EAST CENTRAL COLLEGE

REQUEST

FOR

PROPOSALS

April 20, 2016

Category 6, Structured Cabling System

Project 2015-2016

Due 1:30 PM CST/CDT
Monday, May 16, 2016

Company Name: _____

Contact Information: _____
Printed Name & Title

_____
Address, City, State

_____
Phone Number

EAST CENTRAL COLLEGE
REQUEST FOR PROPOSALS

*Please mark the outside of your return envelope:

TO: EAST CENTRAL COLLEGE
1964 Prairie Dell Road, Union MO 63084
Email: melissa.popp@eastcentral.edu
PH: (636) 583-6703 FAX: (636) 584-8602

BID: Category 6, Structured Cabling System

DUE: 1:30 PM, May 16, 2016

Questions concerning this Request for Proposals must be received by fax or email no later than 12:00 PM May 9, 2016.

Proposals must be received May 16, 2016 No later than 1:30 PM CST/CDT.

DIRECT CONTACT WITH EAST CENTRAL COLLEGE BOARD OF TRUSTEES IS PROHIBITED.

INSTRUCTIONS AND CONDITIONS: Please quote the lowest net price at which you agree to furnish the service listed. Please send 3 copies of this bid response sheet and descriptive folders giving trade names, specifications, and related information on items bid. Samples may be sent to further describe the merchandise in question.

VERIFY YOUR PROPOSAL BEFORE SUBMISSION AS THEY CANNOT BE WITHDRAWN OR CORRECTED AFTER BEING OPENED. The College is exempt from the Missouri State Tax. The College is a state funded institution and requires all bids to be submitted as prevailing wage. Franklin County is listed under section 36 in the Missouri Statute. East Central College is not responsible for Request for Proposals lost in transit or received after time of quotation closing. It is the vendor's responsibility to confirm receipt of their proposal by the Purchasing Department.

WE WILL ACCEPT ONLY SEALED WRITTEN BIDS; VERBAL QUOTES OR BIDS SUBMITTED VIA FAX, E-MAIL, OR ANY OTHER MEANS WILL NOT BE ACCEPTED.

ALL PRODUCT DESCRIPTION, FEATURES, CHARACTERISTICS AND PRICING ASSOCIATED WITH THIS SERVICE MUST BE DETAILED IN THE BID. EAST CENTRAL COLLEGE RESERVES THE RIGHT TO REJECT ANY OR ALL PROPOSALS, WAVE MINOR IRREGULARITIES, CONSIDER MINOR VARIATIONS TO SPECIFICATIONS THAT ARE CLEARLY DETAILED, AND ACCEPT THE LOWEST BID WHICH APPEARS TO BE IN THE BEST INTEREST OF THE COLLEGE.

Item#	Qty	Description	Total Cost
1		Category 6, Structured Cabling System	

***Return this form to East Central College Purchasing Department with Unit Price and Extension Total indicated.**
East Central College reserves the right to purchase by individual item. All prices quoted shall be F.O.B. East Central College, Union, Missouri or to any East Central College off-campus location when indicated. All prices quoted shall be valid for a minimum of 90 days from closing date of request for proposal.

We agree to furnish the above material and service for delivery as specified, at prices shown opposite each item. This form must be completely filled out and signed, or it will not be accepted.
IT IS REQUIRED THAT THE VENDOR READ AND FOLLOW ALL INSTRUCTIONS ON THIS FORM. FAILURE TO DO SO IS SUFFICIENT CAUSE FOR REJECTION.

THIS IS NOT AN ORDER

_____
Name of Firm

Date: _____

_____
Signature & Title

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NOTE:

Though East Central College is seeking an end to end Siemen solution, bid alternates will be accepted and reviewed.

1 INTRODUCTION

00 01 01: GENERAL BACKGROUND

This document is issued as a request for quote for the supply and installation of a structured telecommunications cabling system for **East Central College**
The structured cabling system will support voice, data, and imaging applications within the facility located at **42 Prairie Dell Plaza Rd.**
This document describes the system requirements to be met in the proposals of the telecommunications cabling vendors to secure under contract all materials, design, engineering, installation, supervision and training services for the structured cabling system.

