

**SECTION 27 15 13**  
**CABLE PLANT**

**PART 1 GENERAL**

1.1 RELATED REQUIREMENT

- A. Construction Drawings and specific provisions of this Contract, including other Sections, apply to the work specified in this Section.

1.2 RELATED WORK NOT IN THIS SECTION

- A. General and specific provisions of these Specifications apply to the work specified in this Section, as well as:
  - 1. General Requirements (Section 28 01 00)
  - 2. Wire and Cable (Section 28 05 13)
  - 3. Access Control and Alarm Monitoring System (28 10 00)
  - 4. Intercom Entry System (28 15 23)
  - 5. Digital Video Management System (Section 28 30 00)

1.3 DESCRIPTION OF WORK

- A. This Section describes the scope of work and standards defined for the telecommunications cabling at the West Valley-Mission Community College District. This project includes CommScope SYSTIMAX Category 6A copper station cabling.
- B. The work covered by these Specifications includes the construction described herein and represented on the Drawings, including all labor necessary to perform and complete such construction, all materials and equipment incorporated, and all services, facilities, tools, and equipment necessary or used to perform and complete such construction. The scope of work includes, but is not limited to:
  - 1. Installation of Category 6A cables for data stations.
  - 2. Termination of all cables in the building Telecommunication Equipment Room (IDF) and other specified locations.
  - 3. Installation of cable routing apparatus, including sleeves, J-hooks, D-rings, etc. Use of existing pathway as approved by WVM IS.
  - 4. Testing, labeling and documentation of all cables and hardware installed under this contract. Labeling scheme to be provided by WVM IS.

5. Preparation and submission of testing reports, as-built drawings, and cabling documentation.
6. Fire-stopping of penetrations
7. Coordination with WVM IS staff.
8. Coordination with other contractors.

C. SUPPLEMENTAL ITEMS

1. The Contractor shall provide all items and work described in this Specification in accordance with the conditions of the Contract. This includes all incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc., necessary to provide a complete cabling system as described herein.

D. COMPLETE SYSTEM

1. The Drawings and Specifications are intended to provide a cabling system ready for use by West Valley-Mission Community College District Information Systems department (WVM IS). Any item not detailed or called for in the Specifications but normally required for a complete system is considered part of the Contract.

E. DEFINITIONS

1. In addition to the definitions already specified in earlier sections, the following definitions will be used:
  - a. 'Wiring' means the inclusion of all fittings, conductors, connectors, tape, connections; splices, and all other items necessary and/or required in connection with such work.
  - b. 'Contractor' means the company or sub-contractor hired to provide and install the communications cabling system described herein.
  - c. Telecommunication Equipment Room (or IDF) means a room, or part of a room, dedicated to the function of housing communications equipment, including cabling, cable termination equipment (patch panels, patch cords) and network electronics.

1.4 REFERENCES AND STANDARD REQUIREMENTS

- A. Published specifications, standards, tests or recommended methods of trade, industry or government organizations apply to work of this section where cited by abbreviation noted below:
  1. EIA Electronic Industry Association.

2. IEEE Institute of Electrical and Electronics Engineers.
  3. ISO International Organization for Standardization.
  4. ITU International Telecommunications Union.
  5. ANSI American National Standards Institute.
  6. TIA Telecommunications Industry Association.
  7. ASTM American Society for Testing and Materials.
  8. CEC California Electric Code.
  9. FCC Federal Communications Commission.
  10. ICEA Insulated Cable Engineers Association, Inc.
  11. IEC International Electrotechnical Commission.
  12. NEMA National Electrical Manufacturer's Association.
  13. UL Underwriters' Laboratories, Inc.
  14. IPC The Institute for Interconnecting and Packaging Electronic Circuits.
  15. CFC California Fire Code.
  16. BICSI Building Industry Consulting Service International.
  17. OSHA Occupational Safety and Health Act Standards.
  18. CBC California Building Code.
  19. Title 24 State of California Code of Regulations.
  20. ADA Americans with Disabilities Act.
  21. NESC National Electrical Safety Code.
  22. SCTE Society for Cable Telecommunications Engineers.
- B. The installation shall be in compliance with the most recent issue of the following standards:
1. TIA Commercial Building Telecommunications Cabling Standard (ANSI/TIA-568-D).

