Building Design Standards

Version 1.8 Updated March 2023

EMORY UNIVERSITY

Office of Information Technology

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OVERVIEW

1. Networking and Telecommunications Infrastructure Budgets

1.1. Emory Office of Information Technology (OIT) infrastructure budgets are required for all Emory owned properties or leased space. OIT infrastructure budgets are prepared in accordance with the OIT Building Design Standards outlined in this document, which are a collection of requirements that architects, and engineering consultants must adhere to when addressing communication needs for new and renovated buildings as well as leased space. The standards provide a baseline for the design of pathways and spaces. Designing and budgeting with these standards in mind effectively allows Emory University to maximize the benefits of a common, facility-based infrastructure, establish meaningful budgets, allocate space, and more effectively plan how technology is integrated into a new construction project or existing facility. The Building Design Standards may be modified based on the size and scope of the project but must be approved by the OIT Project Manager (PM) assigned to the project. Once a request for budget is submitted to the Project Management Office (PMO) a PM is assigned and a feasibility budget is prepared. During this early stage of a project, specific site plans may not be available to accurately determine the true requirements of the occupants. To that end, the PM designs the space and cabling requirements based on the information provided.

1.2. Infrastructure Budgets may include but are not limited to the following:

- Required network service entrance – typical for remote sites (AT&T/Charter)
- Building entrance cable – copper/fiber
- Riser connectivity between floors – copper/fiber/coax
- Build-out of communications closets
- Estimated low voltage cabling for workstations
    - (2) Cat6 drops per workstation - typical
- Network electronics – sized for occupants
- Estimated Phone budget – new vs. relocations
- Emory CATV
- Wireless Access Points – Coverage based on feasibility drawings
- Distributed Antenna System (DAS) for Cellular/Radio (Cellular *see Section 27 53 19*)
- OIT labor – Engineer/Coordinator/Project Manager/Move-in
- Contingency – returned to project if not used

1.3. DAS Cellular & Radio at Emory

1.3.1. Carrier provided (AT&T, Verizon, etc.) or approved Emory vendor installed cellular distributed antenna system (DAS) for Emory University and Emory Healthcare within Emory OIT scope. Carrier neutral DAS (multiple Carriers can join) and/or Carrier specific DAS may be installed where Carrier cellular coverage is limited or needs enhancement to deliver uninterrupted coverage and enhance user satisfaction.

1.3.2. For cellular DAS, Carrier funded is preferred and should be considered first. If NOT Carrier funded, an approved Emory OIT vendor is contracted to install cellular DAS, the vendor is expected to provide client representation by submitting acceptable neutral host DAS designs to the Carriers as well as working closely with the Carriers to ensure they connect to the DAS system. Carrier or approved Emory OIT vendor will require building design drawings from Emory to provide a budgetary and/or potential solution as part of the bid-out process.

1.3.3. Approved vendor RF/grid/benchmark testing of the facility will determine the need for in-building cellular DAS. RF/Grid/Benchmark testing is generally completed once the building is erected, with all exterior skin and glass installed, as well as interior drywall or other wall construction material and ceilings are complete. Exceptions to the timing of this test can be made where Emory is paying for the DAS and is not Carrier funded. There may be instances where multiple RF/grid/benchmark tests must be paid for, if the first testing was completed prematurely.

1.3.4. For Carrier provided cellular DAS, Emory University OIT will encourage the Carrier and their partners to complete and commission the cellular DAS as quickly as possible, with the understanding that all funding and project timelines are determined by the Carrier and their partners. Carrier funded cellular DAS may not be installed or user ready before building construction is complete and occupancy of the building has occurred.

1.4. Once a budget has been submitted, the PM for the project will revise the estimate as more detailed information becomes available. It is important to understand the costs associated with a feasibility budget compared to a detailed estimate based off occupant requirements so a meeting with the customer and OIT PM is strongly encouraged to review the budgetary numbers and provide details into the design and estimate criteria. If for any reason there are questions about the estimate, please work through the OIT PM for escalation or resolution to any areas of concern. It is our goal to provide an accurate and detailed budget so that the user can make an informed decision.

Please note: Exclusion of IT Infrastructure components (e.g., DAS, wireless) from any budget must be approved in writing by the Enterprise CIO and Senior Provost Information Technology and the Vice President for Campus Services.

2. Services

2.1. **Private Emory-owned networks carry Data, Computer Services and Wi-Fi Services**. The design of cable distribution should be coordinated, and campus tie-in determined on a case-by-case basis through the OIT PM.
2.2. **Voice Service** is carried privately by Emory University, OIT. The design of cable distribution should be coordinated, and campus tie-in determined on a case-by-case basis through the OIT PM.
2.3. **Video Service** is carried privately by Emory University, OIT. The design of cable distribution should be coordinated, and campus tie-in determined on a case-by-case basis through the OIT PM.

2.4. **Two-way radio** is carried privately by Emory University, OIT. The design of cable distribution should be coordinated, and campus tie-in determined on a case-by-case basis through the OIT PM.

2.5. **Audio Visual –** AV designs that are required to be hosted on the Emory network and must be coordinated with OIT PM/Engineer to avoid a parallel network. The design/installation of audiovisual technologies in support of conference rooms or digital displays, are **not** included in the OIT scope of work. OIT requires any required electronics be provided by OIT and that they reside on the Emory Network. Any Design of third-party systems to reside on the Emory network must go through OIT ART design review prior to being offered to Emory to ensure compliance with OIT security standards. Pending OIT design approval, OIT budgets may be revised to include necessary electronics.

3. Drawings

3.1. Drawings **must be provided in the form of electronic files** during all phases of construction. Drawings and design documents should be delivered to the assigned OIT PM.

DIVISION 27 STANDARDS

SECTION 27 00 00 COMMUNICATIONS

1. General

1.1. The information in this section should be used as a guideline for the design of communication spaces. It is both owned and maintained by the Emory University, OIT Division with updates occurring on an annual basis. It should be used by the Architect for the programming of communications spaces as described within. This document is intended primarily for building infrastructure such as pathways and spaces to support voice, data, and video cabling.

1.2. The major organizational sections are:

- 27 05 26 Grounding and Bonding for Communications Systems
- 27 05 28 Pathways for Communications Systems
- 27 05 28.29 Hangers and Supports for Communications Systems
- 27 05 28.31 Riser Pathways
- 27 05 28.33 Conduits and Backboxes for Communications Systems
- 27 05 28.36 Cable Trays for Communications Systems
- 27 05 28.39 Surface Raceways for Communications Systems
- 27 05 43 Underground Ducts and Raceways for Communications Systems
- 27 08 00 Commissioning of Communications
- 27 10 00 Structured Cabling
- 27 11 00 Communications Equipment Room Fittings
- 27 21 33 Data Communications Wireless Access Points
- 27 24 00 Data Communications Peripheral Data Equipment
- 27 26 23 Network Integration Requirements
- 27 32 23 Elevator Phones (Including Elevator Camera)
- 27 32 26.01 Emergency Blue Light
- 27 32 26.03 Gate Controls
- 27 32 26.05 Fire Alarm Panels
- 27 53 19 Internal Cellular, Paging, Distributed Antenna System

1.3. Refer to the appropriate industry standards listed below for any information that is not covered in the above sections.

2. Standards, Codes, & References

- Building Industry Consulting Service International (BICSI)
- Telecommunications Distribution Methods Manual (TDMM)
- Network Design Reference Manual
- Customer-Owned Outside Plant Design Manual
- Wireless Design Reference Manual (BICSI)
- Electronic Security (BICSI)
- American National Standards Institute, Inc. (ANSI)
- National Electrical Safety Code
- Federal Communications Commission (FCC) Publications
- FCC Rules and Regulations – Part 15
- FCC Rules and Regulations – Part 68
- Occupational Safety and Health Act of 1970 (OSHA)
    - Public Law 91-596
- Insulated Cable Engineers Association (ICEA) Standard
    - ICEA S – 80 – 59
- National Fire Protection Association (NFPA)
    - 101
- National Electrical Code (2005)
- Institute of Electrical and Electronics Engineers, Inc. (IEEE)
- National Electrical Safety Code
    - 800 Series Standards
- Electronics Industries Association (EIA/TIA 568B, 569, 606, 607)
- International Telecommunications Union (ITU), formally CCITT
- I Series Standards
- The Joint Commission

END OF SECTION 27 00 00

SECTION 27 05 26 GROUNDING & BONDING FOR COMMUNICATIONS SYSTEMS

1. Grounding & Bonding

1.1. A ground bus (CPI 13622-010 copper ground bar or equivalent and TIA/EIA 607 compliant) must be installed on the back wall of each Communications Room.
1.2. All wire used for communications ground applications must be no smaller than AWG #3/0.
1.3. Two paths to ground must be created and bonded to the ground bus bar in each communications room for the purpose of creating a redundant communications ground system (note accompanying vertical requirements diagram). One ground path leads to the building main electrical ground and should bond within two (2) to three (3) Feet of the ground connection for the main electrical panel. The second ground path leads to building metal frame in proximity to the Communications Room.
1.4. Communications ground systems must be Meggar tested to 10 ohms or less.
1.5. Ground bus bars must be mounted 18 inches above the finished floor and, along with the associated grounding riser, must be placed or routed in a manner that does not obstruct backboard space.

END OF SECTION 27 05 26

SECTION 27 05 28 PATHWAYS FOR COMMUNICATIONS SYSTEMS

SECTION 27 05 28.29 HANGERS & SUPPORTS FOR COMMUNICATIONS SYSTEMS

1. Hangers & Supports

1.1. J-hook Pathways

1.1.1. Cable hooks (J-hooks) are a suitable alternative to cable tray only when the planned capacity of the pathway system is 50 cables or less.

1.1.2. Use and design of J-hook pathways must be coordinated with and approved by the OIT PM.

1.1.3. Unless otherwise noted by the OIT PM for a particular project, J-hook routing and installation is part of the building infrastructure and is within the scope of the general contractor. The routing and design must be coordinated with the OIT PM.

1.1.4. J-hook pathways are to be installed in accordance with industry standards (not to exceed 48-60 inches between supports).

1.1.5. Pathways are not to be routed across adjacent office spaces.

1.1.6. Pathways are to be used for OIT Cabling Only. Note Pathways are intended to service and facilitate OIT cabling for the life of the building and therefore Only OIT cabling should be inside the pathway.

END OF SECTION 27 05 28.29

SECTION 27 05 28.31 RISER PATHWAYS

1. Riser Pathways

1.1. A minimum of five (5) four-inch sleeves with bushings must be installed between stacked communications rooms. Sleeves must extend four (4) inches above and below the floor and must be no farther than four (4) inches from the wall.

1.2. Cores alone are not permitted.

1.3. Regarding non-stacked rooms, conduit turns must be installed with sweeping radiuses having no more than two (2) 90-degree bends. The inside radius of the conduit bends must never be less than ten (10) times the internal diameter of the conduit.

1.4. All riser sleeves and conduits must have bushings, must be installed with measure tape (200 pounds or equivalent) and must be fire stopped.

1.5. All sleeves must be sealed or waterproofed around their perimeter to avoid any leakage to the floor below in the event of a water leak.

1.6. Space within the riser conduits specified in this document is intended for OIT only. Any planned use of the riser must be coordinated and approved by the OIT PM.

END OF SECTION 27 05 28.31

SECTION 27 05 28.33 CONDUITS & BACKBOXES FOR COMM. SYSTEMS

1. Workstation Conduit & Security Camera Conduit

1.1. Space within the workstation conduits specified in this document is intended for OIT only.

1.2. Where accessible lay-in type ceiling is used, a one-inch conduit with bushings must connect from the outlet box and run to the cable support system in the adjacent corridor.

1.3. In areas where the ceiling is inaccessible, the one-inch conduit with bushings must connect from the outlet box, run above the ceiling, and continue to a point where it can be accessed for pulling cable. Pull String must be provided. A maximum of two (2) bends are allowed, and no breakout points are allowed.