00 11 00: TERMS AND CONDITIONS OF BIDS

This is an invitation to submit a bid based on the materials, systems and equipment described in this document.
All bids must be submitted in accordance with the specifications and information contained herein, as well as with any addenda, if required, issued by the purchaser.
The bid package shall be accompanied by a presale warranty commitment binding the awarded contractor and manufacturer to the customer selected, extended warranty package not less than 20 years in length.
It is the intent of the Drawings and Specifications to provide a complete workable telecommunication cabling system ready for the Owner's use. Any item not specifically shown on the Drawings or called for in the Specification, but normally required for a complete system, are to be considered a part of the contract.
Consideration other than cost alone will be used in making the determination of the successful contractor. These factors will include financial stability, availability, design support, project management and field supervision.
The Manufacturers and Products specified in the document are to be used. No substitutions of components specifically referenced will be allowed, without prior written customer consent after submittal review.

00 21 13: INSTRUCTIONS TO THE BIDDER

The currency used for said bid will be in **US Dollars.**
Prices shall be quoted in **US Dollars.**
Bids shall be valid for 90 days and other factors such as material and labor rate increases during the duration of this project must be taken into account.
The Bidder shall consider the nature and amount of work to be done as well as the difficulties involved in its proper execution.
No bid will be accepted by any contractor who did not attend the scheduled mandatory site survey.
The bid shall include all costs deemed necessary to cover all contingencies essential to the installation of the specified system.
Total cost for installation materials, labor project management, permit fees, sales tax and other miscellaneous items must be listed separately.
A complete materials list, including description, manufacturer, part number, quantity, unit price and total price must also be included.
A statement of estimated labor hours and prevailing hourly labor rates must be included.
All products and materials shall be new, clean, free of defects and free of damage and corrosion.
Where discrepancies are found during the bid process, the most stringent requirements must be included in the bid.
Any cost encountered, which is not specifically itemized in the bid, shall not be incurred unless specifically agreed upon, in writing.
No additional compensation will be allowed for extra work incurred on the part of the Contractor due to the bidders failure to notice any existing condition, which may cause the additional labor.
Bid responses shall be concise following the format and numbering of this specification. Items not requiring responses shall be acknowledged by the bidder as being understood.
Bidders must notify the Purchaser as soon as detected any omissions or errors in the specification so corrective addenda may be issued. Such notification must be received by the Purchaser, at least (10) days prior to the date for receipt of bids.

Bids will be accepted by Melissa Popp 636-584-6703 at 1964 Prairie Dell Road Union, MO 63084 by 1:30 pm, Monday, May 16, 2016. Bids received after this time will be returned unopened.
Inquiries and requests for clarifications should be submitted to **Mark Eaton Director, Facilities & Grounds 636-584-6733** in writing by 12:00 pm, Monday, May 9, 2016 receipt of these specifications.

00 70 00: RIGHTS OF THE PURCHASER

The Purchaser reserves the right to accept any bid or, at its discretion, reject any or all bids for whatever reason it deems appropriate.
The Purchaser reserves the right to purchase ALL or PART of the cabling materials and Hardware needed for the project.
Receipt of a bid response does not obligate the Purchaser to pay any expenses incurred by the bidder in preparation of the bid response or obligate the Purchaser in any other respect.
The Purchaser reserves the right to modify the specifications contained in the Request for Quote anytime during the bidding period.
Only changes issued as an addendum will be binding upon the Purchaser. No verbal instructions or interpretations of requirements shall be accepted.

01 32 00: SCHEDULE OF EVENTS

The schedule below indicates the critical dates that must be satisfied by the Contractor. The Contractor must staff its work crews appropriately to meet the required dates of completion.

EVENT	DATE
Release of this RFQ	**(4/20/16)**
Mandatory Pre-Bid Meeting	**(5/06/16)**
Proposal Due	**(5/16/16)**
Contract Award	**(6/14/16)**
Start of Installation	**(6/20/16)**
Completion of Installation	**(9/02/16)**

2 GENERAL REQUIREMENTS

01 00 00: GENERAL REQUIREMENTS

- **Liability insurance with a minimum of $1,000,000.00 coverage, with a certificate on file with the owner prior to installation.**
- **Contractor must have workman's compensation insurance in the state in which work is performed.**
- **The Contractor should be prepared to furnish surety, performance and completion bonds if required.**
- **Payment Terms**
- **Contracts**
- **Disclosures and Patent Infringement**
- **Inspection, Tests and Guarantees**

01 43 23: CONTRACTOR QUALIFICATIONS

The Contractor shall at a minimum possess the following qualifications:
Be in business a minimum of five (5) years.
Contractor shall demonstrate satisfaction of sound financial condition and can be adequately bonded and insured if the project deems necessary.
Possess those licenses/permits required to perform telecommunications installations in the specified jurisdiction.
Personnel knowledgeable in local, state, province and national codes and regulations. All work shall comply with the latest revision of the codes or regulations. When conflict exists between local or national codes or regulations, the most stringent codes or regulations shall be followed.
Must possess current liability insurance certificates.

