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**PART 1 - GENERAL**

**1.01 WORK INCLUDED**

- A. Drawings and General Provisions of the Contract, including General and Supplementary Conditions and Division 1 and Section 16010 specification sections, apply to work specified in this Section.
- B. Furnish and install Telephone and Data Communications Structured Cabling System including all wiring and connections and other materials as shown on Plans and specified herein.

**1.02 RELATED DOCUMENTS**

- A. Code Requirements: Components and installation to meet latest rules and regulations for telecommunications cable systems of the California Building Code, California Code of Regulations, Title 24, Part 3, and California Electrical Code.
- B. Applicable Standards:
  - 1. ANSI/EIA/TIA - 568-A, Commercial Building Telecommunication Cabling.
  - 2. TSB-67, Field Testing of UTP Cabling Systems, October 1995.
  - 3. TSB-72, Centralized Cabling Guidelines, October 1995.
  - 4. TSB-75, Additional Horizontal Cabling Practices for Open Offices, August 1996.
  - 5. TSB-95, Additional Field Testing Requirements for Category 5, October 1999.
  - 6. ANSI/EIA/TIA - 568-A, Addendum 1, Propagation Delay and Delay Skew Specifications for 100 ohm 4-Pair Cable, September 1997.
  - 7. ANSI/EIA/TIA - 568-A, Addendum 2, Miscellaneous changes and corrections.
  - 8. ANSI/EIA/TIA - 568-A, Addendum 3, Hybrid and Bundled Cables.
  - 9. ANSI/EIA/TIA - 568-A, Addendum 4, Modular Patch Cord Production Testing, December 1999.
  - 10. ANSI/EIA/TIA - 568-A, Addendum 5, Category 5e Performance.
  - 11. ANSI/EIA/TIA - 568-B.2-1, Transmission Performance Specification for 4-pair 100 Ohm Category 6 Cabling.
  - 12. ANSI/EIA/TIA-TSB-36, Technical Systems Bulletin Additional Cable

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Specifications for Unshielded Twisted-Pair Cables.

13. EIA/TIA-455-61, FOTP-61, Measurement of Fiber or Cable Attenuation using an OTDR.
  14. IEEE 802.3, Carrier Sense Multiple Access with Collision Detection.
  15. ANSI/EIA/TIA - 569-A, Commercial Building Standard for Telecommunications Pathways and Spaces, February 1998.
  16. ANSI/EIA/TIA - 570-A, Residential Telecommunications Cabling Standard, October 1999.
  17. ANSI/EIA/TIA - 606, Administration Standard for Telecommunications Infrastructure of Commercial Buildings, February 1993.
  18. ANSI/EIA/TIA - 607, Commercial Building Grounding and Bonding Requirements for Telecommunications, August 1994.
  19. ANSI/EIA/TIA - 729, Screened, 100 Ohm Twisted Pair Cabling.
  20. ANSI/EIA/TIA - 758, Customer-Owned Outside Plant Telecommunications Cabling Standard, April 1999.
  21. BICSI - TDMM, Building Industries Consulting Services International, Telecommunications Distribution Methods Manual (TDMM) - 9<sup>th</sup> Edition, 2000.
  22. National Fire Protection Agency (NFPA-70), National Electrical Code (NEC) - 1999.
- C. Install and test all cabling in accordance with the most recent edition BICSI publications:
1. BICSI - "Telecommunications Distribution Methods Manual."
  2. BICSI - "Cabling Installation Manual."

### 1.03 GENERAL REQUIREMENTS

In order to qualify for installation of the data communications system, the Contractor must possess the required license classification, trade certifications, a performance history, experience in the installation and termination of fiber optics cable systems, and proof of time in business.

- A. License Classification: Contractor must possess a valid C-7 California State

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Contractor's License. This license must have been issued two years prior to the date of this bid. No other license classification is acceptable.