Inaccessible ceiling must be avoided where high concentrations of voice/data cabling are present or anticipated in the future. In situations such as an office with inaccessible ceilings, consideration should be given to include empty conduit and wall boxes on opposing ceilings to facilitate future moves, adds or changes. This will need to be coordinated with the OIT PM.

1.4. Although not preferred, the one-inch conduit with bushings may *home run* from the outlet all the way back to the local communications room. A maximum of two (2) bends are allowed and no breakout points are allowed. Pull String must be provided.

1.5. Drop conduits longer than 25 feet, including home runs, must be labeled with room numbers where the conduit terminates, and must be installed with Pull String.

1.6. Flexible conduit is not allowed.

1.7. Firewall penetrations in corridors should be sized according to cable quantities and fire stop requirements.

2. Workstation Outlet Boxes

2.1. **Wall Locations**

2.1.1. Space within the outlet boxes specified in this document is intended for OIT only.

2.1.2. Communications outlet boxes must be four inches by four inches by 2¼ inches electrical boxes with a single gang plaster ring.

2.1.3. The outlet boxes must be mounted at least 18 inches on center above the finished floor.

2.1.4. Outlets above counters must be 12 inches on center above the counter if the counter does not have a back splash, and six inches on center above the back splash if the counter does have one.

2.1.5. A minimum of eight inches on center of clearance must be maintained around the outlet.

2.2. **Wall Phone/Jack Locations**

2.2.1. Communications outlet boxes for wall mount phones must have single gang electrical box. Plaster mud rings are not allowed for the stability of the phone.

2.2.2. Communications outlet boxes for wall mount phones must meet ADA regulations which require 48" AFF with no more than 4 inches protrusion from the wall, phone inclusive.

2.3. **Modular Furniture**

2.3.1. Designers must consult with OIT PM when selecting during schematic design phase.

2.3.2. Any communications floor outlet applications must be coordinated and approved by OIT PM.

2.3.3. The selection of modular furniture solutions must be coordinated with OIT PM.

2.3.4. Furniture placement must be taken into consideration when lying out communications jacks and wiring schemes. The design including conduit sizing and wall box specifications must be coordinated with the OIT PM in the case of *ganged* modular furniture. Access to communications outlets must not be obstructed by furniture installations. If it appears that restricted access is unavoidable, special plans must be made in advance to either relocate the jacks on the wall or possibly install jacks directly in the furniture.

2.3.5. Additional outlet boxes are required for video applications.

2.4. **Power Outlets**

2.4.1. Electrical power for connecting occupant voice/data/video devices must be made available wherever communications outlets are planned.

2.4.2. One duplex electrical outlet must be installed in close proximity of each CATV outlet.

END OF SECTION 27 05 28.33

SECTION 27 05 28.36 CABLE TRAYS FOR COMMUNICATIONS SYSTEMS

1. Cable Trays

1.1. Cable Tray is to be used for OIT Cabling Only. Note Cable Tray is intended to service and facilitate OIT cabling for the life of the building and therefore Only OIT cabling should be inside the cable tray.
1.2. Other trades may attach to the side or bottom of the cable tray Only.
1.3. Cable tray is required in any building requiring OIT services.
1.4. Design of cable tray systems must be coordinated with appropriate OIT PM.
1.5. The use of wire "basket tray" is acceptable and may realize a cost savings from both price and ease of installation.
1.5.1. The cable tray must be single tiered and must be installed to allow 12 inches of open space above and to one side of the tray.
1.5.2. The volume of cable being installed at construction, as well as future growth projections, will determine actual type and dimensions of cable tray.
1.5.3. Cable trays are to be installed in all corridors and hallways and should not be installed above individual offices, conference rooms or restrooms.
1.5.4. A minimum of two (2) four-inch conduits must be used in place of a cable tray when installation involves passing over inaccessible ceilings and entrances into communications rooms. Additional conduits may be required as cable volume dictates. Determination of conduit requirements must be coordinated with appropriate OIT PM.

Appendix B: Typical Communications Horizontal Requirements

END OF SECTION 27 05 28.36

SECTION 27 05 28.39 SURFACE RACEWAY

1. Surface Raceway

1.1. The design of raceway, communications poles, modular furniture & floor-mounted devices will be coordinated with OIT PM.

END OF SECTION 27 05 28.39

SECTION 27 05 43 UNDERGROUND DUCTS & RACEWAYS FOR COMM. SYSTEMS

1. Underground Ducts & Raceway

1.1. An entrance conduit bank must be constructed from the building entrance communications room to an appropriate location, as determined by OIT, for the purpose of connection to existing OIT infrastructure.
1.2. Trenches for underground conduits should be excavated to required depths. Bottoms of trenches should be tamped hard and graded as required. If rock is encountered, trench should be excavated to a depth of six inches below bottom of pipe. Before laying pipe, the space between bottom of pipe and rock surface should be filled with gravel and thoroughly tamped. After testing, inspection and approval by Project Engineer and local inspecting authorities, trenches should be backfilled with clean dirt as follows:
- Backfill should be installed in layers six inches deep and should be adequately tamped and wetted or flushed before the next layer of earth is laid in place.
- Backfill should be compacted to 95% density and this process continued until trenches are filled.
- No roots, rocks, or foreign materials of any kind are to be used in back-filling trenches.
- Contractor should furnish all additional material required and should remove excess materials and debris from site.

1.3. A minimum of three (3) four-inch conduits (schedule 40) should run between the service manhole outside of the building and the entrance to the communications room. **Outdoor conduit banks must be encased**

in concrete. The top of the conduit bank must be buried at least 24 inches below grade surface. Reduction in the quantity of entrance conduits must be approved by OIT PM.

1.4. Buried/encased conduit should be placed at a depth of no less than thirty inches below surface, except for locations where underground obstructions such as steam tunnels or gas lines prevent the practical installation at this depth and shall be installed with a sensing tape.

1.5. Conduit runs should be placed as straight as possible with no more than two (2) 90-degree bends, using a minimum 40-inch radius (48-inch radius preferred). All new conduits and existing conduits used by the contractor should be roped and free from sharp edges or burs. All conduits should have a #10-gauge THHN or #10 steel galvanized pull wire.

1.6. Conduits must be clean, obstruction free, debris free, dry, and capped at both ends with a waterproof cap. Building entrance conduits that are used (populated with cable/fiber) should be waterproof sealed to prevent water entrance into the building.

1.7. Building entrance conduits entering through the floor should be turned up six inches above the slab at the Plywood backboard. Conduits should be located as close to the wall as possible to allow for maximum utilization of the floor space.

1.8. Conduit turns must be installed with sweeping radiuses having no more than two (2) 90-degree bends without some form of breakout point (e.g., manhole or breakout box). The inside radius of the conduit bends must never be less than ten (10) times the internal diameter of the conduit.

1.9. Conduit runs must not exceed 500 feet without a breakout point.

2. NEC ARTICLE 800.2 DEFINITIONS

2.1. **Point of Entrance:** Within a building, the point at which the wire or cable emerges from an external wall, from a concrete floor slab, or from a rigid metal conduit or an intermediate metal conduit grounded to an electrode in accordance with *NEC* 800.100(B).

3. NEC ARTICLE 800.50

3.1. Outside plant cables are typically unlisted because of the sheath material and filling compounds used within the cables. In the United States the *NEC* allows the use of exposed OSP cable for the first 15m/50ft at the building entrance. Per BICSI TDM: "**further away than 15m/50ft** but still relatively close, the most cost-effective solution is to enclose the cable in a **rigid or intermediate metal conduit** for the conductive cables, grounded in accordance with the *NEC* and local building codes."

3.2. All conduits with bushings must be installed with measure tape and must be non-corrosive with a pulling strength of 200 pounds or equivalent &must be obstruction-free and capped off at both ends.

3.3. The conduit design must consider the proper slope to prevent water accumulation entering the building.

3.4. Space within the entrance conduits specified in this document is for OIT only.

END OF SECTION 27 05 43

SECTION 27 08 00 COMMISSIONING OF COMMUNICATIONS

1. Commissioning of Communications

1.1. Commissioning of data equipment to complete the certificate of occupancy that a building or project may require may include the following, it is **not** an exhaustive list.

- HVAC
- Elevators
- Linear accelerators
- Swiss Log

- Nurse Call
- Omnicell
- Security Systems (Camera, FACP, Blue Light)
- Cellular Dialers for Systems
- Distributed Antenna Systems (Cell, Public Safety ERRCS)
- System Servers
- Building Automation
- Lighting Control
- Card Access
- AV Systems
- MRI/CT Equipment
- Biorepository Systems
- Any service requiring OIT Wireless Access Points

1.2. All Required data activations MUST have a Billing Speed Type for port charges.
1.3. Coordination of these services should begin as soon as the schedule allows so that coordination for data services with OIT can be planned and managed to have the services ready for commissioning.
1.4. **ALL** equipment requiring OIT Network services must run through the OIT PM along with Campus Services or Healthcare PM to see if an Architecture Review Team (ART) will need to be performed. If the system requires an ART review, the process is outlined in Section 27 26 23 Network Integration Requirements.
1.5. This includes any equipment requiring wireless data service also. Because this takes place prior to certificate of occupancy dates, coordination with OIT engineer is required in order to place APs in potential incomplete areas of the building.
1.6. Locations of control panels for monitoring must be coordinated with OIT PM to ensure cabling has been planned for each location.
1.6.1. A one-inch conduit will be required from the nearest accessible ceiling into the control panel for cable routing.
1.6.2. It is critical that OIT closets that serve peripheral data equipment be completed 30 days ahead of service needs for commissioning to allow time for OIT electronics and equipment to be placed and tested.

SECTION 27 10 00 STRUCTURED CABLING

1. Structured Cabling

1.1. Horizontal cable selection, placement and termination shall be the sole responsibility of OIT.
1.2. **ABANDONED CABLING MUST BE REMOVED and** shall be considered a part of the project's budget. In the case of a renovation project, it is at the discretion of the OIT Project Manager to determine if existing cabling meets standards, or if replacement cabling will be required. Both removal and replacement are considered part of the project expense and should be budgeted as part of the project.

2. NEC 800.2 DEFINITIONS

2.1. **Abandoned Communications Cable:** Installed communications cable that is not terminated at both ends at a connector or other equipment and is not identified for future use with a tag.

END OF SECTION 27 10 00

SECTION 27 11 00 COMMUNICATIONS EQUIPMENT ROOM FITTINGS

1. Communications Equipment Room Fittings

1.1. Every effort should be made to ensure OIT closets & Power are completed as soon as possible during construction to allow for build out and installation of network electronics to support and equipment requiring data services for commissioning and certificate of occupancy. Failure to complete the OIT rooms places CO's and Go Live dates in jeopardy.

1.2. The construction project must include communications room requirements such as backboards, sleeves, conduits, and grounding components necessary for the managed routing and grounding of communications cabling within the communications rooms. Cable tray design and installation within the room will be the responsibility of OIT PM.

1.3. The construction project will provide all space, power, lighting, and HVAC requirements necessary for the delivery of OIT.

1.4. Communications rooms must be placed on all floors. The doors must open out (unless prohibited by code) to enable maximum use of space. The room entrances must be placed on an adjacent hallway to allow easy access to rooms during system outages and future equipment installations, and to ensure that after-hours access is available (24 hours a day, 7 days a week).

1.5. Each room must be placed at a location, which minimizes the length of the vertical and horizontal distribution system and is as close as possible to the geographic center of the building, keeping average cable runs to 150 feet with a maximum of 295 feet.

1.6. Satellite rooms are required where horizontal cable runs exceed 295 feet or where circumstances such as high-density communications applications (more than three drops per 100 square feet) are required.

1.7. The minimum height of the ceiling in Communications Equipment Rooms should be no less than 102 inches. False ceilings are not permitted within the Entrance Facility Room and Communications Equipment Room. Obstructions such as lighting fixtures, air ducts, and cable trays should be no less than 90 inches from the floor throughout the rooms.

