

SECTION 16905
COMMUNICATIONS SYSTEM
(Data and Voice)

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Cable path guidelines.
- B. Supportive equipment such as grounding and plywood backboards.
- C. Communication room setup and design.
- D. Communication outlets.
- E. Testing and certification of the communication systems.
- F. Power requirements.
- G. Cooling requirements.

1.2 REFERENCES

- A. NFPA: National Fire Protection Association.
- B. ANSI: American National Standards Institute.
- C. TIA: Telecommunication Industry Association.
- D. EIA: Electronic Industries Association.
- E. ISO: International Organization for Standardization.
- F. IEC: International Electro-technical Commission.
- G. NEC: National Electrical Code (NFPA 70).
- H. UL: Underwriters Laboratories.
- I. NEMA: National Electrical Manufacturer's Association.
- J. Section 02310 – Earthwork, for all underground installations.

1.3 SYSTEMS DESCRIPTION

- A. The primary communication room shall be the entry point for communication cables coming into the facility and the origination point of the communication systems in the facility.
- B. A communication distribution node will be a communication room which is used to feed several other buildings.
- C. Provide materials and labor for complete cable paths and power distribution; including conduits, pull strings, junction boxes, empty outlet boxes, backboards, power receptacles, and grounding for communication systems.
- D. Provide materials and labor for installation and testing of the fiber optic cables, twisted pair cables, CAT6, termination racks, communication outlets, and final terminations of cables.
- E. Provide materials and labor for installation of panic system dialers and emergency phones.
- F. Provide labor for installation of Wi-Fi access points at locations and in quantity as specified by the Wi-Fi heat map, created by Florida Tech IT - Networks, for the project.
- G. Provide materials and labor for installation of emergency phones and panic system dialers.
- H. Provide CAT6 Ethernet patch cords in the lengths of 3', 5', 7', and 10' with quantities specified on a per job basis. Coordination with Florida Tech IT - Telecommunications is needed for determination of patch cord quantities.
- I. Plywood backboards shall be fire-rated 4' x 8' x 3/4" A-C grade plywood painted grey.
- J. Data outlets shall be located within 24" of a corresponding electrical outlet
- K. All fiber should be rated, tested, and certified for 10 Gb capacity.
- L. All Ethernet should be rated, tested, and certified for 1 Gb capacity.
- M. See riser diagram on drawings for details.
- N. Each communication room shall have at least one 19" two post equipment rack.

- O. There shall be at least 36" of clearance in front, behind, and to one side of each rack/row of racks.
- P. Each rack shall have a front and back 6" wide vertical cable manager on each side.
- Q. Two racks side by side may share a single vertical cable manager.
- R. Each communication room shall have ladder rack connecting the individual equipment racks to the backboard and following all cable paths within the communication room to their point of floor, ceiling, or wall penetration.

1.4 ELECTRICAL STANDARDS

- A. Electrical products, which have been tested, listed and labeled by an approved testing Laboratory such as UL and shall comply with NEMA.
- B. Electrical Standards: Provide electrical products, which have been tested, listed and labeled by Underwriters Laboratories and comply with NEMA standards.

1.5 SUBMITTAL

- A. Submit under provisions of Section 01300.
- B. Under most conditions issues and responses requiring the involvement of any Florida Tech Department will be relayed via the Architect or Construction Manager as provided for in Section 01300.
- C. All questions should be submitted under provisions of Section 01300 unless specifically instructed by either the Architect or Construction Manager to work and/or coordinate directly with other Florida Tech Departments.

