



Data Network Cabling and Infrastructure Specifications

San Joaquin County Office of Education
Network Services

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Contents

- 1. GENERAL 3
 - 1. Contractor/Installer Requirements 3
 - A. Furnish And Install The Following: 3
 - B. Contractor Qualifications 3
 - C. Quality Assurance 4
 - D. Rules And Regulations 5
 - E. References 5
- 2. SUBMITTALS 6
 - 1. Construction Schedule 6
 - A. Construction Schedule To Be Provided By The Contractor And Approved By SJCOE Prior To Notice To Proceed 6
 - 2. Material submittals 6
 - A. Submit Manufacturer's Literature Including Product Specification, And Installation Instruction For All Hardware, Cabinets, Racks, Components, Cable, And Materials To Be Provided For This Project 6
 - 3. Construction Drawings 7
 - A. Submit One (1) "ANSI B" Size Reproducible Construction Drawing 7
 - 4. System Specifications 7
 - A. Cable Plant Requirements 7
 - B. Network Device Requirements 8
 - 5. Products 8
 - A. Inside Plant Category 6/Category 6A Cable, UTP 8
 - B. Outside Plant Category 6/Category 6A Cable, UTP 8
 - C. Category 6/Category 6A Patch Panels 8
 - D. Wire Management 9
 - E. Data Jack Plates/Housings/Enclosures 9
 - F. Fiber-Optic Cable 9
 - G. Fiber-Optic Patch Panel 9
 - H. Fiber-Optic Patch Cords 10
 - I. Category 6/Category 6A Patch Cables 10
 - J. Data Cabinets/Racks 10
 - K. Flexible Corrugated Tubing & Conduit 10
 - L. Rack Mounted Power Strips 11
 - M. Active Network Devices 11
 - N. Replacement Brands 12
- 3. EXECUTION 12
 - 1. Labelling 12

San Joaquin County Office of Education

- A. General Specifications And Requirements 12
- B. Category 6, Category 6A, And Fiber-Optic Cable..... 12
- C. Copper And Fiber-Optic Patch Panels 12
- 2. WIRING CABINETS..... 12
 - A. Main Distribution Frame (MDF)..... 12
 - B. Intermediate Distribution Frame (IDF)..... 13
 - C. Cabinet Mounting 13
 - D. Category 6/Category 6A Cabling 13
 - E. As-Built Drawings & Close-Out Documents 19

San Joaquin County Office of Education

1. GENERAL

1. CONTRACTOR/INSTALLER REQUIREMENTS

A. FURNISH AND INSTALL THE FOLLOWING:

1. Project pricing quotes submittals, construction drawings, and contractor qualifications. The San Joaquin County Office of Education (SJCOE) requires contractors to complete a pre-qualification form prior to beginning any work. The pre-qualification form is available through SJCOE Operation Department – (209) 468-4800. The pre-qualification form is also available electronically:

<http://www.sjcoe.org/Operations/pdf/Contractor%20Pre-Qualification%20Application.pdf>

2. All copper data network cable, jacks and related terminations.
3. All fiber-optic data network cable, jacks, (interior) flexible conduit, and related terminations.
4. Wiring cabinets and/or racks complete with necessary copper and fiber-optic patch panels, specified cable management, and specified patch cables.
5. Testing, certification, and test results (No PASS / FAIL test results accepted, full test results reports only) of copper data network cable and termination – both hardcopy and electronic are required.
6. Testing, certification, and test results (No PASS / FAIL test results accepted, full test results reports only) of fiber-optic network cable and termination – both hardcopy and electronic are required.
7. If specified, install all network electronics, VoIP phones, and UPS units.
8. If specified, configure and test all network electronics, VoIP phones, and UPS units.

B. CONTRACTOR QUALIFICATIONS

1. Data/networking systems/cablings Contractors and Installers shall have the following qualifications:
 - a. Minimum 5 years' experience in the design, installation, testing and maintenance of data communications systems and associated inside and outside network cabling and systems.
 - b. Vendor must employ full time at least one BICSI (Building Industry Consulting Service International - <https://www.bicsi.org/>) certified Registered Communications Distribution Designer (RCDD) who is involved in approving all design work covered by this project. Provide proof of employment / business card.
 - c. Maintain a local service facility within 150 miles of the main SJCOE campus which stocks spare devices and/or components for servicing systems.
 - d. Possess a complete and full working knowledge of data/networking systems, cabling and infrastructure planning in accordance with ANSI/TIA/EIA 568 and 569 specifications.
 - e. Has performed successful installation and maintenance on at least three (3) projects similar in scope and size, with portfolio submissions available.
 - f. Can provide job reference for at least three (3) similar projects, including scope of work, project type, owner/user contact name and telephone number.
 - g. Holds and maintains a valid California C-7 or C-10 Contractors License and can exhibit validity upon request.

San Joaquin County Office of Education

- h. Possesses the ability to create AUTOCAD "as built" documentation, including hardcopy and digital media.
- i. Possess calibrated acceptance testing equipment (No PASS / FAIL test results accepted, full test results reports only) as delineated within ANSI/TIA/EIA 568 Building Wiring Standards for Ethernet network topology and can perform acceptance testing through 10000Mbps (10 Gig).
- j. Contractor must be Panduit Certified and provide proof of certification.