1.8. The Entrance Facility Room will be located close to where the voice, data and video cables enter the building; it must connect to both the entrance cable pathway and the building backbone pathway. The ideal location would be within 50 feet of the building cable entrance point (this may be 50 feet from the point where the cable exits the continuous entrance conduit) and situated either on the ground floor or in the basement. This location should provide accessibility for the delivery of large equipment.

1.9. The Communications Equipment Room should be vertically aligned with the building's vertical riser system. The room should be located in the center of the space that it serves, to minimize wiring distances from the room to the communications faceplate. The room must be connected to the building backbone pathway. The location should allow accessibility for the delivery of large equipment. These rooms should be used for communications equipment only; it is to be separate from spaces used for such things as building electrical services, fire alarm, building mechanical services, janitorial services, and general storage. If security equipment will be placed in the room, OIT PM must approve placement and installation.

1.10. Access to Communication Equipment Rooms must be direct and not be through any other room.

1.11. Communications rooms must be sized according to floor space as follows:

- Up to 10,000 square feet; 10 feet by 11 feet.
- Up to 8,000 square feet; 10 feet by 9 feet.
- Up to 5,000 square feet; 10 feet by 8 feet.

1.12. Plans for any floor exceeding 10,000 square feet will require additional space in the form of either an increased room size or the placement of a satellite room on the floor. Any requested changes in closet design or sizing will be coordinated with and approved by the OIT PM.
1.13. When Security Equipment must be in OIT Equipment Rooms, consideration must be given to the following:
- Required Rack Space Must be coordinated with OIT PM.
- Additional Closet size may be required.
- Additional Power and UPS consideration Must be coordinated.

1.14. Satellite communications rooms must be no smaller than 6 feet by 8 feet and must meet the same specifications as standard communications rooms. A minimum of two (2) four-inch conduits must be installed between a satellite room and the main communications room for the same floor.
1.15. Communications room door size must be a minimum of three feet wide and six feet eight inches tall. (These measurements do not include the doorsill or center post.)
1.16. Room shape should be as square as possible, with continuous walls to maximize the use of space. *Appendix A: Communication Room Footprint*
1.17. The communications room environment must have a temperature range of 64 to 75 degrees Fahrenheit. Typical BTUs for the space are approximately 17,000. The temperature must be measured at five feet above the finished floor and must not vary by more than or less than five degrees Fahrenheit. Relative humidity must remain between 20% and 60%. The humidity change must not vary by more than or less than ten percent.
1.18. Adequate lighting is required and must be a minimum of 50 foot-candles measured three feet above the finished floor. Location of lighting MUST be coordinated with OIT PM to allow room for ladders once cable tray is installed.
1.19. Floor loading must be at a range of 50 to 200 pounds per square foot.
1.20. Communications room HVAC circuits should be on generator power, when available. In the case of life critical situations, both generators back up with UPS back up and conditioning will be required. In some cases, other critical technology-based devices may also require a building UPS backup solution.
1.21. Under normal building operating conditions communications equipment rooms require the HVAC system to function properly at all times (24 hours per day, 365 days per year) which cannot be overridden by the building automation system. If the building's HVAC system cannot ensure continuous operation (including weekends and holidays), provide a stand-alone HVAC unit with independent controls for the Equipment Room. Condensation from a stand-alone HVAC unit must be addressed, i.e., drip pan, drain line, etc., so as not to compromise equipment operation. If emergency power and HVAC sources are available in the building, connect the Equipment Room to them.
1.22. The HVAC system that serves the Equipment Room should be tuned to maintain a positive air pressure differential with respect to surrounding areas. Equipment to control humidity and air quality will be provided as warranted.
1.23. There must be a minimum of two (2) four-inch conduit sleeves or OIT approved fireproofed access product installed from the ceiling area of the communications room to the corridor pathway system in an adjacent hallway. Additional sleeves may be necessary as cable quantities dictate.
1.24. All walls must be lined with ¾ inch plywood, beginning at 24 inches above finished floor, and extending upward to the cable tray, unless otherwise directed by the OIT PM. The plywood must be fire-treated and painted with two (2) coats of gray fire-resistant paint.
1.25. The room (including the ceiling) must be painted, and the floor must be tiled to help reduce atmospheric dust. Paint and tile colors are restricted to either white or light gray.
1.26. All communications room doors must be installed with a lock that is keyed for use with the OIT key and the electronic security access system installed for the building prior to occupancy. All communications rooms on campus, including Oxford and locations in the immediate vicinity, will be keyed with the PPX-7

key. Healthcare locations may vary of cores, verify with facilities for each location. In the situation of off campus satellite facilities, the door will be secured with a push button door lock that allows for changeable lock codes. The approved choices from the Emory Security shop are the PRO5196 or the PRO5596 depending on the door type. Further information on these locksets can be found at: *http://www.locknetics.com/pdf/Manually%20Programmable%20Locks.pdf*

1.27. During construction, OIT must have access to and temporary locks placed on OIT doors so that OIT vendors are not delayed during construction seeking access.

1.28. During construction, it is the responsibility of the GC to ensure that the seal around the door as well as other openings to the room are properly sealed to eliminate dust from being drawn into any OIT equipment placed within the rooms for the CO. Any damage to the equipment including replacement if required will be at the expense of the GC.

1.29. ALL OIT Closet Doors should have the following to prevent dust infiltration during construction:

- Threshold on the floor that seals to the bottom of the door
- Door Sweep the closes flush to threshold
- Door gasket that prevents dust from entering around the door

1.30. Due to the limited space requested for communications rooms, all space allocations are for Emory University, OIT' requirements only. Spaces where water vapor exposure, steam pipes, drains, clean out, chemical exposure, air handling units, EMI or RFI situations or transformers, alarm panels and associated cabling, or electrical panels are present, or spaces where any non-OIT supported systems are present, are not permitted.

2. **Emory OIT Network Services – Guidelines for Communications Room Equipment Electrical Power - AC**
Please use this documentation as a guide and always verify power needs for each project with the Emory OIT Engineers/Build Team/Aux Team and Emory OIT Construction Project Management team.

2.1. One duplex electrical outlet should be installed on each wall of the communications room. Each outlet must be on a separate 120V/20A dedicated circuit and should be connected to emergency power where available. This power is NOT for Emory OIT permanent network devices.

2.2. 1.2. Communications room AC circuits will split between commercial/normal and generator/emergency power. If generator power is available in the communications room, split the necessary amount of circuits between normal and generator. Please see **Diagrams/Tables below** & Design: PDU for additional important information. Each power supply should be planned to have its own electrical circuit.

2.3. Network equipment with **two power supplies** - power supply **slot #1** is cabled to PDU on **commercial/normal** power & power supply **slot #2** is cabled to PDU on **generator/emergency**. See **Diagram** below.

2.4. Network equipment with **four power supplies** - power supply **slot #1 & slot #3** are cabled to PDU on **commercial/normal power** & power supply **slot #2 & slot #4** are cabled to PDU on **generator/emergency**. See **Diagram** below.

2.5. **If the Chassis requires 5 to 8 power supplies, an additional two or more 208V/30A circuits will be required for that device.**

2.6. Network equipment with **six power supplies** - power supply **slot #5** is cabled to PDU on **commercial/normal** power & power supply **slot #6** is cabled to PDU on **generator/emergency.**

2.7. Network equipment with **eight power supplies** - power supply **slot #5 & slot #7** are cabled to PDU on **commercial/normal** power & power supply **slot #6 & slot #8** are cabled to PDU on **generator/emergency.**

2.8. In a case of NO generator/emergency power, still follow the power supply cabling method (#1 on one circuit, #2 on another circuit) (#1 & #3 on one circuit, #2 & #4 on another circuit) (#1 & #3 on one circuit, #2 & #4 on another circuit, #5 & #7 on another circuit, #6 & #8 on another circuit).

2.9. In the case of Emory Healthcare deployments, life critical situations and high availability network deployment, generator back up power along with UPS backup is required. In some cases, other critical technology devices may require a building UPS backup solution as indicated by the customer. UPSs should be rented through Emory OIT Network Services payment plan. The rental payment includes data connectivity, monitoring, maintenance and/or replacement. If UPS backup is currently in use, existing UPS should be in proper working condition and properly maintained by the owner. If UPS is not in proper working condition, the customer is to be notified of repair or replace at the customer's expense (unless UPS is under current Emory OIT payment/monitoring/maintenance plan).

2.10. For existing communications rooms: Verify current available power Voltage, verify Amperage, verify commercial/normal power and generator/emergency power for High Availability (HA), verify number of available receptacles, and verify receptacle location to racks and network equipment location.

2.11. Coordinate the location of power for the equipment racks with the Emory OIT PM and Emory OIT Network Services Build teams. Ensure the rack space is suitable for power and network equipment.

2.12. ***The following accounts for 2 power supplies for each Chassis. Additional circuits may be required for additional power supplies.

- Communications rooms with **one to two (1-2) switches (1100W power supply switches)**: Plan for a minimum of **two 208V/30A circuits/electrical outlets with twist-lock L6-30R receptacles**. One circuit to Commercial/Normal & one circuit to Generator/Emergency. Utilize proper conduit and other approved methods and extended to the top of the OIT rack or where specified by OIT design/OIT PM teams. Plan for a minimum of two rack mount PDUs with input cable of NEMA L6-30P twist-lock power cord and outputs of C19 and C13. Please see 1.2, **Diagrams/Tables below** & Design: PDU for additional important information.
- Communications rooms with **three to four (3-4) switches (1100W power supply switches)** OR **one (1) chassis**: Plan for a minimum of **two 208V/30A circuits/electrical outlets with twist-lock L6-30R receptacles**. One circuit to Commercial/Normal & one circuit to Generator/Emergency. Utilize proper conduit and other approved methods and extended to the top of the OIT rack or where specified by OIT design/OIT PM teams. Plan for a minimum of two rack mount PDUs with input cable of NEMA L6-30P twist-lock power cord and outputs of C19 and C13. Please see 1.2, **Diagrams/Tables below** & Design: PDU for additional important information.
- Communications rooms with **two (2) chassis**: Plan for a minimum of **four 208V/30A circuits/electrical outlets with twist-lock L6-30R receptacles**. Two circuits to Commercial/Normal & two circuits to Generator/Emergency. Utilize proper conduit and other approved methods and extended to the top of the OIT rack or where specified by OIT design/OIT PM teams. Plan for a minimum of four rack mount PDUs with input cable of NEMA L6-30P twist-lock power cord and outputs of C19 and C13. Please see 1.2, **Diagrams/Tables below** & Design: PDU for additional important information.
- Communications rooms with **three (3) chassis**: Plan for a minimum of **six 208V/30A circuits/electrical outlets with twist-lock L6-30R receptacles**. Three circuits to Commercial/Normal & three circuits to Generator/Emergency. Utilize proper conduit and other approved methods and extended to the top of the OIT rack or where specified by OIT design/OIT PM teams. Plan for a minimum of six rack mount PDUs with input cable of NEMA L6-30P twist-lock power cord and outputs of C19 and C13. Please see 1.2, **Diagrams/Tables below** & Design: PDU for additional important information.

