Network Infrastructure Cabling System Design, Performance and Installation Standards

Scope of Work:

This document serves as a Grass Valley School District Master Specification from which all projects under the following identified scopes are governed.

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Common Work Results for Communications:

I. Referenced Documents and Authorities
   A. TIA/EIA on line.org
      1. TIA/EIA-568-B.1 (ANSI/TIA/EIA-568-B.1-2001)
         Commercial Building Telecommunications Cabling Standard – Part 1
      2. TIA/EIA-568-B.1-1 (ANSI/TIA/EIA-568-B.1-1-2001)
         Commercial Building Telecommunications Cabling Standard – Part 1: General Requirements – Addendum1 – Minimum 4-pair UTP and 4-pair ScTP Patch Cable Bend Radius
      3. TIA/EIA-568-B.2 (ANSI/TIA/EIA-568-B.2-2001
         Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components
      4. TIA/EIA-568-B.2-1 (ANSI/TIA/EIA-568-B.2-1-2002)
         Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components – Addendum 1
      5. TIA/EIA-568-B.2-2 (ANSI/TIA/EIA-568-B.2-2-2001)
         Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components – Addendum 2
      6. TIA/EIA-568-B.2-3 (ANSI/TIA/EIA-568-B.2-3-2002)
         Commercial Building Telecommunications Cabling Standard – Part 2: Balanced Twisted Pair Cabling Components – Addendum 3 – Additional Considerations for Insertion Loss and Return Loss Pass/Fail Determination
      7. TIA/EIA-568-B.3 (ANSI/TIA/EIA-568-B.3-2000)
         Optical Fiber Cabling Components Standard
      8. TIA/EIA-569A (ANSI/TIA/EAI-569-A-98)
         Commercial Building Standard for Telecommunications Pathways and Spaces
      9. TIA/EIA-569-A-1 (ANSI/TIA/EIA-569-A-1-2000)
         Commercial Building Standard for Telecommunications Pathways and Spaces – Addendum 1
      10. TIA/EIA-569-A-2 (ANSI/TIA/EIA-569-A-2-2000)
         Commercial Building Standard for Telecommunications Pathways and Spaces – Addendum 2
      11. TIA/EIA-569-A-3 (ANSI/TIA/EIA-569-A-3-2000)
         Commercial Building Standard for Telecommunications Pathways and Spaces – Addendum 3
      12. TIA/EIA-569-A-4 (ANSI/TIA/EIA-569-A-4-2000)
         Commercial Building Standard for Telecommunications Pathways and Spaces – Addendum 4
      13. TIA/EIA-569-A-5 (ANSI/TIA/EIA-569-A-5-2001)
         Commercial Building Standard for Telecommunications Pathways and Spaces – Addendum 5 – In Floor Systems
      14. TIA/EIA-569-A-7 (ANSI/TIA/EIA-569-A-7-2001)
         Commercial Building Standard for Telecommunications Pathways and

Spaces – Addendum 7 – Cable Trays and Wirelines

15. TIA/EIA-598 (ANSI/TIA/EIA-598)
    Optical Fiber Cable Color Coding (May 1995)
16. TIA/EIA-526-7
    Measurement of Optical Power Loss of Installed Single Mode Fiber Cable Plant (August 1998)
17. TIA/EIA-526-14
    Measurement of Optical Power Loss of Installed Multi-mode Fiber Cable Plant (August 1998)
18. TIA/EIA-758 (ANSI/TIA/IA-758-99)
    Customer-Owned Outside Plant Telecommunications Cabling Standard
19. TIA/EIA-758-1 (ANSI/TIA/EIA-758-1-1999)
    Customer-Owned Outside Plant Telecommunications Cabling Standard - Addendum 1
20. TIA/EIA-606 (ANSI/TIA/EIA-606-93)
    Administration Standards for the Telecommunications Infrastructure of Commercial Buildings
21. TIA/EIA-607 (ANSI/TIA/EIA-607-94)
    Commercial Building Grounding and Bonding Requirements for Telecommunications
22. TIA/EIA-854 (ANSI/TIA/EIA-854-2001)
    Full Duplex Ethernet Specification for 1000 Mb/s (1000 BASE-TX) Operating over Category 6 Balanced Twisted-Pair Cabling
23. TSB125
    Guidelines for Maintaining Optical Fiber Polarity Through Reverse Pair Positioning
24. Building Industry Consulting Services International (BICSI)
    Telecommunications Distribution Methods Manual
25. Most current revisions of National Fire Code (NFPA), California Electrical Code (CEC), Uniform Building Codes and Local Building Codes.

