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SECTION 27 12 00
TELECOMMUNICATIONS CABLING EXPANSION

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

Drawings and General Provisions of the contract, including General and Supplementary Conditions and Division 1 Specification Sections.

1.2 SUMMARY

- A. This section includes installation, testing, documentation and training for a fully functional local area network cabling system.
- B. Furnish and install Horizontal UTP Copper cabling, patch panels, patch cords, termination units, and horizontal cross-connects, information outlets, respective cable termination connections, and other items necessary to "terminate" selected information outlets (IO) as shown on the Drawings.
- C. Existing Telecommunication Demolition - Existing cables and jacks scheduled to be removed shall be documented with telecommunication closet location and identification of the termination location in the telecommunication closet.

1.3 WORK PROVIDED UNDER OTHER SECTIONS

- A. Data cabling pathways, power wiring devices, lighting and other work related to the Local Area Network System will be provided by the Electrical Contractor unless noted otherwise.

1.4 WORK FURNISHED, INSTALLED, AND CONNECTED BY OTHER

- A. Electronic data communication equipment is not specified under this contract.

1.5 SUBMITTALS

- A. Submit a complete list of all proposed equipment and materials, including manufacturer's specifications and product cut sheets.
- B. Submit a labeling scheme approved by the owner.
- C. Telecommunications Maintenance Manual: Furnish one (1) complete Telecommunications Maintenance Manual containing the following:
 - 1. Descriptions of network cabling equipment and normal operating procedures.
 - 2. Riser Diagrams showing complete installed UTP and Fiber cabling.
 - 3. Proof of Performance Report outlining the operating parameters tested, complete test results, and a summary of industry standards used for each parameter.
 - 4. Warranty information.

1.6 APPLICABLE PUBLICATIONS, STANDARDS, CODES, TESTING LABORATORIES, GUIDELINES

- A. ANSI/EIA/TIA Standard 568B.1, 568B.2, AND 568B.3
- B. ANSI/EIA/TIA Standard 569
- C. ANSI/EIA/TIA Standard 606
- D. ANSI/EIA/TIA Standard 607
- E. Technical Service Bulletins TSB-36, TSB-40, TSB 67
- F. NFPA 70 National Electrical Code.
- G. Provide products specified in this section that are listed and labeled.
 - 1. The terms "listed" and "labeled": As defined in the "National Electrical Code", Article 10G0.

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1.7 GUARANTEES AND WARRANTIES

- A. Guarantee system, in writing, against defects in workmanship and associated material not covered by cabling system warranty, for one year after final acceptance. During this time, the entire system shall be kept in proper operating condition at no additional labor or material cost to the Owner.
- B. The manufacturer of the major components shall maintain a replacement parts department and provide test equipment when needed. The parts department shall be located in a geographical proximity consistent with rendering service within the stated period of time. An ample stock of individual components and equivalent unit replacement shall be carried for as long a period as demand warrants. This period shall extend beyond the normal life expectancy of the equipment.

1.8 QUALITY ASSURANCE

- A. Contractor shall be currently licensed to install low-voltage cabling systems in the state of Minnesota.
- B. Contractor shall meet manufacturer's requirements for the provision and installation of specified equipment.
- C. Contractor shall provide proof of certification as a structured cabling system installer for the system provided under this bid.
- D. Contractor shall utilize the following test equipment and shall have operators trained for use of such equipment:
 - 1. Copper Cable Test Equipment (or equivalent):
 - a. Fluke / MicroTest (level 3 tester)
 - b. Agilent WireScope 350 (level 3 tester).
 - c. Prior approved equal.
 - 2. Fiber Optic Cable Test Equipment:
 - a. Approved OTDR.
 - b. Approved OLS/OPM.

1.9 PROJECT/SITE CONDITIONS

- A. Examine areas and conditions under which the system is to be installed, and notify COTR in writing of conditions detrimental to proper completion of the work. Do not proceed with that portion of the work affected until unsatisfactory conditions have been corrected in an acceptable manner.

1.10 MANUFACTURER

- A. Subject to compliance with specified requirements, provide specified materials, or prior approved equal to the referenced products included for the design of the Local Area Network Cabling system.

