

- A. Contractor shall provide horizontal cables to connect each telecommunications outlet to the backbone subsystem on the same floor unless noted otherwise.
- B. Terminate each horizontal cable onto a dedicated telecommunications outlet and onto termination hardware in the Telecommunications Room (TR).
- C. Unless noted otherwise on the telecommunications drawings or elsewhere within this document, the type of horizontal cables used for each telecommunications outlet shall be 4-pair unshielded twisted pair (UTP).
- D. The 4-pair UTP cables shall be installed using a star topology from the Telecommunications Room (TR) to each individual telecommunications outlet. All cable routes shall be submitted and approved by DC-Net prior to installation of any cabling.
- E. The length of each individual run of horizontal cable from the termination point in the TR on each floor to the telecommunications outlet shall not exceed 295 feet (90M).

Chapter 6.) OCTO SCHOOL MODERNIZATION STANDARDS

INTRODUCTION

This section of the document contains comprehensive standards for school modernization projects. The standards can be classified as infrastructure, security, administrative, and instructional or classroom technology. Infrastructure includes Wiring and Cabling, Wired and Wireless Network, Directory Servers, and Audio. Security contains CCTV, Public Address, and Physical Intrusion Detection.

PART 1 – GENERAL

1.1 General

- A. DC-Net reserves the right to determine the final approval of the system at the time of scheduled job completion. Failure to meet the installation schedule or provide the "precise functional equivalent" shall result in the removal of the system at the Contractor's expense.

- B. Voice/Data Systems Coordination: The Telecommunications Contractor shall be responsible for coordinating the interfaces, shared devices and installation of the Structured Cable System (SCS) and the Auditorium Sound System. No surplus cost to the DC-Net shall be permitted for the Contractor's failure to do so.

1.2 SCOPE

- A. Furnish and install all equipment, accessories, and materials in accordance with these specifications and drawings to provide a complete functional Electronic Communication Systems consisting of the following sub-systems:
 - 1) A complete and operable Voice Cabling System.
 - 2) A complete and operable Data Communications Cabling System as specified herein.
 - 3) Complete and operable structured cabling systems as specified herein. The structured cabling system for this project includes all communications cabling, wire ways, communications outlets, terminal blocks, racks, patch cords, cabinets, splitters, surge protectors, and related connectors, mounting hardware, identification devices, accessories, and appurtenances for TIA/EIA Cat 6 data cabling system (Category 6 Augmented as an Alternate), data hardware allowance, and the telephone distributions cabling system where applicable. On new Construction, the rough-in shall provide all conduit paths, outlet boxes, plaster rings, pull strings, backboards, grounding conductors and bus-bars, power receptacles, surface raceway and connectors, and utility columns as indicated on the Construction Documents to accommodate the detailed installation.
- B. Contractor shall provide a complete telecommunication system, fully operational, capable of operating at speeds up to 100 Mbps at High Schools, 50 Mbps at Middle Schools, and 25Mbps at Elementary schools, ready for the occupants to use both the voice and data communications outlets. The installation shall include all accessories, devices, and any required extensions/cutovers from the telephone and cable TV utilities points of demarcation to provide complete and functioning systems. Any materials and devices not specifically mentioned in these Specifications or indicated on the Contract Drawings that are required for a finished and operating system installation shall be furnished and installed at no additional cost to the Owner.
- C. Contractor shall be responsible for providing a complete, functional system including all necessary components, whether included in this specification or

not. Quantities indicated on the Drawings and in these Specifications are for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and equipment to provide a complete functional system. In the event any item(s) is (are) not specified, but is (are) needed to complete the work properly, the Contractor shall provide the needed item(s) at no additional charge.

- D. If mention has been omitted herein of any items of the work or materials usually furnished for, or necessary to, the completion of the cabling work, or if there are conflicting points in the Specifications, it shall be the Contractor's responsibility to call the Owner's and Engineer's attention to such an item or items in sufficient time for a formal addendum to be issued. Any and all conflicting points in the Specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

- E. Contractor shall provide all labor, materials, equipment, software tools, and services necessary for, incidental to, installation and testing of data cable and equipment for a building-wide network. The base data network is to be a ring/loop topology 1000Base-T Ethernet network and sub-networks. The base data network shall have 1000Base-F(X) fiber backbone capacity.