- B. BICSI Certifications: Contractor will use personnel certified by the trade organization BICSI. The vendor must have a Registered Communications Distribution Designer (RCDD®) on staff who will be ultimately responsible for this project. The RCDD must have sufficient experience in this type project as to be able to lend adequate technical support to the field forces during installation, during the warranty period, and during any extended warranty periods or maintenance contracts. The vendor must attach a resume of the responsible RCDD to the vendor's submittal for evaluation. Should the RCDD assigned to this project change during the installation, the new RCDD assigned must also submit a resume for review by the District. The vendor must also have BICSI registered installers and technicians on staff and assign them to this project. The project shall be staffed at all times by installers and technicians, who, in the role of lead craftsman, will be able to provide leadership and technical resources for the remaining crafts persons on the project. A minimum of 30 percent of personnel shall be BICSI registered telecommunications installers.
- C. A factory registered Panduit ® PCI Contractor Agreement or equivalent. The contractor shall have completed standards based product and installation training. A copy of the Contractor Registration shall be included in contractor's submittal.
- D. Performance History: Contractor must have successfully performed at least three projects of similar scope, within two years of the date of this bid. Proof of performance shall be in the form of reference sheets which shall include a brief description of the project, the beginning and ending contract price, the project foreman or superintendent's name, and the name, address, and telephone number of a project contact.
- E. Fiber Optics Experience: Contractor must be able to prove to the satisfaction of Owner that they have had significant experience in the installation of fiber optics cable systems. Installation must include installation of fiber optics cable in innerduct, fiber breakout systems, fiber termination, a knowledge of interconnect equipment, and a thorough knowledge of testing procedures. Contractor must provide a minimum of three (3) references supports its claim of experience for similar projects within the two years prior to this bid. Documentation must be included with the submittal documents.
- F. Time in Business: Contractor must have been in business, and in the business of installing telecommunications/data communications systems, continuously, for a period of at least three years, prior to the date of this bid. Contractor must submit at least one project reference for each of the three years prior to the date of this bid. The contractor must also maintain a full time staff at an established business location having appropriate parts and service facilities and the ability to provide a one-hour response time to Elk Grove Unified School District. Any contractor not able to meet these requirements will not be considered as an acceptable contractor for this project.

**1.04 DEFINITIONS**

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- A. Main Distribution Facility (MDF): The MDF is the location, within a building or complex of buildings, where the entire telecommunications system originates. It may include the physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks.
  
- B. Intermediate Distribution Facility (IDF): The IDF is the location in a building where a transition between the backbone or vertical riser system and the horizontal distribution system occurs. It may include the physical location, enclosure, wire and cable management hardware, termination hardware, distribution hardware, and equipment racks. In this case, the IDFs are collocated with the CTBs (Computer Terminal Backboards) and provide the interface location between fiber distribution cable (backbone) and station cable (horizontal distribution).
  
- C. Backbone Pathway: The backbone pathway consists of a series of conduits of chases, which connect the MDF to IDFs or IDFs to IDFs. It generally houses the vertical or backbone system.
  
- D. Backboard: Backboard generally refers to the plywood sheeting lining the walls of telecommunications facilities. Backboard may also refer to the entire wall-mounted assembly, including wire management, wiring blocks, and equipment racks. In this case, the term Backboard is fully interchangeable with CTB and the equipment required to fulfill the scope of work below.

#### 1.05 SYSTEM DESCRIPTION

- A. The data and telephone structured cabling communications system shall consist of three components: termination equipment, a fiber optics backbone, and copper twisted-pair Category 6 workstation cabling (voice and data). The central location shall house an MDF and each of the other locations shall house an IDF. Each fiber optics cable shall originate in the MDF and shall be terminated in its respective IDF. All fiber optics cables shall be enclosed in innerduct. The combination of innerduct with fiber optic cable shall be routed through a system of conduits and raceway installed by the responsible contractor for that discipline, in accordance with the drawings. The drawings depict a typical conduit layout and fiber cable routing. All copper backbone cables shall be routed along with the fiber cable, shall originate at the MDF, and terminate in each of the IDFs. From each IDF, one (1) or more twisted-pair copper cables shall be routed to each data and telephone outlet location, either via routing established by the installing contractor or provided by Owner, within its respective building or buildings. These cables shall originate in an IDF and terminate in its respective data outlet location.

Should the installation not require copper exchange cable for the telephone system the conduit shall be installed as a spare and labeled as such.