1.11 UPGRADED PRODUCTS

- A. Due to the fast-changing technology, products shall be the most current and up-to-date quality and labor-saving versions available for the application, unless otherwise restricted.
- B. Prior to bidding, provide written notification of any discrepancies in model or part numbers specified. Corrections will be clarified by addendum.
- C. Prior to bidding, provide written notification to COTR of announced discontinuation or upgrade replacements of specified materials.
- D. Provide necessary supplies, mounting hardware and accessories required to install specified materials.

1.12 PRODUCT SUBSTITUTION

- A. No manufacturer substitutions will be allowed for the structured cabling system.

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Approved Material List

Category	Item	Part #	Manufacturer	Estimated Quantity
Jack Locations	4 Cable 2V-2D			
	6 Cable 2V-4D			
	1 Cable Cat 3			
Face Plates				
	4 Port	CFPSLY4E IY	Panduit	
	6 Port	CFPSLY6E IY	Panduit	
	8 Port	CFPSLY8E IY	Panduit	
Jacks				
	Cat 6 Violet	CJ688TVL	Panduit	
	Cat 6 Green	CJ688TGR	Panduit	
	Cat 3 Orange	CJ88UORY	Panduit	
	Cat 3 Red	CJ88URDY	Panduit	
	Wall Jack			
Patch Panels				
	24 Port	CP24WSBLY	Panduit	
	48 Port	CP48WSBLY	Panduit	
Cable supports				
	4" J-Hook	181120	Caddy	
	2" J-Hook	181100	Caddy	
Fasteners				
	Velcro 3/4"		Panduit	
Jack Supports				
	Single Gang	LV-1	Arlington	
	Double Gang	LV-2	Arlington	
Cable				
	Cat 6 Blue	7131688	General	

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	Cat 6 White	7131689	General	
	Cat 3 Gray		General	
Fire Stop				
Category	Item	Part #	Manufacturer	Estimated Quantity
Grounding				
	#6 CU 19-Strand Green			
	Lug #6 long Barrel 2 Hole	YA6C-2TC14	Burndy	
	Tag	LTYK	Panduit	
	Bonding Washer	RGW-100-1	Panduit	
	Ground Bar 19"x3/4"x1/4"		Hoffman Electric	
	Main Ground Bar	GB2B0312TPI-1	Panduit	
Cross connect				
	1 Pr Wh/Gn 24 ga Roll 1000'		General	
Patch Cords Cat 6				
	Black - 1'			
	Black - 1.5'			
	Black - 2.0'			
	White - 1'			
	White - 1.5'			
	White- 2.0'			
Station Cords				
	Cat 6 Black			
	Cat 6 Black			
	4-Con Silver Satin F/M 14'			

1.13 MANUFACTURER'S CERTIFICATION

A. Manufacturer of cabling products shall be ISO9001 Certified.

1.14 UTP COPPER CABLE LENGTHS, TERMINATIONS, MARKINGS

A. Copper Cable runs shall be compliant with EIA/TIA recommended lengths: Horizontal cables shall not exceed 295 feet. Cable runs shall be continuous with no allowance for splicing.

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- B. For construction on Mpls VAMC Campus: Copper cable Eight-Position Jack Pin/Pair Assignments shall match the VA Hospital's existing facilities. Coordinate with the owner prior to installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide a certified structured cabling system by: General Cable or approved equal.
- B. Data Cable: Part Number 7131688, Cat 6, blue.
- C. Voice Cable: Part Number 7131689, Cat 6, white.

2.2 EQUIPMENT RACK:

- A. Rack: Free-standing, 19"Wx84"H, self-supporting, constructed of high-strength aluminum, black in color. 5/8" - 5/8" - 1/2" alternating hole pattern compatible with EIA 1 1/4" - 1/2" alternating hole patterns. Includes 50 pilot point #12-24 mounting screws. Anchor to floor and provide connection to electrical ground bus bar, green, #6, 19-strand.
1. Provide products manufactured by one of the following:
 - a. Chatsworth Products (CPI) #46053-703 series
 - b. Prior approved equal.
 - B. Wire Management: Furnish and install cable management ducts on side of racks as noted. Vertical ducts shall be 3" or 6" wide, as indicated on drawings, with integrated molded plastic cable guides and a hinged door/cover. Furnish and install horizontal wire management panel for each modular patch panel. Horizontal duct shall be black plastic with removable top cover.
 1. Provide products that mate and match the existing racks.
 2. Provide products manufactured by one of the following:
 - a. Vertical Management: Chatsworth products (CPI) #30094-703 series.
 - b. Horizontal Management: Chatsworth Products (CPI) #13075-719 series.
 - c. Prior approved equal.