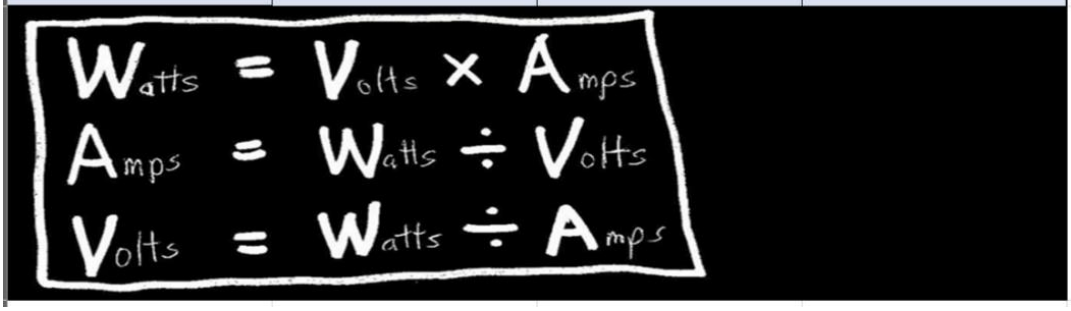
3. **Emory OIT Network Services - Guidelines for Selecting Power cords for Chassis and Switches**

3.1. **Please use this documentation as guide to select power cords for new orders of chassis and switches with Cisco/CDWG and always verify power needs for each project with the Emory OIT Engineers/Build Team/Aux Team and Emory OIT Construction Project Management team**

- In an effort to standardize the ordering of network equipment power cords, PDUs, UPSs, as well as general warehouse stock, the following are required for all ***new builds and refresh/renovation projects*** **where the communications room has existing or receives 208V/30A electrical power**

    - Chassis orders: **Chassis 9400: CAB-C19-CBN**: Cabinet Jumper Power Cord, 250 VAC 16A, C20-C19 Connectors
    - Switch orders: **Nexus 9300: CAB-C13-CBN**: Cabinet Jumper Power Cord, 250 VAC 10A, C14-C13 Connectors
    - Switch orders: **Cisco 9300-48U: CAB-C15-CBN**: Cabinet Jumper Power Cord, 250 VAC 10A, C14-C15 Connectors *Has a notch on female end
    - **Media Gateway: CAB-C15-CBN**: Cabinet Jumper Power Cord, 250 VAC 10A, C14-C15 Connectors *Has a notch on female end

Single AC Circuit →	208V/30A (6240W) (L6-30R) (Recommended)	UPS (if required)	PDU Qty.
1-2 Switches	**2 circuits** (1-Commercial/Normal & 1-Generator/Emergency)	**1** (5kVA)	**2**
3-4 Switches	**2 circuits** (1-Commercial/Normal & 1-Generator/Emergency)	**1** (5kVA)	**2**
1 Chassis	**2 circuits** (1-Commercial/Normal & 1-Generator/Emergency)	**1** (5kVA)	**2**
2 Chassis	**4 circuits** (1-Commercial/Normal & 1-Generator/Emergency)	**2** (5kVA)	**4**
3 Chassis	**6 circuits** (1-Commercial/Normal & 1-Generator/Emergency)	**3** (5kVA)	**6**



END OF SECTION 27 11 00

SECTION 27 21 33 DATA COMMUNICATIONS WIRELESS ACCESS POINTS

1. Data Communications Wireless Access Points

1.1. OIT provides and supports the managed, encrypted, authenticated, and secure wireless service for Emory.

1.2. Design

1.2.1. Design and placement of WI-FI within projects is the sole responsibility of the OIT Wireless Engineer.

1.2.2. Project Shall provide OIT PM/Engineer with CAD drawings and/or a minimum of PDF drawings of space. The more detail provided regarding wall types and placement will enhance the initial predictive design and WAP placement.

1.2.3. The inclusion of the wireless access point design into the communications layer of the prints should be coordinated with the OIT Wireless Engineer. OIT engineer will mark up drawings to indicate predictive WAP placement.

1.2.4. The building design itself should consider wireless when it comes to design features which may interfere with wireless signal such as, but not limited to large mirrors, building materials and types of tinted glass. Examples of material conflicts are metal lathe in stucco, perforated and non-perforated metal wall coverings, firebrick, rebar, and glazed tiles. Any questions regarding potential signal conflicts should be coordinated with the OIT Wireless Engineer.

1.2.5. Inclusion for complete wireless coverage in living spaces such as dorms will be coordinated with the OIT Wireless Engineer. Wireless Access Points within living spaces are acceptable by OIT Standards.

1.3. Installation

1.3.1. Installation of WI-FI within projects is the sole responsibility of OIT and is an integral part of all projects.

1.3.2. Initial cable installation will be installed based off predictive survey performed by OIT engineer. OIT will perform a survey of the floor once the walls and ceiling are in place to verify initial design placement is valid. Based on the results of the survey additional WAP's may be required, and some cables may require relocation.

1.3.3. Installation of WAP's can only begin once survey has been completed by OIT engineer and ceiling grid has been completed.

1.3.4. This includes any equipment requiring wireless data service also. Because this takes place prior to certificate of occupancy dates, coordination with OIT engineer is required in order to place APs in potential incomplete areas of the building.

1.3.5. OIT Closets must be complete in order to have the network set up and tested prior to an WAP placement.

1.3.6. Close communication with GC on schedule will need to be maintained and identify any potential delays to the schedule due to site readiness for final AP placement. Areas to closely monitor include; Ceiling grid & tile installation, door installation, glass walls & furniture and any other structures that may affect signal coverage.

1.4. Wireless Coverage

1.4.1. A Post installation survey will be performed once the project is complete to verify coverage throughout the floor. WAP's will be added based on final survey.

END OF SECTION 27 21 33

SECTION 27 24 00 DATA COMMUNICATION PERIPHERAL DATA EQUIPMENT

1. Data Communication Peripheral Data Equipment

1.1. These are just some examples of the types of peripheral data equipment that a building or project may require, it is **not** an exhaustive list.

- HVAC
- Elevators
- Linear accelerators
- Swiss Log

- Nurse Call
- Omnicell
- Security Systems (Camera, FACP, Blue Light)
- Cellular Dialers for Systems
- Distributed Antenna Systems (Cell, Public Safety ERRCS)
- System Servers
- Building Automation
- Lighting Control
- Card Access
- AV Systems
- MRI/CT Equipment
- Building Integration (Servers down stream)
- Simulation Equipment (SON)
- Biorepository Systems
- Any service requiring OIT Wireless Access Points

1.2. Coordination of these services should begin as soon as the schedule allows so that coordination for data services with OIT can be planned and managed in order to have the services ready for commissioning.

1.3. **ALL** peripheral equipment needs must run through the OIT PM along with Campus Services or Healthcare PM to see if an Architecture Review Team (ART) will need to be performed. If the system requires an ART review, the process is outlined in Section 27 26 23 Network Integration Requirements.

1.4. Locations of control panels for monitoring must be coordinated with OIT PM to ensure cabling has been planned for each location.

1.5. A one-inch conduit will be required from the nearest accessible ceiling into the control panel for cable routing.

1.6. It is critical that OIT closets that serve peripheral data equipment be completed ahead of service needs for commissioning to allow time for OIT electronics and equipment to be placed and tested.

END OF SECTION 27 24 00

SECTION 27 26 23 NETWORK INTEGRATION REQUIREMENTS

Architecture Review Team (ART)

1. Overview of the Architecture Review Team (ART)

1.1. The Architecture Review Team (ART) is a formal committee at Emory University that reviews, evaluates, and makes recommendations on proposed IT hardware and software solutions to ensure technical quality, security compliance, sustainability, and current best practices within the standards and guidelines adopted by Emory's Office of Information Technology (OIT). ART is particularly interested in proposed solutions that would operate on an enterprise-wide level, or support a significant business process, or could introduce a significant risk to the institution. ART reviews include solutions which are developed at Emory, as well as those purchased from outside vendors.

Note: Emory Healthcare (EHC) has its own version of ART, known as "Technical Review", which reviews EHC IT projects. If you are leading an EHC project, contact EHC Information Systems (EHC IS) to inquire about scheduling a Technical Review.

2. The Members of the ART
   2.1. The ART is made up of subject matter experts from various technical departments at Emory, including Network Services, Enterprise Security, Identity Management, the IT Service Management Office (ITSMO), Email & Messaging, Storage, Database Administration, Middleware & Integration, and Systems. Additional subject matter experts may be asked to join ART on a temporary basis, depending on the solution being reviewed.
3. Determining Whether Your IT Project Needs an ART Review
   3.1. Whether or not your project requires an ART review depends on a few factors, namely whether the proposed solution relies on the various components, services, and support, that make up Emory's IT architecture.

   The IT "architecture" at Emory consists of both the physical infrastructure (i.e., the wires, switches, and other equipment used to build the wired, wireless, and telephone networks), as well as the services and support provided by the various IT departments. The Network Services department, for example, provides installation of network equipment and devices, as well as monitoring network usage (e.g., bandwidth and capacity). Other IT departments provide services such as setting up user authentication to prevent unauthorized access (ID Management), protection against hackers and other security threats (Enterprise Security), email and messaging services (Email/Messaging), technical support for applications and IT assets (the IT Service Management Office, including the IT Help Desk), data storage on Emory-managed servers (Enterprise Storage), and integrations between different IT systems and applications (Integration and Systems).

   In general, an ART review is required for IT projects that arise or are being managed within the Office of Information Technology (OIT), and which require some or all of the components, services and support listed below. An ART review is optional, but strongly recommended, for projects arising or being managed outside of OIT which also require some or all of these components, services or support.
   - User authentication - the solution will need to be configured with Single Sign-On (Shibboleth/SAML2/LDAP) to authenticate users when they attempt to access the solution.
   - Server storage - the solution will reside on a physical or virtual server that is either managed on-premises at Emory or within Emory's Amazon Web Services (AWS) space in the cloud.
   - Database services - the solution will store or access data on a database that is either managed on-premises at Emory or within Emory's Amazon Web Services (AWS) space in the cloud.
   - Integration services - the solution will need to integrate with other applications or systems at Emory (e.g., PeopleSoft HR, Student Information Services, Compass Financials).
   - Networking services
     - the solution will require new hardware (either Emory-owned or provided by a vendor) to be installed on the Emory data network.
     - the solution is likely to involve many users, leading to high bandwidth/capacity demands, which could also increase the chances of network instability, outages, or delays (e.g., the solution involves large data sets, or streams video to a large group of simultaneous users).
   - Enterprise Security services - the solution will store or access sensitive data, process credit card transactions, or needs to be reviewed for any possible security vulnerabilities.
   - Technical Support/Incident Management services - the solution will be set-up as a "configuration item" (CI) in Emory's IT Service Management system (ServiceNow) and/or will be supported by an Emory team (including the University Help Desk).
   - Messaging services - the solution will need to send/receive email to/from users and admins

Note: these are just some examples of the types of IT components, services, and support that a solution may require, it is not an exhaustive list.

Note: Emory has other types of IT reviews that may be required even for projects that do not require an ART review. For example, Enterprise Security may still require that a solution undergo an in-depth security review, or Network Services may require a solution to undergo a network engineering review if new equipment must be installed on the Emory network. In addition, Emory IT governance (e.g., the IT Steering Committee (ITSC) and its various sub-committees) may need to review and approve a project before it can proceed. Project leaders should contact the appropriate IT departments and IT governance to determine if additional reviews are required.

4. Requesting an ART Review for Your IT Project
   4.1. To request an ART review, the project team must submit the required ART documentation, which includes:
      4.1.1. The ART Questionnaire. There are 2 versions of the ART Questionnaire, depending on the type of solution; only one version needs to be submitted.
         4.1.1.1. ART Questionnaire for ***Cloud*** Solutions (if the solution will be stored/accessed on servers in the cloud, managed by a vendor)
         4.1.1.2. ART Questionnaire for ***On-Premise*** Solutions (if the solution will be stored/accessed on servers managed by Emory)
      4.1.2. An architecture diagram of the solution.
         4.1.2.1. The architecture diagram should show the various IT elements of the solution (e.g., local computers, servers, storage, any required vendor devices, the Internet, data traffic flow, VPNs, etc.) and how those elements specifically fit within Emory's IT architecture. The diagram should be specific to Emory; it should not be a generic diagram from promotional or marketing materials.
         4.1.2.2. The architecture diagram can be created using a tool such as LucidChart or Visio and can be submitted in any common image format (e.g., JPG, PNG).
      4.1.3. The Network Services Questionnaire
         4.1.3.1. The Network Services Questionnaire contains technical questions designed to gauge the impact of the solution on Emory's wired, wireless, and telephone networks.
      4.1.4. The NDAA Certification Form (for projects that include vendors)
         4.1.4.1. Each vendor on the project must complete a separate NDAA Certification form
         4.1.4.2. Projects that do not have vendors do not need to submit the form

Things to be aware of:

- Many of the questions on the ART Questionnaire and the Network Services Questionnaire are highly technical and will require input from the technical members of the project team and/or the vendor team.
- The project team and vendors are encouraged to work together on the ART documentation.