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**1.06 SCOPE OF WORK**

- A. Contractor shall provide materials for and install a complete wiring/cabling and conduit system in accordance with this specification and the drawings. Contractor shall be responsible for providing a complete wiring/cabling and conduit system including all necessary components, whether included in this specification or not.
- B. The installation shall include cable (fiber optic, copper telephone exchange, and twisted-pair copper), innerduct, fiber interconnect equipment, connectors (fiber and copper), jumpers (twisted-pair copper), wiring blocks, and data communications outlets. The necessary material and equipment are depicted throughout the specifications and applicable drawings. Contractor is responsible to supply Owner with all necessary components, whether included in the specifications and drawings or not.
- C. At each IDF location, Contractor is to install a 208 volt, 60 amp load center with a minimum of 20 breaker locations. Contractor to install two (2) 20 amp dedicated isolated ground circuits to a location within 6' of the equipment rack. At the MDF location, Contractor is to install a 208 volt, 100 amp load center with a minimum of 20 breaker locations. Contractor to install two separate 20 amp dedicated isolated ground receptacles within 6' of the equipment racks. Contractor also to install a 110 volt, 30 amp (L5-30) receptacle within 6' of the equipment rack and a 110 volt, 15 amp (L5-15) receptacle for each phone system module and additional circuits and receptacles to support equipment per the District approved floor plan of the MDF. All receptacles in these locations are to be wired to separate circuit breakers, regardless of available power unless instructed otherwise by District staff.
- D. The work performed under this specification shall be of good quality and performed in a workmanlike manner. In this context, "good quality" means the work shall meet industry technical standards and quality of appearance. The Owner reserves the right to reject all or a portion of the work performed, either on technical or aesthetic grounds.

**1.07 MANUFACTURER**

- A. Contractor shall furnish and install all equipment, accessories, and materials necessary for a complete, functional fiber optics data distribution system in accordance with these Specifications and Drawings.
- B. Materials: The preference of EGUSD, unless otherwise noted in these specifications, shall be Panduit ® and conform to the Panduit ® Certification Plus System Warranty standard and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least 25 years. **Any substitutions shall meet all requirements set forth in the Panduit references, including rack space usage, VIP testing, and single contact for all warranty work. Any submittal MUST include a rack space usage drawing or it will be rejected as non-conforming to our specifications.**

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- C. Unless specified otherwise in the following, the equipment furnished shall fall into five classes, and with exception of Class 5, all of the material within a single class shall be the standard product of Panduit®. Exceptions are annotated [CLASS EXEMPT]. The five classes are as follows:
1. Class One: Fiber optics cable, copper cable (both station and backbone), copper jumpers, blocking kits, interconnection devices, wiring blocks, connectors (fiber and copper), and telecommunications outlets. All material covered in Class One shall conform to the Panduit® Certification Plus System Warranty. and be tested to specification standards. The materials and installation of these products must have a warranty program of twenty-five (25) years, or better.
  2. Class Two: Fiber innerduct. All material covered in Class Two shall be equal in quality and performance to that manufactured by Carlon or Arnco, no substitutions.
  3. Class Three: Equipment racks and cabinets. All material covered in Class Three shall be equal in quality and performance to that manufactured by Saunders or CPI Dracon, no substitutions.
  4. Class Four: Wire management panels. All material covered in Class Four shall be Panduit® and conform to the Panduit® Certification Plus System Warranty standard.
  5. Class Five: Wire ties, printed labels, "D" rings, nuts, bolts, screws, and other miscellaneous hardware [CLASS EXEMPT].

#### 1.08 SUBMITTALS AND SUBSTITUTIONS

- A. Within 30 calendar days after the date of the award of the contract, the Contractor shall submit to the Owner for review eight (8) copies of a complete submission. The submission shall consist of five (5) major sections with each section separated with insertable index tabs. The first section shall be the "Index" which shall include the project title and address, name of the firm submitting the proposal, and name of the Architect. Each page in the submission shall be numbered chronologically and shall be summarized in the index. The second section shall include a copy of the Contractor's valid C-7 California State Contractor's License, BICSI certifications, the information required in Section 1.03 above, and a list of instrumentation to be used for system testing. The third section shall contain the comparative specification listing of any substitutions and a complete listing of the characteristics of the equipment in the specifications. The fourth section shall contain samples of proposed cable markers and labeling. The fifth section shall contain a complete, detailed satellite closet count, proposed floor plan and backboard plan, workstation count, and bill-of-materials. Refer also to Section 16010 for other submittal requirements. Any contractor failing to include all of the required information shall be deemed non-responsive and may be

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disqualified, at the discretion of the Owner.

- B. For purposes of determining conformity, technical and general information set forth on the respective data sheets by manufacturers named in Section 1.07 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 by an independent testing laboratory to prove equality. The decision of the Owner regarding equality of proposed equal items will be final.
- C. Shop Drawings: Furnish shop drawings showing front and side elevations of backboard and rack mounted equipment and interconnections. Drawings shall be computer drafted and shall be part of submittals. Drawings shall show layout of all equipment at each location. Drawings attached to this specification are schematic, do not show all panels, hubs, etc. required, and are only offered to show general layout.
- D. Two submittal reviews will be made by the Architect. Subsequent reviews will be charged to the Contractor. A rejection of a submittal or review of a partially presented submittal constitutes one submittal review.
- E. Record Drawings: Refer to General Conditions. Final Inspection will not be made until drawings are received and approved. Record Drawings shall include "As-Built" one-line and wiring diagrams, with terminations identified, wire color coding schedule, pull box locations, and conduit routing plans.