II. Minimum Criteria

1. All work is expected to meet or exceed the presented governing document requirements. In the event these documents and/or a local or state construction code disagree, the most stringent requirement will rule. If difficulty in determination occurs, it is the contractor's responsibility to present the matter to the Grass Valley School District's Information Technology Representative in writing for clarification as instructed prior to the bid. The representative's decision is final and legally binding.
2. District's Information Technology Representative is defined by any individual or organization granted authorization to act on behalf of the Grass Valley School District as a liaison of communication between any and all organizations involved in any way with the scope of work identified within this document. The Representative's authority is granted solely and exclusively by the Grass Valley School District Technology Department.
3. All components must be part of a specified factory warranted system. When

the document includes the words *or equal*, an approved substitution is possible if, and only if, approved by the Grass Valley School District or its project specific representative as instructed prior to the bid. The decision of the District or its representative is final and legally binding. It is the responsibility of the bidding contractor to obtain component/system approval from the District or District's representative, in writing prior to the installation of any components.

If approval is denied, it is the legal obligation of the bidder to install the system(s) as identified in this document.

4. All components shall be U.L. (Underwriters Laboratories) listed or recognized as is appropriate. It is the responsibility of the contractor to install plenum cable in plenum environments.

III. System Overview

While data/voice cabling system is considered to be one system, the long-term Grass Valley School District technology plan is to install and fully utilize VoIP (Voice over Internet Protocol), clocks/bells/paging, video on demand, wireless access, and surveillance systems. Therefore, the horizontal cabling system is designed as a universal information system. The backbone system is designed in two parts: a) single mode fiber optic and b) Cat 6 and/or Cat 6a copper data cabling. The single mode fiber optic cabling shall terminate on rack-mount cabinet slide-out enclosure devices. All horizontal cabling for all data system devices shall be terminated on patch panels in the nearest IDF cabinet, which in some cases could also serve as the campus MDF.

IV. Project Drawings

This document may refer to project drawings. It is the responsibility of the project manager to ensure all references to project drawings are addressed in the drawing documents. It is the responsibility of the bidding data/voice cabling system contractor to notify the District's representative, in writing, of any conflicting information or any information not presented prior to the bid opening. All decisions made by the representative are final and legally binding.

V. Work By Others

This document refers some work to be completed by others. It is the responsibility of the project Architectural firm to ensure all references to work completed by others is fully addressed elsewhere in the project documentation.

Pathways for Communications:

I. Inter-building Pathways

A. While utilized under this scope, the installation of inter-building pathways is the responsibility of the data contractor. However, in the event an impediment to cabling installation arises, it is the responsibility of the contractor to advise

the Grass Valley School District in writing. The decision of the representative is final and legally binding.