C. QUALITY ASSURANCE

1. Contractor will provide Panduit Certificate of completion for training in fiber-optic and/or Category 6/Category 6A cabling.
2. SJCOE Network Services or Project Manager may ask any or all data cabling workers to demonstrate their skill level before performing any work or continuing work. If in the opinion of the Network Coordinator any worker is found to be deficient in this area, the Contractor must immediately provide necessary training to remove the deficiency or replace the worker with one having the required skills.
3. The Contractor shall place and maintain on the project a sufficient number of skilled installers who are thoroughly trained and experienced on the necessary crafts and completely familiar with the specified requirements and methods needed for the proper performance and completion of the work.
4. Persons skilled in the trade represented by the required work, and in accordance with all applicable building codes, shall install the systems in accordance with best trade practices and manufacturers recommended methods and standards.
5. The Contractor must provide a project manager who has demonstrated the ability to supervise similar projects. The project manager must be available to be interviewed by the Network Coordinator and/or their representative, and must be deemed acceptable by the Network Coordinator and/or their representative. The project manager must be available to attend meetings as required.
6. The work of this section shall conform to California Code of Regulations and all other applicable codes and standards.
7. Only a qualified Contractor holding licenses required by legally constituted authorities having jurisdiction over the work shall do the defined work. The Contractor shall have been engaged in business of supplying and installing the specified type of systems for at least three (5) years and shall be an equipment manufacturers' certified Contractor for the specified type of cabling system.
8. Manufacturer shall warranty availability of spare parts common to proposed system for a period no less than that stipulated within the California Multiple Award Schedule (CMAS) terms and conditions. If no time period is contractually stipulated, the Contractor shall provide a warranty of twenty five 25 years.
9. Contractor shall warranty all Certified installations for a period of not less than twenty five (25) years from the date of acceptance. A complete installation warranty will be provided per site with specific details of the coverage. The Contractor shall repair or replace at no expense to SJCOE, any defective material or workmanship discovered within the warranty period. Any materials, structures, or work damaged thereby that may be displaced in repair or replacement of material and/or workmanship will be replaced and/or repaired at no cost to SJCOE. Examination of or failure to examine work by SJCOE shall not relieve Contractor from these obligations.
10. Contractor shall have a service organization capable of responding to warranty service requests within 24 hours of receipt of written notification and resolution within five (5) working days for MDF installations and/or equipment and fifteen (15) working days for

San Joaquin County Office of Education

IDF installations and/or equipment located either in the IDF.

11. If Contractor fails to repair or replace material or work indicated above upon receiving written notice, SJCOE, may at its' discretion, hire a qualified Contractor to make required repairs and assess cost against Contractor.
12. Contractor shall include the telephone number of the customer's client contact for three (3) completed projects and a letter signed by a corporate officer, partner, or owner of the contracting company describing the service capability of the company and stating the company's commitment to maintain that service capability through the warranty period.
13. Contractor shall include in the Material List Submission copies of the manufacturers' valid certifications that the Contractor is an authorized installer of the submitted manufacturers' products and has been adequately trained in the installation of those products. This applies to all Category 6/Category 6A, and fiber-optic components and cable.

D. RULES AND REGULATIONS

1. All work and materials shall be in full accordance with the latest rules and regulations of the following codes, industry standards and references:
 - a. FCC Part 68 – Connection of Terminal Equipment to Telephone Network
 - b. Uniform Building Code - International Conference of Building Officials (ICBO); Regional Office: 3060 Saturn Street, Suite 100, Brea, California 92821
 - c. NFPA 70 (NEC) - National Electrical Code
 - d. NFPA 75 - Protection of Electronic Computer and Data Processing Equipment
 - e. NFPA 78 - Lightning Protection Code
 - f. NFPA 101 - Life Safety Code
 - g. OSHA 29 CFR Part 1910 - Occupational Safety and Health Standards
 - h. FCC Part 76.611 - CFR Title 47 Radiation Leakage Standards
 - i. State of California:
 - i. Title 24, Building Standards, State of California.
 - ii. Occupational Safety and Health Act (OSHA).
 - iii. Title 8, Electrical Safety, State of California.
 - iv. Title 19, California Code of Regulations.
2. Governing Codes and Conflicts: If the requirements of this section or the Project Drawings exceed those of the governing codes and regulations, then the requirements of this section and the Drawings shall govern. However, nothing in the drawings or specifications is to be construed as permitting work not conforming to the codes or standards. These codes or standards are to be considered minimum requirements. Should the plans or specifications call for material, methods or construction of a higher standard, the plans or specifications shall govern.

E. REFERENCES

1. Design, manufacture, test, and install data distribution systems per manufacturer's requirements and in accordance with NFPA 70 (National Electric Code), state codes, local codes, requirements of authorities having jurisdiction, and particularly the following ANSI/TIA/EIA Standards.
 - a. This Technical Specification and Associated Drawings
 - b. ANSI/TIA/EIA-568-B series, Commercial Building Telecommunications Cabling Standard, and its published addenda.
 - c. 3. ANSI/TIA/EIA 568-C.0, Generic Telecommunications Cabling for Customer Premises, and its published addenda.

San Joaquin County Office of Education

- d. 4. ANSI/TIA/EIA 568-C.1, Commercial Building Telecommunications Cabling Standard, and its published addenda.
- e. 5. ANSI/TIA/EIA 568-C.2, Balanced Twisted-Pair Telecommunications Cabling and Components
- f. 6. ANSI/TIA/EIA 568-C.3, Optical Fiber Cabling Components Standard, and its published addenda.
- g. 7. ANSI/TIA/EIA-569-C, Commercial Building Standard for Telecommunications Pathways and Spaces, and its published addenda
- h. 8. ANSI/TIA/EIA-606-A, Administration Standard for the Telecommunications Infrastructure of Commercial Buildings, and its published addenda
- i. 9. ANSI/J-STD-607-A, Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications, and its published addenda.
- j. 10. Building Industries Consulting Services International (BICSI) Telecommunications Distribution Methods Manual (TDMM)
- k. 11. ANSI/TIA-942, Telecommunications Infrastructure Standard for Data Centers, and its published addenda.
- l. 12. NFPA 70 National Electric Code (NEC)
- m. 13. ISO 11801 Generic Cabling for Customer Premises .
- n. The Contractor is responsible to determine and adhere to the most recent edition of these standards when developing their responses.

