

Victor Elementary School District
Technology Department
Bill Klopping, Dir of Technology
14875 S. Mojave Drive
Victorville, CA 92392
Phone 760.245-3533
Fax 760.245-5043
www.vesd.net

Victor Elementary School District

Technology Infrastructure Standards

Table of Contents

INTRODUCTION	3
OVERVIEW OF STANDARDS	3
GENERAL CONDITIONS	5
EQUIPMENT SPECIFICATIONS	7
I. Active Network Components	7
II. Uninterruptible Power Supplies.	8
MATERIAL SPECIFICATIONS	8
I. All fiber optic cable and components shall be manufactured by Corning.	8
II. All CAT-6 cable shall be manufactured by Belden.	9
III. All CAT-6 termination equipment shall be manufactured by Leviton Telecom.	9
IV. All surface mount raceway shall be manufactured by Panduit.	9
V. MDF Cabinets	10
IDF Cabinets	10
VI.	10
VII. Electro Static Discharge Flooring.	11
VIII. Cable	11
IX. Conduit	13
X. Raceways (Ladder Racking)	14
TESTING	15
1. Copper Cable Testing	15
2. Optical Fiber Cable Testing	15
DOCUMENTATION	16
PROJECT DIRECTION	17
WARRANTY	17
INSPECTION	18
SUBMITTALS	20
ENGINEERING	20
DAMAGES	21

INTRODUCTION

Victor Elementary School District desires to provide, at its Schools and District sites, a state of the art voice/video/computer network system that will accommodate both present and future computer applications. The intent is to achieve an industry standard-based infrastructure, which will enhance educational and administrative activities on school sites with the flexibility and support of future needs and activities. To that end, the Victor Elementary School District (hereinafter referred to as District) has developed the following specifications, requirements and guidelines for all MAN and LAN installations in the District.

OVERVIEW OF STANDARDS

The Local Area Network system shall utilize a network of fiber optic, and unshielded twisted pair, riser, tie, and station cables. The fiber backbone will operate at a minimum speed of 1 and preferably 10 Gigabits from the core switch to switching hubs that will provide 10/100 Base-T connections to a minimum of 6 drops in each classroom, library, cafeteria, resource rooms, labs and office area but no less than the current number of installed nodes. Each 1/10-gigabit connection will be a home-run from the MDF to each IDF. Each IDF will service 4 classrooms. The office areas will be provided a separate IDF unit. Computer Labs will be configured with a dedicated IDF cabinet and a minimum of 48 computer nodes.

Each building will be provided with at least an 1-1/2 inch conduit for each classroom dedicated for computer technology only. The conduit requirements between buildings may be combined into a single larger conduit (minimum 6 inches), which will terminate into vaults outside of the buildings.

The MDF will consist of a minimum of 3 stand-alone cabinets connected and anchored side by side. The cabinets will be mounted with at least 3 feet (4 feet for new construction) of clearance from any wall and will be placed where the cabinets, conduit, and ladder racking will not block any access panels or equipment in the wall or the ceiling. The first cabinet will consist of termination panels for both fiber and copper cables. The second cabinet will contain the MDF electronics only. The third cabinet will house site equipment. Additional space needed for other applications such as servers, intercom, fire alarms or CCTV equipment will be

placed in additional matching cabinets. All electronic and cable equipment will be rack mounted. Ladder racking will be installed and used to transfer cabling to and between the cabinets. The cabinets will be capable of accepting additional bays as the need arises. The MDF cabinets will be placed in an area designated as the MDF room. The room will be centrally located and will not be designated for any other purpose. The MDF room will be of at least 120 square feet (180 square feet for new construction) with 8 foot (10 foot for new construction) minimum ceilings. The MDF room will be air conditioned with its own unit and thermostat. The MDF room will be fed by its own electrical service. Any cabinets that will contain equipment will have a 30 amp dedicated circuit for connecting an UPS. The MDF room will be carpeted with a District approved ESD flooring. The MDF room will be equipped with a networked temperature monitor with camera. The MDF room will be placed and designed to prevent the noise of all electronic and cooling equipment from disturbing other building occupants.