1.6 RELATED WORK

- A. See Division 15000 and HVAC Design Criteria for Air Conditioning requirements.
- B. Communication Rooms shall have 24 x 7 air conditioning capable of holding the room at 76°F with an additional capacity equivalent to 6000 BTU per equipment rack.
- C. Cooling needs require the coordination of Florida Tech IT – Networks/Telecommunications. Cooling capacity shall be determined using the measure of 12000 BTU/hour per 3.5kW based on the actual power consumption (heat dissipation) sum of required equipment.
- C. DX air conditioners are required when the local AHU cannot meet the requirements of the communication rooms and for all communication distribution nodes.
- D. Air supply ducts in communication rooms shall be positioned to provide a supply of conditioned air to the front of communication racks (cold aisle).
- E. Air return ducts in communication rooms shall be positioned to provide for removal of heated air from the back of communication racks (hot aisle).
- F. Each communication rack will have a dedicated 20 Amp 120V circuit with a NEMA 5-15/20 receptacle installed within 5' of the rack base and connected to emergency power were available. In the case of a communication distribution node, coordination is required with Florida Tech IT – Networks/Telecommunications to determine exact power needs.
- G. Electrical circuits serving communication rooms shall have automatic failover to emergency generator power if available.
- H. Electrical circuits serving all communication distribution nodes and the corresponding DX air conditioner shall have automatic failover to emergency generator power if available.
- I. Each emergency phone has a blue strobe light which shall be mounted to the back of the stanchion or on the wall above the phone. The strobe light requires a connection to 120V AC and a single twisted pair connected back to the applicable phone.
- J. Each communication room shall have a #6 AWG ground wire directly connected to the main electrode grounding for the building.
- K. Lighting fixture location shall be positioned to give direct light on the front and back of each communication rack. In communication rooms do not install the light fixtures directly above any

- communication rack.
- L. The primary communication room for a building shall have 4 x 2", or larger, pipes connecting the communication room to a communication pull box outside the building. The pipes must have no more than 180° of total bends and all bends must be long sweeps.
 - M. Small concrete pads are required for free standing emergency phones.

1.7 ALLOWANCES

- A. Provide 6 additional CAT6 or CAT6A, single port, above ceiling, communication outlets per floor as directed in field at any time up until final acceptance has been issued by Florida Tech. This is specifically intended to accommodate Wi-Fi access point locations which change due to design and room usage alterations during construction.
- B. Provide mounting and installation services for the Wi-Fi access points. The typical access points used by Florida Tech clip onto ceiling grid our mount directly onto a communication outlet in place of the faceplate.
- C. Allowance includes materials and labor for the additional communication outlets.
- D. Panic system dialers and emergency phones shall be delivered to Florida Tech IT - Telecommunications for final programming. Seven business days shall be allowed for this final programming to take place prior to the devices being available for pickup and final installation.

1.8 PROJECT RECORD DOCUMENTS

- A. Submit product data under provisions of Section 01700.
- B. A set of records must be kept and used to provide as built prints to the Florida Tech IT - Telecommunications office showing the cable paths, penetration and sleeve locations, communication outlet locations, communication outlet identification, and Wi-Fi access points with MAC addresses.
- C. Test and certification results for the Ethernet and fiber cable testing performed after installation shall be supplied to the Florida Tech IT - Telecommunications office. This testing must include the installed jacks and termination blocks.
- D. Acceptable test and certification results must show that the Ethernet and Fiber connections comply with certification level standards for the category and class of cable. Documentation should also be provided to show that under these conditions all Fiber connections can handle 10 Gb and all Ethernet connections can handle 1 Gb.

PART 2 PRODUCTS

2.1 COMMUNICATION SYSTEM

- A. Rack mounted Fiber termination cans shall be Siemon Model RIC3-(xx)-01 where x represents the U size of 1, 2, 3, or 4. Fiber termination cans shall be equipped with SC connectors. Use RIC-F-SCx-01 where x determines fiber count per adaptor plate.
- B. Wall mounted Fiber termination cans shall be Siemon Model SWIC3G-(x)(x)-01 where x represents lock mechanism for both doors. Fiber termination cans shall be equipped with SC connectors up to 4 adaptor plates. Use RIC-F-SCx-01 where x determines the fiber count per adaptor plate.
- C. Indoor Fiber shall be Siemon Premise OFNR or OFNP (depending on environment) Distribution Tight Buffer Single Unit Distribution. Single and Multimode fiber shall be rated and tested for 10 Gb. All Multimode fiber shall be 50µ. Model 9BB(X)(X)-(XXXX)-(XXXX)A
- D. Outdoor and underground fiber shall be Siemon Outside Plant . Single and Multimode fiber shall be rated and tested for 10 Gb. All Multimode fiber shall be 50µ. Model 9PE(X)C-(XXXX)-(XX)-01-A
- E. CAT6 Ethernet Patch panels shall be Siemon Model HD6-xx where xx represents the port count of 24 or 48.
- F. CAT6 Ethernet jacks shall be Siemon Model MX6-02 (White).