**1.09 GUARANTEE**

- A. One firm to assume full responsibility for performance on all work of this section. Guarantee all equipment not covered by the Panduit ® Certification Plus System Warranty against defects in material and workmanship for one (1) year, and provide on-the-premises service during normal working hours for one year, at no cost to purchaser if trouble is not caused by misuse, abuse, or accident, or at current labor rates if so caused. Provide manufacturer's written one-year guarantee for equipment and parts to Owner. Refer also to 1.07C.1. Class one products require a warranty program of twenty-five (25) years.
- B. Service shall normally be available within 24 hours from service department of authorized distributor of manufacturer by factory trained servicemen.
- C. On-the-premises service at other than normal working hours to also be available, but labor charges for such calls to be paid by purchaser at current labor rates.

**1.10 FUNCTION AND OPERATION**

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- A. The intended function of the data communications cable system is to transmit data signals from a central location to several individual data outlet locations. Upon completion of the work outline in this specification, the system shall be capable of transmitting data signals at 1000 Base-T or Category 6 levels.
- B. The multi-mode fiber optics cable system shall be capable of transmitting signals with a bandwidth of up to 500 MHz at either 850 or 1300 nm. The cumulative signal loss, through connectors, jumpers, couplers, and fiber cable, shall be less than 10 dB. The single-mode fiber optics cable system shall be capable of transmitting signals with a bandwidth of up to 500 MHz at both 1310 and 1550 nm. The cumulative signal loss, through connectors, jumpers, couplers, and fiber cable shall be less than 10 dB.
- C. Work station cable, commencing at the wiring blocks, shall be installed in accordance with ANSI/EIA/TIA TSB standards and shall be capable of transmitting a signal at Category 6 level with acceptable attenuation losses and cross-talk attenuation. The entire workstation cable system, including wiring blocks, cable, and telecommunications outlets shall be tested for Category 6 compliance, so an extended warranty can be provided to EGUSD. The cabling system shall be channel tested to the standard for Cat 6
- D. Voice cables shall be Category 6 compliant..

## PART 2 - PRODUCT AND INSTALLATION SPECIFICATIONS

### 2.01 GENERAL

- A. Throughout this Part 2, material quantities and minimum installation practices are given. These quantities and instructions are given for reference purposes only. It is the responsibility of the Contractor to provide appropriate quantities of materials and install them to Manufacturer Specifications as to provide a complete, functional system that will have an extended warranty applied.
- B. Equipment shall be installed in accordance with drawings. General installation provisions are as follows:
  - 1. Equipment Racks: Equipment racks shall be assembled and mounted in locations as shown in the Drawings and as described in the following. Each rack shall be assembled in accordance with the manufacturer's instructions and recommendations. Each rack shall be mounted such that the side rails are plumb. Each rack shall have vertical wire management installed on each side and horizontal wire management installed per EGUSD specifications. Each rack shall be installed in accordance with the approved plans submitted to Technology Services.
  - 2. Wiring Blocks and Wire Management Components: Should copper exchange

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cable be required it shall be terminated on rack mounted patch panels located on a dedicated equipment rack in such a manner that allows for neat and orderly cross connections. Standard 568B will be used for all terminations.

3. Fiber and Copper Cable: Where fiber or copper cable enters an MDF or IDF, it shall be affixed to the backboard via "D" rings and cable ties in accordance with the attached drawings. All cable shall be neatly bundled, combed, and tied. All cable runs, within the MDF and IDF, shall be horizontal or vertical within the constraints of minimum cable bending radius and will not be mounted in manner that segments the backboard.
  
4. Fiber Optics Interconnect Equipment: Interconnect equipment shall be mounted in the equipment racks.
  
5. Labeling:
  - a. With the exception of work station cables, hand written labels are not acceptable. All labels shall be machine printed on clear or opaque tape, stenciled onto adhesive labels, or typewritten onto adhesive labels. The font shall be at least 1/8" in height, block characters, and legible. The text shall be of a color contrasting with the label such that it may be easily read. If labeling tape is utilized, the font color shall contrast with the background. Patch panels shall exhibit workstation numbers, per the EGUSD labeling scheme, for all workstations served by the MDF or IDF.
  
