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**SECTION 27 00 00**

**COMMUNICATION AND DATA PROCESSING SYSTEMS**

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**PART 1 - GENERAL**

**1.1 GENERAL REQUIREMENTS**

- A. Conform to General and Supplementary Conditions, the modifications thereto and Division 1 General Requirements for all work in Division 27.

**1.2 SCOPE OF WORK**

- A. Provide design labor, materials and appliances and satisfactory installation of communication and data processing work ready to operate in accordance with Owner's requirements.
- B. Coordinate Work of this Section with Owner's telephone switch, telephone instrument, workstation, and LAN equipment suppliers. Coordinate service entrance arrangement with local exchange carrier.
  - 1. Meet jointly with representatives of above organizations and Owner's representatives to exchange information and agree on details of equipment arrangements and installation interfaces.
  - 2. Record agreements reached in meetings and distribute record to other participants.
  - 3. Adjust arrangements and locations of distribution frames, patch panels, and cross connects in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.
  - 4. Coordinate use of riser space and backboards with other systems.

**1.3 CODES AND STANDARDS**

- A. If any conflict occurs between legally adopted codes and this specification, the codes are to prevail; this shall not be construed as relieving the Contractor from complying with any requirements of the plans or specifications which may be in excess of code requirements and not contrary to same.
- B. Conform to code and agency requirements having jurisdictional authority over installation and as indicated on plans.

**1.4 FINAL CONSTRUCTION APPROVAL**

- A. Completion and approval of the following is required for final approval of systems.
  - 1. Operation and maintenance instruction.
  - 2. Operation and maintenance manuals submitted.
  - 3. Equipment cleaning.
  - 4. Record drawings submitted.
  - 5. Testing Report submitted.

## 1.5 DOCUMENTATION

- A. Product Submittals: Within thirty (30) calendar days after contractor's receipt of Owner's Notice to Proceed, submit in PDF format:
  - 1. Organized PDF electronic file that includes relevant catalog data for equipment, devices and cabling in accord with Division 1.
  - 2. Unless otherwise indicated, material and equipment to be submitted includes all items specified in Part 2 (Products) in each section of Division 27 and as listed on equipment schedules on drawings, and/or necessary to complete the work.
  - 3. Clearly indicate on each page the equipment schedule designation, as applicable, and model intended for use.
  - 4. Do no fabrication or manufacture any products until return of approved submittals.
- B. Provide shop drawings for all products, systems, system components, and special supports which are not a standard catalog product and which may be fabricated for the Contractor or by the Contractor. Lay out drawings to scale and show dimensions where accuracy of location is necessary for coordination or communication purposes.
- C. The word "provide" in the drawings and specifications shall be understood to mean "furnish and install complete and operational".
- D. Permits: Submitted for, paid for, and obtained by Contractor. Submit copies of signed, approved permits to the Architect. See Supplementary Conditions.
- E. Record Drawings: See Division 1. Provide two sets of record drawings. Show location and size of equipment.
- F. Operating and Maintenance Manuals: Furnish three (3) copies of operating and maintenance manuals. Manual shall be hard-cover loose-leaf with index and tabbed Sections. Manual shall include the following:
  - 1. Manufacturers, suppliers, and subcontractors' names, address, and phone numbers.
  - 2. Schedule and description of routine maintenance for each component.
  - 3. Written guarantees.
  - 4. Record drawings corrected and completed.
  - 5. Copies of manufacturer's warranties on equipment.
  - 6. Equipment submittals.
  - 7. Completed equipment start-up forms.
- G. Operation Instruction Period: Conducted by Contractor during minimum eight (8) hour period. Deliver and post all operation and maintenance instructions at this time.

## 1.6 ELECTRICAL

- A. Power Wiring: By Electrical Contractor.
- B. Low Voltage Wiring: By Division 27. If line voltage control wiring is required, provide an allowance for same.

- C. Owner will not entertain additional cost requests due to lack of coordination between Division 27 and Electrical Contractor.

## **1.7 WARRANTY**

- A. Warrant materials and workmanship for one year in accord with the General and Supplementary Conditions. Provide written guarantees which exceed one year. Submit with Maintenance and Operating Manual. Warranty period to extend from date of substantial completion.

## **1.8 EMERGENCY SERVICE**

- A. The subcontractor shall provide a twenty-four (24) hour emergency telephone number for all warranty work related to their contract. The subcontractor shall complete all emergency service work with the same day of notice.

## **1.9 CUTTING AND PATCHING**

- A. Coordinate all cutting and patching necessary to install work. Patching shall match adjacent surfaces.

