

SECTION 16720
COPPER DATA/COMMUNICATION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

B. Related Sections: The following sections contain requirements that relate to this section:

1. Section 16050, Basic Electrical Materials and Methods.
2. Section 16196, Electrical Identification.
3. Section 16129, Fiber Optic Cable and Accessories for Data Communications.
4. Section 16715, Premises Telephone Wiring.

1.2 SUMMARY

A. ~~This Section includes wire, cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for high-speed data transmission. This section establishes the requirements for the copper based data/communications networks to be installed at the SNSCNMS site. Included in the scope of this section are the product (materials), installation, and testing requirements for copper networks being used for the telephone system, the data networks. This section covers network elements both inside facilities and in the underground ductbank system.~~

~~B. Related sections: The following sections contain requirements that relate to this section:~~

- ~~1. Section 16050, Basic Electrical Materials and Methods.~~
- ~~2. Section 16196, Electrical Identification.~~

1.3 REFERENCES

~~A.A.~~ Electronic Industries Association/Telecommunications Industry Association (EIA/TIA)

- ~~1. EIA/TIA-568-A-95: Commercial Building Telecommunications Cabling Standard (ANSI) B Series: General Requirements; Balanced Twisted Pair Cabling Components; Optical Fiber Cabling Components Standards~~
- ~~2. EIA/TIA-569-90: Commercial Building Standard for Telecommunications Pathways and Spaces (ANSI)~~
- ~~3. EIA/TIA TSB 67-95: Transmission Performance Specifications for Field Testing of Unshielded Twisted-Pair Cabling Systems~~
- ~~4. EIA/TIA 568-A-5, Transmission Performance Specifications for 4-Pair 100-Ohm Category 5e Cabling~~
- ~~5. EIA/TIA TSB 95, Technical Services Bulletin a5: Additional Transmission Specifications for 4-Pair 100-OHM Category 5 Cabling~~

B. InterNational Electrical Testing Association

1. NETA ATS-1995: Electrical Testing Specifications

C. National Fire Protection Association (NFPA)

1. NFPA 70-~~9996~~: National Electrical Code

D. Building Industry Consulting Service International. (BICSI)

1. Telecommunications Distribution Methods Manual. Issue ~~97~~. Tampa, FL: BICSI, ~~1995~~. (10500 University Dr., Suite 100, Tampa, FL 33612-6415 ; 800-242-7405)

1.4 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. LAN: Local area network.
- D. PVC: Polyvinyl chloride.
- E. STP: Shielded twisted pair.
- F. UTP: Unshielded twisted pair.

1.5 SUBMITTALS

- A. Product Data: Include data on features, ratings, and performance for each component specified.
- B. Shop Drawings: Include dimensioned plan and elevation views of components. Show access and workspace requirements.
 1. System labeling schedules, including electronic copy of labeling schedules, as specified in Part 3, in software and format selected by Construction Manager.
- C. Samples: For combination telephone and workstation outlet connectors, jacks, jack assemblies, and faceplates for color selection and evaluation of technical features.
- D. Product Certificates: Signed by manufacturers of cables, connectors, and terminal equipment certifying that products furnished comply with requirements.
- E. Qualification Data: For firms and persons specified in "Quality Assurance" Article. Provide evidence of applicable registration or certification.
- F. Field Test Reports: Indicate and interpret test results for compliance with performance requirements.
- G. Maintenance Data: For products to include in maintenance manuals specified in General Conditions.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: ~~An experienced installer who is a registered communication distribution designer certified by the Building Industry Consulting Service International. As a minimum, the installer must be certified by the termination manufacturer or the technician may be BICSI certified (RCDD).~~
- B. ~~Installation Contractor will have at a minimum one (1) certified technician onsite while work is being performed.~~
- B-C. Comply with applicable articles of NFPA 70.

~~C.D.~~ Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, ~~Article 100~~, by an approved testing agency ~~acceptable to authorities having jurisdiction~~, and marked for intended use.

~~D.E.~~ Meet EIA-TIA-568-A Testing Standards. performance requirements specified in ANSI/EIA/TIA 568-B Series.

1.7 COORDINATION

- A. 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.

1.8 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
1. Cable: 1000 feet of each size and type used for Project. Furnish on reels.
 2. Patch-Panel Units: One of each type for every 10 installed, but not less than one.
 3. Connecting Blocks: One of each type for every 25 installed, but not less than one.
 4. Outlet Assemblies: One of each type for every 25 installed, but not less than one.

Part 2 - PRODUCTS

~~1.92.1~~ MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Cable:

a. Belden Wire & Cable Company.