2.3 CABLE SUPPORT

- A. Supply velcro straps, length and strength as required to properly organize and bundle cables. Vinyl/plastic tie wraps are prohibited throughout except where allowed in section 2.6.
- B. Install cables in conduit and wireway systems provided by the Electrical Contractor. Coordinate with the Electrical Contractor for specific requirements.

2.4 CATEGORY 6 CHANNEL

- A. The Category 6 - 4 pair UTP channel consists of all cable and components with up to four connections that comprise the full 100 meter circuit from the LAN Electronics to the work station device. The channel shall support applications such as 10Base-T, 100Base-T, 155 Mbs ATM, 77 channel broadband video, 1.0 Gbps Ethernet, 1.2 Gbps, and proposed 2.4 Gbps ATM technologies.
- B. The channel shall include the patch panels, horizontal cabling, and the station cord, and shall have a positive PSACR across the full frequency range of 1MHz - 250MHz.
- C. All components shall be backward compatible with existing Category 3, 4 and 5 networks.
- D. The cabling channel with specified manufacturers above shall exceed Category 6 requirements.

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2.5 INFORMATION OUTLETS

- A. Activations: 4 outlets will be required at each location shown on the plans with tabs down.
- B. Modular Faceplates: Ivory, smooth nylon, UL rated 94V-0 high impact, flame-retardant, thermoplastic, integral label card and cover, sized as follows:
 - 1. Data information outlets: Devices shown on plans as data information outlets shall be four position faceplates. Panduit 4 position face plate Part Number CFP4E1Y.
 - 2. Telephone information outlets: same as data.
- C. Modular Information outlets: Modular single information outlet designed for high-performance networking applications. Panduit gigaspeed information outlet:
 - 1. Data outlet Cat 6 Violet 568B: Panduit CJ688TGVL
 - 2. Voice outlet Cat 6 Green 568B: Panduit CJ688TGGR
- D. Minimum electrical requirements:
 - 1. Insulation resistance: 500 MΩ minimum
 - 2. Dielectric withstand voltage 1,000 VAC RMS, 60 Hz, minimum contact-to-contact and 1,500 VAC RMS, 60 Hz minimum from any contact to exposed conductive surface.
 - 3. Contact resistance: 20 MΩ maximum
 - 4. Current rating: 1.5A at 68 degrees F per IEC Publication 512-3, Test 5b
- E. Dust Cover/Blank: Contractor shall provide dust covers for each outlet as required to close all faceplate openings.
- F. Where data/voice jacks are fished into a hollow wall space without a raceway, Arlington LV-1 or approved equal shall be used. Metal types such as Caddy brand are not allowed.

2.6 MODULAR PATCH PANELS

- A. Furnish and install Modular Patch Panels, Panduit CPP48WSBLY. The panels shall be 19-in. wide for rack mounting. The panels shall accommodate Panduit CJ88TPVL Cat 6 Violet 568B Data Jack and Panduit CJ8BTPGR Cat 6 Green Voice Jacks (Small Clinic Installations) or Panduit Cat 6 110 blocks, GPKBWxx (Large Clinic or Medical Center Installations - xx = 24, 48, 72, or 96). All cables shall be secured to the strain relief bar using vinyl/plastic tie wraps. Provide labeling strip above each jack. Contractor shall be responsible for sizing the modular patch panels according to the following specifications:
 - 1. Number of Modular Patch Panel Ports shall be 125 percent of the total number of terminated information outlets required for the VRT project.
 - 2. Patch panels shall be 24 port or 48 port.

2.7 PATCH CORDS

- A. Provide Patch Cords, Panduit Gigaspeed D8CM, 24 AWG, polyfin, twisted, jacketed, with 8-position Modular Plug at each end.
 - 1. Data Color: Blue
 - 2. Voice Color: White
- B. Lengths of patch cords shall comply with EIA/TIA 568A recommended lengths: Patch cords shall not exceed 20 feet. Provide varying lengths to suit data closet installation. Coordinate final length selection with COTR prior to ordering.
 - 1. Data Lengths: Assume 50% 3 ft, 50% 5 ft.