# **PART 2 - PRODUCTS**

## **2.1 MANUFACTURERS**

- A. Cable:
  - 1. Belden Wire & Cable Company (317-983-5200)
  - 2. BIW Cable Systems, Inc. (508-520-1200)
  - 3. Essex Group, Inc.; Telecommunications Products Division (214-461-4000)
  - 4. General Cable (908-769-3200)
  - 5. Lucent Technologies, Inc.; Network Systems (800-344-0223)
  - 6. Mohawk/CDT (800-422-9661)
  - 7. Panduit Corp. (888-506-5400)
- B. Terminal and Connector Components, and Distribution Racks:
  - 1. Hubbell, Inc. (203-882-4800)
  - 2. Lucent Technologies, Inc.; Network Systems (800-344-0223)
  - 3. Panduit Corporation (888-777-3300)
  - 4. Thomas & Betts Corp. (800-888-0211)
  - 5. Leviton Mfg. Co., Inc. (800-323-8920)

## **2.2 SYSTEM REQUIREMENTS**

- A. General: 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 fibers and conductor pairs in cables, positions in patch panels, cross connects, and terminal strips, and space in backbone cable trays and wireways to accommodate 50 percent future increase in active station pairs.

## **2.3 MOUNTING ELEMENTS**

- A. Backboards: 3/4-inch interior-grade, fire-resistive-treated plywood.
- B. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
- C. Approximate Module Dimensions: 84 inches high by 22 inches wide.
- D. Finish: Baked-polyester powder coat.

## **2.4 TWISTED-PAIR CABLES, CONNECTORS, AND TERMINAL EQUIPMENT**

- A. Listed as complying with Categories 6e of EIA/TIA-568-A. Telephone branch cable shall be Category 6. Data branch cable shall be Category 6.
  - 1. Insulation Color: Blue
  - 2. Conductors: Solid copper
- B. UTP Cable: Comply with EIA/TIA-568-A. Four thermoplastic-insulated, individually twisted pairs of conductors; No. 24 AWG, color-coded; enclosed in PVC jacket.
- C. Jacket Color:
  - 1. Telephone: White
  - 2. Data Cable: Blue
- D. STP Workstation Cable: Comply with EIA/TIA-568-B. Two thermoplastic-insulated, individually twisted pairs of conductors; No. 22 AWG, color-coded, overall aluminum and polyester shield and No. 22 AWG tinned-copper drain wire; enclosed in PVC jacket.
- E. UTP Plenum Cable: Listed for use in air-handling spaces. Features are as specified above, except materials are modified as required for listing.
  - 1. UTP Cable Connecting Hardware: Comply with EIA/TIA-568-A. IDC type, using modules designed for punch-down caps or tools.
  - 2. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
- F. IDC Connecting Hardware: Consistent throughout Project.
- G. STP Cable Connecting Hardware: Comply with EIA/TIA-568-A for connectors, plugs, and jack assemblies.
- H. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.

1. Number of Terminals per Field: One for each conductor in assigned cables.
2. Mounting: Backboard or rack as indicated.
- I. Patch Panel: Modular panels housing multiple, numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
  1. Number of Jacks per Field: One for each four-pair UTP cable indicated.
  2. Mounting: Backboard or Rack.
- J. Jacks and Jack Assemblies for data circuit UTP Cable: Modular, color-coded, RJ-45 receptacle units with integral IDC-type terminals.
- K. Jacks and Jack Assemblies for telephone circuit UTP Cable: Modular, color-coded, RJ-11/RJ-45 receptacle units with integral IDC-type terminals. Color coded: white/blue, white/orange, white/green, white/brown.
- L. UTP Patch Cords: Four-pair cables in 48-inch lengths, terminated with RJ-11 plug at each end.
- M. STP Patch Cords: Two-pair cables in 48-inch lengths, terminated with STP plug connectors at both ends. Match plug connectors with patch-panel connectors.
- N. Workstation Outlets: Dual jack-connector assemblies mounted in single or multigang faceplate.
  1. Faceplate: High-impact plastic; color as selected by Owner representative.
  2. Mounting: Flush, unless otherwise indicated.
  3. Legend: Factory label top jack, "Voice" and bottom jack, "Data"; by silk-screening or engraving.

## 2.5 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

- A. Cables: Factory fabricated, jacketed, low loss, glass type, fiber optic, multimode, graded index, operating at 850 and 1300 nm.
  1. Backbone, Strands per Cable: 12, unless otherwise indicated.
  2. Dimensions: 62.5-micrometer core diameter, 125-micrometer cladding diameter.
  3. Maximum Attenuation: Minus 3.75 dB/km at 850 nm; minus 1.5 dB/km at 1300 nm.
  4. Minimum Modal Bandwidth: 160 MHz/km at 850 nm; 500 MHz/km at 1300 nm.
  5. Operating Temperature Range: Minus 20 to plus 70 deg C.
- B. Plenum Cable: Listed for use in plenums.
- C. Cable Connectors: Quick-connect, simplex- and duplex-type SC couplers with self-centering, axial alignment mechanisms. Insertion loss not more than 0.7 dB.
- D. Patch Panel: Modular panels housing multiple-numbered duplex cable connectors.
  1. Permanent Connection: Permanently connect one end of each connector module to installed cable fiber.
  2. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to satisfy specified expansion criteria.