~~b.~~ ~~Berk-Tek, Inc.~~

~~b.~~ ~~Berk-Tek, Inc.~~ ~~Brand-Rex Co.; Unit of BICC Cables Corp.~~

~~d.c.~~ Essex Group, Inc.; Telecommunications Products Division.

d. Lucent Technologies, Inc.; Network Systems.

~~e.~~ ~~Lucent Technologies, Inc.; Network Systems.~~

~~f.~~ ~~West Penn.~~

~~g.e.~~ ~~CorningSiecor~~ Corp.

CommScope, Hickory, NC

f. CommScope, Hickory, NC

~~2.2.~~ Terminal and Connector Components and Distribution Racks:

~~a.~~ ~~AMP, Inc.~~

~~b.a.~~ Hubbell Premise Wiring, Inc.

~~Leviton Mfg. Co., Inc.; Telecom Division.~~

~~d.b.~~ Lucent Technologies, Inc.; Network Systems.

~~e.c.~~ Panduit Corporation.

~~f.d.~~ Thomas & Betts, Electrical.

e. HellermanTyton, Milwaukee, WI

4.142.2 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 20 percent future increase in active workstations.

4.142.3 MOUNTING ELEMENTS

- A.A. Cable Trays: Comply with Division 16 Section "Cable Trays."
- B.B. Raceways and Boxes: Comply with Division 16 Section "Boxes."
- C.C. Backboards: 3/4-inch (19-mm) interior-grade, fire-resistive-treated plywood.
- D.D. Distribution Racks: Freestanding and wall-mounting, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
1. Approximate Module Dimensions: 84 inches (2130 mm) high by 22 inches (560 mm) wide.
 2. Finish: Baked-polyester powder coat.

4.142.4 TWISTED-PAIR CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

- A.A. Listed as ~~Category 5e complying with EIA/TIA-568-A, and with EIA/TIA TSB 95. EIA/TIA-568-B.-2 or Category 6 complying with EIA/TIA-568-B.-2.1.~~
- B.B. Conductors: Solid copper.
- C.C. Insulation: In tunnels any ~~teflon-coated~~FEP insulated jacketed wiring is prohibited.
- D.D. UTP Cable: Comply with EIA/TIA-568-A-5B-2.1-Series-2, and with ~~EIA/TIA TSB 95~~NFPA 70 Article 800, where applicable. Four thermoplastic-insulated, individually twisted pairs of conductors; ~~No. 24 AWG~~, color-coded; enclosed in ~~PVC~~ PVC or plenum-rated jacket.
1. UTP Plenum Cable: Listed for use in air-handling spaces. Features are as specified above, except materials are modified as required for listing. Connecting hardware and cable must meet the same performance requirements.
- F.E. UTP Cable Connecting Hardware: Comply with EIA/TIA-568-A-5B.-2., and with ~~EIA/TIA TSB 95.~~ 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.
 3. Connecting hardware and cable must meet the same performance requirements.
- G.F. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.
- 1.1. Number of Terminals per Field: One for each conductor in assigned cables.
 - 2.2. Mounting: Backboard or rack as indicated.
- H.G. 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.

- ~~4.1.~~ Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria.
- ~~2.2.~~ Mounting: Backboard.

~~I.H.~~ Jacks and Jack Assemblies for UTP Cable: Modular, color-coded, 8-pin 8-conductor IDC connection (RJ-45 Type) receptacle units ~~with integral IDC-type terminals~~. Use keyed jacks for data service.

~~J.I.~~ UTP Patch Cords: Four-pair cables in 48-inch (1200-mm) lengths, terminated with 8-pin 8-conductor IDC connection (RJ-45 Type) ~~RJ-45~~ plug at each end. Use keyed plugs for data service.

~~K.J.~~ Workstation Outlets: Dual jack-connector assemblies mounted in single or multigang faceplate.

~~4.1.~~ Faceplate: High-impact plastic; color as selected by Construction Manager.

~~2.2.~~ Mounting: Flush, unless otherwise indicated.

3. Legend: ~~Factory-l~~abel top jack, "Voice" and bottom jack, "Data"; by ~~silk-screening or engraving~~ by approved method.

~~4.13~~ 2.5 IDENTIFICATION PRODUCTS

A. Comply with Division 16 Section "Basic Electrical Materials and Methods", "Electrical Identification" and the following:

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

PART 3 - EXECUTION

~~4.14~~ 3.1 EXAMINATION

~~A.A.~~ Examine pathway elements intended for cable. Check 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 5e of EIA/TIA-568-A-5~~ EIA/TIA-568-B-2.1-B-Series 2, fiber-optic cables complying with EIA/TIA-568B.3, ~~for runs between equipment rooms and wiring closets and for runs between wiring closets.~~

B. Horizontal Cables for Data Service: Use UTP cable complying with ~~Category 5e of EIA/TIA-568-A-5~~ EIA/TIA-568-B-B-2.1-Series 2 for runs between wiring closets and workstation outlets.