The required ART documentation forms may be downloaded here: ART Documentation

The project team should email the completed ART documentation back to the ART Coordinators at ART@emory.edu.

The documentation will be reviewed by the ART coordinators, who will then follow-up with the project team to clarify any information, as needed, and to schedule the project's ART review meeting.

What to Expect at the ART Review Meeting

The ART meets every Thursday from 1-2 pm (Eastern) via Zoom.

- The project team will not need to prepare a formal written presentation to the ART (e.g., a PowerPoint slide deck, business case document).
- The ART meeting will focus on the information provided by the project team in the ART Review Intake Form, and the architecture diagram of the proposed solution, as well as any other documentation that was submitted.
- Members of the project team – including vendors – should attend the ART meeting to present the solution and answer any questions from the ART members. Attendees should include technical resources who can speak to the technical elements of the solution.
- At the beginning of the meeting, the project team will be asked to present a brief overview of the project and walk through the architecture diagram (the diagram will be displayed by the ART coordinators on the Zoom screen).
- ART members will ask questions and discuss the proposed solution with the project team and vendors.
- ART members will note any objections, concerns, recommendations, or required follow-up items (e.g., a formal security review, a Network Services engineering review).
- At the conclusion of the meeting, ART members will indicate whether the project is approved to proceed, or whether there are required follow-up items that must be completed before a final decision can be made.
- If there are required follow-up items, the project team should complete those items as soon as possible, and provide an update to the ART coordinators, who will pass the information on to the ART members for a final decision. In general, a second ART meeting will not be required, unless specifically requested by the ART.

Note: Only one project is reviewed at each ART meeting, to allow sufficient time for the presentation and any questions.

If You Have Questions or Need Assistance

If you have questions about the IT architecture review process, or you need assistance with the required documentation, please reach out to the ART Coordinators at ART@emory.edu.

END OF SECTION 27 26 23

SECTION 27 32 23 ELEVATOR PHONES (Including Elevator Camera)

1. Elevator Phones

1.1. Elevator phones are critical to obtaining the certificate of occupancy (CO), and it is imperative that this installation be closely coordinated with the OIT PM. The elevator phone is part of the elevator car and is not provided by OIT. However, the elevator phone should not be connected without OIT personnel present. In a typical installation, the phone cable should enter the elevator control panel through a one-

inch conduit. A one-inch conduit should be extended from elevator control panel to the nearest accessible ceiling. There can be no exposed communication cable within the elevator control room. *Appendix D: Elevator Control Room diagram*

1.2. Elevator Camera design and network connectivity must be coordinated with OIT PM. Design must be submitted to OIT PM and approved by OIT Network Services Engineer. Coordination of this effort is key so that CO dates are not put in jeopardy due to security compliance. The elevator camera is not provided by OIT.

END OF SECTION 27 32 23

SECTION 27 32 26.01 EMERGENCY BLUE LIGHT

1. Emergency Blue Light

1.1. Emergency Blue Light phones should be included into projects. (2) one-inch conduits should be placed from the location of the pole to the nearest OIT communication room for OIT Data and Security Camera.

1.2. Cabling for the above services is required.
Appendix E: Emergency Blue Light diagram

END OF SECTION 27 32 26.01

SECTION 27 32 26.03 GATE CONTROLS

1. Gate Controls

1.1. Parking gate control circuit connectivity must be coordinated with OIT. The Port controller equipment itself should be mounted in a location other than the OIT communication closets. There must be one (1) one inch conduit from the Gate Island into the OIT closet closest to the physical location of the ITR Gate Control Dialer equipment. Additionally, there must be coordination with the ITR team to determine their needs.

1.2. Cabling for the above services is required.

END OF SECTION 27 32 26.03

SECTION 27 32 26.05 FIRE ALARM PANELS

1. Fire Alarm Panels

1.1. Fire alarm systems are critical to obtaining the certificate of occupancy (CO) and it is imperative that this installation be closely coordinated with OIT PM.

1.2. The fire alarm panel will not reside in the OIT communication room and is not provided by OIT; however, the circuit by which it reports is provided by OIT.

1.3. In the event cellular dialers are to be used, care should be taken to ensure cellular coverage for these areas.

1.4. The fire alarm panel should not be connected to the communication circuit without OIT personnel present.

1.5. A one-inch conduit will be required from the nearest accessible ceiling into the fire alarm control panel.

1.6. Cabling for the above services is required.

END OF SECTION 27 32 26.05

SECTION 27 53 19 INTERNAL CELLULAR & DISTRIBUTED ANTENNA SYSTEM

1. Distributed Antenna System – Cellular Coverage

Distributed Antenna System for Cellular coverage budget is required for all Emory Owned properties and/or leased space. Carrier provided (AT&T, Verizon, etc.) or approved Emory vendor installed cellular distributed antenna system (DAS) for Emory University and Emory Healthcare within Emory OIT scope. Carrier neutral DAS (multiple Carriers can join) and/or Carrier specific DAS may be installed where Carrier cellular coverage is limited or needs enhancement to deliver uninterrupted coverage and enhance user satisfaction.

For cellular DAS, Carrier funded is preferred and should be considered first. If NOT Carrier funded, an approved Emory OIT vendor is contracted to install cellular DAS, the vendor is expected to provide client representation by submitting acceptable neutral host DAS designs to the Carriers as well as working closely with the Carriers to ensure they connect to the DAS system. Carrier or approved Emory OIT vendor will require building design drawings from Emory to provide a budgetary and/or potential solution as part of the bid-out process.

For Carrier provided cellular DAS, Emory University OIT will encourage the Carrier and their partners to complete and commission the cellular DAS as quickly as possible, with the understanding that all funding and project timelines are determined by the Carrier and their partners. Carrier funded cellular DAS may not be installed or user ready before building construction is complete and occupancy of the building has occurred.

1.1. New Building Construction

1.1.1. The OIT PM will coordinate the design of infrastructure to support the DAS system and ensure that the requirements are incorporated into the project plans.

1.1.2. Based on the size and layout of the building, additional closet space beyond the OIT equipment room may be required at various points on the floor for distribution. Each of these break-out rooms will require a 3’ X 3’ ¾” fire rated plywood with (2) coats of fire rated paint and a dedicated 20Amp circuit located on the back board.
Appendix G: Distributed Antenna System Break-out Room

1.1.3. Additional conduit, sleeves, or alternative pathways may be needed for the DAS installation. The OIT PM will work with the GC and/or Campus Services PM to identify those instances to co-develop a solution that best supports the facility.

1.1.4. If the site location for the new building is not located on an Emory Campus with a DAS head-end established (1) 4” conduit would be required for roof access. (May be shared with other OIT DAS services)

1.2. Renovation of existing floor or Building

1.2.1. The OIT PM will determine the feasibility of DAS design and the impact on the project budget based on the following criteria:

- DAS is already present in the building in which case the design will need to be re-worked based on the new floor plan.
- DAS is not present in the building in which case the feasibility of placing DAS into the space will be reviewed with executive leadership for approval.

1.3. Leased Space

1.3.1. The OIT PM will determine the feasibility of DAS design and the impact on the project budget based on the following criteria:

- Existing cell tower coverage
- What Staff will occupy the space & how many
- Size of the location
- Type of lease & duration

1.4. Rooftop antenna by Cellular Provider

1.4.1. If the location of the building requires a rooftop antenna, the cell provider will determine the approval of cellular service based on the design of service for the given area.

Please note: Exclusion of IT Infrastructure components (e.g., DAS, wireless) from any budget must be approved in writing by the Enterprise CIO and Senior Provost Information Technology and the Vice President for Campus Services.

2. Distributed Antenna System – Radio Coverage

The OIT PM will coordinate the design of infrastructure to support the DAS system and ensure that the requirements are incorporated into the project plans along with providing a budget for the DAS installation on the project. Public Safety DAS is managed by Emory University OIT: Network Support Services Aux: Trunked Radio Operations.

Approved vendor RF/grid/benchmark testing of the facility will determine the need for in-building cellular DAS. RF/Grid/Benchmark testing is generally completed once the building is erected, with all exterior skin and glass installed, as well as interior drywall or other wall construction material and ceilings are complete. Exceptions to the timing of this test can be made where Emory is paying for the DAS and is not Carrier funded. There may be instances where multiple RF/grid/benchmark tests must be paid for, if the first testing was completed prematurely.

This guideline applies to all Emory University and Emory Healthcare new buildings and parking structures (to be called "buildings" throughout this document)

Emergency Responder Radio Coverage Systems (ERRCS), two-way radio communication enhancement systems are meant to enhance and ensure communications between emergency responders for the interior of the building. All areas of the building must have code compliant radio coverage. Federal Communications Commission (FCC)-certified signal boosters, or other approved systems are required for such systems. These systems shall be designed and constructed to comply with, meet or exceed all local, state, and federal guidelines for the design, commissioning, and operation

The OIT: Network Services Auxiliary: Trunked Radio Operations team shall determine and approve the Contractor(s) and related work for Emory Emergency Responder Radio Coverage Systems (ERRCS), two-way radio communications and public safety DAS for all Emory University and Emory Healthcare new buildings and parking structures

Whereas this document may not be all-inclusive; there may be additional requirements determined by the Emory OIT: Network Services Auxiliary: Trunked Radio Operations teams, Commissioning Authority and/or AHJ, or Emory FM Fire Safety Division

Buildings which will achieve radio coverage without amplification are exempt

Where it is determined by an approved radio signal strength test and clarity study that buildings and areas of buildings that meet the code compliant minimum radio coverage signal strength levels without the use of an indoor radio coverage system, the building is exempt.

Specification Requirements

Provide performance-based specifications. Require final and complete design, specifications and drawings be provided by the Contractor and submitted as part of the shop drawing process.

Include the following in the ERRC performance specification

- ERRCS equipment shall be FCC approved and/or certified as required
    - ADRF is preferred manufacturer equipment for Emory

- Contractor shall be FCC licensed as required by code
- Contractor shall submit detailed shop drawings for review to Emory OIT Network Services Auxiliary Manager, Emory OIT Trunked Radio Operations Admin and Emory OIT Construction Project Manager
- Components shall be industry standard and readily available to Emory University
- Provide performance specifications for major components
- Follow required separation distances between ERRCS equipment and other mechanical, electrical and telecommunications equipment
- Follow required separation distances between ERRCS antennas and antennas of other radio systems
- Components shall be labeled with unique part or address numbers which correspond to numbers shown on the Contractor drawings
- Riser cables and cables for individual antenna feeders shall be installed in a neat and workman like manner. Cabling shall be individually supported or neatly placed in OIT cable tray if authorized
- Furnishing qualified service representatives to supervise the field assembly, connection of components, commissioning and testing of their respective systems
- Contractor to submit a detailed work plan including narrative of how the Contractor will provide the scope of services
- Contractor to attend progress meetings as required by Emory OIT or the Construction Management team to maintain a thorough understanding of the project schedule and associated coordination issues
- Utilizing iBwave Model Generation software or similar, the Contractor shall perform a predictive RF propagation survey and submit results to the Emory OIT
- Grid test results provided to Emory OIT

Shop drawing submittals shall include the following

- Proof of Contractor's qualifications and licenses (including low-voltage license for the installing contractor)
- Detail technical design package
- Submittal of design to AHJ for approval in accordance with code requirements

Specify the following to support operation and maintenance activities

- When applicable: An electronic file containing the final system software including the master program generic to the system, the software associated with each programmable piece of equipment, and the software licenses and passwords required by the OIT Trunked Radio Operations Admin to perform programming changes
- A minimum of 4 hours of owner training on operation and maintenance
- One year of customer service from the date of acceptance
- A parts and labor warranty for 1 year from date of acceptance
- The first code-required annual operational recertification test before the end of year 1

Emory OIT requires one set of ERRC technical information and documentation to be stored at the headend location and electronically filed with the Emory OIT and/or FM Fire Safety Division. Specify submittal of one set of the following

- ERRCS bid specifications and drawings
- ERRCS as-built drawings including vertical/riser and horizontal cabling runs

