D. Written text, as required to supplement product data for the particular installation.

1). Organize in a consistent format under separate headings for different procedures.
2). Provide a logical sequence of instructions for each procedure.

E. Mechanical and Electrical Systems:

1). The booklet shall contain a complete description of each system in the building as hereinafter outlined.

a. Description of Electrical System.

b. Manufacturer's catalog data and parts list on each piece of service entrance equipment and each electrical subpanel in the building.

c. Manufacturer's catalog data, cuts and parts list of all lighting fixtures and show in which rooms they were installed.

d. Manufacturer's catalog data, cuts, parts list and wiring diagram on each piece of fire alarm system, sound system, program system, clock and bell system and all other systems. Data shall include two (2) sets of drawings of circuitry by installer.

e. Provide four (4) sets of drawings to include riser diagrams, panel schedules with directory of circuits and any revisions from Contract Drawings.

F. Description of Heating and Air Conditioning System:

1. Complete manufacturer's catalog data, cuts, part list and wiring diagrams on each piece of heating and air conditioning equipment furnished.

2. Manufacturer's catalog data, cuts, parts list and diagrams on each type of temperature control. Data shall include two (2) sets of temperature control diagrams.

3. Maintenance and lubrication instructions of each piece of equipment furnished instructions must be on the letterhead of the manufacturer of the equipment.

G. Finish Schedule:

1. Provide a copy of the room finish schedule. Schedule shall identify each room by name and number, identify each type finish and color of floors, base, wainscot, walls, ceiling, and all other finishes. Where applicable, pattern or design identification numbers shall be included.

1.4 *Submittal Schedule:*

A. General:

1). Submit three (3) copies of the Operating and Maintenance Data.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01820

C. Co-sign all submittals. Contractor is responsible for coordination and completion of all warranty work during two (2) year warranty period.

D. Retain warranties and bonds until time specified for submittal.

1.6 TIME OF SUBMITTALS

A. For equipment or component parts of equipment put into service during construction with Authority's permission, submit documents within ten (10) days after acceptance.

B. Make other submittals within ten (10) days after date of Substantial Completion, prior to final Application for Payment.

C. For items of Work when acceptance is delayed beyond Date of Substantial Completion, submit within ten (10) days after acceptance, listing the date of acceptance as the beginning of the warranty period.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01850

SECTION 01850 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Provisions established within the General and Supplementary General Conditions of the Contract, Division 1 - General Requirements, and Drawings are collectively applicable to this Section.

1.2 SECTION INCLUDES

A. Preparation and submittal of warranties and bonds.

1.3 RELATED SECTIONS/DOCUMENTS

A. Instruction to Bidders: Bid Bonds.
B. General Conditions: Performance Bond and Labor and Material Payment Bonds, Warranty, and Correction of Work.
C. Section 01701 - Contract Close-Out Procedures.
D. Section 01820 - Operation and Maintenance Data.
E. Individual Specification Sections: Warranties and bonds required for specific Products or Work.

1.4 FORM OF SUBMITTALS

A. Bind in commercial quality 8-1/2 x 11 inch three-ringed binders, with hardback, cleanable plastic covers.

B. Label cover of each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor; name of responsible principal.

C. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the Specification Section in which specified, and the name of Product or Work item.

D. Separate each warranty or bond with index tab sheets as necessary. List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.

1.5 PREPARATION OF SUBMITTALS

A. Obtain warranties and bonds, executed in duplicate by responsible subcontractors, suppliers, and manufacturers, within ten (10) days after completion of applicable item of Work. Except for items put into use with Authority's permission, leave date of beginning of time of warranty until the Date of Substantial Completion is determined.

B. Verify that documents are in proper form, contain full information, and are notarized.

SECTION 18010 - GENERAL PROVISIONS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. General requirements applicable to all components and systems included in Contract.

1.02 REFERENCES

A. AIA American Institute of Architects
B. AISC American Institute of Steel Construction
C. ANSI American National Standards Institute
D. ASTM American Society of Testing Materials
E. IEEE Institute of Electric and Electronic Engineers
F. IES Illuminating Engineering Society
G. NBFU National Board of Fire Underwriters
H. NEC National Electric Code
I. NEMA National Electrical Manufacturers' Association
J. NETA International Electrical Testing Association
K. NFPA National Fire Protection Association
L. UL Underwriters' Laboratories, Inc.
M. TIA Telecommunications Industries Association

1.03 SYSTEM DESCRIPTIONS

A. Testing of Existing Systems: Test each existing system scheduled for modification in presence of Owner's Representative and issue report to Owner and Architect listing conditions found prior to any removals, relocations, or additions. Modified systems shall include (but are not limited to):

1. Computer Network System
2. Telecommunications System
3. Telephone System

B. Design Requirements - Provide complete systems, properly tested, balanced, and ready for operation including necessary details, items and accessories although not expressly shown or specified, including (but not limited to):

1. Systems included, but not limited to:

a. Computer Network System
b. Telecommunications System
c. Telephone System

C. Electric Layouts: Arrange all panels, switches, cables, equipment, raceways, and similar components neatly, orderly and symmetrically. Provide 3/4-inch plywood-faced wood backboards with 1-1/4-inch angle iron frame where backboards are required to mount apparatus. Arrangements shown on Drawings are diagrammatic only; provide and adjust raceways, wiring, and other components as required.

1.04 SUBMITTALS

A. Shop Drawings

1. Telecommunication Room Layouts: Submit detailed drawings showing exact sizes and locations for approval before beginning work.

B. Samples

1. Factory-Finished Surfaces: On all submittals, indicate standard factory color. Where more than one color is available, selection made by Architect from manufacturer's full range of colors.

1.05 QUALITY ASSURANCE

A. Regulatory Requirements

1. Codes and Standards: Comply with all applicable Federal, State and Local Building and Electrical Codes, Laws, Ordinances, and Regulations, and comply with all applicable NFPA, National Electrical Code and Utility Company requirements and regulations. Provide Underwriter's Laboratory Seal on all materials.

2. Permits and Inspections: Obtain all approvals, tests, and inspections required by Architect, Engineer, Local Electrical Inspector, agent or agency specified in Project Manual, or National, State, or Local Codes and Ordinances.

   a. Schedule electrical inspection by an agency acceptable to the local authority having jurisdiction and submit certificate to Architect.
   b. Furnish all materials and labor necessary for tests and pay all costs associated with tests and inspections.
   c. Conduct all tests under load for load balancing and where required by Codes, Regulations, Ordinances, or Technical Specification.