  - b. Workstation outlets shall be labeled by room number (per architectural drawings) and location number beginning at the entrance door and progressing clockwise around the room. Data will be designated as "D1", "D2" etc. Telephone as "V1", "V2" etc.  
  
Patch panels will be labeled the same. All dedicated telephone outlets will be terminated on a dedicated patch panel as noted later in this specification. A dedicated telephone outlet / termination, for the purposes of this specification, shall be an outlet designated on the architectural signal drawings as a telephone outlet.
  
6. Warning Tags: At each location where the fiber cable is exposed to human intrusion, it shall be marked with warning tags. These tags shall be yellow or orange in color, and shall contain the warning: "CAUTION FIBER OPTIC CABLE." The text shall be permanent, black, block characters, and at least 3/16" high. A warning tag shall be permanently affixed to each exposed cable or bundle of cables, at intervals of not less than five (5) feet. Any section of

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exposed cable which is less than five (5) feet in length shall have at least one warning tag affixed to it.

7. T-Bar Suspended Ceilings: Where allowed by code, copper station cabling may be run outside of conduits and above t-bar suspended ceilings when available, at the option of the installer. Cables installed in this fashion are to be run horizontally in bundles and tied down neatly, well clear of any light fixtures or other electrical appliances that may affect data transmission. Cables shall be supported from roof structure and shall not lay on ceiling system.

#### 2.02 FIBER INNERDUCT

- A. Description: If required, from the MDF to each IDF, segments of fiber optics innerduct shall be installed in the conduit system.
  1. Product: Carlon AW4X1A, 1-1/4" Outside Plant Fiber Optics Innerduct with all necessary accessories.
  2. Quantities Required: Innerduct runs do not have to be continuous throughout, breaks are expected at the pullboxes. Contractor is responsible for determination of actual lengths of innerduct required. Enough innerduct shall be provided and installed to extend from the fiber service loop in the MDF to the fiber service loop in each IDF. If the route passes through a pullbox, the segments of innerduct shall extend twelve inches into the pullbox. If the route passes through an en route IDF, each segment of innerduct shall extend at least twelve inches beyond the end of the service conduit. Seal all ends of the innerduct after the installation of the fiber is complete.
- B. Installation: Fiber innerduct shall be installed in conduit in accordance with manufacturer's instructions and industry standards. Within the equipment rooms, the innerduct shall extend from the end of conduit to four (4) feet above the floor and shall be affixed to the backboard by means of clamps designed for that purpose. Care shall be taken to avoid kinking the innerduct or applying excessive tension during the installation process.

#### 2.03 FIBER DISTRIBUTION

- A. Description: From the MDF to each IDF, a continuous segment of fiber cable shall be installed. Routing shall be via conduit in accordance with electrical drawings. The cable shall be a twenty four (24) fiber multi-mode cable and a twelve (12) fiber single-mode cable, suitable for subsurface installation. The cable shall not be extended more than 50 feet into the building interior unless enclosed in conduit.
  1. Products: General Cable BG0244M1A (24 strands) multi-mode 50.0 / 125  $\mu$ m cable  
General Cable AP0124M1A (12 strands) single-mode cable.

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2. Quantities Required: The contractor is responsible for determination of actual segment lengths. Actual quantities will be determined by the routing established by the drawings.
  3. Required Accessories and Quantities:
    - a. Connectors: Panduit FSCMM50BL opticrimp SC (multi mode)  
Panduit FSCCBU SC fiber optic connector (single mode).  
**One SC connector for each end of each fiber.**
    - b. Furcation Kits: Panduit FK2BJ in sufficient quantities for all fibers
    - c. Miscellaneous supplies to terminate fiber cables to industry standards.
- B. Installation: Installation shall be conducted following guidelines established by the product manufacturer and industry standards.
1. Fiber Optic Cable: During installation of the fiber optic cable segments into the conduit system, special care shall be taken to avoid damage to the cable. While under pulling tension, the cable shall not be bent into a curve with a radius of less than 20 times the cable diameter. Pulling tension shall not exceed manufacturer's recommended maximum tensile load.
- The fiber optic cable shall be routed through the conduit and innerduct and onto the appropriate IDF backboard. Routing on the backboard shall be straight and plumb. A minimum fifteen (15) foot service loop shall be provided at each terminal location. Refer to drawings for cable configuration.

