SECTION 270000 – COMMUNICATIONS

PART 1 - GENERAL

1.1 SUMMARY OF WORK

A. The scope of work specified by these documents shall result in the provision, installation and testing of the following IT Communications infrastructure, systems and equipment.

1. All Voice and Data System Wiring
2. Wiring for the ceiling mounted projectors
3. Projectors and Projector Ceiling Mounts

B. Systems shall utilize digital technology to integrate the following systems into a single network linking them to a central site:

1. LAN System
   a. The facility will be provided with wiring for a Local Area Network for all local voice/data and video connectivity.
   b. Data Network Backbone shall be comprised of 50/125-micrometer, optical fiber cabling.
   c. Voice Backbone shall be 100 Pair Category 3 UTP cable.
2. Data Communication System consisting of Category 6 horizontal cabling infrastructure.
   a. Data Communications Network infrastructure shall be provided as per the specifications herein.
   b. Topology
      1) The network in which this system shall be integrated will consist of existing Main Distribution Frame (MDF) and existing Intermediate Distribution Frames (IDF's) connected to the MDF. The MDF contains the network servers and the network core. All IDF's will terminate horizontal workstation runs. The runs will connect to 10/100/1000 Ethernet switches that are connected to the multi-mode fiber backbone that feeds the core switch that shall service both wired and wireless data networks.
      2) The network backbone shall consist of gigabit Ethernet over multi-mode fiber.
      3) The horizontal cabling to the desktop from the wiring closets shall consist of Fast Ethernet 100BASE-TX
      4) Refer to Division 27 for detailed cabling requirements:
   c. This section includes the minimum requirements for termination hardware and cable for a Data Communication System.
   d. Quality Assurance
      1) All equipment shall be installed in a neat and workmanlike manner.
      2) All methods of construction that are not specifically described or indicated in the Contract Documents shall be subject to the control and approval of the Authority's representative.
      3) Materials shall be of the quality and manufacturer indicated. Only equipment and materials manufactured by major manufacturing companies are acceptable. No generic equipment or materials shall be allowed, unless otherwise approved in writing by the Design Consultant.
      4) Separation from sources of EMI shall be as specified in section.
      5) Communication grounding/earthing and bonding shall be in

accordance with applicable codes and regulations. It is recommended that the requirements of IEC 1000-5-2, ANSI/TIA/EIA-607, or both be observed throughout the entire cabling system.

6) Materials and work specified herein shall comply with the applicable requirements of:
   a) EIA/TIA-568-A.
   b) EIA/TIA-569-A
   c) EIA/TIA-606
   d) EIA/TIA-607
   e) Underwriters Laboratory
   f) FCC (including CFR 47 and Part 68 - subpart F)
   g) National Electric Code
   h) Local and State Codes
   i) ISO/IEC 11801
   j) IEC 1000-5-2
   k) CSA C22.2
   l) IEC 60603-7

C. These systems shall be integrated by means of an in building Network of cables.

1. Cable Infrastructure
   a. All horizontal technology cabling for the new school will be integrated with the data network, telephone, intercom, and security systems, utilizing Category 6; Fiber Optic and coaxial cables.
2. Backbone cabling for data shall utilize laser optimized Fiber Optics cable as specified.
3. Cabling for data and telecommunications between the jack plate and either MDF or IDF shall be category 6 (minimum).
4. Based on distance limitations from MDF/IDF's to the classroom, the cabling distance standard of 290' for data networks shall be adhered to.
5. Backbone cabling for the telephone system shall be multi-pair category 6 UTP sufficient to extend all telephone jacks and shall be run from the MDF/IDF to the Telco DeMarc.
6. All wiring will be in conduit.

1.2 REGULATIONS AND CODE COMPLIANCE

A. All work and materials shall conform to and be installed, inspected and tested in accordance with the most current governing rules and regulations of federal, state and local governmental agencies.