3. 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.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Storage and Protection

1. Take all reasonable precautions to store materials and products to protect finishes and not permit dust and dirt to penetrate equipment.
2. Replace all equipment damaged beyond reasonable repair as required by Architect.
3. Refinish any equipment with marks, stains, scratches, dents, etc., as required by Architect.

1.07 COORDINATION OF WORK

A. Cutting and Patching (as required for installation of components and systems included in Contract):

1. New Construction

   a. Openings, Chases, Recesses, Sleeves, Lintels and Bucks (required for admission of Contract's systems and components): Coordinate requirements with General Work Prime Contractor for inclusion in General Work Prime Contract. Furnish all necessary information (e.g. locations and sizes) to General Work Prime Contractor in ample time for installation of systems and components included in Contract.

b. Anchor Bolts: Deliver to General Work Prime Contractor all anchor bolts required for Contract that are to be installed in construction included in General Work Prime Contract.

c. Locate settings, check locations as installation in General Work Prime Contract progresses, and provide templates or holding fixtures as required to maintain proper accuracy.

2. Existing Construction: Unless otherwise specified, employ General Work Prime Contractor for all cutting, patching, repairing and replacing of general work required for installation of systems and components included in Contract. Secure approval before cutting.

a. Anchor Bolts: Deliver to General Work Prime Contractor all anchor bolts required for Contract that are to be installed in construction included in General Work Prime Contract. Provide templates or holding fixtures as required to maintain proper accuracy.

B. Access Doors: Provide and install all access doors shown on Drawings or required for access to pull boxes, junction boxes, and all other telecommunication devices requiring periodic inspection, adjustment or maintenance, where located above or within inaccessible walls or ceilings, and including cutting and patching of adjacent walls and ceilings to match existing materials and finishes.

1.08 ALTERATION PROCEDURES

A. In locations where existing telecommunications devices are to remain in place, ensure cabling feeding such devices remain operational. Modify existing cabling as required to allow new construction to occur and to maintain all necessary cabling to existing devices.

B. In locations where entire existing system is being removed or modified:

1. Refer to individual system specification sections for Documentation and Testing Requirements prior to any alteration work on any system.
2. Take all necessary measures to ensure that down time will not compromise safety.
3. Notify Owner, Architect and all other Prime Contractors not less than 2 weeks prior to interruptions in service.
4. Coordinate work schedule to minimize duration of system outage during hours when building is occupied.

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

3.01 CUTTING AND PATCHING

A. Do not cut waterproofed floors or walls for admission of any equipment or materials and do not pierce any structural members without written permission.

B. Provide all sleeves, inserts, panels, raceways, boxes, etc., ahead of general construction work and maintain Contractor personnel at Site during installation of general construction work to be responsible for and to maintain these items in position.

C. Unless otherwise noted elsewhere in Contract Documents, bear expense of all cutting, patching, repairing or replacing of work of other trades made necessary by any fault, error or tardiness on part of Telecommunications Work Prime Contract or damage done by Telecommunications Work Prime Contract. Employ and pay Prime Contractor whose work is involved.

3.02 DEMONSTRATION OF COMPLETE TELECOMMUNICATION SYSTEMS

A. Thoroughly demonstrate and instruct Owner's designated representative in care and operation of all telecommunication systems and equipment furnished and installed in Contract.

1. System Operator: Maintain competent operator at building for at least 2 days in 2 consecutive weeks after Owner takes occupancy of major parts of building to operate systems and equipment in presence of Owner's representative.

2. Factory Representative: In addition to demonstration and instruction specified above, provide technically qualified factory representatives from manufacturers of major equipment, to train Owner's representatives in care and operation of applicable products as specified in applicable technical sections of Division 18.

3. Coordinate and schedule time and place of all training through the Architect at the Owner's convenience.

4. Submit letters attesting to satisfactory completion of all instructions, including date of completion of instruction, names of persons in attendance and signature of Owner's authorized representative.

5. Arrange for presence of Architect's representative when Owner's representative participates in instruction. Owner's representative must be present during all instruction.

6. The following equipment and systems are included:

   a. Computer Network System
   b. Telecommunications System
   c. Telephone System

END OF SECTION

SECTION 18050 - BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Sequencing and scheduling including coordination with other Prime Contracts.

2. Grounding, including connections for all raceways and equipment as required and in strict accordance with the National Electric Code.

3. General requirements for materials including painting of electrical components.

4. Installation requirements for painting related to installation of Telecommunications Work Prime Contract components.

5. Supports, anchors, sleeves and seals for all raceways and equipment as specified or shown on drawings, including conduit, surface metal raceways, surface non-metallic raceways, cable tray, boxes and enclosures.

6. Identification devices, including color codes, for following items:

   a. Racks, panels, junction boxes, pull boxes, equipment cabinets, devices and conduits.
   b. Signal and/or communication wiring in equipment and junction boxes, including pull wires.

7. Fire stopping at all telecommunications conduit penetrations through fire-rated walls and floors.

8. Related Sections:

   a. SECTION 18759 – Telecommunications Grounding

1.02 SUBMITTALS

A. Product Data

1. Identification Devices: Submit manufacturer's product literature for conduit markers and nameplates demonstrating compliance with specified requirements.
2. Fire Stopping Materials: Submit manufacturer's product literature for fire stopping materials, demonstrating compliance with specified requirements.

1.03 SEQUENCING AND SCHEDULING

A. New Construction

1. Painting

   a. Telecommunications Work Contractor: Install construction and components included in Telecommunications Work Prime Contract in sufficient time to facilitate painting by General Work Contractor. Compensate General Work Contractor for additional costs resulting from all painting made necessary by any fault, error, or tardiness on part of Telecommunications Work Contractor including damage resulting from construction included in Telecommunications Work Prime Contract.

B. Existing Construction

1. Painting: Unless otherwise specified in Contract Documents, employ qualified general contractor for all painting required by installation of construction and components included in Telecommunications Work Prime Contract.

C. All Construction

1. Painting - Unless otherwise specified in Contract Documents, provide painting for following items:

   a. All ferrous material, with unprotected surfaces, located in crawl spaces, tunnels, or exposed to the outdoors, with bituminous or preservative paint.
   b. All wooden surfaces installed for purposes of affixing equipment, racks, devices, panels, etc., with semi gloss black before devices are affixed to surface.