2. SUBMITTALS

1. CONSTRUCTION SCHEDULE

A. CONSTRUCTION SCHEDULE TO BE PROVIDED BY THE CONTRACTOR AND APPROVED BY SJCOE PRIOR TO NOTICE TO PROCEED.

1. Submit a construction schedule outlining project milestone in the project as follows:
 - a. Submittals
 - b. Conduits & Raceways
 - c. Racks/Cabinets, and hardware & components
 - d. Copper Cable
 - e. Fiber-optic Cable
 - f. Cable Testing
 - g. Final Inspection
 - h. Closeout Documents, as-builds, test records, etc..

2. MATERIAL SUBMITTALS

A. SUBMIT MANUFACTURER'S LITERATURE INCLUDING PRODUCT SPECIFICATION, AND INSTALLATION INSTRUCTION FOR ALL HARDWARE, CABINETS, RACKS, COMPONENTS, CABLE, AND MATERIALS TO BE PROVIDED FOR THIS PROJECT.

1. Submit four (4) complete sets of Product Submittal as follows:
 - a. Each set shall be edge bound (not stapled).
 - b. Each set shall be formatted as follows:
 - c. Title Page, showing project name & address, owners name, Contractors name & address.

San Joaquin County Office of Education

- i. Table of Contents, listing page number of each product in submittal, product manufacturer and model number, in the order as follows:
- ii. Active components and electronic equipment.
- iii. Fiber-optic cable, with connectors, patch panels, and patch cables.
- iv. Category 6/Category 6A cable with connectors, patch panels, and patch cables.
- v. Racks and enclosures.
- vi. Raceways, including all manufacturers factory fittings, devices boxes, and faceplates, including each size to be used.
- vii. Conduits, including all fittings, connectors, bushings, and junction boxes, including each size to be used.
- viii. Misc. items, fasteners, cable support, sealants, etc.

3. CONSTRUCTION DRAWINGS

A. SUBMIT ONE (1) "ANSI B" SIZE REPRODUCIBLE CONSTRUCTION DRAWING.

1. Construction Drawings as follows:
 - a. EC0 – Title Sheet
 - b. EC0.1,2,3... – Drawing Index/symbol sheet.
 - c. EC1.1,2,3... – Site Plans
 - d. EC3.1,2,3... – Floor plans. At 1/8" scale, as follows:
 - i. Data outlet locations with circuit number.
 - ii. MDF & IDF locations
 - iii. Cable pathways
 - iv. Raceways
 - v. Rough in
 - vi. Mounting height
 - vii. Conduit size
 - viii. Wire type
 - ix. Wire fill
 - e. EC4.1,2,3... – Equipment Rooms/Rack Elevations. At scale as required.
 - f. EC5.1 – Riser
 - g. EC6.1 – Racks
 - h. EC7.1,2,3... – Installation Details, as required
 - i. Mounting details Stamped and signed by Engineer licensed in jurisdiction for Work of this type.
 - j. Show loads, strength of connections, etc.
 - k. Show calculations on drawings or in bound volume for review by authorities having jurisdiction.

4. SYSTEM SPECIFICATIONS

A. CABLE PLANT REQUIREMENTS

1. The cable plant shall be a star configuration, unshielded twisted pair system and shall support data rates as required for Category 6/Category 6A specifications.
2. The drop cable shall run from intermediate distribution frames (IDFs) to each classroom

San Joaquin County Office of Education

and office location as well as other miscellaneous locations defined in the scope of this project.

3. The trunk fiber-optic cable shall run between the main distribution frame (MDF) and each IDF location as indicated on the project drawings (if supplied).
4. The cable plant shall meet EIA/TIA-568 "Commercial Building Telecommunications Wiring Standard" and the maximum length of any UTP data drop shall NOT exceed 100 meters including patch cables and future station cables in the classroom.
5. Every IDF location shall have one 12-strand multi-mode (50/125 micron, OM3/OM4 fiber-optic cable) dedicated connection to the MDF for LAN service.
6. Quantity of LAN cable drops shall be as per the project drawings or as stated by SJCOE Network Services.

B. NETWORK DEVICE REQUIREMENTS

1. When network electronic devices (routers and switches) are called for, they shall be HP/Aruba brand products. Uninterruptible power supplies (UPS) shall be Tripp-Lite brand. All wireless network access points shall be Ruckus brand.

5. PRODUCTS

A. INSIDE PLANT CATEGORY 6/CATEGORY 6A CABLE, UTP

1. Cable shall meet, as a minimum, the requirements of the latest revision of ANSI/TIA-568-C.2 Category 6, ISO 11801 Class E, and IEC 61156-5 Category 6 and ANSI/TIA-568-C.2 Category 6A, IEEE 802.3an-2006, and ISO 11801 Class EA, and IEC 61156-5 Category 6A specifications.
2. Category 6 UTP cabling shall be Panduit PUP6004BU-UY or equivalent approved by SJCOE Network Services. Category 6A UTP shall be Panduit PUP6ASD04BU-UG OR PUP6AM04BU-UG or equivalent approved by SJCOE Network Services.