B. The following is a list of codes and standards that will apply to this project:

1. Federal Occupational Safety and Health Administration - OSHA.
2. National Life Safety Code, NFPA 101.
3. National Electrical Code (NEC), NFPA 70
4. Underwriters Laboratory (UL).
5. ANSI/TIA/EIA - Telecommunications Building Wiring Standards (Most current addition, revision and addenda), including, but limited to, the following compilation series of documents: 568, 570, 598, 606, 607, 758, TSB 67, TSB 72, TSB 75, FIP 174, FIP175, FIP176,
6. BICSI Telecommunications Distribution Methods Manual, Telecommunications Cabling Installation Manual, Customer-Owned Outside Plant Manual, LAN and Internetworking Design Manual.

7. IEEE Standards.
8. IEEE-SA - National Electrical Safety Code (NESC)
9. Federal Communications Commission.
10. NEMA – National Electrical Manufacturers' Association
11. CSA – Canadian Standards Association
12. ADA, Americans with Disabilities Act.

1.3 GLOSSARY

A. ANSI: American National Standards Institute

B. ASME: American Society of Mechanical Engineers

C. ASTM: American Society for Testing Materials

D. BICSI: Building Industry Consulting Services International

E. CSA: Canadian Standards Association

F. EIA: Electronic Industries Association

G, FCC: Federal Communications Commission

H. FM: Factory Mutual Insurance Company

I. IEEE: Institute of Electrical and Electronics Engineers

J. IRI: Industrial Rick Insurers

K. ISO: International Standards Organization

L. NEC: National Electrical Code

M. NEMA: National Electrical Manufacturers' Association

N. NESC: National Electrical Safety Code

O. NFPA: National Fire Protection Association

P. OSHA: Occupational Safety and Health Administration

Q. TIA: Telecommunications Industry Association

R. UFPO: Underground Facilities Protective Organization

S. UL: Underwriter's Laboratories, Inc.

1.4 DEFINITIONS

A. Approved / Approval: Written permission to use a material or system.

B. As Called For: Materials, equipment including the execution specified/shown in the contract documents.

C. Code Requirements: Minimum requirements.

D, Concealed: Work installed in pipe and duct shafts, chases or recesses, inside walls, above ceilings, in slabs or below grade.

E. Design Equipment: Refer to the article, BASIS OF DESIGN.

F. Design Make: Refer to the Article, BASIS OF DESIGN.

G. Equal or Equivalent: Equally acceptable as determined by Design Consultant.

H. Exposed: Work not identified as concealed.

I. Final Acceptance: The Authority's acceptance of the project from Contractor upon certified by the Authority's Representative.

J. Furnish: Supply and deliver to installation location.

K. Furnished by Others: Receive delivery at job site or where called for and installed.

L. Inspection: Visual observations by the Authority's site Representative.

M. Install: Mount and connect equipment and associated materials ready for use.

N. Labeled: Refers to classification by a standards agency.

O. Make: Refer to the article, BASIS OF DESIGN.

P. Or Approved Equal: Approved equal or equivalent as determined by Design Consultant.

Q. Authority's Representative: The Prime Professional

R. Prime Professional: Design Consultant having a contract directly with the Authority for professional services.

S. Provide: Furnish, install and connect ready for use.

T. Relocate: Disassemble, disconnect, and transport equipment to new locations, then clean, test, and install ready for use.

U. Replace: Remove and provide new item.

V. Review: A general contractual conformance check of specified products.

W. Roughing: Pipe, duct, conduit, cabling, equipment layout and installation.

X. Satisfactory: As specified in contract documents.

Y. Site Representative: Construction Manager at the work site.

Z. Refer to General Conditions of the Contract for additional definitions.

1.5 INTENT OF DRAWINGS

A. The drawings are diagrammatic, unless detailed dimensioned drawings are included. Drawings show approximate locations of equipment, and fixtures. Exact locations are subject to the approval of the Authority's Representative.