Those sites constructed so that all nodes are within the same building and the runs are less than 300 feet will utilize home runs from the wall jacks to the patch panel in the MDF room. There will be no IDF points in this configuration. The MDF switch must be designed with ample room for ventilation, accessibility, and located in such a manner that all patch cables are easily dressed into cable managers.

The IDF cabinets will be wall mounted. All electronic and cable equipment will be rack mounted. IDF cabinets will be provided with a 120v outlet inside dedicated to network equipment. The IDF cabinet will be provided with a rack mounted UPS unit of the correct size for the anticipated load, including POE. The IDF Cabinet will be mounted at least 2 inches from the ceiling with a minimum of 12 inches of side clearance for access. All computer drops will be home runs to the IDF cabinet. There will be 1 IDF for each 4 classrooms unless building layout logically suggests more. When one IDF might serve more than 4 classrooms, the fiber count in that cable will double. Each IDF switch will be provided its own fiber link to the MDF. No IDF switch will serve more than 24 ports. No IDF will serve more than 6 classrooms.

All patch cords, computer cables, and terminations shall be provided. Fiber cables shall terminate on Fiber Distribution Centers (FDC's) and/or modular patch panels located in all demarcation and termination

points. All cables and terminations shall be identified at all locations. All copper cable terminations shall comply with and be tested to TIA/EIA 568A, TIA-568-B and TSB-67 standards for CAT-6 installations. No splices will be allowed in either fiber or copper home runs. All fiber strands will be terminated and connected to a panel. Fiber and Copper patch panels will be placed in the top of the MDF and IDF cabinets in this order; 2 inch fan clearance, fiber panel, wire manager, copper panel, and wire manager. Each District Site will be connected by T-1 (or larger) data lines to the Technology Department. Interconnectivity will be provided by Cisco Routers and Adtran Digital modems. Contractor will install all equipment and configure to District Standards. All cabling, connections, and equipment will support Layer 3 switching, voice over IP, and power over Ethernet (POE).

GENERAL CONDITIONS

If school will be in session during the time the work is to be performed, the contractor must be careful not to disrupt classes while they are in session. Excessive noise or equipment work will be performed only during non-school hours from 3:30 p.m. to 12:00 a.m. Monday through Friday. Scheduling on Saturday and Sunday must be coordinated with the District.

Any work external to the confines of the buildings and drawings shall be governed by the provisions of this specification and the applicable drawings.

The contractor must cover all internal work areas to prevent the contamination of student and teacher materials with dirt and debris caused by construction.

All classroom materials, teaching tools and props must be returned to their original places, unless written specific authorization is given, so that classes may continue normally.

Contractor must remove all tools, equipment, excess construction materials, and construction waste from student accessible work areas when leaving any portion of the project. Contractor must remove all tools, equipment, excess construction materials, and construction waste when the total project is finished.

The selected contractor will make recommendations for any required structural, electrical and/or environmental system upgrades.

The contractor will be responsible for providing necessary electrical services to all new MDF and IDF locations; and upgrading existing electrical service to existing MDF and IDF's which will be modified or added to.

All receptacles, blocks, patch panels, terminations, etc. will be uniformly color coded and labeled for use.

Install necessary fiber patch panels, Ethernet twisted pair patch panels, and RJ45 jacks as required for connections to the desktop.

Data-Power poles shall be provided to extend voice, data and electrical capabilities from overhead to the work area level when indicated on drawings. Otherwise, all outlets will be installed in the walls.

The Contractor shall be responsible for printed labels on cables and cords, distribution frames, and outlet locations, according to District specifications i.e., 2N-001-V, 2N-001-D1, 2N-001-D2 at the time of delivery. No labels are to be written by hand.

The Contractor shall be responsible for providing an approved ground at all newly installed distribution frames, and/or insuring proper bonding to any existing facilities. The contractor shall also be responsible for ensuring ground continuity by properly bonding all appropriate cabling, closures, cabinets, service boxes, and framework. All grounds shall consist of #6 AWG copper wire and shall be supplied from a District approved building ground and bonded to the main electrical ground. Grounding must be in accordance with the NEC, NFPA and all local codes and practices.