B. OUTSIDE PLANT CATEGORY 6/CATEGORY 6A CABLE, UTP

1. Outside Plant (OSP) Category 6/Category 6A cable shall be designed and constructed for installation in outside underground conduits and shall meet the transmission requirements for ANSI/TIA-568-C.2 and ISO 11801 Class E, Telcordia Specification GR-421-CORE Water Penetration Requirement Specifications for Category 6 and ISO/IEC 11801 Ed 2 Amendment 2:2010 Class EA, and ANSI/TIA 568-C.2 for Category 6A horizontal cables.
2. Cable construction shall utilize a UV-resistant Polyethylene (PE) jacket with water blocking flooded core. Category 6 OSP cable shall be Panduit PUO6C04BL-U or equivalent approved by SJCOE Network Services. Category 6A OSP cable shall be Belden OSP6AU or equivalent approved by SJCOE Network Services.
3. In the event that direct burial cable is required, Category 6 UTP cabling shall be Primus C6CMXF-2044BK or equivalent approved by SJCOE Network Services. Category 6A cabling shall be Primus C6AXT-1505 or equivalent approved by SJCOE Network Services.

C. CATEGORY 6/CATEGORY 6A PATCH PANELS

1. Shall be rack mounted with 24 and/or 48 modular front accessible RJ45 jack ports (Based on Configuration).
2. Panels shall be Panduit Part #CPP24FMWBLY (24-port) or #CPP48HDWBLY (48-port) loaded with 24 or 48 Category 6/Category 6A RJ45 jacks (based on configuration). Jacks shall be Panduit brand or equivalent approved by SJCOE Network Services. Specified

San Joaquin County Office of Education

colors for MDF/IDF modular jacks is as follows:

- a. Orange – All jacks installed for wireless access points.
- b. Blue – All jacks installed for anything other than wireless access points.

D. WIRE MANAGEMENT

1. Wire management shall be provided for each patch panel and switch installed into the MDF and IDF racks or cabinets (see drawings for details).
2. Vertical wire management shall be Panduit Part #WMPV45E.
3. Horizontal wire management shall be Panduit Part #WMPF1E.

E. DATA JACK PLATES/HOUSINGS/ENCLOSURES

1. Jacks shall meet the requirements of most recent revision of ANSI/TIA Category 6/Category 6A standards. The jacks shall be Panduit brand or equivalent approved by SJCOE Network Services.
2. Jack Plates and housings shall be appropriate for jack type and location where they are to be used and shall be labeled using a numbering system specified by SJCOE Network Services.
3. Specified colors for modular jacks is as follows:
 - a. Orange – All jacks installed for wireless access points.
 - b. Blue – All jacks installed for anything other than wireless access points.
4. Color for housing and enclosures shall be approved by SJCOE Network Services.

F. FIBER-OPTIC CABLE

1. All data backbone/trunk fiber-optic distances less than 1,000 feet shall be 12-strand multi-mode (50/125 micron, OM3/OM4 fiber-optic cable) Panduit/General Part # BL0121ANU.BK (OM4), BE0121ANU.BK (OM3), or equivalent approved by SJCOE Network Services.
2. All data backbone/trunk fiber-optic distances greater than 1000 feet shall be 12-strand single-mode fiber-optic cable Panduit/General Part # AP0121ANU.BK or equivalent approved by SJCOE Network Services.
3. All data fiber-optic cable shall be labeled with sequential strand identification including color scheme, and destination of fiber-optic cable.

G. FIBER-OPTIC PATCH PANEL

1. The fiber-optic enclosures for the MDF location shall be rack mountable with applicable number of LC duplex port connector outlets for termination of all fiber runs (6 strands per IDF). The fiber patch panel for the MDF shall be sized such that the initial installation does not exceed 50% of its capacity.
2. The MDF fiber-optic enclosures shall be Panduit Part #FRME1U (or larger enclosure if required).
3. The MDF fiber-optic patch panel should use Panduit Part #FAP6WAQDLCZ mounting plate with 6 duplex LC connectors shall be used to support each IDF. The Panduit Part #FRME4 will support up to 144 strands of fiber. If the configuration exceeds this capacity then the vendor should use comparable substitutions necessary to support the greater capacity.
4. The IDF patch panel shall be a Panduit Part #FRME1U loaded with Panduit Part #FAP6WAQDLCZ.
5. If current campus configuration utilizes ST or SC type connectors, then above mentioned

San Joaquin County Office of Education

part numbers shall be adjusted to substitute ST or SC. If the installation is part of a new campus, and there is no existing fiber optic cable, then LC type terminations and connectors are to be utilized.

H. FIBER-OPTIC PATCH CORDS

1. The fiber-optic patch cables shall be factory constructed using materials that are compliant with the current revision of fiber-optic standards.
2. The fiber-optic patch cables shall be:
 - a. Panduit Part #F62ERLNSNSNM for LC to SC (Multimode OM1) terminations
 - b. Panduit Part #FX2ERLNLNSNM for LC to LC (Multimode OM3) terminations
 - c. Panduit Part #FZ2ERLNLNSNM for LC to LC (Multimode OM4) terminations
 - d. For installations that require 50/125 multimode or 9/125 single mode fiber, part numbers must be adjusted to accommodate 50/125 or 9/125 fiber.

I. CATEGORY 6/CATEGORY 6A PATCH CABLES

1. The Category 6/Category 6A Patch Cables shall be factory constructed using materials that are compliant with the current revision of the Category 6 and Category 6A Standards.
2. The Patch Cables shall be Panduit UTP28SPBU (CAT6, Blue, No Boot), Panduit UTP28XBU (CAT6A, Blue, No Boot), or equivalent approved by SJCOE Network Services and the length shall be no longer than necessary to accommodate the physical layout of the equipment to be connected. In the event that larger gauge wiring is required for installation, substitute appropriate Panduit Category 6/Category 6A cable.