B. The Contractor should verify all dimensions locating the work and its relation to existing work, all existing conditions and their relation to the work and all man made obstructions and conditions, etc. affecting the completion and proper execution of the work as indicated in the Contract Documents.

PART 2 – PRODUCTS

2.1 Equipment and Materials Minimum requirements:

A. Materials requirements:

1. All equipment and material for which there is a listing service shall bear a UL label.
2. Electrical equipment and systems shall meet UL Standards and requirements of the NEC and CSA. This listing requirement applies to the entire assembly. Any modifications to equipment to suit the intent of the specifications shall be performed in accordance with these requirements.
3. Equipment shall meet all applicable FCC Regulations
4. All materials, unless otherwise specified, shall be new and be the standard products of the manufacturer. Used equipment or damaged material will be rejected.
5. The listing of a manufacturer as “acceptable” does not indicate acceptance of a standard or catalogued item of equipment. All equipment and systems must conform to the Specifications and meet the quality of the design make.
6. Where applicable, all materials and equipment shall bear the label and listing of Underwriters Laboratory of Factory Mutual. Application and installation of all equipment and materials shall be in accordance with such labeling and listing.

B. Proprietary Specifications:

1. Subject to compliance with codes and all project requirements, the Contractor is required to use the indicated product/manufacturer and to verify compatibility with the project School District’s existing systems.

2.2 CABLES

A. Any cable associated with this Contract, passing through two or more floors shall be suitable, listed and marked for use in a riser or plenum application. Riser cable shall minimally be CMR or OFNR rated per the National Electrical Code and shall meet all local and state codes.

B. Any cable associated with this Contract shall be rated, listed and marked for use in a plenum application, regardless if the ceiling is a ducted return air plenum or not. Cable shall meet all local and state codes.

C. Voice copper backbone cables, if required, shall be twisted 24 AWG, contain a corrugated aluminum shield, be of the size indicated on the drawings and have the proper jacket classification per the NEC.

D. All copper underground feeder cable associated with this Contract, if required, shall be suitable, listed and marked for use in a duct application per the National Electrical Code article 800 and shall meet all local codes. Copper underground cables shall be jell-filled, twisted 24 AWG., contain a overall corrugated shield, be of the size indicated on the drawings, shall have footage indicators imprinted on the cable jacket and shall meet REA/RUS specification PE-39 or PE-89.

2.3 FACTORY ASSEMBLED PRODUCTS

A. Provide maximum standardization of components to reduce spare part requirements.

B. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of same manufacturer.
2. Constituent parts, which are alike, shall be product of a single manufacturer.
3. Components shall be compatible with each other and with the total assembly for intended service.

C. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

D. Major items of equipment that serve the same function must be the same make and model. Exception will be permitted if performance requirements cannot be met.

2.4 COMPATABILITY OF RELATED EQUIPMENT

A. Equipment and materials installed shall be compatible in all respects with other items being furnished and with existing items so that a complete and fully operational system will result.

B. Provide maximum standardization of components to reduce spare part requirements.

C. Manufacturers of equipment assemblies that include components made by others shall assume complete responsibility for final assembled unit.

1. All components of an assembled unit need not be products of same manufacturer.
2. Constituent parts that are alike shall be product of a single manufacturer.
3. Components of equipment shall bear manufacturer's name or trademark, model number and serial number on a nameplate securely affixed in a conspicuous place, or cast integral with, stamped or otherwise permanently marked upon the components of the equipment.

2.5 LIFTING ATTACHMENTS

A. Equipment should have suitable lifting attachments to enable equipment to be lifted in its normal position. Lifting attachments shall withstand any handling conditions that might be encountered without bending or distortion of shape, such as rapid lowering and braking of load.