- Summary of ERRCS frequencies utilized
- Summary drawing showing locations of ERRCS headend equipment, node equipment, BDA, and antenna sites
- Copy of Grid Test Results
- Copy of installing contractor's low voltage license
- Copy of the Certificate of Completion from the City/County/Fire Marshall's Office
- Provide O&M manuals and equipment spec sheets

ERRC/Public Safety DAS - General System Requirements

- Provide and install DAS head end electronics for City of Atlanta 800MHz Public Safety services and Emory Radio 800MHz services
- ERRCS shall utilize a bidirectional amplifier (BDA) with a distributed antenna system to achieve the required radio coverage
    - ADRF is preferred manufacturer equipment for Emory
- ERRCS shall use a Class A channelized amplifier set up to use DeKalb County Public Safety, Emory University, and City of Atlanta radio channels
    - ADRF is preferred manufacturer equipment for Emory
- Provision and installation of electronic equipment, coax, and fiber cabling, including splitters, couplers, directional couplers, and jumpers
- Shall have ability to provide coverage on the 700 MHz and 800 MHz public safety bands
- Shall permit the simultaneous use and interoperability of analog and digital modulation radios
- Shall have expandability to permit future additions and changes to the emergency responder radio frequencies
- Shall be designed to maintain full system operation during a normal power outage up to 24 hours
- Shall enclose active components in NEMA-4 Type enclosures
    - ADRF is preferred manufacturer equipment for Emory
- ERRCS headend and node equipment shall be securely attached to racks or backboards
- Identify all required outside plant fiber optic cables required to connect ERRC to remote antennas and/or other systems in other buildings
- System and related equipment shall be FCC certified
    - ADRF is preferred manufacturer equipment for Emory
- Shall include 24 hours of battery backup per head end unit
- Shall include 24 hours of battery backup per remote location

Support Systems and Spaces

- System shall include supervision of the ERRCS antennas, signal boosters, power supplies and UPS
- Supervisory and trouble alarm output contacts indicating an impairment – have fire alarm contractor connect the supervisory and trouble alarm contacts to the building fire alarm system
- Fire alarm system shall transmit ERRCS supervisory and trouble alarm signals to the appropriate supervising station as well as EPD Dispatch Center
- Locate the headend equipment in the main telecommunications room or MDF whenever possible - Coordinate with the Emory OIT Trunked Radio Operations Admin and Emory OIT Construction Project Manager for space and power within telecommunication rooms

- Locate the node equipment in telecommunications rooms or IDF by design - Coordinate with the Emory OIT Trunked Radio Operations Admin and Emory OIT Construction Project Manager for space and power within telecommunication rooms
- All telecommunications rooms containing ERRCS equipment shall have continuous air conditioning to alleviate heat build-up within the rooms - The ERRC equipment can operate at an elevated temperature during a power outage
- Active components shall be enclosed in a NEMA Type 4 enclosure
- For systems requiring donor antennas, Contractor shall provide and install non-penetrating rooftop sled mounts with donor antenna and cable runs as well as indicate roof penetration location(s)
- Contractor shall provide and install remotes on Contractor provided fire rated backboards when telecommunications rack is not used or available
- Contractor to provide and install all wire and hardware for grounding including for provided and installed head end electronics
- Emory shall provide access to (2) hour fire rated riser(s) or stairwell(s) for ERRC riser cables. If two hour rated riser(s) is not available, system and cabling will be designed to meet related code requirements

ERRC/Public Safety DAS - Passive Infrastructure

- All passive infrastructure must be approved by the AHJ before purchase or installation
- Passive infrastructure network shall be designed and tested in such a manner to distribute signals with acceptable loss to each antenna
- Antennas, hardware, and components shall be Low PIM rated to reduce signal mixing and creation of harmonics
- Must utilize compression style fittings and tools for coaxial connections
- If conduit is required in certain areas by the local AHJ or by Emory University, Contractor will work with the project's Electrical Contractor for the project to provide conduit in all locations necessary as determined by the design and/or AHJ requirement
- Individual antenna feeds shall be ½" coaxial cable and approved jumpers
- Individual antenna feeds in parking decks or structures without ceilings shall be installed in metal conduit (EMT) or air dielectric coaxial cable with corrugated copper sheathing and PVDF jacket
- Install minimum 2" diameter conduit for routing cabling through inaccessible ceilings, finished spaces with open ceilings and unfinished spaces
- Following the AHJ's requirements and with their approval - riser and feeder cables shall be plenum rated and installed in metal conduit (EMT) or air dielectric coaxial cable with corrugated copper sheathing and PVDF jacket or be approved/certified Dragonskin cable type or ½" Plenum cable inside metal raceway
- Cables shall be installed hidden from view except in open ceiling areas
- Review antenna styles, conduit paths and equipment powering and mounting locations with Emory OIT Network Services Auxiliary Manager, Emory OIT Trunked Radio Operations Admin and Emory OIT Construction Project Manager for aesthetic concerns and approvals
- Antennas shall be securely attached independently from the work of other trades
- Provide acceptable coax and fiber cable testing results

Further Considerations – Pre-Installation, Acceptance Testing and Commissioning

- The Contractor shall perform pre-installation grid testing for percent coverage and signal strength in accordance with code. Testing shall not be performed until after the building is fully enclosed (roof, exterior skin, doors, and windows are installed), and majority of interior ceilings and walls are in place. Measure the percent coverage and signal strength in both the critical and general areas on each floor. Measure the signal strength receivable within the building and the signal strength received when transmitting from within the building
- The Contractor shall perform acceptance testing for percent coverage and signal strength in accordance with code requirements
- Final testing shall be scheduled and performed in conjunction with Emory OIT Trunked Radio Operations Admin
- The Project's Commissioning Authority and/or AHJ should witness the testing
- Final testing will demonstrate full compliance with code requirements
- Final testing will demonstrate full compliance with specification requirements
- Final test results shall be spreadsheet or PDF form, along with building floor plans overlaid with test grid used in testing procedure. Testing and testing results shall comply with all code requirements
- Test results shall indicate date, time, and weather conditions at the time of the testing
- Meet or exceed all local, state, and federal guidelines for the design, commissioning, and operation of the quoted system(s)
- Contractor to set the repeaters attenuation and gain settings and calibrate output powers based on donor signal levels
- Contractor to label equipment in DAS OEM software
- Contractor to work with fire alarm contractor to provide materials and services to connect ERRCS/Public Safety DAS to alarming/monitoring panel
- Contractor, in conjunction with Emory OIT, to use a scanner to collect data for live signals after the initial commissioning to demonstrate coverage provided by DAS
- Contractor to coordinate inspection by Authority Having Jurisdiction for the approval of the installation, per national and local codes and standards
- Contractor to provide 1 return visit for any system related software, equipment, or antenna adjustments after AHJ acceptance
- Contractor shall include design services as part of their proposal with all design revisions included
- Contractor shall have an active low voltage license for the state of Georgia
- Contractor shall provide a public safety/ERRCS permit and AHJ coordination for the system(s)
- Contractor shall provide one round of post installation GRID testing

ERRC/Public Safety DAS – Closeout Documents to Include

- Coax Test Results
- Fiber Test Results
- System Tests including commissioning report and post install walk test data
- Screen captures of the system GUI
- As-Built documentation in PDF format
- Any installation photos
- All related specification documentation for the installed system

Distributed Antenna System for Radio coverage is required for all Emory Owned properties and/or leased space.

2.1. New Building Construction

2.1.1. The OIT PM will coordinate the design of infrastructure to support the DAS system and ensure that the requirements are incorporated into the project plans

2.1.2. Additional conduit, sleeves, or alternative pathways may be needed for the DAS installation. The OIT PM will work with the GC and/or Campus Services PM to identify those instances to co-develop a solution that best supports the facility

2.1.3. (1) 4" conduit will be required from the OIT Equipment Room on the top floor to the roof for antenna placement (May be shared with other OIT DAS services)

2.2. Renovation of existing floor or Building

2.2.1. The OIT PM will determine the feasibility of DAS design and the impact on the project budget based on the following criteria:

- DAS is already present in the building in which case the design will need to be re-worked based on the new floor plan
- DAS is not present in the building in which case the feasibility of placing DAS into the space will be reviewed with executive leadership for approval

2.3. Leased Space

2.3.1. The OIT PM will determine the feasibility of DAS design and the impact on the project budget based on the following criteria:

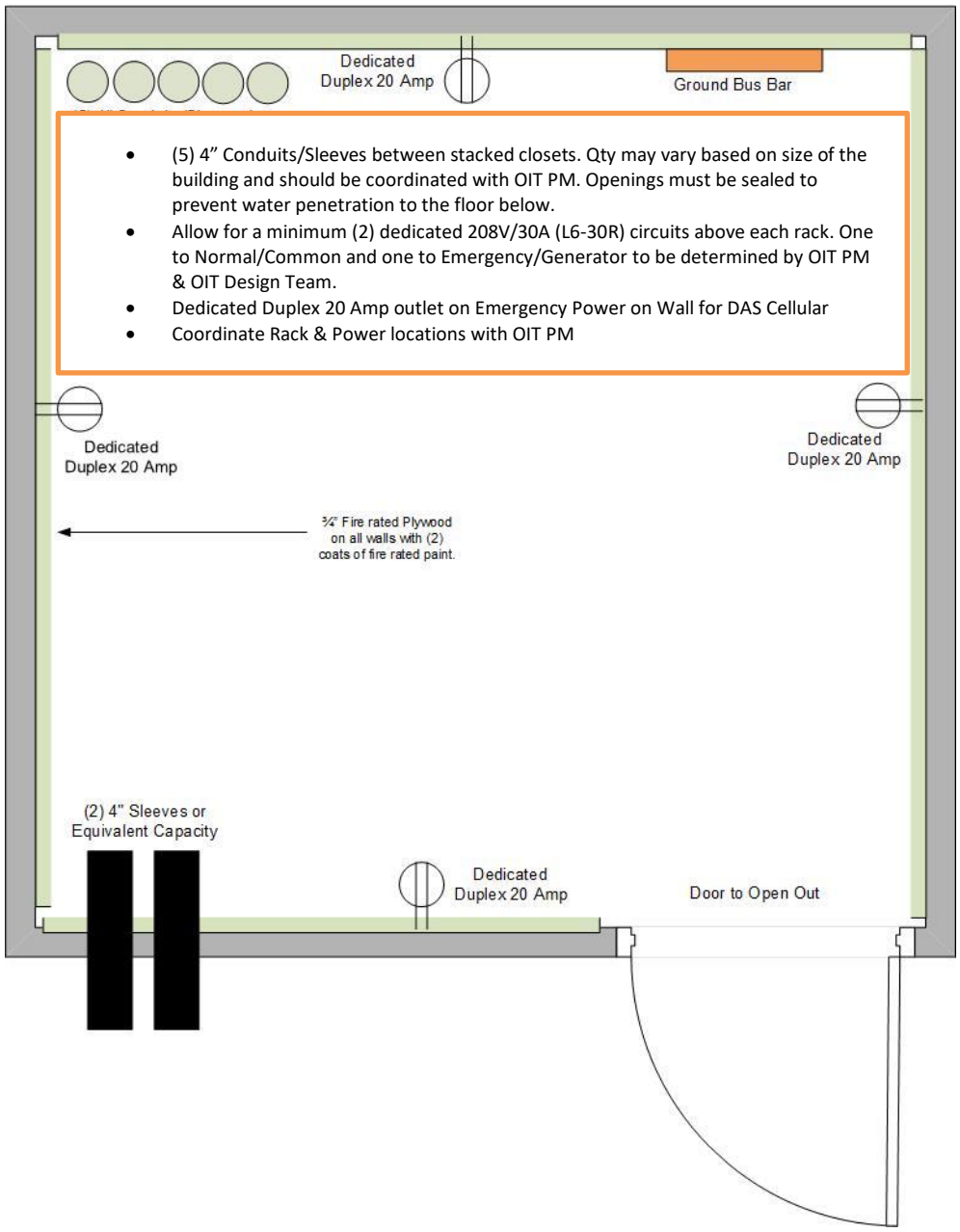
- Existing cell tower coverage
- What Staff will occupy the space & how many
- Size of the location
- Type of lease & duration