J. DATA CABINETS/RACKS

1. The following cabinets/racks or equivalent approved by SJCOE Network Services shall be used:
2. Cabinet size shall be selected such that the initial installation does not exceed 80% of the number of available rack space units.
3. All cabinets and rack systems color selection will be black.
4. All floor mounted racks will incorporate ladder racking and be mounted to the floor and wall for stability. All cut ladder racking will have rubber grommets installed to protect injury from the cut edge.
5. MDF rack or cabinet shall be the above listed CPI model unless site conditions necessitate a different model. Under such circumstances, limiting conditions shall be clearly explained in bid response. Substitution of a different cabinet shall only be considered if the CPI unit is not feasible.
6. Alert SJCOE Network Services if a larger network cabinet is required from those listed above. Typical cabinet size use will vary with each site installation.
7. Rack type will be specified by SJCOE Network Services.

K. FLEXIBLE CORRUGATED TUBING & CONDUIT

1. The flexible corrugated tubing & conduit shall be an extruded, corrugated wall, coil-able and meet the following additional criteria:
 - a. Manufactured of Polyethylene (PE) with a density of .944 gm/cc
 - b. One inch diameter
 - c. Orange in color

San Joaquin County Office of Education

- d. Tensile strength: 500 pounds.
- e. Impact Resistance at 32 degrees F: 50 ft. Pounds
- f. Couplings shall be threaded metallic type
- g. Shall have factory installed pull-rope
- h. Tubing & conduit will be Plenum type where required

L. RACK MOUNTED POWER STRIPS

- 1. Rack mounted surge protecting power strips will be:
 - a. 15 Amp - Tripp-Lite Part #IBAR12, rear mounted, 19" rackmount.
 - b. 20 Amp – Tripp-Lite Part # IBAR12-20T, rear mounted, 19" rackmount.

M. ACTIVE NETWORK DEVICES

- 1. MDF/IDF Network Switch shall be selected from the following list depending on port density. Note: . All power supply slots must be populated.
 - a. 24 port - Aruba 3810M 24G PoE+ 1-slot Switch (Part # JL073A)
 - b. 48 port - Aruba 3810M 48G PoE+ 1-slot Switch (Part # JL074A)
 - c. Up to 144 ports - Aruba 5406R Switch - 44 Copper PoE+ Ports and 4-Port SFP+ (No PSU) v3 zl2 Switch (Part # JL003A).
 - d. Up to 288 ports - Aruba 5412R Switch - 92 Copper PoE+ Ports and 4-Port SFP+ (No PSU) v3 zl2 Switch (Part # JL001A) .
- 2. MDF/IDV Network Switch Models shall be selected from the following list depending switch:
 - a. Required modules for Aruba 3810 24 or 48 port switches:
 - i. Aruba 3810M 4SFP+ Module (Part # JL083A) (Qty: 1)
 - ii. Aruba X372 54VDC 1050W 110-240VAC Power Supply (Part # JL087A)
 - b. Required modules for Aruba 5406R or 5412R:
 - i. Aruba 5400R zl2 Mgmt Module (Part # J9827A) (Qty: 1)
 - ii. Aruba 5400R 1100W PoE+ zl2 Power Supply (Part # J9829A)
 - iii. Aruba 5400R 2750W PoE+ zl2 Power Supply (Part # J9830A)
 - iv. Aruba 24p 10/100/1000BASE-T PoE+ v3 zl2 Mod (Part # J9986A)
 - v. Aruba 20p PoE+ / 4p SFP+ v3 zl2 Mod (Part # J9990A)
 - vi. Aruba Networking Multimode 1GB SFP (Part # J4858C)
 - vii. Aruba Networking Single-mode 1GB SFP (Part # J4859C)
 - viii. Aruba Networking Multimode 10GB SFP+ (Part # J9150A)
- 3. Uninterruptable Power Supply (UPS):
 - a. Tripp-Lite SmartPro® 120V 750VA 600W Line-Interactive Sine Wave UPS, 1U Rackmount, Pre-installed Network Management Card, USB, DB9 Serial (Part # SMART750RM1UN)
 - b. Tripp-Lite SmartPro® 120V 1.5kVA 1.35kW Line-Interactive Sine Wave UPS, 2U Rack/Tower, Pre-Installed Network Management Card, LCD, USB, 8 Outlets (Part # SMART1500RM2UN)
 - c. Tripp-Lite SmartPro® 120V 2.2kVA 1.92kW Line-Interactive Sine Wave UPS, 2U Rack/Tower, Pre-installed Network Management Card, LCD Display, USB, DB9 Serial (Part # SMART2200RM2UN)
 - i. 2-Post Rack-Mount or Wall-Mount Adapter Kit for select Rack-Mount UPS Systems (required) (Part # 2POSTRMKITWM)

San Joaquin County Office of Education

- 4. Power Management:
 - a. Tripp-Lite - 1.4kW Single-Phase ATS / Switched PDU, 120V (8 5-15R), 2 5-15P, 100-127V Input, 2 12ft Cords, 1U Rack-Mount, TAA (Part # PDUMH15ATNET)
 - b. Tripp-Lite - 1.4kW Single-Phase Switched PDU, 120V Outlets (16 5-15R), 5-15P, 10ft Cord, 0U Vertical, 49 in, TAA Compliant, TAA (Part # PDUMV15NET)
- 5. Wi-Fi Equipment shall be:
 - a. Ruckus Wi-Fi Access Point: ZoneFlex R700 dual-band 802.11abgn/ac Wireless Access Point, 3x3:3 streams, BeamFlex+, dual ports, 802.3af PoE support. Does not include power adapter or PoE injector. (Part #901-R700-US00)
 - b. Ruckus Wi-Fi Access Point License: 1 AP license for SZ100 to Manage Access Point (required). (Part #L09-0001-SG00)
 - c. Ruckus Wi-Fi Access Point Support: 1 year support for Access Point (required). (Part #S41-0001-1LSG)
- 6. All active network devices, including UPS units, must have industry standard warranty.