C. Cables in all areas, buildings, spaces, etc. except for the CLOCNMS building, shall use only the insulation materials listed in this section, except that Teflon jacketed cables shall not be used. Teflon or nylon jacketed cable may be used in the CLOCNMS. Teflon and nylon materials, even for non-insulating functions, shall not be used in any way in the manufacture, assembly, or construction of these cables.

3.3 INSTALLATION

~~A.A.~~ Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board

partitions where cable wiring method may be used. Use a UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and wiring except in unfinished spaces.

B.B. Install cable using techniques, practices, and methods that are consistent with Category 5e rating of components and that EIA/TIA-568-B-2.1-Series. eEnsure EIA/TIA-568-B Series Category 5e performance of completed and linked signal paths, end to end.

C.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.

2-2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.

3-3. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage media or raceway.

F. Install exposed cable parallel and perpendicular to surfaces or exposed structural members, and follow surface contours where possible.

G. Secure and support cable at intervals not exceeding 30 inches (760 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.

H. Wiring within Wiring Closets and Enclosures: Provide adequate length of conductors. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.

I. 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.

J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.

K. Use splice and tap connectors compatible with media types.

L. Pinning standard T568A is the method of termination.

M. Comply with EIA/TIA-568-AB Series Standards.

4.173.4 GROUNDING

A.A. Comply with Division 16 ANSI/EIA/TIA 607 Section "Grounding." and Section 16450.

B.B. 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.

C.C. Bond shields and drain conductors to ground at only one point in each circuit.

~~D.D.~~ D.D. Signal Ground Terminal: Locate in each equipment room and wiring closet. Isolate from power system and equipment grounding.

~~E.E.~~ E.E. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.

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

~~1.193.5~~ 1.193.5 ~~————~~ INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS

~~A.A.~~ A.A. Line walls with plywood backboards, floor to ceiling.

~~B.B.~~ B.B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.

~~C.C.~~ C.C. Group connecting hardware for cables into separate logical fields.

~~D.D.~~ D.D. Use patch panels to terminate cables entering the space, unless otherwise indicated.

~~1.193.6~~ 1.193.6 IDENTIFICATION

~~A.A.~~ A.A. Identify system components complying with applicable requirements in Division 16 Section "Basic Electrical Materials and Methods", "Electrical Identification" and the ~~following Specifications.~~ applicable drawings.

~~B.B.~~ B.B. 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.

~~1.1.~~ 1.1. First syllable identifies and locates wiring closet or equipment room where cable originates.

~~2.2.~~ 2.2. Second syllable identifies and locates cross-connect or patch-panel field in which cable terminates.

~~3.3.~~ 3.3. Third syllable designates type of media (copper or fiber) and position occupied by cable pairs or fibers in the field.

~~C.C.~~ C.C. Workstation: Label cables within outlet boxes.

~~D.D.~~ D.D. Distribution Racks and Frames: Label each unit and field within that unit.

E. 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.

F. Cables, General: 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.

G. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable ~~at~~ intervals not exceeding **15 feet (4.5 m)**.

H. 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 Construction Manager.

4.203.7 FIELD QUALITY CONTROL

- ~~A.A.~~ Testing Agency: Contractor will engage a qualified testing agency to perform field quality-control testing.
- ~~B.B.~~ 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.
- ~~4.1.~~ Copper Cable Procedures: Inspect for physical damage and test each conductor signal path for continuity and shorts. Use the appropriate category Class 2 bidirectional ~~Category 5~~ tester. Test for faulty connectors, splices, and terminations. Test according to EIA/TIA-TSB 67, and EIA/TIA – 568-~~B Series A-5~~. Link performance for UTP cables must meet minimum criteria of EIA/TIA-568-~~B-2.1-Series A-5~~ for Category ~~65e~~.
- ~~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. Per Specification 16129.~~
- ~~C.C.~~ Correct malfunctioning units at Project site, where possible, and retest to demonstrate compliance; otherwise, remove and replace with new units and retest.

4.213.8 CLEANING

- ~~A.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.

4.223.9 DEMONSTRATION

- ~~A.A.~~ Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems.
- ~~4.1.~~ Train Owner's maintenance personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
- ~~2.2.~~ 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.
- ~~3.1.~~ Review data in maintenance manuals. Refer to General and Supplementary Conditions Section "Contract Closeout."
- ~~4.2.~~ Review data in maintenance manuals. Refer to General and Supplementary Conditions Section "Operation and Maintenance Data."
- ~~5.3.~~ Schedule training with Owner, through CM, with at least seven days' advance notice.

END OF SECTION 16720