- G. Coax F connectors shall be Siemon Model MX-F-FA-02 (White).
- H. Communication outlet faceplates shall be Siemon Model MX-FP-S(x)-02 (White) where x is replaced by 1, 2, 4, or 6 for the port count.
- I. Communication outlet surface mount boxes shall be Siemon Model MX-SMZ(x)-02 (White) where x is replaced by 1, 2, 4, or 6 for the port count.
- J. Blank inserts for unused communication outlet ports shall be Siemon Model MX-BL-02 (White).
- K. CAT6 Indoor Ethernet cable shall be Siemon Category 6 CMR (Gray) or CMP (White), depending on environment. (9C6X4-E2-02-RXA).
- L. CAT6 Outdoor and underground cable shall be Siemon Outside Plant (9C6O4-E1).
- M. Coax cable shall be RG-6 rated.
- N. Surge Protectors for twisted pair copper between buildings shall be Circa Model 1880ECA and shall be fully equipped with Circa Model 4B1FS-240 surge protection modules.
- O. Surge Protectors for underground Ethernet cables, traveling more than 5' underground away from the building, shall be Circa Model 1880ENA1 and shall be fully equipped with Circa Model 4B6S-75e surge protection modules.
- P. Surge Protectors for security phones mounted to stanchions shall be Circa Model 1880ENA1 and shall be fully equipped with Circa Model 4B6S-240e surge protection modules.
- Q. Main grounding bus bars shall be equivalent to Chatsworth Products Model 40153-12.
- R. Vertical Cable Managers shall be Siemon Model VCM-6D.
- S. Horizontal Cable Managers shall be Siemon Model RS-RWM-2DS.
- T. Two post racks shall be Siemon Model RS-07.
- U. Four post racks shall be Siemon Model RSQ1-07-S.

2.2 EMERGENCY AND SECURITY DEVICES

- A. Emergency Phones shall be Ramtel Model RR733 (Florida Institute of Technology) with custom silk screening. The manufacturer has the standard configuration for Florida Tech on file. In certain situations a more advanced phone may be specified with additional details concerning extra buttons and door control release mechanisms.
- B. Emergency Phone enclosures shall be Ramtel Model 926-D (Florida Institute of Technology) with custom silk screening painted Safety Yellow. The manufacturer has the standard configuration for Florida Tech on file.
- C. Emergency Phone strobe lights shall be Ramtel Model LS-5 with mounting bracket 500-1287.
- D. Emergency Phone stanchions, for free standing units, shall be a standard Ramtel Stanchion configured to the Florida Tech Standard as a surface mounted unit with a light and painted Safety Yellow.
- E. Panic system dialers shall be Viking Model K-2000-DVA.
- F. Panic system pull stations shall be Sentrol Model 3040-W (White).

2.3 FLORIDA TECH SUPPLIED DEVICES

- A. Wi-Fi Access points will be supplied by Florida Tech IT - Networks, in accordance with the Wi-Fi heat map for the building layout, and billed to the project.
- B. Communication switches, routers, and firewalls will be jointly supplied by Florida Tech IT – Networks/Telecommunications, quantities and configuration based on expected occupancy requirements, and billed to the project or applicable department.

PART 3 EXECUTION

3.1 GENERAL REQUIREMENTS

- A. Coordinate installation with all trades.
- B. All installation shall be first class and professional and shall be judged by the Engineer and the

Florida Tech IT - Telecommunications Department.