N. REPLACEMENT BRANDS

- 1. Replacement brands for all products specified above must be approved by SJCOE Network Services.

3. **EXECUTION**

1. LABELLING

A. GENERAL SPECIFICATIONS AND REQUIREMENTS

- 1. The label shall be machine printed using an electronic labeling system on appropriately size vinyl or other approved material.
- 2. The lettering color shall be black on a white background.
- 3. The label shall be a "self-laminating", adhesive material.
- 4. Contractor shall demonstrate a clear understanding of the labeling concept before proceeding with label application.
- 5. Hand written labels are unacceptable and will be replaced at the expense of the Contractor.

B. CATEGORY 6, CATEGORY 6A, AND FIBER-OPTIC CABLE

- 1. Cable label information shall appear at both ends of the cable to facilitate ease of reading.
- 2. Cable label information shall be applied approximately four inches back from the point of termination.
- 3. All cable labels shall have the same orientation.

C. COPPER AND FIBER-OPTIC PATCH PANELS

- 1. The label shall be applied in the space provided on the patch panel.
- 2. Cable label shall depict the letter designation of the MDF/IDF that is serviced by that cable.

2. WIRING CABINETS

A. MAIN DISTRIBUTION FRAME (MDF)

- 1. The designated cabinet will serve as the MDF and will serve as the connection point for

San Joaquin County Office of Education

the designated IDF (Intermediate Distribution Frame) Wiring Cabinets.

2. The cabinet shall contain all necessary components to provide a fully functional system.
3. The MDF will also connect to an RJ-45 jack that shall provide connection to the SJCOE Wide Area Network (WAN).
4. To permit connection of the system installed under this contract, to the SJCOE Wide Area Network (WAN), an RJ-45 jack shall be provided at the WAN location and connected to the MDF wiring cabinet utilizing Category 6/Category 6A cable.
5. The WAN connection will be existing or will be installed under another contract (not part of this contract).
6. The WAN Connection typically will be near the Telephone Company's MPOE point. The exact location will be as directed by SJCOE Network Services at the time of the Local Area Network installation.
7. The MDF wiring cabinet shall be installed in a secure, lockable, air-conditioned area. If no space is available in this area then the cabinet shall be located in a suitable area near the Administration area. The MDF should be located as specified on the associated drawings (if provided) unless otherwise noted.

B. INTERMEDIATE DISTRIBUTION FRAME (IDF)

1. The designated IDF wiring cabinet shall contain all necessary components required to provide a fully functional system.
2. The components shall provide connectivity to the fiber-optic backbone and connection to data outlets in various locations.
3. The IDF shall be located within 90 Meters of all data network jacks served by the IDF.

C. CABINET MOUNTING

1. Provide the following equipment and materials at the MDF and IDF locations:
 - a. A fire rated AC, 3/4" plywood backboard measuring a minimum of 2' X 4' shall be installed on an appropriate wall. The backboard shall be installed in a manner that will allow the designated cabinet to be mounted approximately six inches from the ceiling unless otherwise designated. The plywood backboard shall be installed with the A-graded face exposed. The backboard shall be securely attached to wall studs with appropriately sized hardware to support the weight of the cabinet and proposed network equipment.
 - b. Floor mount freestanding racks require 30" minimum clearance from walls and obstructions unless otherwise designated. Ladder racking shall be installed from the wall to the relay rack for free standing systems. All ladder racking that is cut to length shall have rubber caps installed over exposed, cut surfaces (Panduit or CPI P/N:).
 - c. The mounting of cabinets and racks shall be done in accordance with all code requirements including earthquake standards for the local area/municipality. It is the vendor's responsibility to fully comply with these requirements to help ensure the safety of SJCOE's students and employees.
 - d. All cabinets shall be grounded or bonded in accordance with NEC Article 250.

D. CATEGORY 6/CATEGORY 6A CABLING

1. All Category 6/Category 6A cable installation shall be in accordance with manufacturers recommendations, and as referenced in the TIA/EIA standard, and the following:
 - a. All cable shall be hand pulled and neatly formed.
 - b. Vendor will provide rigging to allow cable to feed from spools without twists.
 - c. Cable pulling tension shall not exceed 25 pounds.