- F. Contractor shall provide a complete structured cabling system consisting of the following sub-systems:
 - 1) Equipment Room Subsystem.
 - 2) Horizontal Subsystem.
 - 3) Backbone Subsystem.
 - 4) Media (Video) Subsystem.

- G. A practical shifting in location of outlets, cabling, and surface metal raceway (up to 20 feet in any direction) shall be expected in order to meet field conditions; and this work shall be provided at no increased cost to DC-Net.

1.3 RELATED WORK

- A. Refer to bid document alternate(s) for items applicable to the intercommunications, data and video sub-systems.
- B. Refer to Bid document Allowance for data hardware.

1.4 SUBMITTALS

DC-Net Structured Cabling Standards

- A. Original specification sheets or clear copies of same shall be submitted on all items. Manufacturers name, make and model number shall appear on each sheet. Submittals shall be bound in booklet form with cover sheet and index, and presented in a neat and logical order in a binder. Submittals shall contain installation, operation and programming manuals of the system to provide the Owner and Engineer complete information as to system features, functions and capabilities.
- B. Submit one-foot sample of each proposed cable type to be used on this project.
- C. Submit product data on each product specified in this section, including, but not limited to the cabinets and cabinet components, cabling, and cabling components, rack hardware and accessories, patch cord organizers and cable ring wiring path blocks, fiber optic cable, multi-pair telephone cable, Category 6 Enhanced UTP cable (Category 6 as an Alternate), cable end connectors, outlets, wireways, cable management, surge protectors, splitters, amps, taps, switches, electronic hardware, conduit, and other raceways and associated components, jacks, etc., in a bound, jacketed loose-leaf binder. Provide the number of specification copies that are required in the General Provisions of the specifications. Each item proposed shall be tagged with a star, an arrow, etc.
- D. Wiring and systems certification shall be provided in text format on hard copy and CD disk copy. Contractor to provide cable routing information on CAD drawings and electronic files. CAD drawings shall show installation locations of equipment, product quantities and types.
- E. Submit dimensional outline drawing of systems control cabinet(s) and racks showing relative position and size of all major components and equipment involving dimensions, elevations, and terminations. Each drawing shall indicate all equipment with its manufacturer and model number shown.
- F. Submittal shall contain a complete schedule of manufacturer's part numbers and quantity listings of all supplied components.
- G. Submit Certifications and lists as required in "Quality Assurance" below.
- H. Submit wiring diagrams showing typical connections for all systems and equipment. Include detailed one-line drawings of each system. Each system drawing shall show proposed circuit numbers for all cables and terminal connections. Provide typical wiring termination details for all devices.

- I. Submit Shop Drawings of each proposed system (Voice/Data) indicating the proposed system configuration and all specified requirements. Shop Drawing shall indicate proposed cable routing, detail installation locations of equipment, cable quantities, cable types, and terminal block locations. All Shop Drawings shall be Contractor's original drawings. Submission of Engineer's Contract Drawings as Shop Drawings is not permitted. Clear and detailed sets of floor plans for the complete building shall be furnished showing the locations of all equipment and devices and their required interconnections. The interconnections shown shall indicate the number, size, and type of wires as described in this Specification. The layout of all telecommunications system equipment, devices, and conduit routings shall closely follow that shown on the Drawings.
- J. A copy of testing procedures including proposed equipment, manufacturer's recommendations, test report forms, and test report format.
- K. Cable Certification Test Results: The Contractor is responsible for testing and certification of all components of the voice/data-cabling infrastructure. All relevant test data including documentation of failed tests, the corrective procedures performed, and the results of re-tests, are to be documented and submitted to the Owner in both printed hard copy and machine readable format within five (5) working days of test completion. Unless otherwise noted, all raw test data will be provided to the Owner in a documented ASCII comma delimited format.
- L. Submit a certificate of completion of installation and service training from the systems Manufacturers. The supplying Contractor shall have attended the Manufacturer's installation and service schools. Certificates of this training shall be provided within the Contractor's submittal.
- M. The Communications Contractor shall submit a list to include at least fifteen (15) of the Contractor's installations of similar or larger size and complexity to the proposed system, which have been in satisfactory operation for a minimum period of five (5) years. The submitted list shall include a minimum of fifteen (15) data cabling system (LAN) references that have been in satisfactory operation for a minimum period of two (2) years. The reference list shall include the project's name, address, date of installation, name of the LEA (Local Education Agency) construction/installation co-coordinator and their telephone number.
- N. Submittals not containing complete documentation of specification items shall be automatically rejected before further review.

