering specialists for each device type. These devices can include HVAC monitors, elevators, EMS panels, etc.

3.12.16 Building Rooftops

Control equipment located on building rooftops frequently requires special provisioning of communications connectivity. This equipment can include HVAC monitors, cellular/wireless antennas, broadcasting equipment, telescopes, communication relays, etc. Some of these systems may be added after the building is built. The Telecommunication Consultant shall design a conduit pathway to the roof that will provide 25% fill ratio through which connections can be added later. Any control systems that require network connectivity need to be located within 90 meters of an Information Technology Room.

3.12.17 Storage Areas

All storage areas that will be accessed by NOCCCD staff on a daily basis will be provided with an outlet for a wall-mount telephone. If the storage area will be provisioned with general purpose electrical outlets, at least one communications outlet will be provisioned on each wall where there is an electrical outlet. Frequently, storage areas are redefined in purpose and may change into small meeting rooms, offices or other work areas requiring connectivity.

3.12.18 Wireless Access Support

For support of wireless access points, provide a ceiling communications outlet with two (2) Category 6A cables. For rooms with hard ceilings, this may take the form of a flush-mount outlet. For dropped ceiling spaces, the outlets may be concealed in the ceiling space with equipment mounted in a pocket door or above the dropped tiles.

Detailed wireless design specifications are provided in Section 8. The actual design will be determined on a room-by-room basis by the District IT Group.

3.12.19 AV Projector Support

For video connectivity to an instructor’s desk/podium, an AV outlet and pathway shall be provided for a video projector location to the classroom through the AV cabinet. The AV outlet shall provide data connections for AV connectivity and a power outlet for projector support. The actual design will be determined on a room-by-room basis by the District IT Group.

3.12.20 Security Devices

As determined by the site security plan, there will be a distribution of telephones that provide ring-down connectivity to campus police. These phones may be implemented along corridors/hallways, in foyers, at bus stops or parking lots. The precise location and functionality of these telephones for each project are to be determined by the District IT Group and Campus Safety personnel.

Additional TCP/IP-enabled security devices, such as cameras, will be connected to the network. These devices may be located on building exteriors, light poles or other internal and external structures. Cabling to these devices require copper or fiber cable, possibly with outside plant sheaths. Pathway and routing to these security devices will be designed on an individual basis. Provisions for these lines and services will need to be coordinated end-to-end to the campus MDF and/or MPOE.

3.12.21 Fire/Life/Safety Devices

It is the responsibility of the Telecommunications Design Architect, the District IT Group to clearly identify and make provisions for traditional phone lines/connections for Fire/Life/Safety devices. A careful review of campus systems must be completed to determine other needs for these traditional phone circuits. These devices include but are not limited to elevator phones, emergency phones, off campus security monitoring systems and services. Provisions for these lines and services will need to be coordinated end-to-end to the campus MPOE across the campus copper cable network.

7.3 WORK AREA OUTLETS

The Telecommunications Consultant and the District IT Group shall work together to define the requirements for this type of installation. For VoIP installations, all station cable shall be terminated in the TRs on 48-port rack-mounted patch panels.

NOTE: Responsibility for Elevator and Fire/Life/Safety systems falls outside of the District IT Group's purview, but the District IT Group is responsible for design and provision of low-voltage cabling for these systems. The Telecommunication Consultant shall work with the Architect, the District IT Group, and the campus entities listed in the table below when designing for Elevator and Fire/Life/Safety low-voltage cabling:

Campus	Fire/Life/Safety	Elevators
Anaheim	Campus Facilities	Campus Facilities
Cypress	Campus Facilities	Campus IT
Fullerton	Campus Facilities	Campus Facilities

Project prints and Bid Documents must clearly indicate the type and style of cable and jacks to install, including provision for adequate services for Fire/Life/Safety devices as defined in Section 3.12.21.