Sealing of openings between floors, through rated fire and smoke walls, existing or created by the contractor for cable pass through shall be the responsibility of the contractor. Sealing material and application of this material shall be accomplished in such a manner that is acceptable to the local fire and building authorities having jurisdiction over this work. Creation of such openings as are necessary for cable passage between locations as shown on the drawings shall be the responsibility of the con-

tractor's work. Any openings created by or for the contractor and left unused shall also be sealed as part of this work.

Generally, place receptacles approximately 18 inches from the floor. Should this be viewed as impossible due to the structure of the building or aesthetics, vendor will place receptacle within 3 feet of position indicated.

Where penetrations through acoustical walls or other walls for conduit or raceways have been provided for the Contractor, such penetrations shall be sealed by the Contractor in compliance with applicable code requirements and as directed by the District.

Where penetrations through fire-rated walls for conduit or raceways have been made for the Contractor, such penetrations shall be sealed by the Contractor as required by code and as directed by the District. Contractor shall, prior to the commencement of on-site activities, submit to District for review by its Architect, details of any special systems to be used

EQUIPMENT SPECIFICATIONS

I. Active Network Components

- A. MDF Fiber Switch – Cisco Catalyst 6513 chassis, fan blade, 48 port 10/100/1000 POE blade and a GBIC blade with accompanying fiber modules to support IDF Equipment or computer nodes. Switch will be equipped with a minimum of 1 and preferably 2 supervisor engine 720 cards and 2 power supplies to accommodate redundancy and P.O.E.
- B. Alternate MDF Fiber Switch for Smaller Systems – Cisco Catalyst 6509 chassis, fan blade, 48 port 10/100/1000 POE blade and a GBIC blade with accompanying fiber modules to support IDF Equipment or computer nodes. Switch will be equipped with a minimum of 1 and preferably 2 supervisor engine 720 cards and 2 power supplies to accommodate redundancy and P.O.E.
- C. Twisted Pair Switches – Cisco Catalyst 24 port 3560 with POE and Gigabit transceiver module.

- D. Router – Cisco Model 2821 router with 2 LAN and 2 Wan ports with HWIC cards and cable to attach to CSU/DSU.
- E. Adtran CSU/DSU Model TSU-ESP.
- F. All equipment will be rack mounted.

II. Uninterruptible Power Supplies.

- A. Per server installed- One APC rack mounted Smartups 3000VA (or larger to accommodate equipment needs) with a network module for monitoring temperature and providing SNMP data to network monitors.
- B. Per MDF- One APC rack mounted Smartups 5000VA (or larger to accommodate equipment needs) with a network module for monitoring temperature and providing SNMP data to network monitors.
- C. Per IDF- One APC rack mounted Smartups 1500VA (or larger to accommodate equipment needs) with a network module for monitoring temperature and providing SNMP data to network monitors.

MATERIAL SPECIFICATIONS

The Victor Elementary School District has established a standard for data communications wiring practices and requires the following materials.

- I. All fiber optic cable and components shall be manufactured by Corning.**
 - A. Corning Freedom loose tube gel-free cable shall be used where cables are installed underground and more than 50 feet into a building.
 - B. Corning Altos loose tube gel-free cable shall be used where cables are installed underground and less than 50 feet into a building.
 - C. Corning MIC indoor tight buffer PVC or Plenum cable where required.

- D. Corning LANscape fiber optic panels and hardware shall be used for fiber terminations.
- E. Corning Glass Insert Anaerobic ST connectors shall be used for all fiber optic terminations.
- F. Each Corning cable run will contain 8 multimode and 4 single mode fibers. The count will double if the IDF serves more than 4 rooms.

II. All CAT-6 cable shall be manufactured by Belden.

- A. All CAT-6 cable shall be Belden Datatwist 600e PVC or Plenum where required.
- B. All cabling running below floor level will be rated for underground.
- C. All patch cables and computer cables will be rated for CAT-6.