- O. Where model number or name of one manufacturer is followed in specifications by one or more other manufacturer's name, design has been based on the first product named, and shall be considered to be the specified product or manufacturer, named alternates may require minor deviations. Contractor shall indicate deviations in submittals/shop drawings.
- P. Manufacturer's model and catalog numbers, which are given for convenience of identifications only, change frequently and may not necessarily include specified or required features and may not insure compatibility with supporting systems or intended application. Contractor shall insure that material and equipment delivered to job site is suitable for the intended application and indicated connections. Review of shop drawings shall not include review and verification of submitted catalog numbers or quantities required.
- Q. Review of and noted comments on Contractor's submitted shop drawings do not constitute a change order or a waiver of contract requirements. In the event of conflict between submittals or shop drawings and contract documents, the latter shall govern. If waiver of particular requirement is requested by the Contractor, a formal written request shall be made to Owner as per General Conditions.
- R. When directed, the Contractor shall provide samples of material or equipment.
- S. Equipment shall be shipped or fabricated in sections in suitable size for entering building and the Contractor shall make all necessary arrangements for their installation.
- T. Shop Drawings and submittals shall bear the General Contractor's review and approval stamp prior to submission to the Engineer.
- U. Manufacturer's Drawings, sketches, and instructions shall supplement, but not supersede, Contract Drawings and Specifications.
- V. Submit installation, operation, and maintenance instructions.
- W. Any and all conflicting points in the specifications and/or drawings which are not questioned by the successful bidder and clarified prior to opening of bids shall be subject to the interpretation of the Owner after award of the contract, and its interpretation shall be binding upon the successful bidder.

1.5 ALTERNATES AND SUBSTITUTES

- A. Under base bid, furnish equipment and material specified or named alternates. Approved equal products by Molex and Hubbell/Mohawk shall also be allowed. Products submitted shall be equal in quality to products of the specified manufacturer and shall include the standard features of the specified product and also optional features or necessary changes specified herein. Submittal of alternates shall include all changes in building systems, piping, wiring, supports or accessories required for satisfactory and intended operation. The Engineer shall be final judge of equivalence.
- B. Substitute equipment submitted shall include a price change or advantage to the Owner, if accepted, at the time of submission. Product and performance requirements of substitute items shall be the same as named alternates.
- C. Receive approval in writing from the Owner and Engineer for each item of substitution prior to commencing work. Items to be considered for substitution must be clearly indicated as a substitute item at the time of submission. No substitutions shall be allowed without written approval.

1.6 WARRANTY

- A. A twenty (25) year Extended Product Warranty and System Assurance Warranty for this wiring system shall be provided as follows:
 - 1) Extended Product Warranty: The Extended Product Warranty shall ensure against product and workmanship defects, that all approved cabling components exceed the specifications of TIA/EIA 568A and ISO/IEC IS 11801, exceed the attenuation and NEXT requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for cabling links/channels, that the installation will exceed the loss and bandwidth requirements of TIA/EIA TSB 67 and ISO/IEC IS 11801 for fiber links/channels, for a twenty (25) year minimum period. The warranty shall apply to all passive SCS components, including both cable and connecting hardware as a combined system. Any claim covers replacement costs of any defective product, both material and labor.
 - 2) System Assurance: The System Assurance shall cover the failure of the wiring system to support the application which it was designed to support (Category 6 and 1000Base FX), as well as additional application(s) introduced in the future by recognized standards or user forums that use the TIA/EIA 568A or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty (25) year period.

- 3) Extended Product Warranty: The Extended Product Warranty and the System Assurance shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s).
- 4) System Certification: Upon successful completion of the installation and subsequent inspection, DC-Net shall be provided with written guarantee, registering the installation.
- 5) Warranty shall be a Hubbell MISSION CRITICAL® program giving assurance of system success with a 25-year guarantee on the components, performance, and installation integrity of your structured cabling system.
- 6) The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.
- 7) The Contractor shall respond to a trouble call within twenty-four (24) hours or less, after receipt of such a call.
- 8) The Contractor shall pre-register this project with the Manufacturer for the Warranty Period, in accordance with the Manufacturer's requirements.
- 9) The Contractor shall be responsible for and pay for damages caused by or resulting from defects in workmanship.
- 10) The Contract unconditionally guarantees, for a minimum of two (2) years, as set forth in the General Conditions, all materials, workmanship, and installation. During this period, adjust, repair, or replace at no cost to the Owner any item of equipment or workmanship found to be defective.
- 11) The Contract is for full maintenance (parts and labor), support, or replacement of all network components (excluding the microcomputers and Ethernet cards) for a period of three years from the date of acceptance by the Owner.