1.04 GROUNDING AND BONDING

A. Requirements of this section apply to electrical grounding and bonding work specified in Section 18759 – Telecommunications Grounding.

B. Comply with NEC as applicable to electrical grounding and bonding systems. Install in strict accordance with NFPA-70, National Electric Code and Article 250.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Provide new and unused materials of latest style and as specified, free of all defects that impair appearance and operation. Provide materials and equipment meeting design and capacity specified by description and manufacturer's catalog number. Include all necessary auxiliary components to form complete, operating and approved installation.

B. Manufactured Supporting Devices

1. General: Provide supporting devices, complying with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation, and as specified in this Section. Where more than one type of device meets indicated requirements, select device according to Contractor's option.

2. Fasteners:

   a. Standard Bolts and Nuts: ASTM A 307, Grade A, regular hexagon head.
   b. Lag Bolts: FS FF-B-561, square head type.
   c. Machine Screws: FS FF-S-92, cadmium plated steel.
   d. Machine Bolts: FS FF-B-584 heads; FF-N-836 nuts.
   e. Wood Screws: FS FF-S-111 flat head carbon steel.
   f. Plain Washers: FS FF-W-92, round, general assembly grade carbon steel.
   g. Lock Washers: FS FF-W-84, helical spring type carbon steel.
   h. Toggle Bolts: Tumble-wing type; FS FF-B-588, type, class and style as required to sustain load.
   i. Stainless Steel Fasteners: Type 302 for interior Work; Type 316 for exterior Work.

3. Cast-in Place Concrete Inserts:

    a. Continuous Slotted Type Concrete Insert: Galvanized
    b. Threaded Type Concrete Insert: Galvanized ferrous castings, internally threaded.
    c. Wedge Type Concrete Insert: Galvanized box-type ferrous castings, designed to accept bolts having special wedge shaped heads.

4. Supports: Provide supporting devices of types, sizes and materials indicated, having following construction features:

    a. Clevis Hangers: Galvanized steel for supporting rigid metal conduit weighing approximately 54 pounds per 100 units
    b. Riser Clamps: Black steel for supporting rigid metal conduit with 2 bolts and nuts and 4-inch ears.
    c. Reducing Couplings: Steel rod reducing coupling.
    d. C-Clamps: Malleable iron with galvanized finish.
    e. I-Beam Clamps: Galvanized steel.
    f. One-Hole Conduit Straps: Galvanized steel for supporting rigid metal conduit.
    g. Two-Hole Conduit Straps: Galvanized steel for supporting rigid metal conduit.
    h. Threaded Round Steel Rod: Galvanized steel.
    i. Offset Conduit Clamps: Galvanized steel for supporting rigid metal conduit.

5. Anchors: Provide anchors of types, sizes and materials indicated with following construction features:

    a. Expansion Anchors: Sleeve, wedge, self-drilling and non-self drilling types.
    b. Toggle Bolts: Springhead type.
    c. Manufacturer: Molly/Emhart, Hilti, Phillips', Ideal Industries, Inc.

6. Sleeves And Seals: Provide factory assembled watertight wall and floor seals, of types and sizes indicated, suitable for sealing around conduit, pipe, or tubing passing through concrete floors and walls. Construct with fabricated sleeves and mechanical sleeve seals.

    a. Sleeve Seals: Mechanical sleeve seals, modular mechanical type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation. Similar to O-Z/Gedney "Type CSM Series", Metraseal 120 "Firewalker", Calpico "Pipe Linx".

7. U-Channel Strut Systems: Provide 16 gauge steel U-channel strut system for supporting telecommunications equipment of types and sizes indicated with 9/16-inch diameter holes at 8 inches on center on top surface, with standard galvanized or PVC finish and following fittings that mate and match with U-channel:

    a. Channel hangers
    b. End caps
    c. Beam clamps
    d. Wiring stud.
    e. U-bolts.
    f. Manufacturer: Greenfield Mfg. Co., Inc., Power-Strut Div., Van Huffel Tube Corp.; Unistrut Div., GTE Products Corp.

C. Fabricated Support Devices

1. Pipe Sleeves: Provide pipe sleeves of one of the following:

   a. Sheet Metal: Fabricate from galvanized sheet metal, round tube closed with snaplock joint, welded spiral seams, or welded longitudinal joint. Fabricate in following gauges:

      (1) 3-inch and smaller sleeves: 20 gauge
      (2) 4-inch to 6-inch sleeves: 16 gauge
      (3) Sleeves over 6-inches: 14 gauge.

   b. Steel Pipe: Fabricate from Schedule 40 galvanized steel pipe and remove burrs.

   c. Iron Pipe: Fabricate from cast iron or ductile iron pipe and remove burrs.

   d. Plastic Pipe: Fabricate from Schedule 80 PVC plastic pipe and remove burrs.

D. Telecommunications Identification Devices

1. Name Plates: White plastic engraving stock melamine plastic laminate with black engraved letters and numbers. Unless otherwise noted, provide single line of text, 1/2 inch high lettering on 12 inch high nameplate (2 inch high nameplate where 2 lines of text are required). Provide text matching terminology and numbering of Contract Drawings or shop drawings. Nameplates permanently fastened using self-tapping stainless steel screws or pop rivets. Where fasteners cannot penetrate mounting substrate, contact-type permanent adhesive are acceptable.

2. Device Identification: Self-adhesive tamperproof vinyl label, 2 inches wide by 0.275-inch high, clear background with black letters, similar to Brady ID "Pro Series", Panduit "PanQuik Series or Tyco "C-533064-5-9"".

3. Directories: Typewritten and enclosed in plastic and mounted in metal or wood frame.

4. Tags: Reinforced white cardboard.

5. Cable/Conductor Identification Bands: Manufacturer's standard vinyl-cloth self-adhesive cable/conductor markers of wrap-around type, either pre-numbered plastic-coated type or write-on type with clear plastic self-adhesive cover flap, numbered to show circuit identification.

6. Plasticized Tags: Manufacturer's standard pre-printed or partially pre-printed accident prevention and operational tags of plasticized card stock with matt finish suitable for writing, approximately 3-1/4inches x 5-5/8 inches, with brass grommets and wire fasteners and appropriate pre-printed wording including large size primary wording (as examples: DANGER, CAUTION, DO NOT OPERATE).