2. TIA Commercial Building Standard for Telecommunications Pathways and Spaces (TIA-59-D).
3. TIA Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications (TIA-607-B).
4. TIA Administration Standard for Commercial Telecommunications Infrastructure (TIA-606-C).
5. BICSI-TDMM, Building Industries Consulting Services International.
6. Telecommunications Distribution Methods Manual (TDMM).
7. National Electrical Code (NEC) (ANSI/NFPA 70).
8. American Society for Testing Materials (ASTM) Publications.
9. National Electrical Manufacturer's Association (NEMA) Publications.
10. International Standards Organization/International Electrotechnical Commission (ISO/IEC) IS 11801-1:2017.
11. Underwriters Laboratories (UL®) Cable Certification and Follow Up Program.
12. National Electrical Manufacturers Association (NEMA).
13. American Society for Testing Materials (ASTM).
14. UL Testing Bulletin.
15. IEEE 802.3 Standard.

16. WVM IS Network Infrastructure Cabling Standards.

- C. The Contractor shall be responsible for acquiring these standards documents, and abiding by their content, as applicable to this installation. Since standards are revised and updated frequently, at installation time, the Contractor shall comply with the most recent version of each of these standards.
- D. The Contractor shall comply with all applicable governmental regulations and with all Federal, State, City and other applicable codes and ordinances. The Contractor shall furnish without extra charge any additional material and labor required for compliance with these laws, rules, and regulations, even though the work is not mentioned in these specifications.

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1.5 SUBMITTALS

- A. Submit manufacturer’s data literature for each item used, describing each product, including specification, installation instructions and general recommendations. This includes cable, racks, patch panels, information outlets, connectors, cable support hardware and accessories.
- B. Complete documentation regarding the manufacturer’s warranty shall be submitted. This shall include but is not limited to:
  - 1. A sample of the warranty that would be provided to WVM IS when the installation is complete, and documentation of the support procedure for warranty issues.
- C. Submit manufacturer’s test information for all cables, prior to installation.

1.6 CONTRACTOR QUALIFICATIONS

- A. Contractor Selection: The Contractor selected for this Project must be certified by the manufacturer of the products, adhere to the engineering, installation, and testing procedures, and utilize the authorized manufacturer components and distribution channels in provisioning this Project.
- B. Contractor Experience and Training: The Contractor shall have a minimum of five (5) years' experience in all aspects of this work. The Contractor shall own and maintain the tools and equipment necessary for successful installation and testing of Category 6A cabling and have personnel who are adequately trained in the use of such tools and equipment.

1.7 INSPECTION, TESTS AND GUARANTEES

- A. After installation is complete, in addition to the required testing specified herein, and at such times as is directed by WVM IS, the Contractor shall be present while WVM IS conducts operational test of the network electronics connected to the cabling system. The installation shall be demonstrated to be in accordance with the requirements of these specifications. Any defects revealed shall be promptly corrected and re-tested at the Contractor’s expense.
- B. All work and all items of equipment and materials shall be guaranteed as described in the General Conditions. The Contractor shall be notified in writing of any defective items and shall repair or replace such items promptly without cost to WVMIS.
- C. The Contractor shall provide a minimum of five (5) years’ written warranty covering workmanship and compliance with WVM IS standards. All repairs, including labor and material, shall be provided at no cost to WVMIS during the warranty period. Contractors shall supply warranted workmanship in accordance with vendor products as available. Within 24 hours after notification, the Contractor shall correct any deficiencies that occur during the warranty period.

- D. WVM IS requires the following minimum CommScope manufacturer's warranty:
1. Twenty-five (25) Year extended product warranty. A 25 Year extended product warranty shall ensure against product defects, that all approved cabling components exceed the specifications of TIA/EIA 568 and ISO/IEC IS 11801 and provide an end-to-end solution capable of delivering 10 GB/sec in accordance with the application standards. The warranty shall apply to all passive cabling components. The 25 Year extended product warranty shall cover the replacement or repair of defective product(s) and labor for the replacement or repair of such defective product(s) for a twenty-five (25) year period.
  2. Twenty (25) Year application assurance. A 25 Year application assurance shall cover the failure of the wiring system to support the application which it was designed to support, as well as additional application(s) introduced in the future, by recognized standards or user forums that use the TIA/EIA 568 or ISO/IEC IS 11801 component and link/channel specifications for cabling, for a twenty-five (25) year period.
  3. The manufacturer shall provide an onsite inspection to verify the correct cable installation prior to certification. Upon successful completion of the installation and subsequent inspection, the customer shall be provided with a numbered certificate, from the manufacturing company, registering the installation.
  4. Warranties and guarantees shall be submitted in writing prior to contract close-out.