III. All CAT-6 termination equipment shall be manufactured by Leviton Telecom.

- A. All data jacks shall be Leviton eXtreme.
 - Leviton p/n 61110-R*6 (*- indicates color)
- B. All data patch panels shall be Leviton eXtreme with T568A wiring scheme.
 - Leviton p/n 69586-U** (**-indicates number of ports)

IV. All surface mount raceway shall be manufactured by Panduit.

- A. All Panduit fittings shall be CAT-6 rated.
- B. All Panduit will have proper fittings, boxes and ceiling tile entrance fittings and shall be mounted with proper fasteners.
- C. Panduit installed using the double-faced tape on the back will not be accepted.
- D. All Panduit shall be installed in a neat, level, square workman like manner and properly sized for the number of conductors installed.
- E. All Panduit locations will be pre-approved by the District.

- F. Panduit will never be used when it is possible to run inside the wall or ceiling.

V. MDF Cabinets

All MDF cabinets shall be manufactured by ESW. Other manufactures such as APC or APW may be presented for District consideration. No plastic construction (especially hinges) will be accepted. Each MDF will consist of three cabinets. The minimum cabinet dimensions will be 84(h)x24(w)x36(d) inches. The width of the cabinets will be expanded when the need for vertical management is present. The cabinets containing the patch panels and the core switch shall be 28 inches wide or better and equipped with vertical wire managers. The mounting rails will be punched to accept nut plates for equipment mounting. No threaded rails will be accepted. The cabinets will be equipped with locks. The cabinets will have solid back doors with bottom vents, solid sides, and glass front doors. The cable cabinet will have a top panel suitable for conduit attachment and no fan. The second cabinet will be properly attached to the cable cabinet without the sides installed. The third cabinet will be attached to the second and there will only be one side installed on the end. Only the cabinets on the ends will have a side installed. They will have a minimum of a 500 cfm exhaust fan located in the top and two outlet strips. The finish color will be as requested by the District.

VI. IDF Cabinets

IDF cabinets shall be manufactured by ESW. Other manufactures such as APC or APW may be presented for District consideration. The IDF cabinets will be wall mounted double swing units of at least 30(h)x24(w)x20(d) inches. No plastic construction (especially hinges) will be accepted. The mounting rails will be punched to accept nut plates for equipment mounting. No threaded rails will be accepted. The cabinets will have a glass front and be equipped with locks. The IDF cabinet will be provided with a double gang 120v outlet inside, so that there is a total of 4 useable 120v outlets. The IDF Cabinet will have provisions for air circulation on the sides and utilize a low noise exhaust fan (no less than 100 CFM) at the top. The IDF cabinets will be mounted to the walls on a painted plywood backing. The finish color will be as requested by the District.

VII. Electro Static Discharge Flooring.

ESD flooring will be of the type as manufactured by UTP Industries, or Julie INC. The installation will strictly adhere to the manufacturer instructions. The Grounding strip will be a minimum of 36 inches in length with no more than 2 inches above the carpet. The District will determine the location of the grounding point.

VIII. Cable

All communication cabling used throughout this project shall comply with the requirements as outlined in the National Electric Code, Articles 725, 760, 770 and 800, and the appropriate local codes. All copper cabling shall bear CMP (Plenum Rated), CM/CMR (Riser Rated) and/or appropriate markings for the environment in which they are installed. All fiber optic cabling shall bear OFNP (Plenum Rated), OFNR (Riser Rated) and/or appropriate markings for the environment in which they are installed.

All cabling must meet or exceed current industry standards such as IEEE, BICSI and EIA/TIA. All new Network materials will support Layer 3 Switching, Voice over IP and Power over Ethernet (POE).

It shall be the responsibility of the Contractor to furnish any special installation equipment or tools necessary to properly complete the System. This may include, but is not limited to, tools for terminating cables, testing equipment for copper/fiber cables, communication devices, jack stands for cable reels, or cable wenchers.

The Contractor shall ensure that the maximum pulling tensions of the specified distribution cables are not exceeded and cable bends maintain the proper radius during the placement of the facilities. Failure to follow the appropriate guidelines will require the Contractor to provide in a timely fashion the additional material and labor necessary to properly rectify the situation. This shall also apply to any and all damages sustained to the cables by the Contractor during the implementation.

All fiber cable installation will be home runs from the MDF Cabinet to each IDF Cabinet. All copper cable runs will be home runs from the classroom jacks to the IDF Cabinet. No splices allowed.

All Copper cable will be installed above the floor line unless construction restraints prevent it. All fiber installed below the floor line will be rated for underground.