B. New conduit fill rates are not to exceed 40% for bare cabling and 50% for Innerduct. If a situation of excessive fill rate is discovered, the contractor is to inform the District representative in writing prior to commencing with cabling installation. The decision of the representative is final and legally binding.
C. All newly installed conduits shall be installed per drawing with fill rates noted above unless otherwise noted on the drawing with an adequate pull rope/string. It is the responsibility of the data/voice cabling system contractor to leave an adequate pull rope/string for future use.
D. Existing conduits may or may not provide an adequate pull rope/string. It is the responsibility of the data/voice cabling system contractor to provide its own pull rope/string and to leave an adequate pull rope/string for future use.
E. All conduits not utilized shall be capped.
F. All conduits utilized shall be fire-stopped; no exceptions.
G. Inter-building pathways may include outside plant vaults or pull boxes. The minimum service loop is 3 meters. If conditions exist that present an impediment to this minimum, it is the responsibility of the data/voice cabling system contractor to inform the District's representative in writing. The District representative's decision is final and legally binding.
H. Conduit bends are to be kept at a minimum; however, sweeps appropriately sized for the conduit diameter shall be utilized in lieu of elbow fittings.

II. Intra-building Pathways

A. Firewalls, conduit, sleeving, fire-stopping
    1. Intra-building conduit/pathway minimum is 1" unless otherwise indicated on the project drawings (if available). If an instance is discovered that exceeds the 40% fill rate maximum requirement, the contractor is to inform the District representative in writing before installing the cable. The District representative's decision is final and legally binding.
    2. All firewalls are to be cored, sleeved, and appropriately fire-stopped.
        a. Clean surfaces are to be in contact with the fire-stopping material. Substances such as dirt, oil, grease, rust, or any other loose substance is to be removed or cleaned.
        b. As fire-stopping material cures, unhealthy gases may be released. Be sure to provide forced-air ventilation until the gases have dissipated.
        c. Fire-stopping areas shall be made accessible for inspection by the District's representative or project inspector. Any repairs, replacement or modifications required shall be provided by the installing contractor at no cost to the District.
    3. All non-firewalls and floors are to be cored, sleeved, and the opening sealed.
    4. Cabling is never to penetrate through any wall at any time without sleeving and the space between the sleeve and wall sealed.

B. Cable Support Hardware
   1. Cable tray or J hook hardware is to be utilized to route cables from the communication closet through accessible hallways to the point of entry into classrooms or offices.
   2. Minimum 1 inch-wide j-hook type hardware is to be utilized once the drop ceiling workstation areas have been reached. J-hook size shall allow for 50% additional cable. The hardware is to be spaced no more than 5 linear feet apart. The suspended cabling shall not hang more than 6 inches below the J-hooks at any time.
   3. EMT shall be utilized in all closed or non-suspended ceiling areas. The diameter shall ensure a maximum of 40% fill rate.

C. Innerduct
   1. Provide indoor riser rated or plenum rated minimum 1 ¼" Innerduct as appropriate for the environment as manufactured by Carlon or approved equal. No fiber optic cabling shall be installed outside of Innerduct at any time unless approved by District's representative.

D. Work By Others
   1. Pathways through a building structure can be routed exposed in areas where it is above an accessible drop ceiling or an unexposed accessible area separate from occupied spaces.
   2. The size and type of exposed pathway shall be governed by the amount of cable required to be installed in the path. In cases where the pathways are inaccessible, such as inside walls or soffits, EMT conduit shall be used to bridge the gap between accessible areas.
   3. The typical work station outlet shall include a flush mounted, double gang back box with a single gang front plate protruding through the wallboard and a minimum of a 1" EMT conduit routed to the nearest accessible main conduit pathway junction box.
   4. Conduit bends are to be kept at a minimum. Sweeps appropriately sized for the conduit diameter shall be utilized in lieu of elbow fittings.

III. Labeling

A. All cables are to be labeled at **both ends,** no more than 3 inches back from each end, with a cable label that matches the faceplate labeling. Labels will be typed with black on white using permanent label tape with a continuous number strip.

B. Labels shall be machine generated, covered, and self-laminating. No hand written labels shall be permitted at any time.

C. All labeling will meet TIA/EIA-606-A Class 4 standards. Port names will reflect location by site/campus, floor, MDF/IDF closet, patch panel and port number to allow easy identification of each termination. General labeling scheme shall be as follows:
   1. All sites are assigned one MDF cabinet [A].
   2. Each IDF will be assigned a letter beginning with [B] and then assigned sequentially.