7. Self Adhesive Plastic Signs: Provide manufacturer's standard, self adhesive or pressure sensitive, pre-printed, flexible vinyl signs for operational instructions or warnings of sizes suitable for application areas and adequate for visibility with proper wording for each application (e.g. 208V, EXHAUST FAN, RECTIFIER). Unless otherwise indicated or required by governing regulations, provide orange signs with black lettering.

8. *Baked Enamel Danger Signs: Provide manufacturer's standard "DANGER" signs of baked* enamel finish on 20 gauge steel with standard red, black and white graphics, 14 inches x 10 inches except where 10 inches x 7 inches is largest size which can be applied where required and where larger size is required for adequate vision with recognized standard explanation wording (as examples: HIGH VOLTAGE, KEEP AWAY, BURIED CABLE, DO NOT TOUCH SWITCH).

E. Firestopping:

1. Raceways: 1-part silicone elastomer compound; similar to "Dow Corning Fire Stop Sealant #2000" by Dow Corning Corp., Nelson Firestop - "ES1399", or Firsto - "FIWA". Apply Fire stopping by filling annular space between sleeves and conduits in openings through fire-rated floors and interior walls. Provide Fire stopping specified in all fire-rated wall and ceiling penetrations complying with ASTM E 119 requirements for rated assemblies with fire rating indicated on Drawings.

2. Cabletrays: Mineral fiber compressible firestop pillow, treated with intumescent material and enclosed in polyethelyne bag, similar to Nelson "PLW Firestop Pillow", Falcon Technologies "Firestop Pillow", or SpecSeal "Firestop Pillow".

F. Applied Fireproofing:

1. Coordinate the installation of hangers, supports and accessories from the structural steel with the Prime Contractor responsible for fireproofing. Install all hangers and supports prior to fireproofing.

2. Any fireproofing removed as part of installing work under the Telecommunications Work Contract, the repair or replacement of that fireproofing is the responsibility of the Telecommunications Work Contractor.

   a. Employ the services of an approved fireproofing contractor to repair or replace the fireproofing by patching any area that have been removed or damaged due to the installation of work after the completion of the fireproofing.

   b. Repaired or replacement fireproofing shall match the fireproofing adjacent to the repaired area. All warranties shall be maintained.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Installation Of Supporting Devices

1. General Installation Procedures and Requirements

   a. Install hangers, anchors, sleeves and seals as indicated, in accordance with manufacturer's written instructions and with recognized industry practices to insure supporting devices comply with requirements. Comply with requirements of NECA, NEC and ANSI/NEMA for installation of supporting devices.

   b. Coordinate with other electrical work, including raceway and wiring work, as necessary to interface installation of supporting devices with other work.

c. Install hangers, supports, clamps and attachments to support raceway properly from building structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together on trapeze type hangers where possible.

d. Tighten sleeve seal nuts until sealing grommets have expanded to form watertight seal.

2. Fasteners

a. Materials:

(1) Dry Locations: Use cadmium or zinc coated anchors and fasteners.
(2) Damp and Wet Locations: Use hot dipped galvanized or stainless steel anchors and fasteners.
(3) Corrosive Atmospheres Or Other Extreme Environmental Conditions: Use fasteners made of materials suitable for conditions.

b. Types (unless otherwise specified or indicated):

(1) Use cast-in-place concrete inserts in fresh concrete construction for direct pull-out loads such as shelf angles or fabricated metal items and supports attached to concrete slab ceilings.

(2) Use anchoring devices to fasten items to solid masonry and concrete when anchor is not subjected to pull out loads, or vibration in shear loads.

(3) Use toggle bolts to fasten items to hollow masonry and stud partitions.

3. Attachment Devices

a. Make attachments to structural steel or steel bar joists wherever possible. Provide intermediate structural steel members where required by support spacing.
b. Make attachments to steel bar joists at panel points of joists.
c. Do not drill holes in main structural steel members.
d. Use "C" beam clamps for attachment to steel beams

4. Channel Support System: Channel supports may be used, as approved, to accommodate mounting of equipment with following material and finish.

a. Dry Locations: 16-gage steel channel support system with standard finish.
b. Damp and Wet Locations: 16-gage steel channel support system with hot dipped galvanized or PVC finish

B. Identification Installation

1. Name Plates: Install nameplates on all equipment cabinets, panels, racks and similar items containing numbers and letters as shown on drawings.

2. Directories: Install directories in equipment cabinets, panels, racks and similar items (identifying each circuit) and in equipment requiring instructions for operation.

3. Tags: Install tags on all wiring in junction boxes, pull wire left in empty conduit, telephone wire at termination blocks, and sound system wire at termination blocks.

4. Cable/Conductor identification: Apply cable/conductor identification on each cable and conductor in each box/enclosure/cabinet where wires of more than one circuit or communication/signal system are present, except where another form of identification (such as color coded conductors) is provided. Match identification with marking system used in equipment cabinets, panels, racks and similar items, shop drawings, contract documents, and similar previously established identification for project telecommunications work.

5. Operational Identification And Warnings: Wherever reasonably required to ensure safe and efficient operation and maintenance of telecommunications systems, and equipment (including prevention of misuse of telecommunications facilities by unauthorized personnel), install self adhesive plastic signs or similar equivalent identification, instruction or warnings on switches, outlets and other controls, devices and covers of enclosures. Where detailed instructions or explanations are required, provide plasticized tags with clearly written messages adequate for intended purposes.

6. Danger Signs: In addition to installation of danger signs required by governing regulations and authorities, install appropriate danger signs at locations indicated and at locations subsequently identified by Installer of telecommunications work as constituting similar dangers for persons in or about project.

    a. Provide danger signs wherever it is possible, under any circumstances, for persons to come into contact with electrical power of voltages higher than 110-120 volts or on switches and similar controls, regardless of whether concealed or locked up, where untimely or inadvertent operation (by anyone) could result in significant danger to persons, or damage to or loss of property.

7. Color Coding: Meet NEC requirements.

C. Fire Stopping

1. Preparation: Comply with written instructions of fire stopping manufacturer for cleaning and preparation of joints, environmental conditions (weather and temperature), priming, and backer rod/bond breaker tape installation.

2. Comply with fire stopping manufacturer's printed instructions unless more stringent requirements are shown on Drawings or specified in Documents. Comply with directions provided by Fire stopping manufacturer's technical representative.