Plenum rated cable must be run inside buildings where appropriate.

Install approved wire mold in areas where wall cavities are not available and the District has approved.

The Contractor shall not place any data cabling alongside power lines, or share the same conduit, channel or sleeve with electrical apparatus.

All CAT-6 UTP wire shall follow the EIA/TIA-568A wiring standard, non-keyed pass through wiring scheme.

Each room data drop will consist of a minimum of 6 Data twist 600e cables. All data connections will be home runs to the IDF or MDF terminating on standard patch panels.

The room data ports will be configured in one of three choices to be obtained from the Site Administrative Manager:

1. 2 outlets consisting of 4 nodes in one and 2 in the other.
2. 6 outlets in one location.
3. 3 outlets consisting of 2 nodes in each location.

The Site Administrative Manager will provide a drawing of each room with the specified configuration before the work begins.

In suspended ceiling and raised floor areas where duct, cable trays or conduit are not available, the Contractor shall bundle, in bundles of 50 or less, station wiring with cable ties snug, but not deforming the cable geometry. Cable bundles shall be supported via J-hooks attached to the existing building structure and framework at a maximum of 5 foot intervals. Plenum rated cable ties will be used in all appropriate areas. The contractor shall adhere to the manufacturer's requirements for bending radius and pulling tension of all data and voice cables.

Cables or J-hooks shall not be attached to lift out ceiling grid or lighting supports or lay directly on the ceiling grid.

Cables or J-hooks shall not be attached to or supported by fire sprinkler heads, delivery systems, a/c ducts or attachments or any environmental sensor located in the ceiling air space.

Any fiber or copper cable used for data networking which runs below any floor line will be rated for underground placement.

IX. Conduit

The District has spent considerable time and expense to preinstall conduit for data cabling as well as for other services such as fire alarms and intercoms. It is the goal of the District to avoid the installation of any new conduit and to use the existing conduit for its intended purpose. However, we recognize that it may be necessary to install conduit in some instances. Unless otherwise approved by the Technology and Maintenance departments, all cable will be installed in conduit designated for technology. It is the responsibility of the contractor to confirm the use of the correct conduit with the District.

All conduit pull boxes must be U.L. approved watertight units and installed according to design specifications for the given use.

All conduit building penetrations will be properly sealed against the weather. These seals will last a minimum of 10 years.

Fiber cable between buildings will be installed in existing conduit where possible.

When distances between buildings are 6 inches or less, where conduit is not available, a 12" x 12" box shall be installed above ceiling level inside both rooms and a 3 inch (minimum) conduit installed from box to box. The Conduit will be rigid pipe and solidly anchored on one end and floating on the other end.

When distances between buildings are greater than 6 inches and conduit is not available, new underground conduit shall be installed between the buildings. Under no circumstances is a penetration to be through a roof or on the front of any portable.

All outside wire will be enclosed in conduit. No exposed cabling will be accepted.

All conduit trenching must be re-compacted and all concrete and/or asphalt must be replaced.

All conduit used for fiber optic cable shall have bends (sweeps) in accordance with fiber optic cable installations and all underground conduit will be buried a minimum of 24 inches deep.

Newly installed conduit shall have no more than a 50% fill rate.

All outside conduit must be connected with waterproof connectors.

All conduit installation will be pre-approved by the District.

X. Raceways (Ladder Racking)

Provide raceway of required size and type where needed. Provide accessories required for a complete installation.

Route raceway to avoid interferences, using standard sections and a minimum number of field-cut sections.

Route raceway to avoid interference with removal and installation of lighting fixtures and devices of other systems, which require servicing or operation.

Remove any sharp burrs or edges from raceway.

Completed raceway runs shall have no cracks or openings at coupled sections.

Radius fittings shall be provided for raceway turns and offsets to accommodate obstructions or elevation changes and maintain minimum cable bending radii.

Overhead C-hanger and under floor raceway support details shall be designed to provide complete cable lay-in capability.

Raceway shall be supported from concrete ceiling or ceiling beams, at five (5) foot maximum span intervals.

Use 3/8 inch threaded rods with c-hangers for supporting raceway.