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- C. Provide 1 patch cord for each activated information outlet.

2.8 STATION CORD

- A. Provide UTP Station Cord interconnection between the work location equipment and the data outlet. Cord shall be 24 AWG tinned copper stranded conductors insulated with solid polyfin, tightly twisted into individual pairs and jacketed with flame retardant PVC. An 8-position modular plug will be terminated to each end of the cords. These cords will match the installed Patch Cords in order to maintain the integrity of the Cat 6 Local Area Network UTP cabling system. Provide Avaya D8CM work station cord.
 - 1. Data color: Blue
 - 2. Voice color: White
- B. Provide UTP Station Cords of the following lengths: 100% 15 feet. Coordinate final length selection with owner.
 - 1. Station cord lengths for wall mounted phones shall not meet this requirement. Provide minimum suitable length of phone cord for connection to phone.
- C. Provide 1 patch cord for each activated information outlet.

2.9 HORIZONTAL UTP CABLE

- A. Furnish and install copper Unshielded Twisted-Pair (UTP) horizontal cable as follows:
 - 1. General Cable Gigaspeed Part No. 6P4P24BLSGCCPP, plenum rated, 24 AWG bare solid copper conductor. The cable shall conform to UL Type CMP listing for plenum and riser applications.
 - 2. Each cable sheath shall contain 4 pairs of unshielded copper twisted-pairs with each pair having a different twist ratio of 12 to 24 twists per foot. Each pair shall be separated by a pair isolator.
 - 3. The cables shall exceed the requirements of:
 - a. EIA/TIA 568B Commercial Building Wiring Standard Horizontal Cable Section for category 6.
 - b. Plenum - UL 910, CMP.
 - 4. The cables shall meet the following representative electrical and transmission characteristics:
 - a. Mutual Capacitance - nom. = 14 nF/1000 ft.
 - b. DC Resistance - max. = 29 ohms/1000 ft. (9.4 ohms/100m).
 - c. Gbps 4 Pair Cable Performance Characteristics as follows:

Frequency MHz	Attenuation	Power Sum NEXT dB	Attenuation to Crosstalk Ratio	Structural Return Loss
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	DB/100m		dB/90m	DB
1	2.0	75.3	75.3	23.0
4	3.8	66.3	64.5	23.6
8	5.3	61.8	54.5	25.4
10	5.9	60.3	58.5	26.0
16	7.5	57.3	51.7	26.0
20	8.4	55.8	49.4	26.0
25	9.4	54.3	46.9	25.5
31.25	10.6	52.9	44.3	25.0
62.5	15.3	48.4	35.1	23.5
100	19.7	45.3	27.6	23.0
200	28.8	40.8	14.0	21.0
250	32.6	39.3	8.7	20.5

5. Provide colors for each defined system as follows: Blue

2.10 FIBER OPTIC CABLE:

A. Fiber optic cable shall be Avaya LazrSPEED ABC-0012D-ZHX or equal. The cable shall have (2) strands of multi-mode fiber. Provide fiber with the following optical characteristics:

1. Multi Mode:

850nm:	Maximum Attenuation	3.5 dB/km
1300nm:	Maximum Attenuation	1.5 dB/km
850 nm	Minimum Bandwidth:	1500 MHz/km

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1300 nm Minimum Bandwidth: 500 MHz/km

2. Supports 10Gb/s Ethernet using 850nm VCSEL to 300m.
3. Fiber tension rating - 600 lbs.
4. Fiber minimum bending radius during installation - 20 x diameter.
5. The fiber cable shall meet the following technical specifications:
 - a. Multi-Mode Fiber Dimensions: 62.5 micron core
125 micron cladding
250 micron coating
900 micron buffering
6. Fiber Identification: Individually color-coated PVC buffer.
7. Buffer Material: Plenum PVC
8. Jacket Material: Plenum PVC (color as selected by owner).
9. Strength Material: Aramid Yarn
10. Operating Temperature: 0 to + 50 deg. C
11. Storage Temperature: -40 to +70 deg. C
12. EIA Fiber Cable tests:

<u>TEST</u>	<u>REFERENCE</u>
Impact	EIA-RS-455, FOTP-25
Compression	EIA-RS-455, FOTP-41
Flexure	EIA-RS-455, FOTP-104
Tensile Bending	EIA-RS-455, FOTP-33
Temperature Bending	EIA-RS-455, FOTP-37
Twist Testing	EIA-RS-455, FOTP-85
Flame Test (OFNP)	UL 910 (NEC) [CSA OFN-FT4, FT6]

2.11 FIBER TERMINATION UNITS:

Furnish and install Avaya 600BLS front access sliding shelf connector panel equipped with SC couplings and cover plate for all Data racks. Units shall provide top or bottom cable entry, fiber termination, cross connection, interconnection, routing, fiber identification labels, fiber storage and radius organizers.