**2.04 COPPER BACKBONE CABLE (EXCHANGE CABLE)**

- A. Description: From the MDF to each IDF a continuous segment 25, 50, 100 pair (or as required) outside plant cable shall be installed. This cable shall be routed along with the fiber optics cable discussed in Section 2.03 above. The cable shall contain required number of pairs and shall be suitable for underground installation. Each end of each cable shall be "dammed", at the breakout point, to halt the flow of gel.
1. Product: AT&T 25-pair (or as required), exchange filled cable, PN #GFMW-25.  
**{One (1) segment from the MDF to each IDF}.**
  2. Required Accessories and Quantities: [CLASS EXEMPT] 3M, Scotchcast™8964, Blocking Kit **{One (1) for each cable segment}**

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- B. Installation: Cable installation shall be in accordance with manufacturer's instructions and recommendations and industry standards. All cable shall be affixed to the backboard via "D" rings and cable ties. Each end of each cable shall be dammed in accordance with instructions and recommendations supplied by the damming kit manufacturer. All pairs extending beyond the breakout point and dam shall be cleaned such that no gel remains on them. Binder groups shall be maintained and tied-off using the colored ribbon identifying each group.

#### 2.05 WORK STATION CABLE

- A. Description: From each IDF, 4-pair, Category 6 cables shall be routed to each work station (data outlets) served by the IDF. Cables shall be routed from the MDF to each workstation located in its building. Data outlet locations are depicted in the drawings and in the Outlet Summary.
1. Product:  
Data: Panduit PUR6004BU-U (Riser)  
Panduit PUP6004BU-U (Plenum)  
  
Voice: Panduit PUR6004WH-U (Riser)  
Panduit PUP6004WH-U (Plenum)
  2. Outside Plant Cable (OSP), for both voice and data, will be installed wherever the cabling will exit the indoor environment (i.e. cables running from one building to another in conduits and pullboxes). Product: Mohawk AdvanceNet LAN-Trak OSP Category 6 cable, part #M57622.
  3. Voice Cables, for the purpose of this specification, will be any location which is designated as voice on the architectural signal drawings.
  4. Wall Plate: Panduit CPFL6WH . **One (1) for each workstation.** Provide blank filler for all unused ports, part CHB2M. VERIFY COLORS FOR EACH JOB WITH DISTRICT.
  5. Modular Outlets:  
Data: Panduit CJ688TPBU (blue)  
Telephone: Panduit CJ688TPWH (white)

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- B. Installation: Installation shall be conducted in accordance with guidelines established by the product manufacturer and industry standards. Wall plates shall be mounted such that their vertical dimension is plumb. Each wall plate shall be labeled with its respective workstation numbers.

**2.06 MAIN DISTRIBUTION FACILITY (MDF)**

- A. Description: The MDF shall consist of a "fire-rated" plywood backboard, equipment racks, fiber interconnection equipment, and wiring blocks for the interface of twisted pair station cabling. **Contractor shall submit a floor plan and backboard plan to Elk Grove Unified School District for approval prior to installation. The equipment shall be installed in accordance with the drawings.**

1. Products and Quantities:

- a. Equipment Rack: Chatswork/CPI Dracon, 55053-503, 7' x 19", floor mount with 10250-112 12" cable ladder. Supply and install per Contract Drawings. In addition to the number of racks required for the fiber optic and copper cable plants, supply and install two (2) empty racks for EGUSD active equipment. (For elementary sites supply and install one (1) empty rack). District standards, no substitutions.
- b. Fiber Interconnect: Panduit FRME4 with 12 Panduit FAP6WBUDSCZ Fiber adapter panels. Fiber adapter panels are to be installed top to bottom in the following manner. Positions 1 – 3 will be for Building A. Positions 1-2 will be Multi Mode. Position 3 will be Single mode. Positions 4-6 will be for Building B. Positions 4-5 will be multi mode. Positions 6 will be single mode etc. **One (1) is required for each one hundred forty four (144) fiber strands entering the MDF (2 buildings). If 144 or more fiber strands enter the MDF, another is required. Supply and install as many as necessary to service all fiber strands entering the MDF.**
- c. Category 6 Patch Panels: Panduit DP48688TP 48 port (DP24688TP, DP96688TP) DP6 Plus Patch Panels. Two (2) ports for each workstation served from the MDF with a minimum of 12 spare ports are required. Dedicated voice cables require a dedicated patch panel with one port for each dedicated voice cable plus an additional 10 percent spares. If the number of workstation / voice cables, plus required spare count (12) is greater than one panel, then a second patch panel is required. **Supply and install as many patch panels in the MDF as necessary to service all workstation cables, dedicated voice cables, plus the required spare count for each system.**
- D. Patch Cables: Panduit UTPSPxxx (xxx denotes length and color. Contractor must verify with EGUSD Technology Services prior to ordering) Patch cables shall be 3', and 6' equally in length, 8-wire, 8-pin TIA/EIA-568A/B wiring configuration, conforming to Category 6 protocol. **One**

