NETWORKING AND TELECOMMUNICATIONS SYSTEMS:

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1. GENERAL

1.1. Networking and Telecommunications, a unit of Computer Services at Missouri State University; is involved in providing the following services for buildings on the Missouri State University campus:

1.1.1. Telephone service, including indoor and outdoor emergency telephones and rescue assistance communication

1.1.2. Data connections to the campus network, including wireless access points

1.1.3. Electronic access control associated with the Bear Pass

1.1.4. Security cameras

1.2. Discussions with Networking and Telecommunications and the end users shall be held early in the design of a project to make sure the needs and expectations of the end users are made clear and to understand what facilities Networking and Telecommunications will require in order to provide the necessary service. The Project Manger shall be the lead in facilitating these discussions.

2. BUILDING INFRASTRUCTURE

2.1. Fiber and copper connections to the campus voice and data systems are typically brought into the building at a single location in a voice/data room. The contractor is typically required to provide the raceway into the building. Networking and Telecommunications will pull the fiber and copper lines into the building and terminate them in a voice/data room. An equipment rack will be installed in the room to provide distribution of voice/data systems to the building. Equipment racks are typically furnished and installed by Networking and Telecommunications.

2.2. The contractor is required to provide all boxes and raceways for the voice/data systems, including access control and security cameras. Conduits shall be a minimum 1" diameter unless noted otherwise on specific details. A cable pathway consisting of conduits, J-hooks, and/or cable trays must provide a continuous path from every location of service back to a voice/data room. Data, voice, CCTV and access control typically share the same cable pathway. Cabling shall not be allowed to run loose, lay on ceilings, or be attached to other conduit and piping, etc. The cable path must be clearly indicated on the bid documents. During construction the entire cable pathway must be in place prior to beginning any voice/data wiring.

2.2.1. Time must be allowed during construction to accommodate the installation of the voice/data wiring in the building. Make sure that the construction schedule allows for this work. After award of the construction contract, make sure that the contractor provides a construction schedule and within that schedule indicates time to allow Networking and Telecommunications to wire the building and to finish out the installation. Coordinate with Networking and Telecommunications to establish their time needs and continue to communicate with them throughout construction to ensure they are informed of the schedule as construction progresses.

2.2.1.1. Voice/Data wiring shall begin after the cable pathway is fully in place but before ceiling grid is installed. Drywall is also typically in place at this stage. Final wiring, which includes installation of the jacks and coverplates, typically occurs after painting is complete and the building is free of excessive dust.

2.3. Provide sleeves through the walls, floors, and ceilings of voice/data rooms as necessary to provide a continuous cable pathway. Provide the size and quantity of sleeves at each location where they are required as appropriate for the number of cables expected to pass through the construction. Consult with Networking and Telecommunications to determine the quantity and size of sleeves required. Sleeves through fire rated construction must be fire stopped.

2.4. J-hooks are the preferred means of providing cable support above accessible lay-in ceilings. Space J-hooks a maximum of 48" on center. At changes in direction, J-hooks must be located not farther than 12" on each side of the change in direction.

2.5. Where a cable pathway must cross above an inaccessible ceiling, such as a drywall ceiling, provide a conduit or multiple conduits to carry voice data wiring above the inaccessible ceiling. Conduits shall be run as straight as possible. All bends in the conduit shall be sweep elbows and shall be kept to a minimum. In no case shall there be more than 180 degrees of total bend in a conduit unless a junction box is provided to act as a pull box. Size the conduit(s) to accommodate the anticipated number of cables that will be installed in the cable pathway. Consult with Networking and Telecommunications to determine the quantity and size conduits that may be required across an inaccessible ceiling area. Ends of conduit shall be de-burred and shall be provided with bushings to protect cables from damage.

2.6. Voice/data cables shall not be painted. Where the cable pathway is exposed, conduit shall be used as the cable pathway if it is desired that everything in the exposed area be painted to match the surrounding surfaces.

3. VOICE/DATA ROOMS

3.1. Every building must have at least one location to house central voice/data equipment such as the service demarcation, equipment racks, data switches, access control equipment, etc.

3.2. Except for in very small facilities, it is strongly preferred that the voice/data room be dedicated to housing voice/data equipment. Do not make an exception to this rule without consulting with Networking and Telecommunications. Do not share voice/data rooms with custodial closets, rooms where equipment might become wet, or rooms that might become excessively hot or cold.

3.3. Generally, the minimum size voice/data room is approximately 6' wide x 8' deep x 8' high. The actual quantity and size of the required voice/data room(s) depends on many factors such as overall building size, number of stories, floor plate size and layout, the density of the services required, etc. It is important to involve Networking and Telecommunications early in the design process so these rooms can be accommodated as the floor plans are developed.