## **PART 2 - PRODUCTS**

### 2.1 GENERAL

- A. The cabling system is defined as all required equipment and cabling, including hardware, termination blocks, cross connects, patch panels, patch cords, and copper cabling, defined as part of the channel test configuration in TIA/EIA 568. The Contractor shall supply a cabling system that conforms to the standards described below.
- B. The Contractor shall supply the products detailed in this specification. For station cabling products, WVM IS has standardized the CommScope SYSTIMAX products for the end-to-end Category 6A cabling system. If not specified by WVM IS, the Contractor can select products of suitable quality and workmanship. For any products selected by the Contractor, they must submit product documentation including the manufacturer's original literature, product specifications and testing reports.
1. Quality of Products: Material and equipment specified herein have been selected as the basis of acceptable and desired quality of performance and have been coordinated to function as components of the specified system.

2. Material Substitution: The Contractor shall notify WVM IS of the changes and proposed substitution. Only replacement products that meet or exceed the specification of the original can be substituted, with WVM IS approval.
3. Consistency: Any given item of equipment or material shall be the product of one manufacturer throughout the facility wherever possible. For the complete end-to-end data cabling systems (copper), the Contractor shall provide materials supplied by one manufacturer.
4. Quantity: Provide quantity as shown on Contract Drawings, the Schedule or as otherwise defined herein.
5. Provide Complete: Provide all auxiliary and incidental materials and equipment necessary for the operation and protection of the work of this Section as specified in full herein.
6. Provide New: All materials furnished shall be new and unused. All materials used shall bear the Underwriter's Laboratory, Inc. label, provided a standard has been established for the material in question. All products and materials to be clean, free of defects, and free of damage and corrosion.

## 2.2 STATION CABLING STANDARDS

- A. All new telecommunications outlets shall be installed to conform to the T568B wiring standard.
- B. Horizontal Station Cabling. For horizontal station cabling within walls and ceilings, the following cable is required:
  1. Category 6A, 23 AWG copper conductors, unshielded twisted pair.  
Plenum: 2091B (DISTRICT STANDARD)
  2. Color:  
Security Cabling Shall be Light Blue
  3. The Contractor shall ensure that the cable is installed with 10 feet of slack in the ceiling space above the telecommunications outlet. The Contractor shall ensure that all runs of station cabling do not exceed 250 feet, from IDF to wall outlet.
- C. Quantity: Each location where a telecommunications outlet is required shall be provisioned with up to four Category 6A cables, terminated in a single gang faceplate or plenum surface mount block (SMB). The WVM IS standard telecommunications outlets for data wall outlet locations are:
  1. Type B – two data in a four-port single gang CommScope M14L faceplate, unused ports blanked.
  2. Type C – four data in a four-port single gang CommScope M14L faceplate.

3. Where outlets are provisioned above ceiling, cables will terminate on CommScope two-port, plenum, surface mount box (SMB). All SMBs shall be mounted securely to the wall/roof deck, or supported on a J-hook, outside of pullboxes and conduits used for security wiring.

D. Station Jacks. All installations will use a modular information outlet. All jacks for security outlets will be color-coded blue. The CommScope Systimax MGS600 is required. (DISTRICT STANDARD)

E. Backboxes: Backboxes for single gang faceplates will be the Randl Telecommunications 5" square backbox.

F. Enclosures. Cabling will be terminated on wall or ceiling mounted two-port plenum surface mount boxes. All SMBs shall be mounted securely to the wall/roof deck or on separate J-hooks, outside of pullboxes and conduits used for security wiring.

G. Station Cords. For devices outside the building, the patch cords will be OSP rated, Category 6A cables, CS44P-IO. Contractor shall provide sufficient patch cords lengths and quantities for all jacks servicing outside devices.

H. Data Terminations. All horizontal station cables will terminate on 48-port ANGLED patch panels and be wiring compliant with, or exceed, the Category 6A standards. Patch panels will use cable termination managers for cable orientation during punch down.

1. The following patch panels are required: Systimax 360 Gigaspeed X10D Angled Patch Panel. (DISTRICT STANDARD).

2. Cabling will terminate in ascending outlet order, and ascending jack order on the same patch panel. D1 and D2 cables will be separated for termination on discrete patch panels.

## 2.03 OTHER EQUIPMENT

A. If the equipment described in this section is not specified by manufacturer and model number, the Contractor shall select equipment of suitable quality and workmanship and provide documentation on each item included in their proposed solution. The Contractor shall submit all material and equipment items for review prior to purchase.

B. J-hooks or Cable Hangers: For suspension of the station cable plant, the Contractor shall provide a J-hook system to be concealed in the dropped ceiling space.

1. The J-Hooks shall be manufactured for the support of up to 25 Category 6A cables without damaging the cables at the base of the bundle.

2. Provide a wide, flat bottom for distribution of the cable weight and compliance with the required bend ratio of Category 6A cables.