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**patch cable is required for each link or workstation served.**

- E. Telephone Exchange Cable: Exchange cable in the MDF shall be terminated on 300-pair, 110 wall-mount-wiring blocks – **One (1) wiring block for each three IDFs served}**.
  - F. Telephone Patch Cables: Telephone patch cables to be 3' - 4 wire silver satin. One to be provided for each dedicated voice outlet, plus 10 %, in the building housing the MDF facility
  - G. Furnish and install all required interfaces, connections, wiring, and components to other systems and/or devices requiring telephone system interface or service, including, but not limited to:
    - 1. Intrusion Alarm System
    - 2. Fire Alarm System
    - 3. Intercom Communications System
    - 4. Energy Management System
    - 5. Irrigation Control System
  - H. Fire, Intrusion Alarm, EMS, and Irrigation Control Systems Connections: Furnish and install jacks and wiring to automatic dialer of each system (2 dedicated Fire, 1 dedicated Intrusion, 1 dedicated EMS, 1 dedicated Irrigation). Connect each jack to a dedicated copper trunk line each. Do not run through phone switch.
2. Required Accessories and Quantities:
- a. Wire Management: Panduit NCMH2 NetManager Horizontal Wire managers for each FRME4 fiber enclosure and one for each 48 ports of patch panel. Panduit WMPV6X8 vertical wire management for each rack installed. Contractor to install sufficient accessories to maintain full radius bend control for Category 6 standards.

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- c. "D" Rings: Provide and install sufficient quantities of 4" "D" rings to conform to the Drawings.
- B. Installation: Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, complete assembly and mounting of the equipment rack, and mounting of the wiring blocks. Equipment shall be mounted in accordance with the drawings.

**2.07 INTERMEDIATE DISTRIBUTION FACILITY (IDF)**

- A. Description: An IDF shall consist of a "fire-rated" plywood backboard, equipment rack or cabinet, fiber interconnect equipment, wire management, and wiring blocks. Contractor shall submit a floor plan and backboard/cabinet plan to Technology Services for approval prior to installation.

1. Products:

- a. Equipment Rack: See section 2.06.A.1.a. Where a wall mounted rack is required product shall be Chatsworth 11791-518, or equivalent. One equipment rack is required for each IDF. **SIZE OF CABINET SHALL INCREASE PROPORTIONALLY TO THE AMOUNT OF WORKSTATIONS TO BE SERVED AND THE ELECTRONICS NEEDED TO SERVE THEM.** A minimum of 48 inch height is required.
- b. Fiber Interconnect: Panduit FRME2 with 3 FAP6WBUDSCZ fiber adapter panels. @ panels will be for Multimode and 1 panel for single mode **One LIU is required for each IDF, mounted in the rack.**
- c. Telephone Exchange Cable: Exchange cable is to be terminated on patch panel(s) located above the dedicated voice station patch panel(s). Termination shall be one pair per port.
- c. Category 6 Patch Panels: Panduit DP48688TP 48 port (DP24688TP, DP96688TP) DP6 Plus Patch Panels. Two (2) ports for each workstation served from the MDF with a minimum of 12 spare ports are required. Dedicated voice cables require a dedicated patch panel with one port for each dedicated voice cable plus an additional 10 percent spares. If the number of workstation / voice cables, plus required spare count (12) is greater than one panel, then a second patch panel is required. **Supply and install as many patch panels in the MDF as necessary to service all workstation cables, dedicated voice cables, plus the required spare count for each system.**

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- d. Patch Cables: Panduit UTPSPxxx (xxx denotes length and color. Contractor must verify with EGUSD Technology Services prior to ordering) Patch cables shall be 3', and 6' equally in length, 8-wire, 8-pin TIA/EIA-568A/B wiring configuration, conforming to Category 6 protocol. **One patch cable is required for each link or workstation served.**
  - e. Telephone Patch Cables: Telephone patch cables to be 3' - 4 wire silver satin. One to be provided for each dedicated voice outlet, plus 10 %.
  - e. Wire Management: Wire Management: Panduit NCMH2 NetManager Horizontal Wire managers for each FRME4 fiber enclosure and one for each 48 ports of patch panel. Panduit WMPV6X8 vertical wire management for each rack installed. Contractor to install sufficient accessories to maintain full radius bend control for Category 6 standards.
  - h. "D" Rings: Provide and install sufficient quantities of 2" and 4" "D" rings to conform to Drawings.
- B. Installation: Installation shall be conducted in accordance with manufacturer's recommendations, industry standards, and this specification. Installation includes complete assembly and mounting of the fiber interconnect equipment, dressing the fiber and copper cables, complete assembly and mounting of the equipment rack, and mounting of the wiring blocks.