3. Prior to installation of fire stopping, verify with all other Prime Contractors that all cabling, supporting devices and other penetrating elements has been completely installed and all temporary cables, lines or other devices has been removed.

4. Use installation techniques ensuring fire stopping is deposited in uniform continuous ribbons without gaps or air pockets, providing complete "wetting" of joint bond surfaces on opposite sides.

5. Cure fire-stopping compounds in accordance with manufacturer's instructions and recommendations producing high early bond strength, internal cohesive strengths and surface durability.

6. Comply with all applicable installation requirements of ASTM E 119 for applicable fire ratings.

END OF SECTION

SECTION 18751 - TELECOMMUNICATIONS CABLING INFRASTRUCTURE

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Local area network (LAN) cabling system, terminations, labeling and associated cable performance testing.

1.02 SYSTEM DESCRIPTION

A. Design Requirements

1. Local Area Network (LAN): Provide labor, materials, equipment, services and operations required for complete installation of LAN compatible with Ethernet 10 Base T (10Mbs), Fast Ethernet 100 Base T (100Mbs), 155mbs ATM and Gigabit Ethernet, with single-mode/multimode hybrid fiber optic backbone cable and Category 6 copper and/or multimode fiber optic horizontal (station) wiring.

   a. All wiring including copper and fiber optical employs star topology.

      (1) Category 6 UTP wiring terminates on Category 6 RJ45 jack in occupied spaces and on Category 6 RJ45 patch panel at the distribution cabinet/rack. Connections wired per EIA/TIA 568A.

      (2) Multi-strand fiber optic backbone cable interconnects distribution cabinets/racks and terminates on fiber optic patch panel.

   b. Network cables routed from distribution cabinet/rack throughout building in corridor ceiling cavity if available, or other locations.

      (1) Refer to notes on each Drawing to determine exact installation methods.
      (2) Note and record all cable lengths to nearest foot.
      (3) Replace any cable exceeding 90 meters (295 feet) long and route to reduce length to 90 meters or less. Complete all cable re-routing at no additional cost to Owner.
      (4) Identify to Architect prior to installation any cables that cannot be reduced to 90 meters or less in length.
      (5) Strictly adhere to most current TIA/EIA-568B Telecommunications cabling standards.
      (6) Unless otherwise noted on Drawings, provide ladder-type cable tray to racks/cabinets from corridor or other wire routing space where indicated on Drawings.
      (7) Install "waterfall" device providing sweep from cable tray to data cabinet and for any non-continuous vertical transitions in cable tray.

   c. Data Outlet: Category 6 rated RJ45 type connectors with all 4 copper pairs terminated and tested in accordance with EIA 568A wiring standard.

   d. Fiber Optic Horizontal and Backbone Cables: Terminate on panels in each rack and utilize SC type connectors with ceramic sleeves. Terminate and test all strands unless otherwise noted.

   e. Permanently identify and label all cables and termination devices, at distribution cabinet/ and classroom data outlet in accordance with EIA/TIA Standard 606 or other as agreed by Architect and Owner.

f. Remove and replace any cables failing to meet end-to-end testing; do not abandon cable in place.

B. Performance Requirements

1. Comply with applicable requirements in Local, State and Federal Codes and both TIA/EIA Standards and BICSI standards

2. Specified cabling system derived from recommendations in recognized telecommunications industry standards, including following documents incorporated by reference:

a. ANSI/TIA/EIA - 568-B.1, Commercial Building Telecommunications Cabling Standard Part 1: General Requirements
b. ANSI/TIA/EIA - 568-B.2, Commercial Building Telecommunications Cabling Standard Part 2: Balanced Twisted-Pair Cabling Components
c. ANSI/TIA/EIA - 568-B.3, Commercial Building Telecommunications Cabling Standard Part 3: Optical Fiber Cabling Components
d. ANSI/TIA/EIA – 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces
e. ANSI/TIA/EIA – 570-A, Residential Telecommunications Cabling Standard
f. ANSI/TIA/EIA – 606, Administration Standard for Telecommunications Infrastructure of Commercial Buildings
g. ANSI/TIA/EIA – 607, Commercial Building Grounding and Bonding Requirements for Telecommunications
h. ANSI/ TIA/EIA – 758, Customer-Owned Outside Plant Telecommunications Cabling Standard
i. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM)
j. National Fire Protection Agency (NFPA – 70), National Electrical Code (NEC)
k. Bellcore GR-63-CORE network equipment building system compliance standards

1.03 SUBMITTALS

A. Product Data: Submit manufacturer's product literature, technical specifications, and similar information for following items demonstrating compliance with specified requirements.

1. Distribution cabinet/, patch panels and all required rack accessories.
2. Communication outlets.
3. Fiber optic cables, patch cables, and terminations.
4. Copper cables, patch cables and terminations.
5. Inner duct and accessories.
6. Rack configurations and wiring diagrams.
7. Un-interruptible power supplies and systems.
8. Network cabling test equipment and routines.
9. Sample of each network cabling test report.

B. Samples

1. Telecommunications Outlets - Submit samples of telecommunications outlets to be provided including following components and characteristics:

a. Flush-Mounted Outlets - New or Existing Walls: Completely assembled face plate with each type of outlet to be provided properly mounted in face plate and including back box, blank covers, and hardware.

b. Surface-Mounted Outlets: Submit complete raceway sample not less than 18 inches and not more than 48 inches long with fully assembled face plates including each type of telecommunications outlet and blank covers required.

c. Sample Characteristics:

(1) Provide all components in colors selected by Architect.
(2) Provide multiple outlet samples where required to accurately represent range of outlets to be provided.
(3) Provide complete outlet and raceway samples with required covers, legends, labeling and other features to be provided.

C. Quality Control Submittals

1. Test Reports: Submit complete sample test data and reports with exact labels used on cables, patch panels and face plates

2. Certificates

a. Manufacturer Certification: Submit certification from manufacturer of products to be installed as part of this Project certifying that Installer is authorized by product manufacturer to install proposed products.

b. Classification Certification: Submit copy of applicable Notice of Classification from New Jersey Division of Building and Construction indicating compliance with "Qualifications" specified in "Quality Assurance" below for Computer Network Installer.

3. Installer Experience Listing: Submit list of at least 5 completed projects as specified below in "Quality Assurance - Qualifications - Installer".

D. Contract Closeout Submittals: Comply with requirements of SECTION 01700, including submission of operating and maintenance instructions as item in "Operating and Maintenance Data" manual described in that section.

