

**SECTION 27 00 00
COMMUNICATIONS**

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following items for wiring systems used as signal pathways for voice and high-speed data transmission:
 - 1. Communication outlets.

1.2 SUBMITTALS

- A. Product Data: For each component specified.
- B. Shop Drawings:
 - 1. Include dimensioned plan and elevation views of telecommunications equipment rooms, labeling each individual component.
 - 2. System Labeling Schedules: Electronic copy of labeling schedules, in software and format selected by University.
 - 3. Cabling Administration Drawings.
 - 4. Wiring diagrams to show typical wiring schematics including the following:
 - a. Workstation outlets, jacks, and jack assemblies.
 - b. Patch cords.
 - c. Patch panels.
- C. Qualification Data: For Installer.
- D. Field quality-control test reports.

1.3 QUALITY ASSURANCE

- A. In addition to the below specifications, all installation and design work shall be performed in accordance with EIA/TIA, BICSI and NEC standards.
- B. Cable, wire and outlet installation shall be performed by personnel that have been certified by an organization such as BICSI (Building Industry Consulting Service International) or have at least 5 years experience in the telecommunications industry.
- C. Installer Qualifications: Cabling installer must have on staff personnel certified by BICSI.
 - 1. Layout Responsibility: Preparation of Shop Drawings, Cabling Administration Drawings, and field testing program development by an RCDD.
 - 2. Installation Supervision: Installation shall be under the direct supervision of a Registered Technician, who shall be present at all times when Work of this Section is performed at Project site.

3. Testing Agency's Field Supervisor: Person currently certified by BICSI as an RCDD to supervise field quality-control testing.
- D. Source Limitations: Obtain all products except cables through one source from a single manufacturer.
- E. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- F. All work specified shall be UL Listed and in accordance with the most current versions of the following codes and agencies: NFPA 70, "National Electrical Code" including Article 800, the National Fire Code (NFPA 72A), Life Safety Code (NFPA 101), BICSI, National Electronic Manufacturer's Association (NEMA), Institute of Electronic and Electrical Engineers (IEEE), EIA/TIA 568 Commercial Building Telecommunications Wiring Standard which includes EIA/TIA 568A, 569, 607 and TSB 75.

1.4 DEFINITIONS

- A. OIT – Office of Information Technology of Ohio University. OIT is responsible for and provides the installation and maintenance of all voice and data communications at Ohio University.
- B. MDF (main distribution frame) - This will be the room where the communication cables entering the building and all riser cables will terminate. The MDF may be used as an IDF on its designated floor.
- C. IDF (intermediate distribution frame) - These will be the rooms where all the station cables will terminate on each floor. Each IDF will be terminated in the MDF.
- D. Riser cable - This type of cable is generally run vertically throughout the building to connect the IDFs with the MDF.
- E. Station cable - This type of cable is generally run horizontally throughout the building to connect the individual room jack with IDFs.
- F. Computer Lab Cabinet - Used to accommodate large amounts of computers in one area.
- G. AHJ – Authority Having Jurisdiction.

1.5 COORDINATION

- A. University OIT personnel shall be allowed to work in the building to install communications cabling and equipment during the construction of other trade activities.
- B. Coordinate with OIT the initial planning of all telephone and data communication needs.
- C. Notify OIT a minimum of two months before the drop ceiling installation is started. This will allow OIT the necessary time to order supplies and provide time to start installing cable.
- D. Notify OIT immediately when the interior wall painting is completed. This will allow OIT to install telephone and data jacks before the furniture is moved in.
- E. Immediately after the contract is awarded to the contractor, contact OIT and provide a contact person to relay any telephone and data jack changes.
- F. Any alterations to these specifications will need to be approved by an OIT representative and the Architect.