- C. All abandoned cable shall be removed.
- D. All conduit shall be concealed in walls and ceilings. No conduit shall be visible outside of utility, mechanical, Electrical, and communication rooms.
- E. Emergency phone locations shall be installed in key areas identified by Florida Tech Security. The phones shall be wired using CAT6 or CAT6A and connected to a patch panel in the communication room.
- F. Panic system pull stations shall be installed in key areas identified by Florida Tech Security.
- G. Panic system pull stations shall be wired using CAT3 or higher rated cable and connected to 66 type blocks within the cross connect field in each communication room.
- H. Panic system dialers shall be installed on the backboards in each communication room. The quantity of dialers is based on the number of panic pull station locations divided by 8. The connection terminals for each panic system dialer shall be connected to 66 type blocks within the cross connect field.
- I. Support conduits, backboards, wiring gutters, J-Hooks, ladder rack, and communication outlets under provisions of Sections 16190.
- J. All communication conduits leaving the perimeter of the building shall have a locate wire installed. Copper communication cable and Fiber which has an integrated locate wire, traversing the entire conduit, can be considered as meeting this specification.
- K. All outdoor Communication Vaults and Hand Holes shall be labeled as "Communications".
- L. Hand Holes shall have a gravel bed and shall be installed in straight sections of conduits.

3.2 COMMUNICATION ROOM - GENERAL

- A. Size of all communication rooms shall adequate to allow for 36" of clearance in front, behind, and to one side of each rack/row of racks. The actual size of each room will be determined by the number of racks being installed.
- B. Any room acting as a central distribution node for the University will require coordination with Florida Tech IT – Networks/Telecommunications to determine exactly what equipment will be installed.
- C. Each floor shall have one or more communication closets for distribution throughout the floor.
- D. Each communication room shall be connected to the primary communication closet with 6 strands of fiber and a 25 twisted pair cable.
- E. Each communication rack, section of ladder rack, and surge protector shall be bonded and home run connected to the main grounding bus bar using a #6 AWG stranded copper insulated grounding conductor.
- F. All 120 volts, NEMA 5-15/20 receptacles designated for communication racks shall be dedicated circuits with dedicated neutrals. See Section 16141 for wiring devices.
- G. Receptacles for communication rooms shall be on separate circuits from other loads with maximum of two dual receptacles on each branch circuit. Each receptacle shall be labeled to indicate the circuit number and electrical panel where the breaker can be found.
- H. Electrical needs for a communication distribution node must be coordinated with Florida Tech IT – Networks/Telecommunications.
- I. Each cable in the communication room shall be labeled for identification via the use of luggage tags or written markings on the insulation.
- J. Each fiber termination can, fiber port, patch panel, Ethernet port, surge protector, and 66 block shall be labeled for identification.
- K. Coax cables should be routed to the backboard, individually labeled, and left with a 10' of excess cabled neatly coiled.
- L. Conduit installations shall meet the requirements of Section 16111.
- M. Provide smooth plastic bushings on all conduits at all locations including sleeves used for

penetrations.

3.3 COMMUNICATION ROOM - RACKS

- A. Fiber termination cans shall be installed at the top of communication racks.
- B. Each communication rack shall have a 6" vertical two sided cable manager mounted on each side. Two racks may share a single vertical cable manager.
- C. A single 48 port CAT5E voice patch panel shall be installed below the fiber termination can and wired to 66 type communication blocks located on the backboard. CAT3 or higher rated cable shall be used for this patch panel.
- D. There shall be a least 4U of space left between the fiber termination can, the voice patch panel, and the start of the CAT6 or CAT6A patch panels.
- E. Patch Panels shall have a 2U horizontal front and back cable manager installed above and below each patch panel.
- F. Each set of racks shall have at least 20 empty/unused ports on the highest numbered patch panel.
- G. There shall be at least 10U of space left at the bottom of each communication rack to be used by Florida Tech IT – Networks/Telecommunications for switches, routers, and UPS hardware.
- H. Each communication rack shall have isolation pads and shall be bolted to the floor.