1.04 QUALITY ASSURANCE

A. Qualifications

1. Installer

a. Qualified to cable, terminate and test data network cabling system specified in this Section, certified by manufacturer of products to be installed, and completed at least 5 computer network installations of similar size, nature and complexity as specified for this project.

b. Classified by New Jersey Division of Building and Construction as "C 051 Telecommunications to install Copper and Fiber Optic Cables."

B. Mock-Ups

1. Classroom Mock-Up: Provide all telecommunications service components in classroom designated by Architect to demonstrate completed installation and provide standard for telecommunications service installation of subsequent classrooms. Include completed raceway, outlets, boxes, mounting hardware and labeling as specified using colors as selected by Architect.

a. Procedures: Obtain final inspection within 1 week after beginning telecommunications installation. Architect will review classroom mock-up and issue punch list for that classroom. Take required corrective action within 1 week after issuance of punch list for mock-up window. Obtain written approval from Architect of completed installation before beginning installation in subsequent rooms.

b. *Intent: Accepted mock-up classroom constitutes standard of quality for installation in remaining classrooms in Project.*

c. Protection: Protect completed mock-up classroom from damage after written approval and during subsequent construction activity in the room.

1.05 SEQUENCING AND SCHEDULING

A. Provide installation schedule demonstrating that existing equipment will be maintained in operation until new equipment is programmed and ready for use.

1.06 WARRANTY

A. Special Warranty: Provide manufacturer's system warranty against electrical or mechanical defects for 1 year from date of final acceptance.

1.07 MAINTENANCE

A. Maintenance Service: Provide complete service for all installed components, including all labor and materials for 1 year after final acceptance. Provide 4 quarterly inspections and service calls on system and make any adjustments and/or repairs required at no additional cost to Owner.

PART 2 - PRODUCTS

2.01 BALANCED, TWISTED PAIR CABLING COMPONENTS

A. Requirements: Complete balanced twisted-pair cabling system fully compliant with current Category 6 provisions of EIA/TIA 568-B Telecommunications Cabling Standard, including but not limited to:

1. "Component compliant" components certified to meet all requirements of TIA/EIA-568-B.2 "Balanced Twisted Pair Cabling Components"

2. After assembly into completed cabling channel, all components meet performance requirements as specified in TIA/EIA-568-B.1 and B.2, meet cable manufacturer and outlet manufacturer's performance requirements, and are performance-certified for category 6 as complete system

3. Category 6 twisted pair cabling meet specified physical and transmission characteristics requirements.

4. Exceed minimum performance requirements required by EIA/TIA 568-B standard by significant margin. Cabling solutions not demonstrating significant margin not acceptable.

5. All completed cabling channels fully backwards compatible with requirements of Category 5E and Category 5 cabling systems.

B. Copper Twisted-Pair Data Cables:

1. 100 OHM Category 6 "Enhanced" Unshielded Twisted Pair Cable (UTP)

a. Physical Characteristics:

(1) Plenum rated and meeting applicable requirements of ANSI/ICEA S-80-576. For cables not specified in "Approved Components" paragraph below, all 4 pairs insulated with F.E.P. providing maximum 0.023 in. diameter of insulated conductor.

(2) Consists of four 22-26 AWG twisted pairs.

(3) Suitable for environment where installed.

(4) Color coding of pairs:

(a) Pair 1 ..... W-BL; BL
(b) Pair 2 ..... W-O; O
(c) Pair 3 ..... W-G; G
(d) Pair 4 ..... W-BR; BR

(5) Overall diameter not exceeding 0.250 inches.

(6) Ultimate Breaking Strength (ASTM D 4565): 400 N minimum.

(7) Withstands 1-inch bend radius at -20 degrees Celsius without jacket or insulation cracking.

(8) Third party verified to meet EIA / TIA Category 6.

b. Transmission Characteristics:

(1) DC resistance of any conductor not exceeding 9.38 Ohms per 100m max. at 20 degrees Celsius measured in accordance with ASTM D 4566.

(2) Mutual capacitance of any pair at 1 kHz for 100m of cable not exceeding 5.6 nF.

(3) DC resistance unbalance between any two conductors of any pair not exceeding 5 percent when measured at or corrected to 20 degrees Celsius in accordance with ASTM D 4566.

(4) Capacitance unbalance to ground at 1 kHz of any pair not exceeding 330 pF per 100m.

(5) Delay skew not exceeding 25ns at 100 mHz.

(6) Propagation delay of any pair at 10 MHz not exceeding 5.7ns/m

(7) Maximum Attenuation of any pair less than:

	Frequency (MHz)	Max. Attenuation (dB)
(a)	1.0	2.0
(b)	4.0	3.8
(c)	10.0	6.0
(d)	16.0	7.6
(e)	20.0	8.5
(f)	31.25	10.7
(g)	62.5	15.4
(h)	100	19.8
(i)	155	25.2
(j)	200	29.0
(k)	250	32.8
(l)	350	39.8

(8) NEXT coupling loss, PSNEXT loss, ELFEXT loss, PS-ELFEXT loss, and Return Loss meeting or exceeding following:

	Frequency (Mhz)	NEXT Worst Pair (dB)	PSNEXT Worst Pair (dB)	ELFEXT Worst Pair (dB)	PS-ELFEXT Worst Pair (dB)	Return Loss Worst Pair (dB)
(a)	1.0	74.3	73.2	67.8	65.8	20.0
(b)	4.0	65.3	63.3	55.8	53.7	23.0
(c)	10.0	59.3	57.3	47.8	45.8	25.0
(d)	16.0	56.2	54.2	43.7	41.7	25.0
(e)	20.0	54.8	52.8	41.8	39.7	25.0
(f)	31.25	51.9	49.9	37.9	35.9	23.6
(g)	62.5	47.4	45.4	31.9	29.8	21.5
(h)	100	44.3	42.3	27.8	25.8	20.1
(i)	155	41.4	39.4	23.9	21.9	18.8
(j)	200	39.8	37.8	21.8	19.7	18.0
(k)	250	38.3	36.3	19.8	17.8	17.3
(l)	350	36.1	34.1	16.9	14.9	17.0

(m) NEXT coupling loss between pairs in cable.

(n) PSNEXT loss, ELFEXT loss, PS-ELFEXT loss, and Return Loss at 20 degrees Celsius +/- 3 degrees (68 degrees F +/- 5.5 degrees) between pairs in cable for length of 100m (328ft).