2.6 MISCELLANEOUS SUPPORTS

A. Metal bars, plates, tubing, etc. shall conform to the following ASTM standards:

1. Steel plates, shapes, bars, and grating - ASTM A 36
2. Cold-Formed Steel Tubing - ASTM A 500
3. Hot - Rolled Steel Tubing - ASTM A 500
4. Steel Pipe - ASTM A 53, Schedule 40, welded

B. Metal Fasteners shall be Zinc-coated (type, grade and class as required)

2.7 FIRESTOPPING

A. Firestopping for Openings through Fire and Smoke Rated Walls and Floor Assemblies shall be listed or classified by an approved independent testing laboratory for "Through-Penetration Firestop Systems." The system shall meet the requirements of "Fire Tests of Through-Penetration Firestops" designated ASTM E814.

B. Inside of all conduits, the firestop system shall consist of a dielectric, water resistant, non-hardening, permanently pliable/re-enterable putty along with the appropriate damming or backer materials (where required). The sealant must be capable of being removed and reinstalled and must adhere to all penetrants and common construction materials and shall be capable of allowing normal wire/cable movement without being displaced.

C. All conduit and sleeve openings shall be waterproofed or fireproofed in compliance with New Jersey Building and Fire Codes. Strict adherence to National and State Fire Codes, particularly firestopping will be required.

D. All openings remaining around and inside all conduit, sleeves and cable penetrations to maintain the integrity of any fire rated wall, ceiling, floor, etc. shall be patched.

E. All building conduits and sleeves installed and/or used under this contract shall be firestopped or re-firestopped upon cable placement through such passageways.

F. Manufacturer's recommended installation standards must be closely followed (i.e. minimum depth of material, use of ceramic fiber and installation procedures).

G. Provide firestop system seals at all locations where conduit, fiber, cable trays, cables/wires, and similar utilities pass through or penetrate fire rated wall or floor assembly. Provide firestop seal between sleeve and wall for drywall construction.

H. The minimum required fire resistance ratings of the wall or floor assembly shall be maintained by the firestop system. The installation shall provide an air and watertight seal.

I. The methods used shall incorporate qualities that permit the easy removal or addition of conduits or cables without drilling or use of special tools. The product shall adhere to itself to allow repairs to be made with the same material and permit the vibration, expansion and/or contraction of any items passing through the penetration without cracking, crumbling and resulting reduction in fire rating. Typical rating:

    1. Floors - 3 hours
    2. Corridor walls - 2 hours
    3. Offices - ¾ hour
    4. Smoke partitions - ¾ - 1 hour

J. Provide firestop pillows for existing cable tray penetrations through firewalls.

PART 3 - EXECUTION

3.1 ROUGH-IN

A. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings, changes in elevation, etc. Verify final locations for installation with field measurements and with the equipment being connected. Verify exact location and elevations at work site prior to any rough in work. If field conditions, details, changes in equipment or shop drawing information require a significant change to the original documents, contact the Authority's representative for approval before proceeding.

B. All equipment locations shall be coordinated with other trades, other renovation projects, and existing conditions to eliminate interference with required clearances for equipment maintenance and inspection.

1. Coordinate work with other trades, other renovation projects, and existing conditions to determine exact routing of all cable tray, hangers, conduit, etc., before fabrication and installation. Coordinate with Technology Drawings. Verify with the Authority's Representative exact location and mounting height of all equipment in finished areas, such as equipment racks, communication and electrical devices. Coordinate all work with existing architecture.
2. Where more than one trade is involved in an area, space or chase, all shall cooperate and install their own work to utilize the space equally between them in proportion to their individual requirements. There will be no priority schedule for trades. If, after installation of any equipment, piping, ducts, conduit, and boxes, it is determined that ample maintenance and passage space has not been provided, rearrange work and/or furnish other equipment as required for ample maintenance space. Any changes in the size or location of the material or equipment supplied or proposed, which may be necessary in order to meet field conditions or in order to avoid conflicts between trades, shall be brought to the immediate attention of the Authority's Representative and approval received before such alterations are made.