- G. OIT shall be consulted before the removal of telephone wire and equipment. All wiring must be removed all the way to the source.
- H. Unless otherwise noted, each communication outlet shall be in proximity to a duplex electrical receptacle to accommodate the need to plug-in electronic equipment.
- I. Contractor shall coordinate with OIT temporary telephone and data services. The contractor may utilize Verizon or Ohio University for telephone/data service, and shall pay appropriate charges for these services.
- J. Provide OIT a secure temporary storage room on the site.
- K. All cabling pathways shall be unobstructed and accessible at a later date.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
 - 1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.
 - 2. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 SYSTEM REQUIREMENTS

- A. Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.
- B. Expansion Capability: Unless otherwise indicated, provide spare conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 30 percent future increase in the number of workstations shown on Drawings. This expansion requirement does not apply to horizontal cable from workstation outlet to first terminal board.
- C. Approved UL fire shop shall be used when penetrating fire rated walls or floors.

2.3 CONDUITS

- A. The Contractor is responsible for installation all conduits.
- B. Conduits from each room shall stub out into hallways above the drop ceiling, if acceptable by AHJ. Otherwise, conduit will be stubbed above drop ceiling or to nearest drop ceiling area.
- C. Conduits shall be temporarily capped to keep out various construction debris.
- D. A pull string shall be installed in each conduit that exceeds ten feet.

- E. Install two, reamed or bushed, 4" conduits from the MDF into the main utility tunnel or if there is not a tunnel present, to an area of the building where the communications cable will enter the building. The conduit shall extend into the tunnel or outside the building as designed by OIT representatives.
- F. All conduits running to the telephone jack and/or data jack in each room shall be 1" in diameter.
- G. A dedicated conduit will serve each outlet box. Pull boxes, if needed, shall be accessible. Pull boxes shall not be located above fixed ceilings, HVAC ducts or piping.
- H. Pull boxes will be installed if: conduit run exceeds 90', there is a ninety degree bend in conduit 2" or larger.
- I. In the hallways install a minimum of one 12" cable tray or two 6" cable trays. Cablofil #CF105/200 cable tray shall be installed.
- J. Install three, reamed or bushed, 2 1/2" conduits stubbed from the hallway into the IDF or if there is a cable tray installed in the hallway, extend the cable tray into the IDF, if allowed by the AHJ.
- K. Install four, reamed or bushed, 2 1/2" conduits stubbed from the hallway into the MDF or if there is a cable tray installed in the hallway, it may extend into the MDF, if allowed by AHJ.
- L. Cable trays shall have a maximum of 8-inch spacing between cable supports and 4-inch sides. Width of the tray will be determined by the quantity of cables in the tray and projected growth. Cable trays and conduits shall be properly grounded. All NEC articles for grounding of cable trays shall be adhered to. Access to the IDF or MDF is acceptable by either extending the cable tray or providing conduit.
- M. For fire stopping required by Code, the electrical contractor shall install the fire stopping for all applicable conduits and sleeves such that the fire stopping shall allow the conduits can be easily re-entered at a later date as allowed by Code and the AHJ.
- N. All 90 degree bends will be long sweeps.

2.4 RACEWAYS

- A. The Contractor shall install all raceways.
- B. Install all raceways with an appropriate spacing and as required by Code and the AHJ for each required communication cable and outlet unit.
- C. All raceways with built-in outlets shall have cutouts that will accommodate the Ortronics Series II modular jacks and/or the series II single gang faceplate. Raceway shall be Wiremold V4000 with V4050 device mounting plate. Electrical power shall be in a separate raceway as required by Code and the AHJ.
- D. All raceway applications shall be approved by OIT and the Architect prior to installation.
- E. Only metallic raceway shall be installed.

2.5 MDFs

- A. The communications grounding system shall be installed in accordance with TIA/EIA section J-STD-607-A and all other applicable Codes and per the AHJ. In addition the electrical sub panels serving the MDF and IDFs shall be surge protected and all grounding to steel shall be CAD welded. Also, all

backbone ground wire shall be a minimum of 1/0. The system is to be designed by an L.P.I. Certified Master Installer/Designer.