1.7 QUALITY ASSURANCE

- A. All items of equipment, including wire and cable, shall be designed by the manufacturer to function as a complete system and shall be accompanied by

the manufacturer's complete service notes and drawings detailing all connections.

- B. The Contractor shall be an established communications and electronics contractor that has had, and currently maintains, a locally run and operated business for at least three (3) years. The contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty and service privileges. The Contractor shall be a valid District of Columbia licensed and bonded Contractor. The contractor shall maintain a local service center located within fifty (50) mile radius of the project. The system manufacturer shall maintain engineering and service departments capable of rendering advice regarding installation and final adjustment of the system.

- C. The Contractor shall be a factory-certified, trained, and authorized installer of all equipment to be installed. The contractor shall be certified prior to award of contract. A factory representative or factory authorized school shall train all installers for both copper and fiber optic applications.

- D. Standards and Codes: All work performed under this contract shall be done in accordance with the most recent issue and latest revisions of the following codes, standards, and guidelines. All materials and equipment shall be UL listed for the intended application.
 - 1) Americans with Disabilities Act (ADA), and the ADA Accessibility Guidelines (ADAAG).
 - 2) American National Standard Institute (ANSI).
 - 3) ANSI A117.1-1980.
 - 4) ASTM E 814 - American Society for Testing Materials, Fire Tests of Through-Penetration Firestops.
 - 5) BISCI Telecommunications Distribution Methods Manual (TDMM).
 - 6) BISCI LAN Manual.
 - 7) BISCI Cabling Installation Manual.
 - 8) UL 1479 - Fire Tests of Through-Penetration Firestops.

- 9) UL Fire Resistance Directory, Volumes 1 and 2.
- 10) EIA-455-171-D Standard Test Procedures for Fiber Optic Cables.
- 11) Federal Communications Commission (FCC) Regulations for Telephone Data Systems.
- 12) Federal Communications Commission (FCC) Rules (including FCC 47 CFR 68) The Code of Federal Regulations.
- 13) ICEA S-80-576, Communications Wire and Cable for Wiring of Premises.
- 14) IEEE 802.3 Institute of Electrical and Electronics Engineers LAN Standard for Ethernet. CSMA/CD Access method - Carrier sense multiple access with collision detection access method and physical layer specifications
- 15) IEEE 802.7, Recommended Practices for Broadband Local Area Networks.
- 16) IEEE 802.11, IEEE Standard for Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) Specifications.
- 17) IEEE 1100-1992 Recommended Practice for Powering and Grounding Sensitive Electronic Equipment.
- 18) National Electrical Contractors Association (NECA) Standards of Workmanship & Installation.
- 19) National Electrical Manufacturers Association (NEMA) Standard for Low-Loss Premise Telecommunications Cable.
- 20) National Electrical Safety Code.
- 21) NFPA National Fire Protection Association, including NFPA 70 (National Electrical Code), NFPA 75 (Protection of Electronic/Data Processing Equipment), NFPA 101 (Life Safety Code), and NFPA 780 (Lightning Protection Code).
- 22) SCTE#1PS-SP-001, Society of Cable Television Engineers Flexible RF Coaxial Drop Cable Specification.