01 43 23: REQUIRED CONTRACTOR TRAINING

The Contractor shall be fully conversant and capable in the cabling of low voltage applications such as, but not limited to data, voice and imaging network systems. The Contractor shall at a minimum possess the following qualifications:
Personnel trained and certified in the design of the Siemon Cabling System®.
Personnel trained and certified to install the Siemon Cabling System®.
The Designer and Installer shall show proof of current certification of the Siemon Cabling System® via an updated certificate given after attending the CI-301 training course or an on-line re-certification class given every two years.
Provide references of the type of installation provide in this specification.
Personnel trained and certified in fiber optic cabling, splicing, termination and testing techniques.
Personnel must have experience using an optical light source and power meter plus OTDR.
Personnel trained in the installation of pathways and support for housing horizontal and backbone cabling.

01 71 00: CONTRACTOR RESPONSIBILITY

Contractor shall be obligated to exercise the highest standard of care in performing its obligations as defined in this request for proposal.
Contractor acknowledges that **East Central College** will rely on contractor's expertise, ability and knowledge of the system being proposed and shall be obligated to exercise the highest of standard care in performing its obligation as defined in the following Scope of Work.

01 43 13: MANUFACTURER QUALITY & PRODUCT SUBSTITUTIONS

All telecommunications connecting hardware and cable must be made by an ISO 9001:2000 Certified Manufacturer.
All products must meet the technical requirements listed in sections 6-8. Any products not meetings these requirements will not be considered.

3 INDUSTRY REQUIREMENTS

01 42 19: STANDARDS

The following installation, documentation, component and system industry specifications shall be met or exceeded:

- ANSI/TIA-568-C.0-2009 and addenda
  "Generic Telecommunications cabling for Customer Premises"
- ANSI/TIA-568-C.1-2009 and addenda
  "Commercial Building Telecommunications Cabling Standard"
- ANSI/TIA-568-C.2-2009 and addenda
  "Balanced Twisted-Pair Telecommunications Cabling & Component Standard"
- ANSI/TIA-568-C.3-2008 and addenda
  "Fiber Optic Cabling Components Standard"
- ANSI/TIA-569-D 2015 and addenda
  " Telecommunications Pathways and Spaces"
- ANSI/TIA-606-B-2012 and addenda
  " Administration Standard for the Telecommunications Infrastructure"
- ANSI-J-STD-607-B-2011 and addenda
  " Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises"
- ANSI/TIA-526-7
  "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant"
- ANSI/TIA-526-14-B
  "Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant"
- IEC/TR 61000-5-2 - Ed. 1.0 and amendments
  "Electromagnetic compatibility (EMC) - Part 5: Installation and mitigation guidelines - Section 2: Earthing and cabling"
- ISO/IEC 11801:2011 Ed2.2 and amendments
  " Information technology - Generic cabling for customer premises"
- CENELEC EN 50173-1:2007 and amendments
  " Information Technology - Generic cabling systems"

4 SCOPE OF WORK

01 11 00: SCOPE OF WORK

(Insert Customized Scope of Work Here)
Examples include but are not limited to:

- **Approximately 25,000 ft2**
- **Approximately 535 Drops (Each contractor is responsible for qualifying their own numbers)**
- **Closet numbers and locations (1)**
- **Pathway types and locations. (See drawings for cable tray details)**

5 HORIZONTAL CABLING - COPPER

In addition to meeting the category 6 specifications outlined in ANSI/TIA/EIA-568-C.2, the requirements in this section must also be met for all applicable balanced twisted-pair products as listed below.

27 15 43: OUTLETS

All category 6 information outlets designed for termination of 4-pair balanced twisted-pair category 6 copper cable must possess the following characteristics at the minimum:
Where necessary (offices, classrooms, and some common areas the contractor shall provide a ¾" conduit with an anti-short bushing stubbed above the ceiling approximately 6" to 8" above ceiling height, connected to a 4"x4" box in the wall with appropriate raised plaster ring and anti-short bushing. Note that this is specified in the electrical contractor's scope as well. Data contractor is responsible for opposite wall.