- B. Each MDF shall have a 4' x 8' piece of 3/4" fire rated plywood or plywood painted with a fire rated paint, specified by code, attached to the wall in the MDF room horizontally with the top edge 6' from the floor. This plywood backboard shall be provided and installed by OIT.
- C. The MDF shall be located as close as possible to the cable entering the building, but not in the same room or in close proximity to a high voltage transformer, elevator switch gear, large electric motor or any other type of high EMF producing devices. Coordinate with OIT the location of the MDF(s).
- D. Each MDF shall have a minimum of four quad 125 Volt AC 20amp outlets. There will be a total of two circuits in the room. Each quad outlet shall have a separate circuit on each side (e.g. circuit 1 would be on the duplex outlet on the left side and circuit 2 would be on the duplex outlet on the right side). All outlet covers shall be marked with the circuit breaker and breaker box ID. These circuits shall be used only for communication circuits and will be connected to the emergency backup generator, if available.
- E. The MDF will be well illuminated with fluorescent lighting fixtures. Minimum lighting conditions will be 540 lux (50 footcandles) when measured at 3' above the floor level.
- F. All walls shall be painted in the room with the MDF(s).
- G. There shall be no water pipes, drain pipes, high power electrical conduits, electrical panels, steam lines, hot pipes, etc. in or through the MDF room.
- H. No sprinkler type fire suppression shall be installed in the MDF room.
- I. Install a fire/smoke detector installed in this room. The detector will be tied into the building fire alarm system.
- J. The communications grounding system shall be built in accordance with TIA/EIA section J-STD-607-A. In addition the electrical sub panels serving the MDF and IDFs shall be surge protected from transient voltage and all grounding to steel shall be CAD welded. Also, all backbone ground wire shall be a minimum of 1/0.

2.6 IDFs

- A. Each IDF shall have a 4' x 7' piece of 3/4" fire rated plywood or plywood painted with a fire rated paint, specified by the local fire code, attached to the wall in the IDF room horizontally with the top edge 6' from the floor. This plywood backboard shall be provided and installed by OIT.
- B. Each IDF shall have a minimum of four quad 125 Volt AC 20amp outlets. There shall be a total of two circuits in the room. Each quad outlet will have a separate circuit on each side (e.g. circuit 1 would be on the duplex outlet on the left side and circuit 2 would be on the duplex outlet on the right side). All outlet covers shall be marked with the circuit breaker and breaker box ID. These circuits shall be used only for communication circuits and shall be connected to the emergency backup generator, if available.
- C. All IDFs shall have two sleeved 4" core drilled holes drilled through the floor directly underneath the plywood and into the IDF directly below. These sleeves will protrude 1" above the floor. Each sleeve will be reamed or bushed. If the IDFs are not stacked, there will be two 4" conduits connecting IDF to MDF. These sleeves and/or conduits shall be installed by the construction contractor for OIT to utilize.
- D. There shall be no water pipes, drain pipes, high power electrical conduit, electrical panels, steam lines, hot pipes, etc. in or passing through the IDF room.

- E. No sprinkler type fire suppression shall be installed in the IDF room.
- F. Install a fire/smoke detector installed in the IDF room. The detector shall be tied into the building fire alarm system.
- G. The communications grounding system shall be built in accordance with TIA/EIA section J-STD-607-A. In addition the electrical sub panels serving the MDF and IDFs shall be surge protected from transient voltage and all grounding to steel shall be CAD welded. Also, all backbone ground wire shall be a minimum of 1/0.

2.7 COMPUTER LAB CABINETS

- A. Computer Lab Cabinets require a space of 77" wide x 25" deep x 72" high. The actual dimensions of the cabinet are 27"x 25"x 72", but once the front and back doors are fully open, it will be 77" wide.
- B. Install a dual 125 Volt AC outlet on two separate circuits installed in or next to cabinet.
- C. All cabinets shall be floor mounted.
- D. All cabinets shall be positioned against a wall or near a large channeled ceiling pole to accommodate cabling into cabinet.

2.8 MOUNTING ELEMENTS

- A. Power Strips: For mounting on backboards, with 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles, number as indicated, but in no case fewer than 6, and including the following:
 - 1. LED indicator lights for power and protection status.
 - 2. LED indicator lights for reverse polarity and open outlet ground.
 - 3. Circuit breaker and thermal fusing. When protection is lost, circuit opens and cannot be reset.
 - 4. Circuit breaker and thermal fusing. Unit continues to supply power if protection is lost.
 - 5. Close-coupled, direct plug-in with 15-foot (4.5-m)] line cord.
 - 6. Rocker-type on-off switch, illuminated when in on position.
 - 7. Peak Single-Impulse Surge Current Rating: 33kA per phase.
 - 8. Protection modes shall be line-to-neutral, line-to-ground, and neutral-to-ground. UL 1449 clamping voltage for all 3 modes shall be not more than 330 V.
 - 9. One RJ11/12C telephone line protector, suitable for modem connection. Maximum clamping voltage 220 peak on pins No. 3 and No. 4.