San Joaquin County Office of Education

- d. Cable runs shall be installed in continuous lengths, without splice.
 - e. Minimum cable bending radius shall not be less than four times the cable diameter or less than the manufacturers recommendation, both during cable pulling and in the final installation.
 - f. Individual and group cable runs in accessible ceiling spaces shall be open cable runs supported by "J" hooks attached to the building structure. Cable support spacing shall not be greater than 5 feet. Cables shall not be pulled tight, but shall exhibit a "noticeable" sag.
 - g. Cables shall not be pulled through "J" hooks, but shall be pulled using low friction devices such as pulleys or other equipment, then placed into the "J" hooks."
 - h. Cable routing shall be positioned to minimize obstruction when accessing the space and to minimize the potential for damage from other building construction or maintenance operations.
 - i. Cables shall be routed by grouping into a bundle and branching to the final locations with right angle bends.
 - j. Provide as a minimum, 10' service loop inside the cabinet for each cable run, neatly formed and mounted to the back of the cabinet.
 - k. Bundled cables shall be tie wrapped to prevent undue sagging between cable support devices. Tie wraps shall be hook & loop, ½" width, black. Cable tie wrap shall be installed hand tightened, without tools, to avoid deforming the cable.
 - l. Cables shall not rest upon "T" bar ceiling or be supported from existing ceiling fixtures, or air terminal support wires.
 - m. Provide a 6" to 12" service loops of cable at each jack location, hidden within the wall space, and 10' service loop of cable in the ceiling (if possible), to accommodate future servicing of the jack.
 - n. All cable in exposed indoor areas shall be installed and enclosed in an approved plastic raceway system which provides a not to exceed 40% fill ratio.
 - o. Cable routed via concealed, non-accessible spaces shall be installed as shown on the drawings.
 - p. Maintain cable spacing from sources of electromagnetic interference in accordance with TIA/EIA-569 – verify spec.
 - q. Observe manufacturer's recommendations for cable stripping and maintenance of pair twists at terminations. Maintain cable jacket to within .5 inches of the point of termination.
 - r. Cables in classroom, offices, etc. shall be installed within wall spaces where possible. Drill through blocking if necessary. If drilling through blocking is necessary, the drilled hole shall be filled with fire putty after cable is installed.
 - s. Refer to Section 1 for labelling specifications and requirements.
2. Category 6/Category 6A Patch Panels
- a. Install Category 6/Category 6A patch panels at locations in wiring cabinets as indicated.
 - b. Cables shall be secured with hook & loop cable tie wraps at patch panel cable management support bar to stabilize cable and ensure proper maintenance of bend radius.
 - c. Each patch panel port shall be labeled with the jack number that it serves. The label on the attached port cable shall provide the information for the port label.

San Joaquin County Office of Education

- d. Port label shall consist of the MDF/IDF designation followed by a 2-character code, designating site/building location and the MDF/IDF location, followed by a 2-digit drop location number, for example:

SJCOE Nelson Center Building, Payroll IDF #1:

- 1 – IDF NP-1.1
- 2 – IDF NP-1.2
- 3 – IDF NP-1.3
- 48 – IDF NP-1.48
- 72 – IDF NP-1.72

- e. Port labelling for the ceiling network jacks installed for the wireless access points, follows the same treatment as above, with the addition of a W between the character code and 2-digit drop number, for example:

SJCOE Nelson Center Building, Payroll IDF #1, Wireless Access Point Ceiling Drop:

- Ceiling Jack 1 – IDF NP-W-1.1
- Ceiling Jack 2 – IDF NP-W-1.2
- Ceiling Jack 3 – IDF NP-W-1.3
- Ceiling Jack 4 – IDF NP-W-1.4
- Ceiling Jack 48 – IDF NP-W-1.48

- f. Refer to Section 1 for labelling specifications and requirements.

3. Category 6/Category 6A Data Jacks

a. Placement and adjustments of jack locations

- i. Contractor shall locate jacks as near as possible to the specified, pre-determined locations.
- ii. Where jack locations are obstructed by existing construction or architectural features, or to accommodate minor furniture re arrangement, please verify revised jack locations as with SJCOE Networking Services.
- iii. Any jack location revisions as directed by the owner shall be accomplished at no change in contract cost, if re location is within 20 feet and remains within the room shown on the plans.
- iv. Category 6/Category 6A jack numbers will be developed by the Contractor using the following information and have the generalized format shown below:

XX-ZZZ Where: XX=MDF/IDF designation. Will be capital letters, utilizing a 2-character code designating the MDF or site/building name and IDF location. ZZZ= Jack location # beginning with 001 and ending at 899 (e.g. 001,005,090, etc.). All ceiling jacks will continue using the ZZZ indication, beginning with 901 and ending with 999, for example:

SJCOE Nelson Center Building (or any site/building), MDF:

San Joaquin County Office of Education

- 1 – MD-001
- 2 – MD-002
- 3 – MD-003
- 48 – MD-048
- 72 – MD-072

SJCOE Nelson Center Building, Payroll IDF #1:

- 1 – NP-001
- 2 – NP-002
- 3 – NP-003
- 48 – NP-048
- 72 – NP-072

SJCOE Nelson Center Building, Payroll IDF #1, Wireless Access Point Ceiling Drop:

- Ceiling Jack 1 – NP-901
- Ceiling Jack 2 – NP-902
- Ceiling Jack 3 – NP-903
- Ceiling Jack 4 – NP-904
- Ceiling Jack 48 – NP-948

- b. Refer to Section 1 for labelling specifications and requirements.
- 4. Category 6/Category 6A cable and Data Jack Testing (No PASS / FAIL test results accepted, full test results reports only).
 - a. All Category 6/Category 6A cable and jacks shall be tested following installation. Testing shall be in accordance with TIA/EIA TSB 67 for link testing at Category 6/Category 6A standards and shall meet the following criteria:
 - i. Field tester shall meet TIA/EIA TSB 67 level IIe accuracy criteria.
 - ii. Field tester shall be Fluke DSP 4000 or better.
 - iii. The chosen test shall check the following parameters:
 - Wire Map
 - Length
 - Attenuation NEXT
 - PSNEXT
 - ELFEXT
 - Delay and Delay Skew
 - PSELFEXT
 - SRL
 - PS NEXT
 - b. Any cable or termination which fails to test within accuracy criteria shall be replaced and retested, at Contractor's cost.