Strict adherence to the National Electrical Code is required for any raceway penetrations of fire-related walls or penetrations.

The Contractor shall make no penetration of floors, walls, or ceiling for conduit or raceway without the prior consent of the District.

TESTING

All 100/1000 Base-T cabling circuits shall be tested for continuity and CAT-6 data certification at the termination points to full CAT-6 specifications. Printed and signed reports will be submitted to the District.

1. Copper Cable Testing

Testing of all copper wiring shall be performed prior to system cutover. 100 percent of the horizontal and riser wiring pairs shall be tested for opens, shorts, polarity reversals, transposition and the presence of AC voltage. Any pairs not meeting requirements of the standard shall be brought into compliance by the Contractor, at no charge to the District. Complete, end-to-end test results must be submitted to the District.

2. Optical Fiber Cable Testing

All Fiber Optic Cable will be tested using an Optical Time Domain Reflectometer (OTDR) for continuity and loss (dB) @ 1300 nm. Test results will be provided to the District on computer DVD/CD and in printed form after completion of this project.

All fiber testing shall be performed on all used fibers in the completed end-to-end system. There shall be no splices. The system loss measurements shall be provided at 850 nm and 1310 nm for multimode fibers and 1310 nm and 1550 nm for single mode fibers.

A. Pre-Installation Cable Testing

The Contractor shall test all light guide cable prior to the installation of the cable. The Contractor shall assume all liability for the replacement of the cable should it be found defective at a later date.

B. Loss Budget

Fiber links shall have a maximum loss of:

1. (Allowable cable loss per Km)(Km of fiber in link) = (.4dB) (number of connectors) = maximum allowable loss
 - a. A mated connector-to-connector interface is defined as a single connector for the purpose of this RFP.
 - b. Loss numbers for the installed link shall be calculated by taking the sum of the bidirectional measurements and dividing that sum by two.

- C. Any link not meeting the requirements of the standard shall be brought into compliance by the Contractor, at no charge to the District.

DOCUMENTATION

The Contractor will supply the District with an as-built drawing, indicating the modifications to existing LAN infrastructure, new LAN/MAN installations, communication outlet location with station and port identification shown, as well as the major routes of inter-building or intra-building backbone cable installed. The Contractor will supply District with network cable and port management diagrams, documenting the correct labeling scheme for all installed network infrastructure. All data from testing installed circuit functionality and performance will be furnished, in a formatted report, to District.

As-built drawings will be supplied in hard copy, as well as software copy. Selected contractor will give the District the option to purchase, or

the information required to purchase, the software necessary to view and or modify all documentation provided as a software copy.

PROJECT DIRECTION

I. Single Point of Contact

Contractor will provide a single point of contact, i.e., Project Manager, to speak for the Contractor and to provide the following functions:

- A. Initiate and coordinate tasks with the District.
- B. Provide day-to-day direction and on-site supervision of Contractor personnel.
- C. Ensure conformance with all Contact provisions.

WARRANTY

I. Contractor Warranty

Contractor shall provide a complete 1 year warranty for full service and replacement on all electronic and mechanical equipment.

Contractor shall provide a 10 year warranty for this cabling system including all components.

The selected contractor must guarantee all networking infrastructure, installed or modified for proper function and performance.

II. Additional Warranty

Contractor shall state any additional Contractor or Vendor supplied warranty.

III. Start Date

No Warranty or service agreements covering any of the work, or electronics, or equipment, or supplies, will begin until the District has officially accepted the project as done.

INSPECTION

- I. An employee, or employees, of the District will be appointed as District Inspector(s) for this project.

In addition to normal inspection duties, they will be specifically observing how and where network circuits and equipment will be installed.

- II. All work for this contract shall be under the observation of said District Inspector(s).

They shall have free access to any or all parts of the work at any time. The Contractor shall furnish the District Inspector(s) reasonable opportunities for obtaining such information as may be necessary to keep them fully informed regarding progress and manner of work and character of materials.

- III. The District Inspector(s), at District expense, may utilize outside consulting firms to verify the correctness of work.

The inspection of work shall not relieve the Contractor from any obligation to fulfill this contract.