3.4. Voice/data rooms will typically house at least one wall mounted equipment rack that is approximately 24" x 24" and hinges open for access to the rear of the equipment. This is generally mounted in the center of one wall to allow the rack to swing open and provide space for a technician to access the rear of the rack when it is open.

3.5. Voice/data rooms shall also have the following characteristics:

3.5.1. Line all walls with ¾" thick, fire-treated plywood. The bottom of the plywood can be mounted 12" above the floor and the top shall extend to at least 8' above the floor. The plywood provides a solid surface for mounting the equipment rack and other equipment enclosures such as the service termination equipment, access control equipment, grounding buss, security camera equipment, etc.

3.5.2. Provide at least one 120-volt, 20 amp quad-plex receptacle on each wall in the space. The receptacles in the space shall be on a circuit dedicated to the voice data room and shall be provided with an isolated ground. Emergency power is typically not required but is desirable if it is available.

3.5.3. Provide each voice/data room with a grounding buss. The grounding buss shall be a minimum of 4"x12"X1/4" thick and shall be mounted to the wall on stand-offs. Where multiple voice/data rooms are provided in a building, the grounding buss shall be bonded to the communication grounding system. The communication grounding system shall be constructed in accordance with the National Electric Code. The grounding system shall be bonded to the grounding system at the building electric service entrance.

3.5.4. Provide good lighting. Control lighting with an occupancy sensor or digital time switch so lighting is not left on indefinitely while the room is unoccupied.

3.5.5. The room shall be provided with air conditioning. In most cases voice/data rooms are not required to be equipped with a dedicated air conditioning system but careful consideration shall be given to the type of space that shares a thermostat with a voice/data room. Do not share a voice/data room with a zone that may require heating since voice/data rooms do not typically require heating.

3.5.6. Do not run piping through voice data rooms. This includes piping for domestic water, hot water heating, chilled water cooling, drain piping, steam and condensate, fire sprinkler, etc. Do not install equipment in or above a voice/data room that might leak or sweat. Water can cause serious and expensive damage to voice data equipment and create a major inconvenience to building occupants. If a voice/data room must be equipped with a fire sprinkler it is preferred to provide a sidewall sprinkler in order to keep piping out of the room if possible.

3.5.7. Provide a lockable, self-closing door. Door hardware shall have a storeroom function. Keying shall match other voice/data closets on campus.

4. TECHNOLOGY ROUGH-INS

4.1. Technology rough-ins typically consists of a 4" square box with a single gang plaster ring. A 1" diameter conduit shall be run from the box to the nearest cable pathway that provides the most practical route to the nearest voice/data closet. The ends of all conduits shall be de-burred and shall be provided with a bushing to protect voice/data cables from damage. Each rough-in shall have a dedicated conduit between the box and the cable pathway. Rough-ins shall not be "daisy chained". Keep bends to a minimum and provide intermediate pull boxes where an excessive number of bends are required. Networking and Telecommunications has the ability to provide up to six (6) jacks (voice and/or data) in a single gang coverplate.

4.1.1. Where floor boxes, surface raceway, modular offices systems that include a wiring raceway, or furniture that includes wire management are used, they must be able to accommodate Systimax jacks. Care must be taken when selecting and specifying these items, especially if they are provided with a special faceplate that fits to the floor box, surface raceway box, or furniture wireway. Many manufacturers make faceplates to accommodate Systimax jacks; it is simply a matter of specifying the correct faceplate and then verifying during the submittal process that the correct faceplate is being provided.

4.1.2. Rough-ins for cameras and wireless access points that are shown to be installed in lay-in ceilings do not require that the rough-in be installed in the lay-in ceiling tile. In these cases, the rough-in can be installed just above the location of the camera or wireless access point and a short plenum-rated patch cable will be used to connect the device to the outlet when it is installed.

4.1.2.1. Cameras do not require a separate power connection at the camera location but use Power-Over-Ethernet (POE). For outdoor cameras a power injector must be installed to provide power to the camera. These power injectors shall be located in the nearest voice/data closet. Coordinate the locations for the power injectors closely with Networking and Telecommunications. In instances where the nearest available location for a power injector is excessively far from the camera location, a power injector may have to be located outside of a voice/data closet in a location nearer to the camera. For outdoor locations remote from any building, this may require mounting the power injector in a weatherproof enclosure located outdoors. These exceptions must be discussed with Networking and Telecommunications during design.

4.1.3. Wireless access points are best mounted on a horizontal surface. Any exceptions to this must be approved by Networking and Telecommunications.

4.1.4. Card Reader locations require a more extensive rough-in than other technology rough-ins. Refer to the specific details for the rough-in and wiring of card readers and their associated electronic access control equipment.

4.2. The following schedule indicates rough-ins for technology typically provided on a project. Every project may not have a need for all of these items.