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3. Shall have smooth, flared edges so the cable outer sheath is not damaged during installation.
  4. Include an integrated hanger attachment that can be connected to walls, beams, posts, threaded rods, etc. as available for placement and access.
  5. Include cable retainer strap to provide containment of the cables within the hanger. The retainer strap shall be sufficiently secure to withstand movement caused by nearby maintenance activity, vibration, and seismic activity. Straps shall be removable and reusable to facilitate installation of the cables. Upon completion of installation, cable retainers shall be replaced on every J-hook.
  6. Acceptable products are Erico Caddy CableCat Cable Hangers, the Arlington "LOOP" or equal.
- C. The Contractor is required to firestop all conduits and penetrations after cable installation.
1. The Contractor shall use intumescent firestopping materials, including putty, pillows, caulking and sheets. Materials shall be UL approved.
  2. The Contractor shall install suitable firestopping to restore the construction assembly to the original fire-resistance rating.
  3. The Contractor shall use firestopping materials that will not deteriorate after curing or when exposed to air and moisture.
- D. Conduits and sleeves:
1. Conduits will be fire stopped on both sides around the exterior of the penetrations.
  2. Sleeves will be fire stopped around the exterior of the penetration and inside the sleeve.
  3. Firestopping materials will be installed around the entire cable bundle and not just in open conduit space.
  4. The Contractor shall ensure that conduits and sleeves are not overfilled with cables such that adequate firestopping materials cannot be installed with suitable burn expansion.
  5. As needed, sleeves will be required if an existing pathway through walls is inadequate.

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### **PART 3 - EXECUTION**

#### **3.1 CABLE ROUTING**

- A. The contractor shall use the existing telecom conduit and cable tray infrastructure in the building. Existing conduit/backbox infrastructure for security cabling shall not be used for data cabling.
- B. WVM IS requires that cables be completely concealed, thereby limiting the possibility of vandalism and/or unintentional damage.
- C. The ceiling is provisioned with a limited amount of cable basket trays. This will be used wherever possible to route bundles of cable between the IDF and station outlets.
- D. Where a cable basket tray is not installed, cables shall be routed using separate J-hook suspension. Cables shall be supported by J-hooks every 4 feet. The Contractor shall install a J-hook above every outlet location and provide a 10-foot service loop above each outlet.
- E. J-hooks shall be independently supported with threaded rod and not attached to existing conduit, ceiling/lighting structures or other suspension apparatus. J-hooks shall be installed according to the manufacturer's instructions.
- F. J-hooks will not be filled with more than 25 cables. Where dense cable runs create large bundles of cables, the cable bundles will be supported on wire cable tray or multiple J-hooks. All bundles of cable will be Velcro-wrapped to the J-hook to prevent cables from spilling out in the event of an earthquake or other disturbance.
- G. The cables will be routed to the IDF, utilizing the shortest practical path possible, but paralleling walls. DATA STATION CABLE RUNS ARE NOT TO EXCEED 250 feet.
- H. Cables shall be run in ceiling spaces wherever possible to avoid furniture and work areas so that maintenance access to the cables is unencumbered. All cable paths will be approved by WVM IS prior to installation.

#### **3.2 INSTALLATION PARAMETERS**

- A. Contractor is required to adhere to the following parameters whether or not existing equipment has been placed by Contractor and/or others. Contractor shall notify WVM IS of any of the following requirements that cannot be met prior to commencement of installation. All cables must be installed in accordance with the manufacturer's instructions.
  - 1. The maximum length of horizontal voice or data cabling from nearest closet shall not exceed 250 feet. The contractor shall notify WVM IS prior to commencement of any installation not meeting the maximum distance limitation.
  - 2. When placing cable, the technician shall maintain the following clearances from sources of electro-mechanical interference (EMI):
    - a. Main Power panel: 6 feet.
    - b. Power cable – 12 inches.