C. Additional Balanced, Twisted-Pair Cabling Components:

1. Category 6 UTP Patch Cables: Factory terminated and tested UTP and optical fiber patch cables and equipment cables for complete cabling system meeting requirements of ANSI/TIA/EIA-568-B for patch cord testing.

   a. Copper (UTP) Patch Cords:

      (1) Manufactured in variety of standard lengths.

      (2) Meet all requirements of ANSI/TIA/EIA 568-B.2 standard.

      (3) Contact plating of minimum of 50 micro inches of gold in contact area over 50 micro-inch of nickel, compliant with FCC part 68.5.

      (4) ANSI/TIA/EIA 568-B compliant.

      (5) Use 8-position connector, un-keyed.

      (6) Capable of universal T568A or T568B wiring schemes.

(7) Modular connector maintaining paired construction of cable to facilitate minimum untwisting of wires.

(8) Factory assembled and constructed of 100 ohm, 4-pair, 24 AWG, stranded conductor, unshielded twisted pair copper per requirements of ANSI/TIA/EIA 568-B standard for category 6 performance.

(9) Performance marking indelibly labeled on jacket by manufacturer.

(10) Accepts color-coded labels compliant with TIA/EIA-606 labeling specifications.

(11) "Snagless" protection for locking tab to prevent snagging and to protect locking tab in tight locations.

(12) Strain relief boot to protect UTP cable from excessive bending stress.

(13) Manufactured by ISO 9001 registered company.

b. Where both horizontal cabling and patch cords are required, provide patch cords certified to match performance of horizontal cable to be provided.

c. Provide different color patch cables for administrative and student network connections and telephone connections as directed by Owner

d. Provide quantity (1) 6 foot and (1) 10 foot patch cord for each computer outlet.

2. Data Outlets: Modular construction with multiple inserts available to support different mediums, connectors and blank inserts as shown on Drawings for each outlet with connectors meeting RJ45 Category 6 specifications and wiring per EIA 568A. Refer to details on Drawings for exact manufacturer, part numbers and configurations required at each location. Provide mounting hardware and configuration providing proper bending radius for all installed cabling. Provide blue color modular jacks (verify color with Architect prior to installation).

3. Faceplates: Mountable in dual compartment surface raceway where shown on Drawings and in recessed boxes in new construction. All single-gang faceplates equipped for 4 modular inserts unless specified otherwise on Drawings. All 2-gang faceplates equipped for 6 modular inserts unless specified otherwise on drawings. Provide blank covers for all unused ports.

   a. Provide faceplates with angled, recessed inserts for all flush mounted boxes. Provide blank covers for all unused ports

   b. Where required due to back box type or where otherwise specified, provide telecommunications outlets mounted on Decora Module Frames with cover plate matching existing or other electrical outlets in color-matched high-impact nylon or stainless steel.

   c. Provide flat faceplates/ flush module inserts matching raceway system for dual compartment raceway.

4. Wall Mount Stainless Steel Faceplate with Support Posts for Wall Mount Telephones: Designed to be surface-mountable directly to wall surface or on standard electrical outlet box, low profile with maximum 0.65 inch protrusion from mounting surface, 8-wire RJ45 connector, wiring per EIA 568A, reinforced steel frame with corrosion-resistant finish; similar to Lucent Part No. 630B8, ICC Part No. IC107FWPWH or TWAComm Part # AT630AIP.

D. Acceptable Components: Components meeting or exceeding specified requirements include components listed below.

1. Single Supplier: Provide all data connectors, faceplates and all associated accessories supplied by same manufacturer.

2. Color Selection: Select component colors to match surrounding devices, finishes and raceway components.

3. Cable:

   a. Berk-Tek Lan Mark 1000 (Plenum Rated)
   b. Commscope Ultra Media 7504
   c. NORDX Gigaflex 2413 – Ordering # 24567945 (blue)
   d. Hitachi Category 6 Plus Low Skew – Part # 30137-8

4. Jack Modules:

   a. Panduit TX-6 – Part # CJ688T3BU (blue)
   b. Siemon Angled Max 6 Modules – Part # MX6-06 (blue)
   c. Siemon Flat Max 6 Modules – Part # MX6-F06 (blue)
   d. NORDX Gigaflex PS6+ Module – Ordering # AX101071 (blue)

5. Blank Module:

   a. Panduit – Part # CMB**-X
   b. Siemon Max Outlet Blank Module – Part # MX-BL-(XX)
   c. NORDX MDVO Blank Insert – Ordering # A0405537 (almond)

6. Modular Patch Panel:

   a. Panduit – Part # CP48WSBL (connectors ordered separately)
   b. Siemon Max Patch Panels – Part # MX-PNL-48 (connectors ordered separately)
   c. NORDX Flex Patch Panel - Ordering # AX101458 (connectors ordered separately)

7. Faceplates:

   a. Single Gang:

      (1) Panduit – Part # CB
      (2) Siemon Max Modular Faceplates – Part # MX-FP-S-04-(XX)
      (3) NORDX MDVOFlex Plate Angled Entry – Ordering # AX100959 (almond)

   b. Double Gang:

      (1) Panduit – Part # CB**-2G
      (2) Siemon Max Modular Faceplates – Part # MX-FP-D-08-(XX)
      (3) NORDX MDVOFlex Plate Angled Entry – Ordering # AX100967 (almond)

   c. Insert:

      (1) NORDX MDVO Adapter Insert 2 port – Ordering # AX100983 (almond)
      (2) Siemon Max Modular Insert - Part # MX-E2A-20
      (3) Panduit - Part # CB

8. Decor Module Frame:

   a. Two Devices:

      (1) Panduit – Part # CFG2
      (2) Siemon Max Modular Mounting Frames – Part # MX-D2-(XX)
      (3) NORDX MDVO Deco Frame - Part # AX101779

   b. Three Devices:

      (1) NORDX Deco Adapter – Ordering # A0409652 (almond)
      (2) Siemon Max Modular Mounting Frames - Part # MX-D3-(XX)
      (3) Panduit - Part # CFG3

   c. Four Devices:

      (1) Panduit – Part # CFG4
      (2) Siemon Max Modular Mounting Frames – Part # MX-D4-(XX)
      (3) NORDX Deco Adapter - Ordering # AX101783