- 23) TIA/EIA-455-61. FOTP-61, Measurement of Fiber or Cable Attenuation Using an OTDR.
 - 24) TIA/EIA-455-A. Standard Test Procedure for Fiber Optic Fibers, Cables, Transducers, Sensors, Connecting, and Terminating Devices, and other Fiber Optic Components.
 - 25) TIA/EIA-492-AAAA. Detail Specification for 62.5 Micrometer Core diameter/125 Micrometer Cladding Diameter Class 1A Multimode, Graded Index Optical Waveguide fibers.
 - 26) TIA/EIA-568-A Electronics Industries Association/Telecommunications Industry Association Commercial Building Telecommunications Cabling Standard.
 - 27) TIA/EIA-569-A Electronic Industries Association/Telecommunications Industry Association Commercial Building Standard for Telecommunications Pathways and Spaces.
 - 28) TIA/EIA -570. Residential and Light Commercial Telecommunications Wiring Standard.
 - 29) TIA/EIA-606. The Administration Standard for the Telecommunications Infrastructure of Commercial Buildings.
 - 30) TIA/EIA-607. Commercial Building Grounding and Bonding Requirements for Telecommunications.
 - 31) TIA/EIA-SP-2840 Commercial Building Telecommunications Cabling Standard - Issue 1.
 - 32) TIA/EIA-4750000-8 Generic Specification for Fiber Optic Connectors.
 - 33) TIA/EIA-TSB-36. "Technical Systems Bulletin Additional Cable Specifications for Unshielded Twisted-Pair Cables".
 - 34) TIA/EIA-TSB-40 "Technical Systems Bulletin: Additional Transmission Specifications for Unshielded Twisted Pair Connecting Hardware".
- E. The Contractor shall have successfully completed the installation, testing, and warranty of systems of similar size at least five (5) years prior to bid. Contractor shall retain at least one (1) BICSI-Certified RCDD on staff. The Contractor shall be factory-certified for all of the products they install.

- F. Contractor shall be able to prove to the satisfaction of Owner that it has significant experience in the installation of fiber optics cable systems. Installation must include installation of fiber optics cable, fiber termination, knowledge of interconnect equipment, and a thorough knowledge of testing procedures.
- G. The Contractor shall provide references (names/telephone numbers and addresses) that which can confirm they have satisfactorily installed similar networks in other schools.
- H. The Contractor shall provide a list of their technical support staff, together with their working experience and certification(s).
- I. The Contractor shall submit documentation of their support staff being trained in the manufacturer's factory, on-site training, or other means (college courses, etc.).
- J. The Contractor shall state their nearest branch office and dealer's office in relation to the proposed site of the structured building cabling system. If none, the location of the main office shall be stated.
- K. The Contractor shall state the nearest location of their principle support center. This center shall have permanently stationed support staff that is capable of providing technical support if required.
- L. The Contractor shall provide evidence of being factory-authorized to design, engineer, install, and maintain the proposed network.
- M. Enclose letters of commendations from previous customers, if any.
- N. The Contractor shall list all sub-contractors and provide information as required in this section for each sub-contractor. Information shall be submitted with bid forms and is due at time of bid opening. The Owner retains the right to request a substitution, if in the Owner's or Engineer's opinion, the sub-contractor is not qualified. If an acceptable sub-contractor cannot be identified, the Owner retains the right for rejection. The Contractor shall submit documentation of Manufacturer's acceptance of subcontractor for all work.

1.8 ACCEPTABLE MANUFACTURERS

- A. Except where specifically noted otherwise, all equipment and products for each subsystem: (Data System, Telecommunications System and Video

System), shall be the standard products of a single manufacturer of known reputation and experience in the industry. Integration of various manufacturers' products within each subsection in an attempt to meet the specifications shall be deemed in direct conflict with this specification and shall be automatically rejected.

- B. Any potential substitute manufacturer shall be judged against the manufacturer of the highest quality and more stringent specifications for all the manufacturers listed in this specification.
- C. Although multiple manufacturers have been listed and cited, along with specific part numbers, this does not indicate pre-approved products. Listing and citations of manufacturer's name and product part numbers is for the purpose of establishing quality and performance criteria.
- D. For purposes of determining equality, technical and general information set forth on the respective data sheets by manufacturers named in this section for each specified item shall be considered as part of these Specifications and binding herein. Any proposed equal item offered shall be substantiated fully to prove equality. The Owner reserves the right to require a complete sample of any proposed equal item and may, if necessary, request a sample tested by and a copy of the test results from an independent testing laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.
- E. It is the responsibility of the Contractor to provide appropriate quantities of materials to provide a complete, functional system.
- F. All specified items, functions, and quantities are critical to the operation of the School and must be provided exactly as specified. The Engineer and Owner reserve the right to determine if alternate equipment and means of operations meet the requirements of the Project.
- G. As this is a performance-based specification, all functions, components and quantities of the system will be reviewed in detail for total compliance. Manufacturers and Contractor shall also fully comply with the provisions specified in this section.
- H. The intent is to create a standard of quality, function, and features. It is the responsibility of the bidder to insure that the proposed product meets or exceeds every standard set forth in these specifications.
- I. All equipment shall be new and shall be the latest product of a manufacturer of established reputation and experience of quality electronic equipment.