2.12 FIBER TERMINATION CONNECTORS: N/A

2.13 FIBER PATCH AND WORKSTATION CORDS: N/A

PART 3 - EXECUTION

3.1 GENERAL

Install equipment and components in accordance with manufacturer's written instructions, in compliance with NEC, and with recognized industry practices. Ensure that all work complies with specifications and serves the intent of the construction documents. Cabling and equipment shall be installed in accordance with good engineering practices as established by the EIA/TIA and the NEC.

3.2 INSTALLATION

A. Cabling - General:

1. Provide dedicated horizontal cable runs from data closets to all "terminated" information outlets as described above and indicated on the Drawings.
2. Provide faceplates for all data and voice information outlets.

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3. Where data or voice outlets are shown on plans, this Contractor shall provide jack termination, faceplate, and cabling.
 4. Provide Modular Information Outlets in outlet boxes for all "terminated" data information outlets.
 5. Excess cable behind faceplate connections shall be pulled back into ceiling spaces and secured in such a manner as to prevent damage to cabling or connections.
 6. A minimum 10 foot loop of extra horizontal cable shall be secured in the accessible ceiling space.
 7. Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors.
 8. Avoid excessive and sharp bends that may damage cabling. Do not exceed manufacturer's recommended pulling tensions for backbone and horizontal cables.
 9. Allow sufficient slack (10 feet) in cable to prevent premature deterioration of cable system components and to assist in the maintenance and servicing of cable and/or other building systems and components.
 10. Provide Cable Distribution J-Hooks as necessary to route and support cables within the data closet. All cables shall be properly supported.
 11. Provide Velcro straps to bundle and organize cabling for a quality and professional installation. **Vinyl/plastic tie wraps are prohibited except where allowed in section 2.6.**
 12. Fittings or connections are allowed only at the input and output of devices. Splicing shall not be accepted in cable runs. Spliced cable runs shall be rejected and replaced with continuous cables, prior to acceptance.
 13. Separation of Wires: Comply with EIA/TIA-569 rules for separation of UTP cables from potential EMI sources.
 14. All cabling outside the data closet shall be routed in conduit or wire way, installed by the electrical contractor.
 - a. Conduit fill shall not exceed 40%. This applies to both raceways and sleeves. Each conduit end not terminated in a box shall be equipped with a protective insulator or sleeve to cover the conduit end to protect the wire or cable during installation and remaining in the conduit.
- B. Sleeving: All cabling penetrating a wall or floor and not in a raceway shall be sleeved. A penetrator sleeve system and method for using same provides an encasement for wires and cables passing through a wall or floor. The system should include appropriate securing devices for tightly retaining the penetrant in place. This will also create a space between the penetrant and surrounding structure, which must be fire stopped in order to restore the fire-resistance rating of the parent assembly. The penetrant shall be one of the following;
1. EMT conduit with bushed ends.
 2. Prefabricated fire-rated pathway. Recommend the following or approved equivalent. Follow manufacturer's conduit fill recommendations.
 - a. EZ-PATH Fire Rated Pathway
 - b. Spec Seal Ready Sleeve