- Be independently verified for category 6 compliance
- Be available in black, white, red, gray, yellow, blue, green, orange, ivory, bright white, light ivory and alpine white
- Have available a gravity feed (45 degree angled) design to help control patch cord bend radius as well as flush mount design
- Utilizes TRI-BALANCE™ technology with optimized pair balance design and linear crosstalk response to address applications up to 250 MHz
- Have 310 style insulation displacement connectors with quadrant pair isolation and a Pyramid™ wire entry system
- Allow termination with a single conductor impact tool
- Have available termination aid (included with each box of 20) for stabilization of module to facilitate lacing and impact during termination
- Modules should feature category markings on front and rear of outlet
- Be backwards compatible to allow lower performing categories of cables or connecting hardware to operate to their full capacity
- Have rear protective strain relief caps with side or rear entry, which can be installed onto cable before or after termination
- Support industry standards for T568A or T568B wiring options on each individual outlet
- Allow installation from the front or rear of the faceplate, and allow for the jack to pass through the faceplate without re-termination
- Beside-stackable for high-density solutions
- Have a color matching protective, hinged or flexible door to protect the outlet from dust and other airborne contaminants
- Provide color-coded, slide-in icons available for circuit identification
- Allow for a minimum of 200 terminations without signal degradation below standards compliance limits
- Be constructed of high impact, flame-retardant thermoplastic
- Have, as an option, an outlet, which can be mounted into an IEC 60603-7 compliant opening (keystone)
- Must be certified by Underwriters Laboratories to United States Standards and C22.2 Canadian Telecommunications Standards
- Meet the following performance specifications:

Margin over category 6 @ 250MHz		
Parameters	**Worst Case**	**Typical**
Insertion Loss (dB)	0.12	0.14
NEXT* (dB)	0.84	4.37
FEXT* (dB)	2.1	5.1
Return Loss (dB)	6.9	8.3

* Tested in both Differential and Common modes

Siemon MAX® 6 Modules Recommended

27 15 43: FACEPLATES

All faceplates installed, as part of this specification shall have these minimum features listed below:

- Be applicable to both fiber and copper applications.
- Be available in 1-, 2-, 3-, 4- and 6-port single-gang configurations or 6-, 8- and 12-port double-gang configurations.
- Allow modules to be removed from the front of the faceplate.
- Allow UTP modules to pass through faceplates even after termination.
- Have write on designation labels for circuit identification together with a clear plastic cover.
- Feature easily removable designation label covers which can be removed without use of tools.
- Be available in single-gang and double-gang configurations.
- Have as a minimum the standard colors of black, white, gray, ivory and light ivory.
- Have optional modular furniture adapters available.
- Have Designer style faceplates and mounting frames available
- Have stainless steel versions available with designation label option.
- Have surface mount boxes and standoff rings available for both single and double gang faceplates.
- Be manufactured using UV resistant, high impact thermoplastic to prevent color fading and provide additional durability.
- Must be certified by Underwriters Laboratories to United States Standards and C22.2 Canadian Telecommunications Standards.

Siemon MAX® Series Faceplates Recommended

27 15 13: CABLE

All Category 6 cable shall conform to the following minimum performance standards:

TWISTED-PAIR CABLING

- All qualified cables shall surpass the most severe category 6 requirements provided in the Industry Standards by meeting or exceeding the performance listed below for all specified frequencies (except where noted):

Parameter	UTP Cable Performance				
	100 MHz	200 MHz	250 MHz		
Insertion Loss (dB)	19.8	29.0	32.8		
NEXT Loss (dB)	44.3	39.8	38.3		
PSNEXT Loss (dB)	42.3	37.8	36.3		
ACR (dB)	24.5	10.8	5.5		
PSACR (dB)	22.5	8.8	3.5		
ACR-F (dB)	27.8	21.8	19.8		
PS ACR-F (dB)	24.8	18.8	16.8		
Return Loss (dB)	20.1	18.0	17.3		
Propagation Delay (ns)	538	537	536		
Delay Skew (ns)	≤ 45	≤ 45	≤ 45		

Siemon Solution 6 Cable Recommended

In addition to the requirements listed above, bundled or hybrid cable must also meet the following requirements:

- Be in groupings of 4-pair units.

- Be power sum NEXT tested where any disturbed pair within the hybrid/bundle cable shall be 3 dB better than the specified pair-to-pair NEXT loss of a single 4-pair cable of the same category.

6 EQUIPMENT ROOM

27 11 19: PATCH PANELS

All termination panels shall facilitate cross-connection and inter-connection using modular patch cords and shall conform to EIA standard, 19-inch relay rack mounting requirements.

- Offered in kit form to include Z-MAX™ Panel outlets.
- Be made of lightweight, high strength steel with durable black finish in 24 & 48 port 1U configurations
- Panel outlets feature a patented angled IDC contact.
- Have a quick release lever that allows individual outlets to be easily removed even in tight installations.
- Be available in both flat and angled configurations
- Have port identification numbers on the front of the panel
- Accommodate both 24 & 48 ports for each rack mount space (1RMS = 44.5 mm [1.75 in.])
- Come equipped with integrated rear wire management system
- Be provided with high visibility snap-on magnifying label holders that contain paper labels or Z-MAX icons for port identification.