3. Mounting: Backboard or Rack.

E. Patch Cords: Dual fiber cables in 36-inch lengths.

1. Terminations: Two duplex connectors arranged to mate with patch-panel connectors, one at each end of each fiber in cord.

## **2.6 IDENTIFICATION PRODUCTS**

A. Comply with the following:

1. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

A. Examine pathway elements intended for cable. Check riser space, electric rooms, raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

### **3.2 APPLICATION OF MEDIA**

A. Backbone Cable for Data Service: Use UTP cable complying with Category 6e of EIA/TIA-568-A, fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets if over 100 meters.

B. Backbone Cables for Voice Service: Use UTP cable complying with Category 6e of EIA/TIA-568-A for runs between equipment rooms and wiring closets and for runs between wiring closets.

C. Horizontal Cables for Data Service: Use UTP cable complying with Category 6e of EIA/TIA-568-A for runs between wiring closets and workstation outlets.

D. Horizontal Cables for Voice Service: Use UTP cable complying with Category 6e of EIA/TIA-568-A for runs between wiring closets and workstation outlets.

### **3.3 INSTALLATION**

A. Wiring Method: Install wiring in raceway where raceway is in an accessible location. Provide cable tray except within consoles, cabinets, desks counters and above accessible ceilings where plenum wiring method may be used. Conceal raceway and wiring except in unfinished spaces.

B. Install cable using techniques, practices, and methods that are consistent with Category 6e rating of components and that ensure Category 6e performance of completed and linked signal paths, end to end.

- C. Install cable without damaging conductors, shield, or jacket.
- D. Do not bend cable in handling or in installing to smaller radii than minimums recommended by manufacturer.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
  - 1. Pull cables simultaneously if more than one is being installed in the same raceway.
  - 2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
  - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage media or raceway.
- F. Secure and support cable at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
- G. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess.
- H. Separation of Wires: Comply with EIA/TIA-569 rules for separating unshielded copper communication and data-processing equipment cables from potential EMI sources, including electrical power lines and equipment.
- I. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
- J. Use splice and tap connectors compatible with media types.
- K. Provide a pull wire or tape in each and every empty conduit.
- L. For each guest room that contains more than one telephone location, all telephones are to be served by dedicated cables back to nearest IDF.
- M. Each cable shall be terminated and labeled with the room number for the purpose of identification.
- N. Each administrative telephone location is to be served by one discrete four pair cable.
- O. Connections of all telephone jacks shall follow the USOC wiring standard.

### **3.4 GROUNDING**

- A. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
- B. Bond shields and drain conductors to ground at only one point in each circuit.
- C. Signal Ground Terminal: Locate in each equipment room and wiring closet. Isolate from power system and equipment grounding.
- D. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

- E. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each wiring closet and equipment room.

### 3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

- A. Line walls with plywood backboards, floor to ceiling.
- B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.
- C. Group connecting hardware for cables into separate logical fields.
- D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

### 3.6 IDENTIFICATION

- A. System: Use a unique, three-syllable alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with the same designation. Use logical and systematic designations for facility's architectural arrangement.
  - 1. First syllable identifies and locates wiring closet or equipment room where cable originates.
  - 2. Second syllable identifies and locates cross-connect or patch-panel field in which cable terminates.
  - 3. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in the field.
- B. Workstation: Label cables within outlet boxes.
- C. Distribution Racks and Frames: Label each unit and field within that unit.
- D. Within Connector Fields, in Wiring Closets and Equipment Rooms: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both communication and data-processing equipment, use a different color for jacks and plugs of each service.
- E. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- F. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
- G. Cable Schedule: Post in prominent location in each wiring closet and equipment room. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Provide electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.



**3.7 FIELD QUALITY CONTROL**

- A. Testing: On installation of cable and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.
  - 1. Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use Class 2 bidirectional Category 6e tester. Test for faulty connectors, splices, and terminations. Test according to EIA/TIA-TSB 67, "Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems." Link performance for UTP cables must meet minimum criteria of EIA/TIA-568-A.
  - 2. Fiber-Optic Cable Procedures: Perform each visual and mechanical inspection and electrical test, including optional procedures, stated in NETA ATS, Section 7.25. Certify compliance with test parameters and manufacturer's written recommendations. Test optical performance with optical power meter capable of generating light at all appropriate wavelengths.
- B. Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

**3.8 CLEANING**

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Remove burrs, dirt, and construction debris and repair damaged finish, including chips, scratches, and abrasions.

**3.9 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.
  - 1. Conduct training.
  - 2. Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
  - 3. Train designated personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and extending wiring to establish new workstation outlets.

**END OF SECTION**