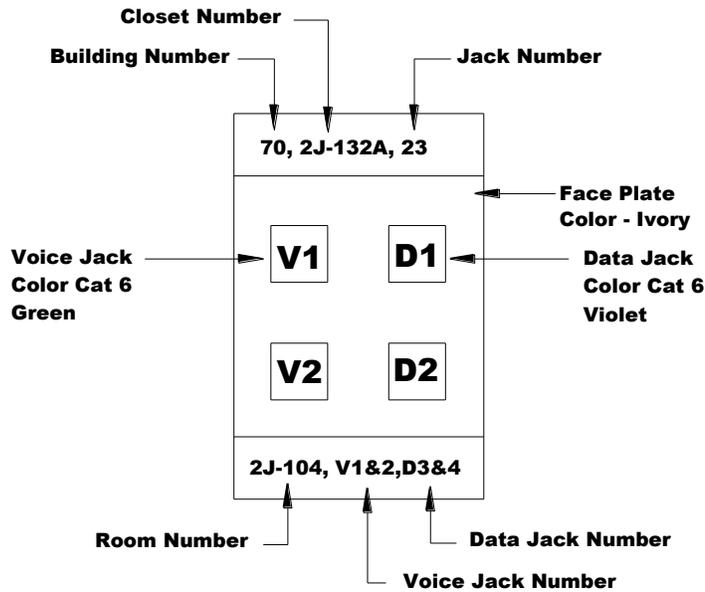
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- C. Firestopping: Provide fire stopping after cabling installation at all fire wall/floor penetrations.
- D. Grounding: The general contractor shall be responsible for installing a ground bus adjacent to the rack. Ground all racks and cable runway to this ground bus. The contractor shall provide a #6 copper conductor from each rack/runway to the ground bus. Ground equipment per manufacturers' instructions and NEC requirements.
- E. Labeling, in accordance with VA Standards:
 - 1. Use Owner's room numbers for labeling. Confirm room numbers with Owner's Representative prior to labeling. See attached graphical information for labeling of face plates.

2. Utilize the following labeling scheme:

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Face Plate Labeling Conventions

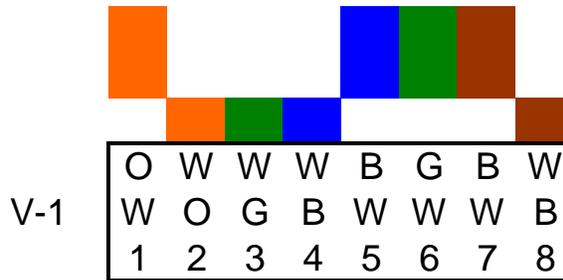


- Utilize manufacturer designed labeling method at Outlet and Patch Panels. Labeling method shall be permanent and minimally susceptible to vandalism. Labels shall be permanent, and contractor shall replace fallen labels as part of the warranty.

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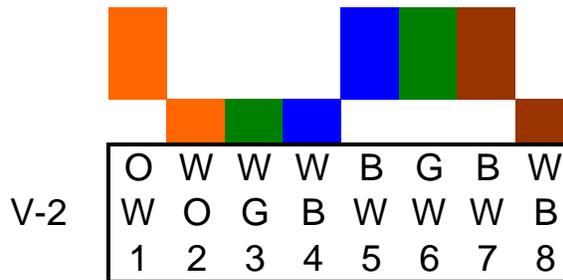
Jack and Block Terminations as follows:

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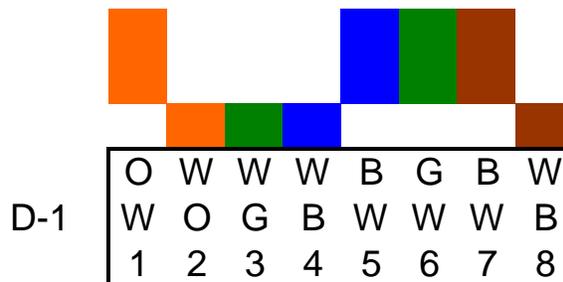
V-1