C. Provide easy, safe, and code mandated clearances at equipment racks and enclosures, and other equipment requiring maintenance and operation.

3.2 CUTTING AND PATCHING

A. Cut and drill from both sides of walls and/or floors to eliminate splaying. Patch adjacent existing work disturbed by installation of new work including insulation, walls and wall covering, ceiling and floor covering, other finished surfaces. Patch and/or paint openings and damaged areas equal to existing surface finish. Cut openings in prefabricated construction units in accordance with manufacturer's instructions.

3.3 CONCEALMENT

A. Use existing conduit and surface raceway where possible and practicable. Conceal all contract work above ceilings and in walls, below slabs, and elsewhere throughout building. If concealment is impossible or impractical, notify the Authority's Representative before starting that part of the work and install only after his review. In areas with no ceilings, install only after the Authority's Representative reviews and comments on arrangement and appearance.

3.4 CHASES

A. General

1. Field verifies for correct size and location for all openings, recesses and chase.
2. Assume responsibility for correct and final location and size of such openings.
3. Rectify improperly sized, improperly located or omitted chases or openings due to faulty or late information or failure to check final location.
4. Correct, by drilling, omitted or improperly located sleeves. Assume responsibility for all work and equipment damaged during course of drilling. Cap or firestop all unused conduits and sleeves.
5. Provide angle iron frame where openings are required for contract work.
6. Seal voids in fire rated assemblies with a firestopping seal system to maintain the fire resistance of the assembly. Provide 18 gauge-galvanized sleeves at fire rated assemblies. Extend sleeves 2" above floors.
7. In wall openings, drill or cut holes to suit. Provide 18 gauge galvanized sleeves at shafts and fire rated assemblies. Provide firestopping seal between sleeves and wall in drywall construction. Provide firestopping similar to that for floor openings.

3.5 WATERPROOFING

A. The Contractor shall seal all foundation penetrating conduits and all service entrance conduits and sleeves to eliminate the intrusion of moisture and gases into the building. This requirement also includes spare conduits.

B. Spare conduits shall be plugged with expandable plugs.

C. All service entrance conduits through building shall be sealed or resealed upon cable placement.

D. Conduits with cables in them shall be permanently sealed by firmly packing the void around the cable with oakum and capping with a hydraulic cement or waterproof duct seal.

3.6 SUPPORTS

A. Provide required supports, beams, angles, hangers, rods, bases, braces, straps, struts, and other items to properly support contract work. Supports shall meet the approval of the the Authority’s Representative. Modify studs, add studs, add framing, or otherwise reinforce studs in metal stud walls and partitions as required to suit contract work. If necessary, in stud walls, provide special supports from floor to structure above. For precast Panels/Planks and Metal Decks, support communication work as determined by manufacturer and the Authority’s Representative. Provide heavy gauge steel mounting plates for mounting contract work. Mounting plates shall span two or more studs. Size, gauge, and strength of mounting plates shall be sufficient for equipment size, weight, and desired rigidity.

3.7 GENERAL INSTALLATION REQUIREMENTS

A. Coordinate ordering and installation of all equipment with long lead times or having a major impact on work by other trades so as not to delay the job or impact the schedule.

B. Where mounting heights are not detailed or dimensioned, install systems, materials and equipment to provide the maximum headroom possible.

C. Set all equipment to accurate line and grade, level all equipment and align all equipment

components.

D. Provide all scaffolding, rigging, hoisting and services necessary for erection and delivery of equipment and apparatus furnished into the premises. These items shall be removed from premises when no longer required.

E. No equipment shall be hidden or covered up prior to inspection by the Authority's representative. All work that is determined to be unsatisfactory shall be corrected immediately.

F. All work shall be installed level and plumb, parallel and perpendicular to other building systems and components.

3.8 IMPLEMENTATION

A. The contractor shall provide and install all hardware, software, connections and appurtenances required for fully operational systems.

END OF SECTION 270000