Power strip shall be mounted on standoff brackets to provide 7 inches of separation from the cable management system. Power strips shall be mounted to the rear of the rack.

- B. Terminal and Connector Component and Distribution Rack Manufacturers:
 - 1. AMP; a Tyco International Ltd. Company.
 - 2. Amphenol Corporation.
 - 3. Avaya Inc.
 - 4. Connect-Tech Products.
 - 5. Cooper Wiring Devices; a division of Cooper Industries, Inc.
 - 6. Homaco.
 - 7. Hubbell Premise Wiring.
 - 8. KRONE Incorporated.
 - 9. Leviton Voice & Data Division.
 - 10. Lucent Technologies; Global Service Provider.

11. Mohawk/CDT; a division of Cable Design Technologies.
12. Molex Premise Networks; a division of Molex, Incorporated.
13. Nordex/CDT; a Subsidiary of Cable Design Technologies.
14. Panduit Corp.
15. Thomas & Betts Corporation.

- C. Cable Connecting Hardware: Comply with TIA/EIA-568-B.2, IDC type, using modules designed for punch-down caps or tools.
1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
 2. IDC Connecting Hardware: Consistent throughout Project.

2.9 COMMUNICATIONS OUTLETS

- A. Telephone receptacle boxes shall be 4" x 4" with a mud ring or plaster ring installed to reduce the 4" x 4" opening to a 2" x 4" opening, unless otherwise noted.
- B. All communication outlets mounted in the floor shall be duplex or quad receptacle type cutouts, unless specifically designed to fit Ortronics series II jacks or Ortronics track jacks. Electrical power shall be in a separate raceway as required by Code and the AHJ. All outlets in floor shall have hinged or spring loaded cover to protect the jack while not in use. Supply and install Wiremold RC3ARTTC poke thru system.
- C. All surface mounted receptacle boxes shall be metallic only. Supply and install Wiremold #V5747.
- D. Communications Outlets faceplate: Finish/color as selected by Architect.

2.10 GROUNDING AND BONDING

- A. Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467.

2.11 IDENTIFICATION PRODUCTS

- A. Manufacturers:
1. Brady Worldwide, Inc.
 2. HellermannTyton.
 3. Kroy LLC.
 4. Panduit Corp.
- B. Comply with TIA/EIA-606-A and with applicable requirements in Section 26 26 05 53 "Identification for Electrical Systems."
- C. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

PART 3 - EXECUTION

3.1 INSTALLATION STANDARDS

- A. Comply with BICSI TCI, TIA/EIA-568-B.1, TIA/EIA-568-B.2, TIA/EIA-568-B.3, and TIA/EIA-569-A.

3.2 EXAMINATION

- A. Examine pathway elements intended for cables.
 - 1. Verify proposed routes of pathways. Check raceways, cable trays, and other elements for compliance with space allocations, clearances, installation tolerances, hazards to cable installation, and other conditions affecting installation. Verify that cabling can be installed complying with EMI clearance requirements.
 - 2. Prepare wall penetrations and verify that penetrations of rated fire walls are made using products labeled for type of wall penetrated.
 - 3. Identify plan to support cables and raceways in suspended ceilings. Verify weight of individual types and sizes of cables. Verify that load capacity of cable support structures is adequate for each pathway.
 - 4. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 APPLICATION OF MEDIA

- A. Each communication faceplate shall be wired with a minimum of two 4-pair unshielded Category 6 station wires. Each wall outlet shall be wired with one 4 pair unshielded Category 6 station wire. All station wire shall be 24-gauge, twisted, solid annealed copper conductor, individually insulated with high density color-coded PVC. All communication wire and cable installed shall meet the requirements of NEC Article 800. Splicing in station wire is not permitted; wire must be continuous from IDF or MDF to the outlet (jack).
- B. One of the 4 pair Category 6 station wires shall be terminated on the top module of the faceplate in accordance with the color-coding on the module. The fourth pair of the wire shall be folded back at the jack, and then punched down on the blocks at the IDF/MDF.
- C. One of the 4 pair Category 6 station wires shall be terminated on the bottom module of the faceplate in accordance with the color coding o the module. Very close attention shall be paid in maintaining the twist of the pairs at both ends of the cable. The twist shall be within ½ inch of any termination.