PANDUIT CAT 6 GREEN JACK
568B



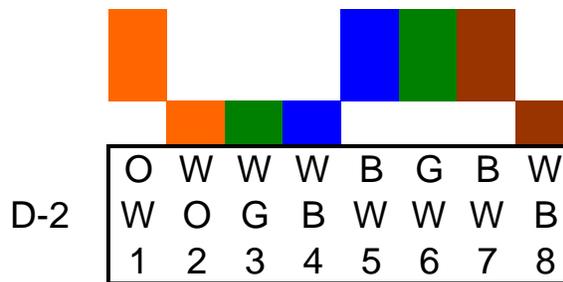
V-2

PANDUIT CAT 6 GREEN JACK
568B



D-1

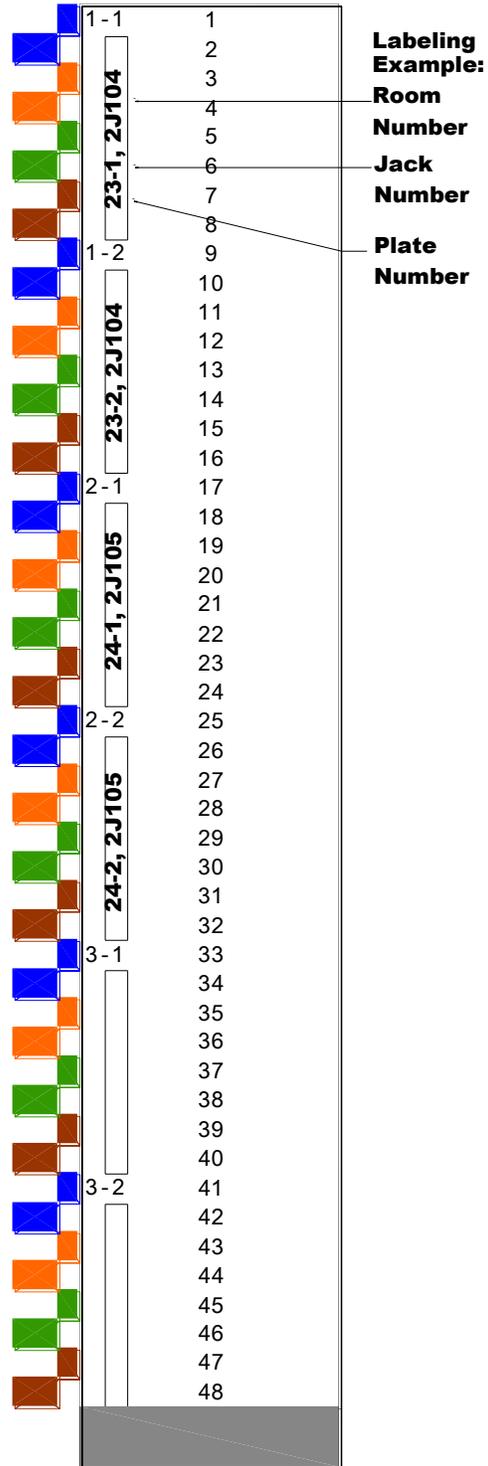
PANDUIT CAT 6 VIOLET JACK
568B



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PANDUIT CAT 6 VIOLET JACK
568B

Panduit 110 Cat 6 Block



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4. Label Faceplates for outlet locations. Jack numbering will begin at the first jack on the left hand wall as you enter the room and be labeled clockwise around the room. Continue the numbering sequence throughout the area served by that data closet.
5. Label patches panel terminations with the identical numbers used at the outlets.
6. Label both ends of each cabling run within 6 inches of termination points with Panduit Pan-Ty marker and flag ties, a label machine, or approved equal. Label the room end of the cable with the data closet identification number (closet number and jack number) and label the data closet end of the cable with the room jack number (room number, voice and data jack number).
7. Whenever possible, cross connect riser pairs shall be run sequentially.

3.3 COPPER CABLE TESTING

- A. Testing of all copper wiring shall be performed prior to system cutover.
- B. Cables shall be tested for all Category 6 100% Channel parameters using the specified level 3 tester. Test all Category 6 Channel parameters, including attenuation, NEXT, PS NEXT, FEXT, ELFEXT, return loss, and delay skew.
- C. Patch cord, workstation cord, and cable lengths shall be recorded as part of the testing.
- D. Faults shall be corrected and retested.
- E. Test information along with manufacturer and model number of test equipment shall be recorded and provided to Owner as part of the project Telecommunications Manual.
- F. Provide proof of factory calibration of test meter within 6 months of the beginning of testing.
- G. The "* pass" option on the test meter must be set to the "on" state. The "* pass" symbol indicates a channel that is within 1 db of failing.
- H. Provide test data in electronic format with corresponding software for viewing of testing documentation on CD-ROM provided from the test meter. Contractor shall provided one CD-ROM to Owner and one to Engineer.
- I. Provide all cross connect information (X-Conn) to COTR.

3.4 GENERAL FIBER OPTIC TEST REQUIREMENTS: N/A

3.5 FIBER TEST PROCEDURES: N/A

3.6 FIBER TRANSMISSION LOSS TEST REPORT: N/A

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