- c. Fluorescent Lights – 12 inches.
  - d. Heat source: 30 inches.
  - e. Transformers – 6 feet.
3. All power feeds crossing the path of the Category 6A cables at right angles must be a minimum of 12 inches in distance from the Category 6A cables.
  4. The cables shall be placed at a minimum of 18 inches above the ceiling.
  5. The cables are to be as accessible as possible.
  6. Pull conductors together where more than one is being installed in a raceway. Cable bundles in suspension systems, or on wallboards must be Velcro-wrapped every 4 feet. Strapping to any other wires (e.g., lighting ceiling grid, etc.) will not be permitted. Station wire cannot be attached to electrical conduit, gas or sprinkler piping, or other code-restricted items.
  7. No cabling shall rest on any ceiling tile or suspension system.
  8. Cables shall be pulled free of sharp bends, kinks, twists, or impact damage to the sheath.
  9. Cables shall not be pulled across sharp edges. Bushings will be installed on rough sleeve or conduit edges before cable installation takes place. Cables shall not be forced or jammed between metal parts, assemblies, etc.
  10. Cables shall not be pulled across access doors and pull box covers. Access to all equipment and systems must be maintained.
  11. Insulation shall be removed to expose shielding and conductors to the exact length required by the manufacturer for proper termination of plugs and pins and as specified in EIA/TIA 568/569.
  12. Pins and plugs, upon termination, shall not be damaged in any way.
  13. All equipment communications racks must be properly anchored to walls and floors and grounded to the building ground grid (not to water pipes, etc.).
  14. Cable splicing will not be permitted at any point within a cable run.
  15. Cable mountings on backboards will be installed efficiently (no divers), to minimize the backboard space consumed. All cables will be routed at right angles, in accordance with the bend radius specifications for the type of cable being routed. Cables will be Velcro-wrapped every 4 to 6 feet and routed through D-rings for a neat appearance and manageability.
- B. WVM IS 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.

### 3.3 CABLE LABELING STANDARDS

- A. WVM IS shall provide the telecom contractor with a numbering plan for the outlets. This will be reviewed at a pre-construction meeting before cabling begins.
1. Label Components: The Contractor shall provide tags, straps, and adhesive labels. These tags, straps, and adhesive labels must be of high quality that will endure heat, water, and time. The labels shall be printed or generated with a mechanical device.
  2. Faceplate Labeling: All faceplates/outlets will be labeled according to the guidelines as set forth in the EIA/TIA 606 standard. This shall include:
    - a. Name of Telecommunication Space to which the cable is routed.
    - b. Unique faceplate/outlet number, incrementing numerically.
  3. Station Cable Labeling - All data station cables will be labeled with wrap-around at each end using the following convention developed from the TIA/EIA 606 labeling standard:
    - a. Room Number of the IDF where the cables terminate.
    - b. Faceplate/outlet number
    - c. Jack label D1/D2 according to outlet design
  4. Above-ceiling labeling – All outlets installed above the ceiling shall be labeled on the SMB and the nearest available T-bar grid, with a large font readable from a standing position, black letters on white background.
  5. The Contractor shall provide labels on the patch panel, at each jack location, and twelve inches from each end of the cable.
  6. The Contractor shall use black lettering on white labels at the outlet/faceplate end.
  7. Coordinate all labeling with WVM IS prior to installation.

### 3.4 STATION CABLE TESTING

- A. Test Tools: The Contractor shall perform all tests and adjustments. The Contractor shall furnish all test equipment necessary and perform all work required to determine or modify performance of the system in accordance with these specifications. All pairs will be tested with a valid copper test tool that conforms to the Category 6A specifications of the Level III requirements detailed in TIA 568.
- B. Test Plan: 100% of the cable pairs shall be tested. The Contractor shall use the Permanent Channel Test Configuration to verify the performance of the permanently installed cable.

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- C. Test Types: Tests shall include wire map, length, Insertion Loss, NEXT loss, PSNEXT loss, Power Sum NEXT, ELFEXT, PSELFEXT, return loss, propagation delay and delay skew.
- D. Compliance: Any pairs not meeting the specifications for Category 6A transmission shall be brought into compliance by the contractor, at no charge to WVM IS.

3.5 AS-BUILT DOCUMENTATION

- A. The Contractor shall provide Draft Record Drawings (As-Built Drawings) to the Consultant, for verification ten (10) business days prior to Acceptance Testing.
- B. The test results shall be submitted in electronic format, with the resulting file capable of being formatted with one test result per 8.5-inch x 11-inch page, Adobe pdf format preferred.

3.6 PROJECT ACCEPTANCE

- A. WVM IS shall accept each cable installation job as complete when the following activities are completed:
  - 1. All cables are installed and terminated as specified in this section, or as amended by Change Orders before or during the Project.
  - 2. All components are verified to comply with WVM IS standards as specified.
  - 3. The WVM IS Project Manager has performed a final inspection of each site.
  - 4. The complete cable test results are submitted to WVM IS.
  - 5. The warranty information is documented and presented to WVM IS. CommScope provides a certificate; no letter needed.
  - 6.
- B. Following acceptance, if cable connections are found to be non-operative, the WVM IS Project Manager will contact the Contractor, and require additional visits and work as needed to comply with the specifications. The cost of these additional visits and work will be the sole responsibility of the Contractor.

END OF SECTION