#### 2.08 TESTING AND DOCUMENTATION

- A. Testing: Contractor shall test each fiber strand and each pair of each twisted pair copper cable. The Owner reserves the right to have a representative present during all or a portion of the testing process. If the Owner elects to be present during testing, test results will only be acceptable when conducted in the presence of the Owner.
  - 1. Fiber Optics Cable: Each fiber strand shall undergo bi-directional testing for signal attenuation losses.
    - a. Test Equipment:
      - 1) Multimode: Fluke 4100 or equivalent.
      - 2) Singlemode: Fluke 4100 or equivalent.
    - b. Test:

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- 1) Multimode: Bi-directional signal attenuation at 850 and 1300 nm.
  - 2) Singlemode: Bi-directional signal attenuation at 1310 and 1550 nm.
- c. Test Criteria: Signal loss of less than 10 dB through entire fiber path, including cable, couplers, and jumpers.
2. Workstation Cable: Each workstation cable shall be channel tested from the jack panel through the patch cord, in accordance to the following documents: ANSI/EIA/TIA - 568-A-TSB-67, ANSI/EIA/TIA - 568-A-TSB-95, and ANSI/EIA/TIA - 568-A, Amendment 5,
- a. Test Equipment: Fluke 4100 (with Category 6 "Perma-Link" adapter) or equivalent. All UTP drops shall be verified for performance using a Permanent Link or Channel Link test. Basic link shall NOT be used. UTP testing will be done by a level II or III tester. 100% of the cables will be tested and the documented results must be given to EGUSD's Technical Support on a CD which can be read by Microsoft Windows
  - b. Test: Autotest, Continuity, Wiremap, NEXT, NEXT@Remote, ELFEXT, Length, Signal Attenuation, Impedance, Resistance, RL, RL@Remote, ACR, ACR@Remote, PSACR, PSACR@Remote, PSNEXT, PSNEXT@Remote, PSELFEXT, HDTDX, and Noise.
  - c. Test Criteria: The system shall be tested to Category 6 compliance. The test path shall include workstation jacks, station cables, jack panels, and adapter cables.
  - d. The channel will be tested to the following specifications:  
Category 6  
Insertion loss: 34.0 dB at 250 MHz  
PS-Next: 34.0 dB at 250 MHz  
Positive PS-ACR at 250 MHz  
Maximum length: 100 meters  
Return Loss 10.0 dB at 250MHz
- B. Documentation: Contractor shall provide documentation to include computer generated test results and as-built drawings.
1. Fiber Test Results: The results of the fiber testing shall be machine generated and printed equal to those by Fluke DSP4100 with fiber adapters. Handwritten results are NOT acceptable. Only original signed copies will be acceptable.
  2. Work Station Cable: The results of the work station cable tests shall be provided in the form of print-outs from the test equipment.

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3. As-Built Drawings: Contractor, upon request, will be provided with clean copies of the electrical drawings depicting data outlet locations as they were designed. The drawings, provided by the Owner, shall be modified to indicate actual cable routing, workstation locations, and workstation numbers.

#### **2.09 ACCEPTANCE**

- A. Acceptance of the Data Communications System, by Owner, shall be based on the results of testing, functionality, and the receipt of documentation. With regard to testing, all fiber segments and all work station data cables must meet the criteria established in Section 2.08 above. With regard to functionality, Contractor must demonstrate to Owner that 1 Gbps data signals can be successfully transmitted, bi-directionally, from the MDF to and from some number of individual data outlets. The number of outlet locations to be tested shall be determined by Owner. With regard to documentation, all required documentation shall be submitted to Owner.

#### **2.10 DIVISION OF WORK**

- A. Contractor shall install the data communications system as described in this section. Installation shall result in a functional system pursuant to Section 2.08 above. The scope of work includes: (1) All necessary voice/data components; (2) Repair of damage to structures incidental to installation; (3) Supply and install all material discussed in this specification; (4) Test and document system, upon completion; (5) Supply and install all material necessary, whether or not discussed in this specification, to result in a complete and functional system (except for electronic components, unless otherwise specified).

END OF SECTION

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