3. The MDF/IDF letter identifications shall be clearly marked on the project drawings by the project Architectural firm.
4. Each work station shall be assigned a port number, sequentially, beginning with 01.
   a. Each workstation faceplate port shall be marked with the same information as the cable.
   b. Each MDF or IDF cabinet shall be marked with the appropriate number. The MDF will always be labeled [A]. Each cabinet shall be labeled with the sequential identification.
   c. The contractor must confirm, with the District's representative, the exact labels to be utilized for the project prior to installation of any cabling or connectivity device.
   d. Permanent and waterproof marking shall be placed on any Inter or Intra Innerduct. The label shall identify the termination point on each end. The label shall be located no more than twelve (12) inches from the Innerduct termination point.

Commissioning of Communications:

I. Installation Practices

A. Cable tie devices shall not be utilized at any time. Only Velcro strap devices or approved equal are permitted. Velcro straps are to be utilized in the MDFs and IDFs at a maximum interval of six (6) inches. All service loops are to be Velcro strapped.
B. All pull rope devices are to be replaced in all pathways for future use.
C. All Intra-building cabling shall be routed either parallel or at right angles to the building structure and/or walls.
D. All Innerduct shall be supported at a minimum of twenty-four (24) inches if running vertical and sixty (60) inches if running horizontal when not installed in conduit.
E. No cabling is to be pulled through new L-bend devices. If L-Bend devices are pre-existing and it is determined, at the review of the District's representative that sufficient space in the conduit is available, the contractor shall remove the L-Bend cap and pull the cable to and carefully beyond the cap.
F. Communications cabling shall never be tied to power cables or devices, lighting systems, or co-exist in any pathway with power cabling.
G. All cabling must conform to a 6-foot separation from electrical power panels, switch gear, transformers, or starter motors.
H. In the event paths of electrical and communications cabling must cross, there is to be a 12 inch separation.
I. All cabling is to be installed a minimum of 12 inches above ceilings. Cabling is never to rest on ceiling tile or suspended systems.
J. Maximum accessibility must be maintained at all times. It is the contractor's responsibility to inform the District or District's representative of any situation that installed cable cannot be easily accessed.

K. Cabling must be a minimum of 30 inches away from any heat source.
L. Cabling shall never be installed over access hatch or pull box and STC enclosures.
M. Insulation shall be removed only to the length as required by the cabling system manufacturer. All connector contacts shall be visually inspected and repaired or replaced.
N. All cabinets shall be properly anchored per industry standards to walls or floors and grounded as defined in other areas of this document. Wall cabinets must have a ¾" plywood backboard painted with fire resistant paint.
O. Where multiple conduits in the same general pathway are available, utilize one conduit to its maximum fill ratio before utilizing the next conduit. Wherever possible, leave as many unused conduits available as possible.
P. All cables requiring lubrication for installation in conduits shall be continuously lubricated during the pulling-in process with a lubricant that will not deteriorate the cable, conduit, or Innerduct. Maximum pulling tensions as defined by the appropriate reference document or the manufacturer's specification shall be adhered to.
Q. All pull ropes/strings shall be left for future use.
R. Any visible damage to a cable, such as kinks or bends in violation of the minimum bend radius, shall render the cable segment defective and the entire cable segment shall be removed and replaced. This is without exception.
S. All materials shall be new, unused, and delivered to job site in original manufacturer or distributor cartons or packages. Materials shall be stored in clean, dry, dust free, protective containers. No previously installed material shall be used at any time.
T. Remove any old cabling in conduits being replaced with new cabling.
U. Cold weather installation: bring cable to room temperature before de-reeling. Heat lamps shall not be used for heating.
V. In the communications equipment room, install a 3 meter long service loop on each end of the cable.
W. At pull boxes, use plastic tags minimum of 2"H X 3"W securely tied around cable. Tags shall be listed for such use and shall not corrode or be susceptible to such environments. All cables shall be labeled by system type and destination, to and from.