3.4 COMMUNICATION ROOM - BACKBOARDS

- A. Backboard usage shall be limited to 60% to provide additional space for equipment and hardware to be installed by various Florida Tech departments.
- B. A #6 AWG stranded copper insulated grounding conductor, installed in a 1" conduit, shall be provided connecting each communication room backboard to the building grounding electrode system.
- C. Each communication room backboard shall have a main grounding bus bar connected to the #6 AWG stranded copper ground wire.
- D. All twisted pair copper connections between buildings shall have surge protectors mounted on the backboards and cross connected to 66 type blocks.
- E. All underground Ethernet leaving the building perimeter and stanchion mounted emergency phone cables shall have surge protectors mounted on the backboards and shall be connected to the patch panels.
- F. 66 type blocks mounted to the backboards shall be arranged to provide for a cross connect field with mushroom cable managers mounted above the blocks. The blocks shall be bottom fed with regards to their permanent cabling.
- G. Cross connect fields shall be laid out to provide for a 40% expansion to be used by additional equipment and hardware being installed by Florida Tech IT - Telecommunications.

3.5 COMMUNICATION OUTLETS

- A. Each communication outlet shall have 2, 4, or 6 CAT6 or CAT6A cables and corresponding jacks installed.
- B. Each communication outlets installed in walls shall have a conduit stubbed up above the ceiling with a grommet. The conduit shall be 1" or sized to allow for no more than a 60% fill once all the cables have been installed.
- C. Each floor outlet shall be connected with a conduit which turns up a neighboring wall and stubs out above the ceiling with a grommet. The conduit shall be 1" or sized to allow for no more than a 60% fill once all the cables have been installed.
- D. General communication outlets shall be located within 24" of a corresponding electrical outlet. This does not apply to communication outlets serving specific devices such as Wi-Fi access points and security cameras unless otherwise noted in the building design.
- E. If more than 6 individual communication jacks/cables are needed at a communication outlet location,

- than 2 or more communication outlets shall be installed not more than 12" apart from each other.
- F. Each jack shall be labeled on the communication outlet.
 - G. Each cable feeding a communication outlet shall be labeled for identification on its insulation.
 - H. Communication outlets installed above drop ceilings for Wi-Fi access points shall be installed using surface mount boxes and have 10' of excess cable coiled neatly above the ceiling.
 - I. Communication outlets installed above ceiling shall be labeled at the outlet and on the drop ceiling grid.

3.6 CABLE PATHS

- A. The maximum cable path distance from the Communication closet to the Communication outlet is 280'. Cable paths shall be created using the shortest distance while making runs as straight and with as few bends as possible.
- B. Cable paths shall be accessible using a ladder whenever possible. Care shall be taken to avoid situations in which cable paths are covered or hidden behind other hardware such as pipes and air ducts.
- C. Provide 2 x 2" unused conduits from Communication Service Room to outside of the building for future use, cap and label conduits in communication manhole. These conduits shall be equipped with pull tape.
- D. Install pull line in all cable paths and conduits, this includes parallel cable paths which shall each receive their own pull line. The pull line shall be tied off at each bend within the cable path except when passing through conduit. Pull tape shall be used in place of pull line for conduits used to connect buildings.
- E. Cable paths within buildings shall be run without conduit using J-Hooks spaced ~5' apart.
- F. All penetrations shall be equipped with a 2" sleeve.
- G. All penetrations and cable paths shall not be over 60% utilized. This includes instances where multiple parallel cable paths are used.
- H. Penetration sleeves shall be filled with removable Fire Putty and/or Fire Wool were applicable. Fire rated foam, caulk and other permanent or semi-permanent fire barriers shall not be used in communication system penetration sleeves.

3.7 HOUSING INSTALLATION

- A. Panic system pull stations shall be installed in each room or suite common room. This is in addition to areas denoted by Florida Tech Security.
- B. Emergency phones shall be installed on each hall of each floor. This is in addition to areas denoted by Florida Tech Security.

3.8 OFFICE/CLASSROOM INSTALLATION

- A. Additional conduits power and cable paths are needed as specified by Florida Tech IT - Instructional Technologies for multimedia classrooms and conference rooms.

END OF SECTION