3.4 INSTALLATION

- A. Comply with NECA 1.
- B. Wiring Method: See 2.2.
- C. Cable Installation: Also see 2.2.
 - 1. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
 - 2. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - 3. Pulling Cable: Do not exceed manufacturer's written recommended pulling tensions. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between

termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.

4. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
5. Install UTP cables using techniques, practices, and methods that are consistent with Category 6 rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
 - a. Do not untwist more than 1/2 inch (12 mm) of 6 cables at connector terminations.

D. Wiring within Wiring Closets and Enclosures:

1. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.
2. Mount patch panels, terminal strips, and other connecting hardware on backboards.
3. Group connecting hardware for cables into separate logical fields.
4. Train conductors to terminal points with no excess.
5. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

E. Separation from EMI Sources: Comply with BICSI TDM and TIA/EIA-569-A recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment. Comply with the following minimum separation distances from possible sources of EMI:

1. Separation between unshielded power lines or electrical equipment in proximity to open cables or cables in nonmetallic raceways is as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: 5 inches (127 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: 12 inches (300 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: 24 inches (610 mm).
2. Separation between unshielded power lines or electrical equipment in proximity to cables in grounded metallic raceways is as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: 2-1/2 inches (64 mm).
 - b. Electrical Equipment Rating between 2 and 5 kVA: 6 inches (150 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: 12 inches (300 mm).
3. Separation between power lines and electrical equipment located in grounded metallic conduits or enclosures in proximity to cables in grounded metallic raceways is as follows:
 - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
 - b. Electrical Equipment Rating between 2 and 5 kVA: 3 inches (76 mm).
 - c. Electrical Equipment Rating More Than 5 kVA: 6 inches (150 mm).
4. Electrical Motors and Transformers, 5 kVA or HP and Larger: 48 inches (1200 mm).
5. Fluorescent Fixtures: 5 inches (127 mm).

3.5 IDENTIFICATION

- A. In addition to requirements in this Article, comply with TIA/EIA-606-A and with applicable requirements in Division 26 Section 26 05 53 "Identification for Electrical Systems."
- B. Cable and Wire Identification (confirm with OIT prior to ordering and installation):

1. Color Codes:
 - a. Pair 1: White Blue, Blue White
 - b. Pair 2: White Orange, Orange White
 - c. Pair 3: White Green, Green White
 - d. Pair 4: White Brown, Brown White
 2. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
 3. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
 4. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet (4.5 m).
 5. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
 - a. All wiring conductors connected to terminal strips shall be individually numbered, and each cable or wiring group being extended from a panel or cabinet to a building-mounted device shall be identified with name and number of particular device as shown.
 - b. Label each unit and field within distribution racks and frames.
 6. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
 7. At Workstations: refer to 3.3.
- C. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- D. Cabling Administration Drawings: Show building floor plans with cable administration-point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, entrance pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606-A. Furnish electronic record of all drawings, in software and format selected by University.

3.6 FIELD QUALITY CONTROL

- A. After each communication outlet is wired and the IDF is punched own, every conductor shall be checked for shorts, crosses, reversals and continuity. Category 6 data jacks should also be checked for attenuation, capacitance, impedance, resistance, near-end cross talk, cable length, ELFEXT, return loss delay, delay skew, and ambient noise. Tests shall follow TIA-568-A-5 specifications and shall be witnessed by a UNITS representative and shall be monitored by a recorder. Utilize a Micro Test OmniScanner Model 8220-00 or equal. Provide a hard copy of test results to UNITS, or a disk with the test results in Microsoft Word format.

END OF SECTION 27 00 00