- IV. The District Inspector(s) or Site Administrative Manager shall have the authority to stop work whenever provisions of the contract documents are not being complied with or workmanship is unacceptable, and the Contractor shall instruct his employees accordingly.

- V. The Project Manager shall perform on-going inspections during construction.

All work shall be performed in a high quality manner and the overall appearance shall be clean, neat and orderly. The following points will be examined and must be satisfactorily complied with:

- A. Is the design documentation complete?
- B. Are all cables properly labeled from end-to-end?
- C. Have all terminated cables been properly tested in accordance with the specifications for the specific category as

well as tested for opens, shorts, polarity reversals, transposition and presence of AC and/or DC voltage?

- D. Is the cable type suitable for its pathway?
- E. Are the cables bundled in parallel?
- F. Have the pathway manufacturer's guidelines been followed?
- G. Are all cable penetrations installed properly and fire stopped according to code?
- H. Have the Contractors avoided excessive cable bending?
- I. Have potential EMI and RFI sources been considered?
- J. Is Cable Fill correct?
- K. Are hanging supports within 1-1/2 meters (5 feet)?
- L. Does hanging cable exhibit some sag?
- M. Are telecommunications closet terminations compatible with applications equipment?
- N. Have Patch Panel instructions been followed?
 - 1. Jacket removal point.
 - 2. Termination positions.
 - 3. All pair terminations tight with minimal pair distortions.
 - 4. Twists maintained up to Index Strip.
- O. Have Modular Panel instructions been followed?
 - 1. Cable dressing first.
 - 2. Jackets remain up to the Connecting Block.
 - 3. All pair terminations tight and undistorted.
 - 4. Twists maintained up to the Connecting Block.

SUBMITTALS

- I. Submittals shall include all items called for in this section and manufacturers cut sheets for the following:
 - A. All wire and cable to include: fiber, copper, cabling, patch cords, cross-connect wire and cross-connect cordage.
 - B. All connectors and required tooling.
 - C. All termination system components for each cable type.
 - D. All MDF and IDF equipment hardware.
 - E. All LAN and MAN equipment.
 - F. All UPS equipment.
 - G. All equipment cabinets including all MDF and IDF equipment.
 - H. All grounding and surge suppression system components.
 - I. All raceways.
 - J. ESD Flooring.
 - K. All conduit.

ENGINEERING

- I. Drawings and Diagrams
 - A. Upon completion of final work, Contractor shall provide to District for its records the following:
 1. MDF and IDF Diagrams (Leave a laminated copy in each MDF & IDF)
 - a. Cable routing.
 - b. Position of all components and apparatus.
 - c. Detailed layout of the wallfield.
 - d. Labeling plan.

2. Equipment Documentation
 - a. Description.
 - b. Serial number.
 - c. Location.
 - d. MAC address.
 - e. IP address.
 3. Work Area Floor Plans
 - a. Detailed cable routes.
 - b. Approved labeling plan for all work areas.
 4. Cross-connect Documentation
 - a. Cross-connect records for all data devices.
 5. Riser Distribution Plan
 6. Cable Tray, Conduit, and Raceway Plans
 7. Campus Distribution Plan (if applicable)
- B. As Built Documentation

Upon completion of the project, Contractor is to prepare “As Built” documentation showing actual site conditions and installation as constructed, and provide copies of such documentation.

C. Additional Records

1. Engineering diagrams
2. Cable Records and Assignments.

DAMAGES

I. The Contractor will be held responsible for any and all damages to portions of the building caused by them, their employees or subcontractors; including but not limited to:

- A. Damage to any portion of the building caused by the movement of tools, materials or equipment.
- B. Damage to any component of the construction of spaces “turned over” to the Contractor.
- C. Damage to the electrical distribution system and/or other space “turned over” to the Contractor.
- D. Damage to the electrical, mechanical and/or life safety or other systems caused by inappropriate operation or connections made by the Contractor or other actions of Contractor.
- E. Damage to any surfaces or work disrupted as a result of the contractor’s work. Repair of surfaces, including painting, shall be included as necessary.
- F. Damage to existing school facilities including, but not limited to cabling systems, sidewalks, roads, fences and buildings.
- G. Other damage to the materials, tools and/or equipment of the District, its consultants, subcontractors and other contractors.