II. Testing Requirements

The District requires 24 hour notice prior to testing. All testing shall be completed to BICSI standards. All test-results documents shall be delivered to the Grass Valley School District Information Technology department in electronic format (.XLS, Linkware, Fluke, etc.) on a CD that includes licensed viewing software. The District reserves the right to conduct 3rd party testing at district expense. Hand written documents are not acceptable. Delivery of these documents is required prior to system acceptance. The documentation shall also include the test plan and procedures. The contractor shall accommodate testing process observation by the District or District's representative if requested.

A. Copper

1. Horizontal

a. Bi-directional swept frequency testing shall be completed and documented in accordance with TIA/EIA-568-B.2-1 Category 6 requirements. Results shall be submitted to the District representative with all other test results at the completion of the project. Any portion of the installed system not meeting these requirements shall be either repaired and re-tested or replaced, both at no cost to the District. The 250mhz link test results shall meet the following as a minimum:

PS NEXT	32.7db minimum
PSACR	1.6 db minimum
Return Loss	10.0 db maximum

2. Backbone

a. Backbone cabling shall be tested for opens, shorts, and polarity errors. Testing for each pair shall be documented and submitted to the District representative with all other test results at the completion of the project.

B. Fiber

1. All fiber cabling shall be factory or distributor tested and labeled with the test results prior to installation. These results shall be submitted to the District's representative with all other test results at the completion of the project.
2. All single and multi-mode fiber cabling shall be tested with a bi-directional test with an OTDR. The exact cable lengths shall be noted and provided as part of the project as-builts.
3. All fiber cabling terminated segments shall be tested in both directions with a Power Meter and meet district requirements of TIA/EIA Level 2 test.
4. All fiber connections will be fusion spliced; no mechanical splicing is allowed. Maximum bi-directional overall splice loss is not to exceed .25dB.
5. The single mode cable shall comply with the following maximum individual fiber loss: Attenuation 850 nm/3.50 dB end to end (basic link), 1300 nm/1.50 dB end to end (basic link) Bandwidth 850 nm/160mhz km, 1300 nm/500mhz.

Any portion of the installed system not meeting these requirements shall be either repaired and re-tested or replaced, both at no cost to the District.

C. Final Verification Tests: Perform verification tests for UTP and optical fiber systems after the complete communications cabling and workstation outlet/connectors are installed.

III. Warranty Requirements

A. Panduit ® CERTIFICATION PLUS™ System Warranty or approved equal
A CERTIFICATION PLUS System Warranty or approved equal shall provide a complete system warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include cable and connectivity components and have one point of contact for all cabling system issues. The system shall be warranted for a period of 25 years.

B. Panduit® PCI Contractor Agreement or approved equal
A factory registered Panduit PCI contractor or approved equal shall complete network installation. The contractor shall have completed standards based product and installation training. A copy of the PCI Contractor Registration shall be submitted in the proposal.

1. Product Guarantee
All Panduit PAN-NET® non-consumable products or approved equal have a 25-year guarantee. When installed per TIA or ISO/IEC standards, the Panduit PAN-NET® Network Cabling System or approved equal will operate the application(s) for which the system was designed to support. Applications may include, but are not limited to:

10GBASE-T Ethernet (IEEE 802.3an)
10/100/1000 Mbps Ethernet (IEEE 802.3)

In order to qualify for the guarantee, the structured cabling system must be installed per the following:

a. Meet all TIA/EIA commercial building wiring standards
b. Panduit categorized product must be used in conjunction with an equivalent or higher Category UL or ETL verified cable.
c. Panduit Products or approved equal must be installed per Panduit or approved equal instruction sheets.

Note: All Networks shall be installed per applicable standards and manufacturer's guidelines.