2.4. Rooftop antenna by Radio Provider

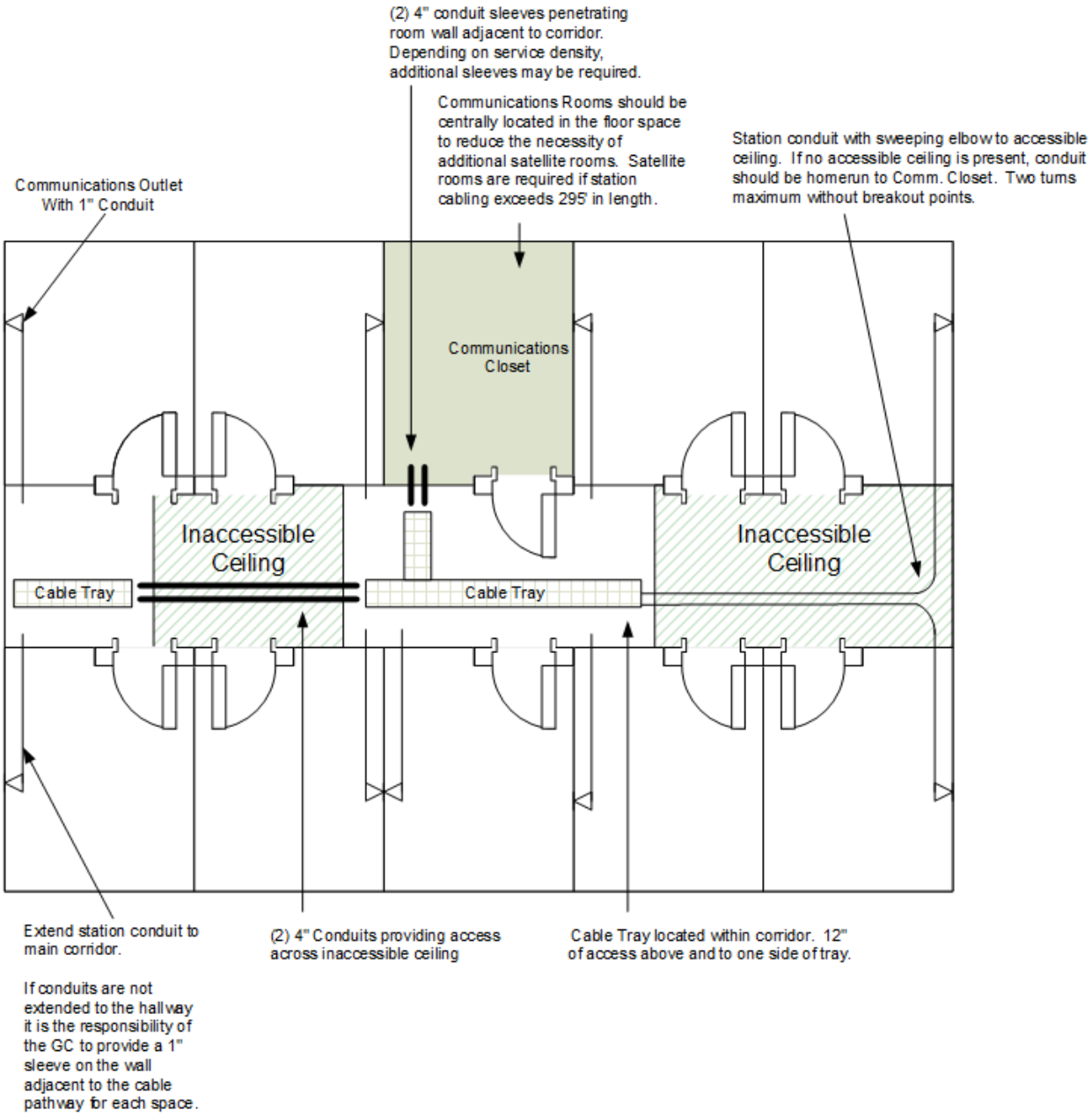
2.4.1. If the location of the building requires a rooftop antenna, the provider will determine the approval of service based on the design of service for the given area

END OF SECTION 27 53 19

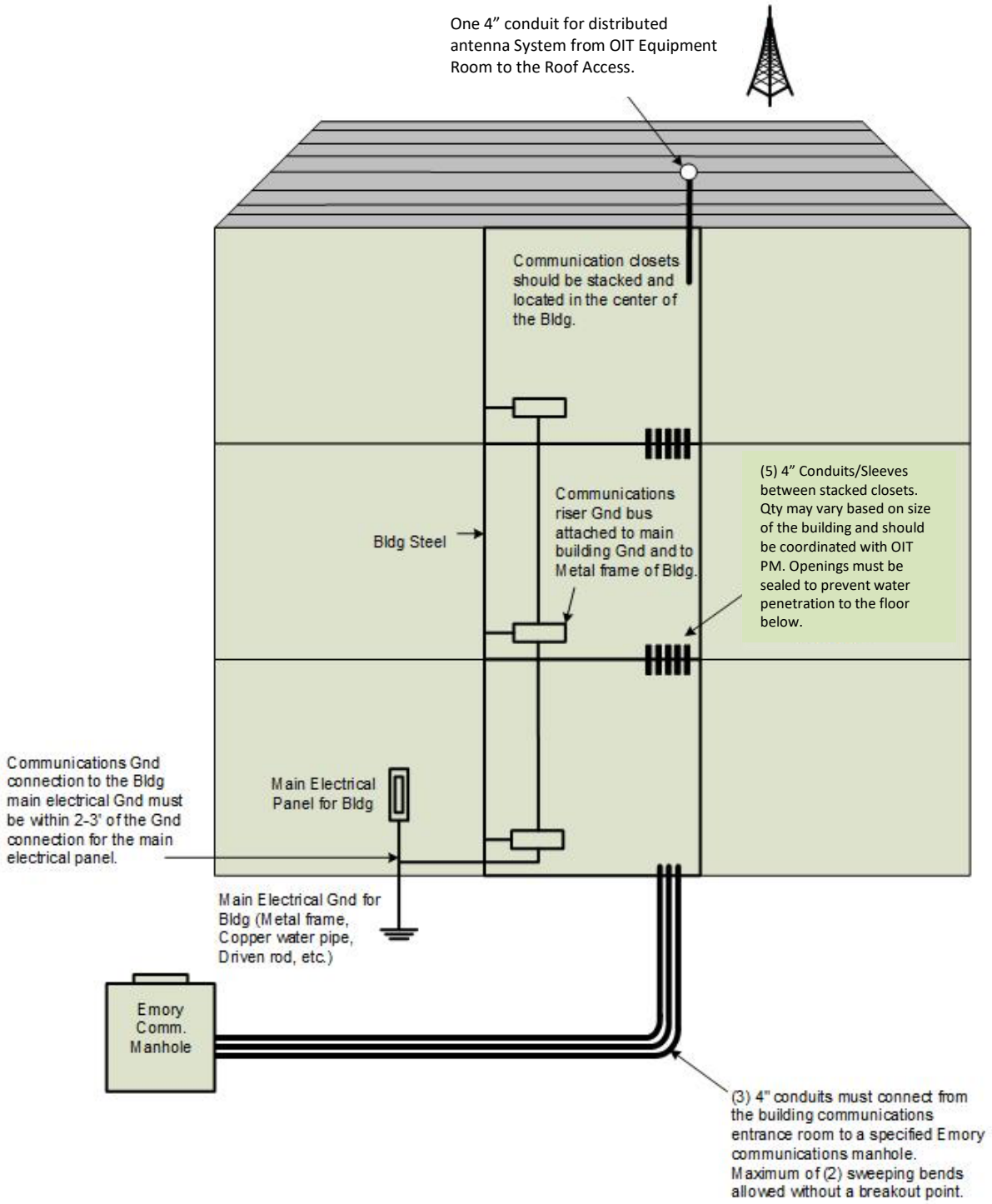
APPENDIX A: COMMUNICATION ROOM FOOTPRINT