TECHNOLOGY ROUGH-IN SCHEDULE	
Item	**Description**
△ #V	Voice – Analog
△ #D	Data
△ #CCTV	Camera
△ #AP	Wireless Access Point
△ #CR	Card Reader (Electronic Access Control)
△ #EA	Emergency Assistance (Rescue Assistance)
△ E	Empty Conduit and Box with Blank Coverplate
△ #D*P	Data and VOIP Phone
# = Quantity of cables to be pulled to outlet * = Quantity of VOIP Phones served by outlet	

4.2.1. The symbols in the above schedule shall be used on the plans to indicate the type, location, and quantity of technology rough-ins required for the project.

4.2.2. Locations of rough-ins, types of rough-ins, and quantity of cables pulled to each outlet, as well as the number of VOIP phones at an outlet shall be determined during the design process. Generally speaking, the following project stakeholders shall be involved in determining the locations quantities:

4.2.2.1. Voice Rough-ins (Analog) - Networking and Telecommunications and the representative(s) of the end users.

4.2.2.1.1. Fire alarm panels require two (2) analog phone lines to provide a means of reporting to Safety & Transportation.

4.2.2.1.2. Emergency phones in elevators and other any locations require an analog phone line per emergency phone to provide voice service. For elevators this jack is provided in the elevator equipment room.

4.2.2.1.3. If the project includes any other equipment that reports to a monitored location via telephone, verify the type of phone line required and note it accordingly on the bid documents.

4.2.2.1.4. Fax machines require an analog phone line.

4.2.2.2. Data Rough-ins – Networking and Telecommunications and the representative(s) of the end users.

4.2.2.2.1. Keep in mind that in addition to providing a data rough-in at each location where there might be a networked computer workstation, data outlets are also required at any networked printer, scanner, or copy machine. Verify any locations such as these where data might be required with the representatives of the end users.

4.2.2.2.2. Data rough-ins are required at each instructor's station in a classroom equipped with audio/visual technology. Typically an instructor's station requires two (2) data cables however; an instructor's station in an ITV equipped classroom requires three (3) data cables. Verify these requirements with Classroom Instructional Technology during the design process. Note that conference rooms or auditoriums equipped with audio/visual technology may also require data connections. Verify those requirements with the A/V system designer and the representative(s) of the end user.

4.2.2.2.3. Data rough-ins are also necessary to connect the building temperature controls system to the central facility management system to allow the building temperature controls to communicate with central monitoring workstations. This typically occurs in only one location in a building but more than one location may be necessary in larger buildings or buildings where the layout dictates. These connections will require a fixed IP address be assigned to the jack. The IP address must be set up at the time the equipment is connected to the network and the IP address provided to the temperature controls contractor. Coordinate this effort with Networking and Telecommunications. Verify the location where these are required with the temperature controls contractor.

4.2.2.3. Camera Rough-ins – Networking and Telecommunications, Safety & Transportation, and the representative(s) of the end users.

4.2.2.4. Wireless Access Rough-ins – Networking and Telecommunications. This also requires a conversation with the representative(s) of the end users to verify how heavy they anticipate the usage of the wireless network will be. For instance, if a department is requiring all of their students to use tablets for electronic textbooks or laptops for recording lab data, Networking and Telecommunications needs to be aware so they can plan the density of the wireless coverage appropriately.

4.2.2.5. Card Reader (Electronic Access Control) – Networking and Telecommunications, Safety & Transportation, and the representative(s) of the end users.

4.2.2.6. Data and VOIP Phone - Networking and Telecommunications and the representative(s) of the end users.

4.2.2.6.1. In the case of these outlets, the quantity of cables pulled to the rough-in is equal to the prefix indicated for the Data. The prefix for the voice over IP phone indicates the number of phones that will be plugged into this outlet. The prefix before the VOIP Phone must always be equal to or less than the prefix before the data. A voice over IP phone plugs into a data outlet and if a networked computer is also required at that location, it is plugged into the VOIP phone.

5. ELECTRONIC ACCESS CONTROL

5.1. Missouri State University uses a system from S2 Security Corporation for electronic access control. Students, faculty, and staff are issued a Bear Pass card that includes the technology required to allow the card to be programmed with the credentials necessary for access control. Guests to the University may also be issued a Bear Pass card for their use when deemed appropriate. The system employs a “Tap & Go” card reader to convey the user’s credentials to the system when access is requested. Note that Residence Life and Services and the Jordan Valley Innovation Center use a system other than this for their electronic access control. When working on projects with those entities, verify their requirements during the design as they may differ from the requirements outlined here.

5.1.1. The contractor is responsible for providing the system of raceway and boxes necessary to accommodate the access control system at locations where electronic access control is required. Refer to the detail included in this standard for rough-in of card readers and their associated electronic access control equipment.