C. The contractor shall provide a minimum two-year parts and labor Quality Assurance warranty direct from the contractor to the District. The contractor is required to repair to the minimum system performance levels within 48-hours, after notification from the District, upon initial system implementation and within 72-hours thereafter during the two-year period.

D. The contractor shall also facilitate factory-direct to the District warranties:
1. A 25-year component warranty for all cabling system components, including Inter and Intra building cabling and connecting devices.
2. A 25-year system performance warranty that guarantees system performance in compliance with the TIA/EIA performance level document in force at the time of the installation completion.

E. The contractor shall submit with the bid, and for review and approval by the District's representative, a sample copy of each warranty from the cabling systems and/or component manufacturer as is proposed. Failure to include the proposed system warranty documentation could result in bid rejection.

IV. Submittals
    A. Project completion (within 10 working days)
        1. Upon completion of the project, the contractor is to deliver to the District's representative for review and approval the following:
            a. As-built drawings (3 copies) on Visio, AutoCAD LT or approved equal showing all locations of voice and data outlets, MDF's and IDF's, and all inter and intra building cabling. The as-builts shall indicate which workstation was served by which wiring closet. All copper and fiber backbone cabling shall be identified as well.
            b. All cabling and termination test results identifying the tests performed, the results, and what values were measured as identified previously within this document.
            c. The information shall be organized alphabetically by site, beginning with the campus MDF, then sequentially by IDF.

V. Contractor qualifications
    A. The contractor shall possess a current State License applicable to the scope of work to be performed and be sufficiently trained in the cabling system components proposed as well as all other aspects of the project's scope in order to complete the installation in a manner that will facilitate the appropriate manufacturer's warranties and meet the expectations of the District's representative.
        1. Submit with the bid and for approval by the District's representative, certificates of training that meet the requirement for the contractor to facilitate the appropriate extended warranties for the products proposed.
        2. Submit with the bid and for approval by the District's representative, a resume not more than ninety (90) days old that identifies the experience of all supervisory and management personnel.
        3. Submit with the bid and for the review of the District's representative, a copy of a certificate that identifies the contractor as being fully authorized to facilitate all factory-direct warranties as are offered by the manufacturer. No site or project specific certifications will be allowed.
        4. Submit with the bid and for the review of the District's representative, a copy of the Panduit Certified Installer certificate for each installer working on the project.

VI. Delivery, Storage and Handling of Materials
    A. The contractor is completely responsible for all materials. At no time is the District responsible for lost, stolen, or damaged goods, tooling, or vehicles.
    B. All unused materials are to be removed from the project.
    C. All work areas are to be cleaned from work spoils and debris at the end of each shift. It is required that all occupied work areas are returned to the original state after each work shift. This includes, but is not limited to, cabinets, rooms, floors, etc. Cleaning processes include, but are not limited

to, sweeping, dusting, and replacement of furniture and other equipment. Permission to postpone this daily requirement shall be rendered solely by the District's representative or project field superintendent.

Structured Cabling:

Communications Equipment Room Fittings:

I. Data/Telecom Room Requirements
   A. Enclosed Cabinet—Chatsworth 24" x 24" x 24" or approved equal (Wall mount).
   B. Patch panels
      1. The Panduit or approved equal patch panels are to be 24 or 48-port Category 6 or 6a.
      2. The installation shall provide for a minimum of 25% future growth.
      3. Port terminations to match the TIA/EIA 568B pin configuration.

C. Cable Management
      1. All rack mount patch panels shall be installed with a minimum of one Panduit (1) 2U or approved equal horizontal cable management panel immediately below.
      2. Velcro straps or approved equal shall be used as cable dressing. Cable ties are not permitted at any time.