9. Patch Cords: Certified by manufacturer as meeting Category 6 channel performance requirements.

   a. NORDX PS6LX Modular Cord – Ordering # AX3100**
   b. Unicom Category 6 Molded Patch Cords - E6DD-C8YY-MXX
   c. Siemon MC6 Modular Cords - MC6-8-T-XX-06

2.02 FIBER COMPONENTS

A. Fiber Patch Panels and Wire Management Components

1. Rack Mounted Fiber Optic Connector Housings and Patch Panels

   a. Manufacturers - For convenience, details and specifications based on:

      (1) Connector Housing and Jumper Management Panel: "CCH-04U with CJP-01U " by Corning Cable Systems
      (2) Closet Splice Housing "CSH-03U" by Corning Cable Systems
      (3) 72 Port Panel: "No. OR-625MMC-72PB1B" by Ortronics.
      (4) 48 Port Panel: "No. OR-625MMC-48PB1B" by Ortronics.
      (5) 24 Port Panel: "No. OR-625MMC-24PB1RB" by Ortronics.

   b. Rack mounted unit, suitable for standard 19-inch equipment rack, providing interconnect between horizontal wiring and patch cable to wiring hub and equipped with smoked plexiglas door with metal trim and lock. Black color (verify color with Architect prior to installation).

   c. Housings mountable in EIA-310 compatible 465 or 592 mm rack and available in several sizes, including 1U, 2U, 3U and 4U.

      (1) One EIA rack space or panel height (denoted as 1U) defined as 44.45 mm in height.

   d. Modular unit with separate splicing, connector, and jumper management and combination connector/splicing housings available.

e. High density multiple fiber cabinet housing, with slide out drawers, providing exact quantity of multimode/single-mode connectors required to terminate all fiber-optic strands for each backbone cable at each rack, plus 10 percent spare for future expansion, and including ceramic connector sleeves.

f. Housing includes provisions for mounting fiber fan-out devices required to build 250-µm fiber in buffer tubes out to 900 µm for fiber protection and to allow direct connectorization.

g. Brackets included allowing wall mounting of rack mount hardware with space for jumper management panels.

h. Provide patch panels at each rack location to accommodate total number incoming cables being terminated with 20 percent spare capacity for future expansion.

i. Properly identify single-mode and multimode fiber terminations.

j. Provide all manufacturer's recommended components and hardware to complete connector housings including splice trays, splice tray housings, cable management components, connector panels, and hardware.

2. Surface-Mounted Fiber Connector Housings

a. Manufacturers - For convenience, details and specifications based on:

(1) Pre-Assembled with SC- Connectors: "No. OR-615SC224-00"by Ortronics.
(2) "WCH-02P, WCH-04P, WCH-06P, WCH-08P, WCH-12P" by Corning Cable Systems.

b. Multiple ports designed for wall-mount applications to enclose patching, splicing, or demarcation of single-mode or multimode fibers and provide for direct connectorization or pigtail splicing. Black color (verify color with Architect prior to installation).

c. Provide wall-mountable connector housing in connector panel version to provide for varying fiber counts and meeting functional requirements specified in "Connector Panels" subparagraph below.

d. Standard connector housing configured for direct connectorization with provision for mounting fiber fan-out devices incorporated into housing. Fiber fan-out devices build 250 µm fiber in buffer tubes out to 900 µm for fiber protection and to allow connectorization.

e. Unit mountable on standard plywood walls.

f. Housings manufactured using 16-gauge aluminum or equivalent for structural integrity and finished with wrinkled black powder coat for durability. Assembly hardware and equipment attaching machine screws included in black color.

3. Connector Panels

a. Manufacturers: For convenience, details and specifications based on "CCH-CP06-xx" for six fiber adapter panels or "CCH-CP12-xx" for twelve fiber adapter panels by Corning Cable Systems.

b. Multiple-port designed for patching, splicing, or demarcation of single-mode or multimode fibers.

c. Rack and wall mountable connector housings accept interchangeable connector panel defined as modular removable plate containing optical fiber connector adapters or copper jacks.

d. Utilizes single mounting footprint with multiple connector adapters in each panel. Interchangeable between rack and wall mountable hardware.

e. Provide ceramic connector sleeves

f. Provide industry standard single fiber and small form factor multi-fiber adapters, including SC duplex, ST compatible, FC, and MT-RJ.

g. Blank connector panels provided to fill unused space within housings attached with at least two push-pull latches allowing quick installation and removal. Housings supplied with blank connector panels for all available positions unless housing ordered with optical fiber adapters pre-installed.

4. Wire Management Panels

a. Horizontal – Wire Management: Black rack-mounted, 2-rack unit with 3 inch x 3 inch slotted duct on front with cover and 2 inch x 4 inch slotted duct on rear with cover. Similar to "Part #WMP1" by Panduit, Part # 3.5-WMP-3X3SC by Communication Cable Co. or Part # 13075-719 by Chatsworth

b. Vertical – Wire Management: Black 83 inches high with 4 inch x 5 inch slotted duct on front with cover and 4 inch x 5 inch slotted duct on rear with cover; allows cable to pass through holes from front to back of compartments. Similar to "Part #WPVS45" by Panduit, "Part #12096-703" by Chatsworth, or "Part #VWMDS4X5BK7H" by Norfolk Wire & Electronics.

B. Optical Fiber Cables: Used as backbone cable connecting all IDF telecommunications rooms, and trunk cable for interconnecting Main Distribution Frame (MDF) to telecom utility company interface. Provide cables with actual fiber type and count as specified on plan and riser drawings.

1. Fiber Optic Strands

a. 62 Micron Multimode Fiber Optic Strands: Ultra rated to 1Gbps, plenum rated fiber optic cable with 62.5/125um core/cladding diameters, 900mm buffer.

(1) Standards:

(a) UL listed for plenum use; meeting NEC, Article 770 - Optical Fiber Cables and Raceways and passed UL 910 flame test.
(b) Tight buffered fibers color coded in accordance with EIA/TIA-598 "Color Coding of Fiber Optic Cables".

(2) Fibers: Meet EIA/TIA 455-45A, Microscopic Method for Measuring Fiber Geometry of Optical Waveguides.

(a) Core Diameter: ..... 62.5 +/- 3.0 µm.

(b) Core Non-Circularity: ..... Less than or equal to 6 percent

(c) Cladding Diameter: ..... 125 +/-2.0 µm.

(d) Cladding Non-Circularity: ..... Less than 2.0 percent