5.1.2. The contractor shall also provide the hardware necessary to monitor door position and request-to-exit, to properly lock and unlock the door, and to provide power transfer to the hardware as required. Hardware specified for these functions must be reviewed during the design process with Networking and Telecommunications as well as the University Locksmith. Refer to the details included in this standard for hardware and wiring for the access control system at doors.

5.1.3. Networking and Telecommunications will provide the central access control equipment, the card reader, and the hybrid cable for the access control equipment. Networking and Telecommunications will typically pull the hybrid cable to the door location and leave enough cable coiled above the ceiling near the door to reach each of the devices at the door. Networking and Telecommunications will typically terminate the wiring on the card reader and install the card reader.

5.1.4. The contractor shall remove the outer jacket from the hybrid cable and separate the cable into its individual cables in the junction box above the head of the door. Care shall be taken not to damage the jacket or shield on any of the individual cables. The contractor shall then pull each cable to its associated device and terminate the cable except that the cable to the card reader shall be pulled to the junction box for the card reader and left coiled in the box. As noted above, Networking and Telecommunications shall terminate the cables on the card reader and install the card reader on the box. The contractor shall coordinate the installation and commissioning of the system closely with Networking and Telecommunications.

5.1.5. Hardware shall fail in the secure position. Networking and Telecommunications will provide a 24-volt unlock signal to unlock an electronic lockset or electronic strike. This signal can power devices requiring 3 amps or less to operate. Electronic locksets are the preferred means of controlling access at most doors where electronic access control is required. These shall be provided with an integral request-to-exit contact and a door position monitor. Where electronic strikes must be used, a separate request-to-exit sensor and door position monitor must be provided.

5.1.6. Where an exit device is used, it must be provided with its own power supply that is compatible with the device. This will require that 120 volt power is brought to the power supply. In this case, Networking and Telecommunications will provide a contact closure to signal the device to unlock.

5.1.7. Magnetic locks shall not be allowed.

5.1.8. In cases where electronic access control is used at gates, turnstiles, or other specialty equipment; the selection and specification of the equipment shall be discussed with Networking and Telecommunications during the design process as well as during construction and commissioning.

6. OUTDOOR PEDESTAL-MOUNTED EMERGENCY PHONES

6.1. Missouri State University uses an outdoor pedestal-mounted emergency phone manufactured by Talk-A-Phone. The phone features an ADA compliant, pushbutton-activated, hands-free emergency phone; a blue beacon on top of the pedestal; and also includes a loudspeaker to provide mass notification announcements.

6.1.1. Networking and Telecommunications shall furnish the unit and the anchor bolts.

6.1.2. The contractor shall provide a concrete base and install the anchor bolts that are furnished with the unit. The contractor shall also provide one (1) dedicated 120-volt, 20 amp circuit for power and a 1-1/2” conduit from the base of the unit to the nearest voice/data cable pathway.

6.1.3. The contactor shall assist Networking and Telecommunications in mounting the unit on the concrete base and connecting power to the unit. Networking and Telecommunications shall pull the voice and data wiring to the unit, terminate the voice and data connections, and program the unit.

6.2. Coordinate the location and infrastructure requirements for these units closely with Safety and Transportation as well as with Networking and Telecommunications.

7. INDOOR EMERGENCY ASSISTANCE PHONES (RESCUE ASSISTANCE COMMUNICATION)

7.1. Indoor emergency assistance phones shall be an ADA compliant, pushbutton-activated, hands-free emergency phone with stainless steel face and LED indicator light. Phones shall be flush-mounted if possible. Indoor emergency phones shall be installed at designated areas of refuge to serve as the code required two-way communication system for the area of refuge.

7.1.1. Networking and Telecommunications shall furnish the unit and its associated flush-mounted back box.

7.1.2. The contractor shall install the flush-mounted back box and a 1" conduit from the back box to the nearest cable pathway providing the most practical route to the nearest voice/data closet. The ends of the conduit shall be de-burred and shall be provided with a bushing to protect voice/data cables from damage.

7.1.3. Networking and Telecommunications shall install the voice wiring to the phone and shall install and program the phone.

7.2. The faceplate of these units typically includes raised or engraved letters and Braille indicating the unit is an emergency phone but do not include the informational or instructional signage required by code for areas of refuge.

7.2.1. For phones serving as the two-way communication system for an area of refuge, the design team shall specify the appropriate signage for the contractor to provide separately from the emergency phone. The signage shall include instructions and other verbiage as required by code. The signage shall be indicated the plans with the other building wide room signage and shall be specified to match the building wide room signage for consistency throughout the building.

7.3. Coordinate the location of these units with Safety and Transportation as well as with Networking and Telecommunications.