- **Type A:** Voice/Data outlet with two (2) data cables terminated in a six-port faceplate, usually at a height of +18 inches AFF. *Typical installation: Conference Room.*
- **Type B:** Data outlet with two (2) data cables terminated in a four-port faceplate, usually at a height of +18 inches AFF. *Typical Installation: Classroom.*
- **Type C:** Data outlet with two (2) data cables terminated in a six-port faceplate, usually at a height of +18 inches AFF. *Typical installation: Administrative Office.*
- **Type D:** Data outlet with a minimum of four (4) data cables, terminated in an eight-port faceplate. Height varies with installation. *Typical installation: Computer Lab.*

- **Type E:** VoIP outlet with one (1) data cable terminated in a one-port metal faceplate, for wall-mount telephones at a height of +48 inches AFF. *Typical installation: Classroom, Corridor.*

7.4 OUTLET DISTRIBUTION

The typical outlet types described in the preceding section will be installed according to room function. In addition to the general outlet information detailed in Section 3.11, the following specific outlets types are required for each room:

Room Type	Outlet Types
Single Person Office[1]	Two (2) Type C outlets to maximize flexibility in placing desks and furniture. One (1) Type C outlet at conference table.
Cubicle/Partitioned Office	One (1) Type C outlet per cubicle in modular furniture communications raceway/trough as available. Outlet provisioned with fittings to hold jacks securely. One (1) additional Type C outlet for each four cubicles for support of fax/shared printers, etc.
Conference room (variable size)	One (1) Type A outlet on front wall by "whiteboard" or presentation screen. One (1) Type A outlet every ten feet of wall within three feet of electrical outlets, minimum one outlet per wall. One (1) Type B outlet centered in ceiling by location for ceiling projector.
Instructional Classroom	One (1) Type C outlet at instructor's podium. One (1) Type B outlet every ten feet of wall within three feet of electrical outlets, minimum one outlet per wall. One (1) Type B outlet centered in ceiling by location for ceiling projector. One (1) Type E outlet at main entrance to classroom, for wall-mount telephone. Where classrooms contain network-attached electronic whiteboards, add one (1) data cable to whiteboard location as needed, routed in-wall.
Work/Prep room	One (1) Type E outlet at room entrance. Multiple Type A outlets distributed every six feet above countertop. One (1) Type C outlet at photocopier location.

[1] Single Person offices may often be reconfigured to be shared by multiple part-time staff, with several desks, phones and computers.

Room Type	Outlet Types
Storage Rooms[2]	One (1) Type E outlet at room entrance.
Maintenance Room	One (1) Type E outlet at room entrance. Multiple voice/data cables to system controllers that have modem or Ethernet connection requirements. If an office/desk for maintenance personnel are included in the maintenance room, add: One (1) Type A outlet for every desk location.
Rooftops	One (1) Type A outlet in weatherproof box. Multiple voice/data cables to rooftop HVAC or other controllers that have modem or Ethernet connection requirements routed in conduit with weatherproofing.
Payphone	One (1) Type E outlet at each location designated for payphone or TTY phone.
Emergency Phones (corridors, elevators, foyers, parking lots, bus stops)	One (1) Type E outlet or cable with custom termination located at every location as required by security plan. OSP cable required for all below grade or routing to building exterior.
Change Rooms	One (1) Type E outlet at room entrance.

The following are general guidelines for computer labs. Each computer lab must be custom designed, incorporating the size, purpose, furniture layout, and floor type into the detailed design.

Room Type	Outlet Types
Instructional Computer Lab	Two (2) Type B outlets on front wall, one on each site of the "whiteboard" or teaching wall. One (1) Type B outlet centered in ceiling by location for ceiling projector. One (1) Type E outlet at main entrance to classroom, for wall mount telephone. Multiple Type D outlets distributed around room periphery, usually in metallic raceway mounted at +6" above tabletop. Number and exact location of outlets varies with room size and placement of computer tables in room.
Self-Study Computer Lab	One (1) Type B outlet centered in ceiling by location for ceiling projector.

[2] Storage rooms are often converted to offices after the fact.

Room Type	Outlet Types
	One (1) Type E outlet at main entrance to classroom, for wall mount telephone. Multiple Type D outlets distributed in walls, wall-mount raceways and flush-mount floor boxes. Pathways will not obstruct pedestrian traffic or viewing. In particular pancake raceway, or power poles are to be avoided.

Specialty locations such as theaters, auditoriums, press boxes, large lecture halls, pools, playing fields and for scoreboards and advertisement boards require custom design according to the proposed functionality. It should be assumed that each specialty device will require a data or voice connection for current or future connectivity. As a minimum, two Category 6A cables shall be provisioned for each location. Where cabling runs below grade or is exposed to the building exterior, outside plant cable shall be required. Cables will be provisioned within the 90-meter length requirement for data connectivity.