San Joaquin County Office of Education

- c. Proper cable NVP shall be entered into tester prior to testing, according to cable manufacturer's specifications.
 - d. Three copies (hard copy) and one electronic copy in PDF format of the test results shall be delivered to the Owner prior to project acceptance.
5. Fiber-optic Cabling
- a. All Category 6/Category 6A cable installation shall be in accordance with manufacturers recommendations, and as referenced in the TIA/EIA standard, and the following:
 - i. Fiber optic cable shall be installed only after complete raceway system and flexible conduit has been installed.
 - ii. Any observed bending of any fiber-optic cable during the installation process which exceeds the manufacturer's recommended bending radius shall be cause for complete replacement of that cable at the Contractor's expense. Such bending can cause micro-cracks which are undetectable with normal testing, and which can cause performance problems in later years.
 - iii. Fiber-optic cables runs shall be installed in a continuous length, no splice allowed. Additionally, there shall be no cross-connects between any IDF and the MDF, without prior approval.
 - iv. Provide necessary rigging to allow cable to feed from reels without twisting and provide a smooth bending transition of cable outside the raceway.
 - v. Pulling tension shall be monitored and not exceed the cable manufacturer's recommendations.
 - vi. Minimum cable bending radius shall not be less than 20 times the cable diameter during pulling installation and not less than 10 times the cable diameter after installation.
 - vii. All fiber-optic cabling installed underground and within buildings shall be installed in an approved raceway. Fiber-optic cable installed in accessible attic spaces may be run without flexible conduit in "J" hooks or other approved support system.
 - viii. All fiber-optic cabling installed underground shall be rated for outdoor installation and shall be installed in an approved underground raceway.
 - ix. Provide a 36" length of buffered fiber at each fiber patch panel or storage tray. Provide at a minimum, a 15' service loop of cable at both ends of each cable run, neatly formed and mounted to the back of the cabinet.
 - x. Individual buffered fibers shall be grouped in pairs and labeled. The fiber pair shall be considered as a single port cable (much the same as a 4 pair, Category 6/Category 6A cable is considered a single port cable).
 - xi. When SC connectors shall be installed on the fiber pair, a separate duplexing clip shall be applied to join the connectors as a duplexed pair.
 - xii. When LC connectors shall be installed on the fiber pair, a separate duplexing clip shall be applied to join the connectors as a duplexed pair.
 - xiii. SC/ST connector shall be attached to the fiber using an epoxy type cement, or equal. Crimp type connectors are unacceptable.
 - xiv. Any cable not meeting SJCOE Network Services approved specifications shall not be installed.
 - xv. Any cable installation not meeting manufacturer specifications shall be removed and reinstalled at the expense of the Contractor.
 - b. Refer to Section 1 for labelling specifications and requirements.

San Joaquin County Office of Education

6. Fiber-optic Patch Panel
 - a. The MDF fiber-optic patch panel labeling shall have the following generalized format, denoting the location of the IDF serviced, for example:

SJCOE Nelson Center Payroll IDF: NC Payroll IDF

SJCOE Nelson Center Business Services IDF: NC Business IDF

SJCOE Wentworth Education Center Downstairs COSP IDF: WEC Downstairs COSP IDF
 - b. Each fiber-optic strand shall be labelled 1 through 24 and fibers are to be terminated on the patch panel using standard color coding. For example:

Strand 01= BLUE

Strand 02= ORANGE

Strand 03= GREEN

Strand 04= BROWN

Strand 05= SLATE

Strand 06= WHITE

Strand 07= RED

Strand 08= BLACK

Strand 09= YELLOW

Strand 10= VIOLET

Strand 11= ROSE

Strand 12= AQUA

...and so on.
 - c. Labelling: Refer to Section 1.07 for labelling specifications and requirements.
7. Fiber-optic Connectors
 - a. Connectors shall be attached to fiber strands preferably using a SWIFT Fusion Splicer or equivalent approved by SJCOE Network Services.
 - b. Crimp type connectors are unacceptable.
 - c. Connectors with indexing gel are unacceptable.
8. Fiber-optic Cable and Connector Testing
 - a. All fiber-optic cable shall be tested using an approved Fluke DSP 4000 or better.
 - b. After installation and termination of the cable all fiber-optic connectors shall be tested using an approved Fluke DSP 4000 or better.
 - c. Measurements shall be made from both ends of the cable.
 - d. Measured results shall be within cable manufacturers specifications.
 - e. Cable shall be tested at both 850 nm and 1300 nm for Multi-mode fiber.
 - f. Cable shall be tested at both 850 nm and 1300 nm for Single-mode fiber.
 - g. Any cable or termination, which does not meet manufacturers specifications, shall be replaced and retested, at Contractor's cost.

San Joaquin County Office of Education

- h. Three copies (hard copy) and one electronic copy in PDF format of the test results shall be delivered to the Owner prior to project acceptance.
 - 9. Flexible Corrugated Tubing/Conduit
 - a. Any time fiber-optic cable penetrates a building or is exposed in an outdoor, underground service or electrical box, it shall be enclosed in SJCOE Network Services approved flexible corrugated conduit. If it is not reasonable or feasible to use flexible conduit due to space limitations or routing issues, then a SJCOE Network Services must be notified.
 - 10. Network Electronics installation
 - a. Network electronics and UPS units shall be preconfigured, labelled and tested by SJCOE Networking Services prior to installation in their MDF or IDF rack/cabinet.
 - b. Network electronics and UPS units shall be powered from a dedicated electrical circuit.
- E. AS-BUILT DRAWINGS & CLOSE-OUT DOCUMENTS
 - 1. As-built drawings shall be an augmentation of existing SJCOE As-built drawings whenever SJCOE possesses and provides electronic drawings.
 - 2. As-built Drawings shall also include wire routing and terminations within rack or cabinet.
 - 3. Provide three (3) sets, of bound operation and maintenance manuals, including approved material submittal, and record of field changes.
 - 4. Provide three (3) sets, in 3-ring binders, and one (1) electronic copy in PDF format of Cat-6 and fiber optic cable test records.
 - 5. Provide complete as built wiring diagrams in Visio format.