Communications Backbone Cabling:

I. Fiber optic (Data System)
   A. 12-strand single-mode 10Gb (backwards compatible to any and all 1G Systems) shall be installed between the building MDF's (Main Distribution Frame) and IDF's (Intermediate Distribution Frame) as indicated on the drawings, as manufactured by General Cable or approved equal.
   B. The cable shall be rated outdoor installation and installed in outdoor rated 1" Innerduct as manufactured by Carlon or approved equal.
   C. In all cases, a fusion spliced Panduit pigtail or approved equal shall be installed.
   D. All fiber optic cabling shall be installed in rack mount fiber optic enclosure devices manufactured by Panduit or approved equal. All enclosures shall have a front pull-out drawer or shelf to access terminations and provide for front and rear post-installation access, cable management rings inside the enclosure (front and rear), service loop room in the rear, and a tie-down point.
      1. The installation shall allow for minimum growth of 50% in the IDF's and 25% in the campus MDF. LC adaptor panels shall be installed. All unused enclosure adaptor panel locations shall be filled with a blank panel.

2. All fiber optic strands are to be full terminated with LC type connectors, as manufactured by Panduit or approved equal and mated to the appropriate LC connector adaptor panel port. Any un-used adaptor panel ports shall be covered at all times with appropriate dust cover as provided by the product manufacturer. At no time shall ports be left open to environmental contamination.
3. All fiber optic connectivity components shall be of the same manufacturer.
4. All cabling runs shall be continuous and without splicing and completely enclosed in Innerduct from MDF cabinet to IDF cabinet. If splicing is required, only fusion splicing is allowed. Service loops shall be coiled within the cabinets.

Communications Horizontal Cabling:

A. Data/Voice Cabling System

1. All horizontal cabling shall originate from the cabinet MDF or IDF as applicable. All cabling shall be terminated on 24 or 48-port Category 6 patch panels as manufactured by Panduit or approved equal. The maximum run length of all horizontal cabling shall not exceed 90 meters. Notify the District's representative in writing of any instance that exceeds the maximum prior to the installation of any cabling. The District representative's decision is final and legally binding.
2. Horizontal cabling shall be plenum or non-plenum rated as required by the environment. All cables shall be homeruns with no splicing at any time. The data cable outer insulation jacket shall be blue in color. The cable performance rating shall be Category 6 as manufactured by General Cable or approved equal.
3. A minimum of twelve (12) inches service loop shall be provided at the workstation outlet end and three (3) meters of service loop at the wiring closet end.

B. Surface Mount Raceway

1. Wiremold 2300, 2900 and 5400 Series are the District standards. Approved equals are acceptable for Erate installations. All installations are to be coordinated with the District's representative to ensure routing and outlet locations are optimized.
2. Any disagreements between crafts shall be settled by the District's representative whose decisions are final and legally binding.
3. The District Representative will determine the color of the raceway to be installed.

C. Workstation Requirements

1. Outlet devices
    a. Workstation outlet devices shall be installed on flush walls, in surface mount raceways, in modular furniture, in floor boxes, or in ceiling mount boxes as indicated on the project drawings.

b. The project drawings are an indication of the location of each outlet, but may not be exact. The District's representative will determine the exact location of each outlet device. The District representative's decisions are final and legally binding.

c. All outlet devices shall be as manufactured by Panduit, Wiremold or approved equal. The project Architect shall determine the color of the workstation outlet devices. The color shall be as close to the surface mount raceway, if applicable, as possible.

D. Connectivity Devices

1. Panduit Category 6A, 8-position, 8-pin, RJ-45 jack devices or approved equal, shall be installed as indicated on the drawings or as indicated by the District representative. All unused ports are to be filled with blank inserts the same color as the faceplate.
2. Termination to match the TIA/EIA 568B pin configuration.
3. All components shall be of the same manufacturer and adhere to the color requirements as identified by the project Architect.
4. Other media devices may be installed in the same outlet device as indicated on the project drawings. All devices shall be of the same manufacturer and adhere to the color requirements.

END OF SPECIFICATIONS