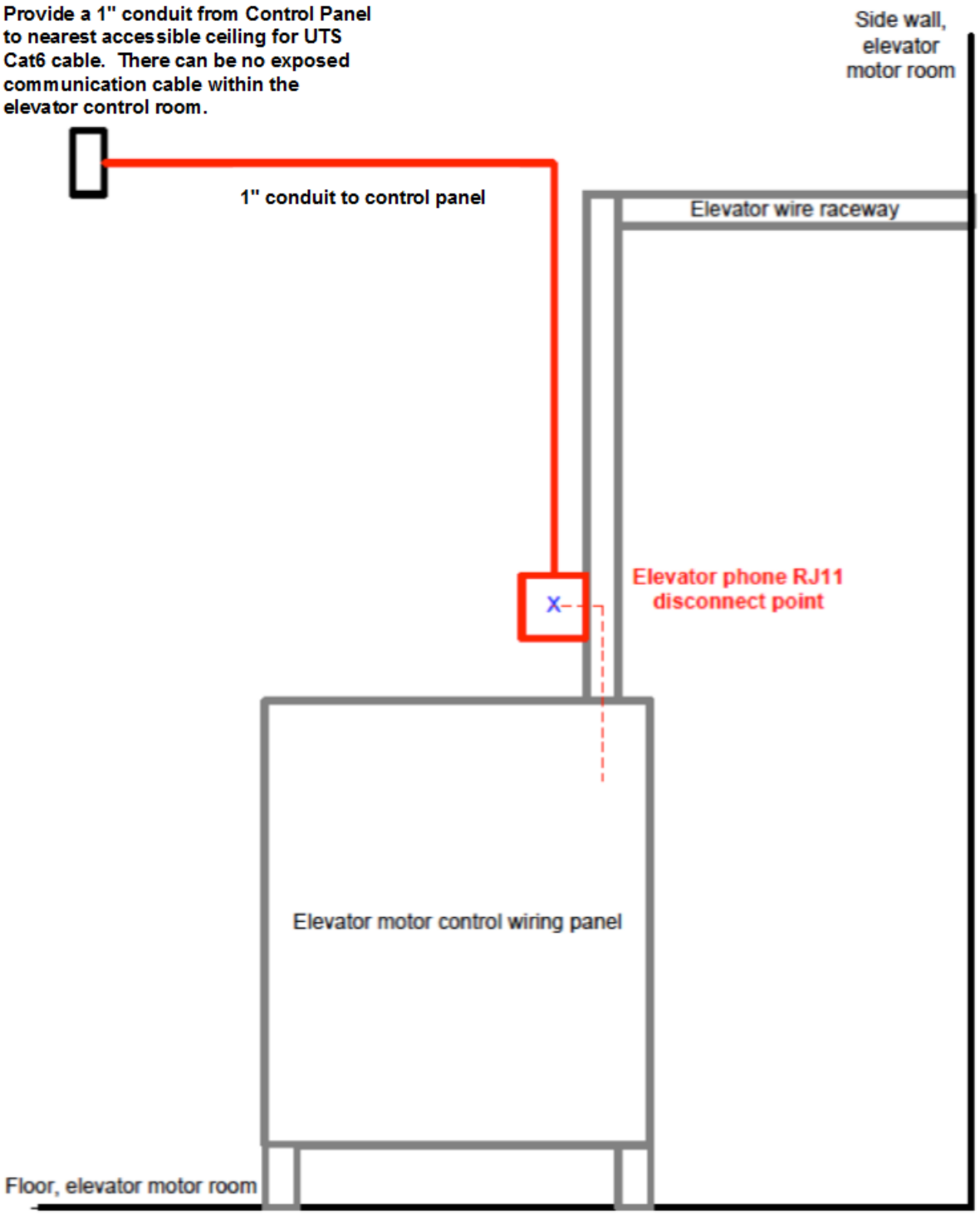
APPENDIX B: TYPICAL COMMUNICATIONS HORIZONTAL REQUIREMENTS



APPENDIX C: TYPICAL COMMUNICATIONS VERTICAL REQUIREMENTS

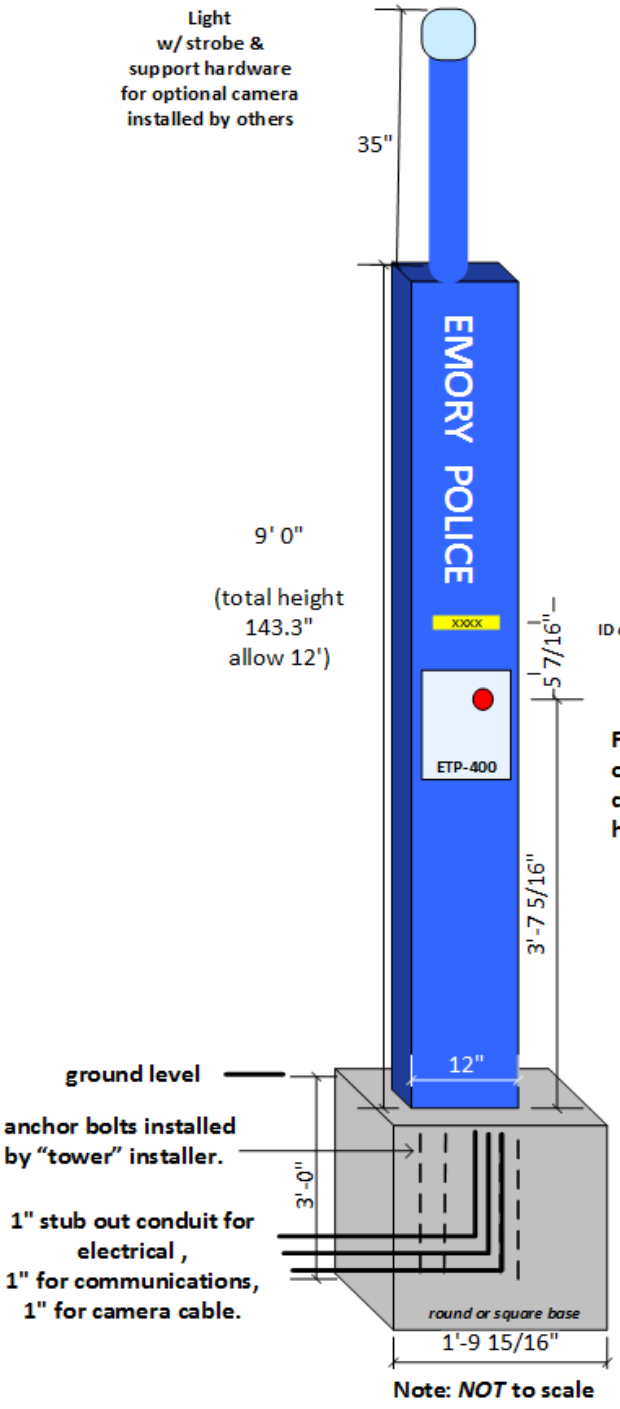


APPENDIX D: ELEVATOR CONTROL ROOM WIRING



APPENDIX E: EMERGENCY BLUE LIGHT WIRING DIAGRAM

TOWER WITH ALARM ERGENCY BLUE LIGHT WIRIN



The Blue Light assembly as shown to the left must be installed to conform with accessibility guidelines as follows:

-Poles must be installed with or adjacent to an accessible ground surface measuring a minimum of 30" x 48", with an approach whose slope and cross slope must not exceed 2%.

- Each location must be along an accessible route, to include appropriate 36" minimum width and 360 degree turning radius to accommodate the average wheelchair.

Per ADA: "Highest operable part of device mounted no higher than 48" AFF".

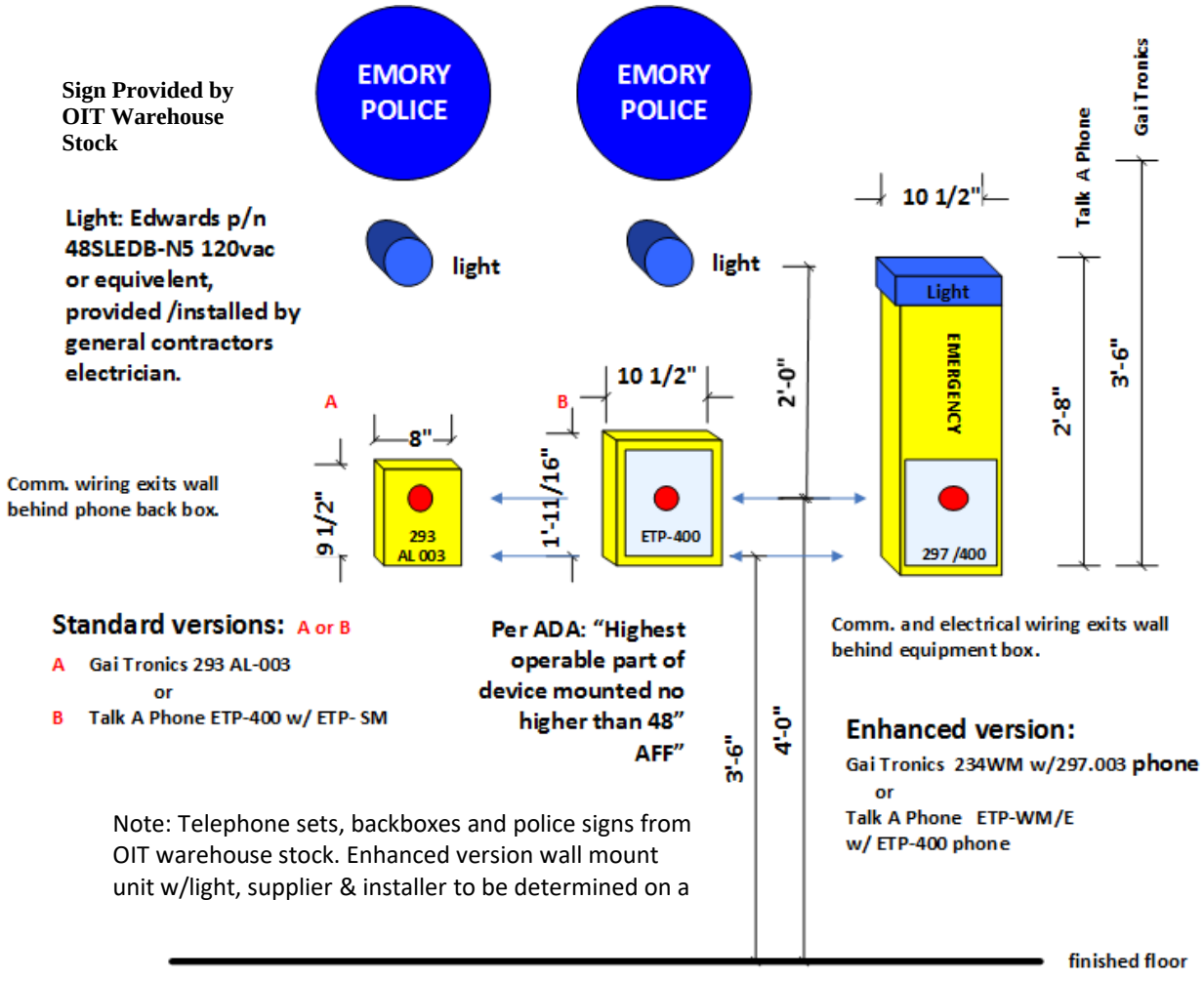
Talk A Phone

ETP-MT/R OP4 "tower" w/ camera arm & ETP 400 phone

Anixter p/n to meet Emory standards (color & graphics) is: "EMORY - TTOWER - LOGO"

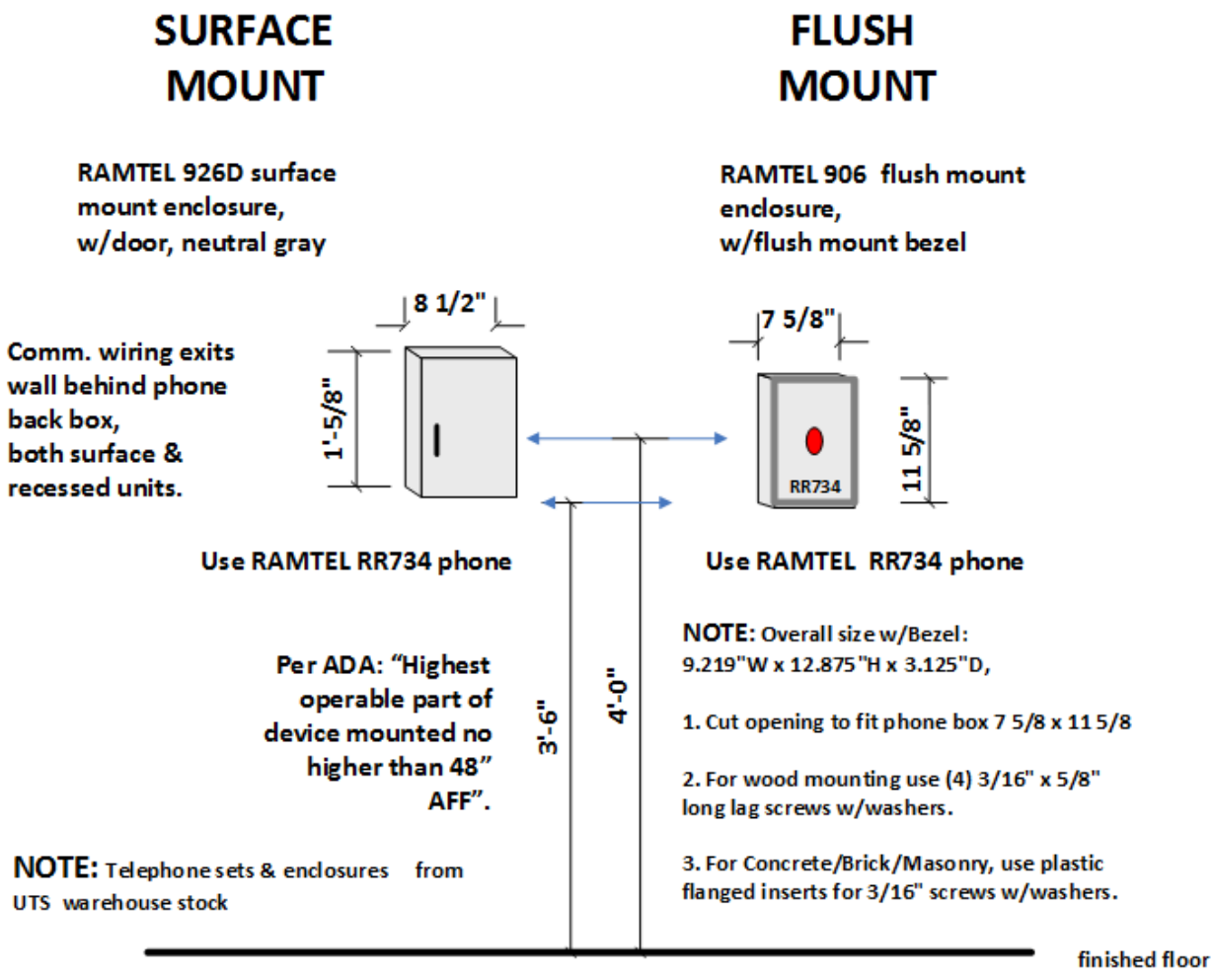
PARKING DECK EMERGENCY BLUE LIGHT WIRING

APPENDIX E: (Continued)



Parking Deck Emergency Phone

APPENDIX F: BUILDING ENTRANCE PHONE WIRING



Building Entrance Phones

APPENDIX G: Distributed Antenna System Break-out Room

- The location of the Distributed Antenna System Break-out Room may be a shared space.
- Backboard must not be placed over sink or blocked by storage.
- Dedicated Duplex 20 Amp outlet on Emergency Power
- OIT must always have access to the room for service.
- Coordinate door key with OIT PM.
- Height of the backboard should not exceed 7’ to allow for mounting of equipment.