Siemon Z-MAX™ 6 UTP Patch Panel Recommended

27 11 19: CONNECTING BLOCKS

The connecting block shall facilitate cross-connection and/or inter-connection using patch cords. The 66 blocks shall posses the following characteristics:

- Be made of high-impact, flame-retardant thermoplastic
- Be available in 4x50-pair size to support up to 12 4-pair balanced twisted-pair cables
- Have optional colored, hinged covers for protection and designation available in white, red, gray, yellow, blue, green, violet and orange
- Have mounting features to allow direct wall mounting, bracket mounting or 19" panel mounting via optional frame
- Incorporate fanning strips on each side of block for management of horizontal cabling and cross-connect (jumper) wires as well as providing a labeling surface for circuit identification
- Have available accessories to include: standoff-brackets, organizer rings, clear snap-on covers, designation strips and category 5e modular test adapter
- Have connecting blocks with a minimum of 200 re-terminations without signal degradation below standards compliance limit
- Support wire sizes: solid insulated 22-26 AWG (0.64 mm - 0.40 mm) or solid stripped 18-19 AWG (1.02 – 0.91mm)
- Meet or exceed TIA and ISO/IEC category 5e component specifications
- Must be Communications Circuit Accessory Listed per Underwriters Laboratories Standard UL 1863
- Must have Certification by the Canadian Standards Association to C22.2 Canadian Telecommunications Standards

Siemon S66™ Wiring Blocks Recommended

27 11 16: RACKS AND CABLE MANAGEMENT

- Panduit 3" Channel Rack P/N: R2P
- Panduit Vertical Manager P/N: PRV8
- Panduit Patch Runner Doors P/N: R2P (x2 per Panduit Vertical Manager)
- Panduit Patch Runner High Capacity Horizontal Cable Manager P/N PEHF2

27 11 16: PATHWAY SUPPORT

Please refer to drawings for this information.

7 SYSTEM DESIGN REQUIREMENTS

27 15 00: HORIZONTAL CABLING

The Horizontal Subsystem is the portion of the telecommunications cabling system that extends from the work area telecommunications outlet/connector to the horizontal cross-connect in the telecommunications room. It consists of the telecommunications outlet/connector, the horizontal cables, optional consolidation point, and that portion of the cross-connect in the telecommunications room serving the horizontal cable. Each floor of a building should be served by its own Horizontal Subsystem.

27 11 00: TELECOMMUNICATIONS ROOM

- The Telecommunications Room is generally considered to be a floor serving facility. The Horizontal Cross-connect links the Horizontal Subsystem and the Backbone Subsystem together.
- The Horizontal Cross-connect shall consist of rack or wall mounted wiring blocks or panels for termination of copper cables or rack or wall mount interconnect centers or fiber management panels/trays for the termination of optical fibers.
- Cross-connect spaces include the labeling of hardware for providing circuit identification and patch cords or cross-connect wire used for creating circuit connections at the cross-connect.
- The telecommunications room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- Separation from sources of EMI shall be in accordance with ANSI/TIA/EIA-569-B and local codes.
- Communication grounding / earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.
- The telecommunications room shall be dedicated to the telecommunications function. Access to telecommunications rooms shall be restricted to authorized service personnel and shall not be shared with building services that may interfere with the telecommunications systems or be used for building maintenance services.
- Lighting in the telecommunications room should be a minimum of 500 lx (50 foot candles) at the lowest point of termination. Light switch should be easily accessible when entering the room.
- A minimum of two dedicated duplex or two dedicated simplex electrical outlet, each on a separate circuit, should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.

27 11 00: EQUIPMENT ROOM

- The Equipment Subsystem consists of shared (common) electronic communications equipment in the equipment room or telecommunications room and the transmission media required to terminate this equipment on distribution hardware.
- The equipment room shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- Separation from sources of EMI shall be as specified in the Telecommunication Room section of this specification.
- Communication grounding / earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.
- The equipment room shall not be shared with building services that may interfere with the telecommunications systems or be used for custodial services.
- Lighting in the equipment room should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
- A minimum of two dedicated duplex or two dedicated simplex electrical outlet each on a separate circuit should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.

27 11 00: ENTRANCE FACILITY

- The entrance facility shall be equipped to contain telecommunications equipment, cable terminations, and associated cross-connects.
- Separation from sources of EMI shall be as specified ANSI/TIA/EIA-569-B.
- Communication grounding / earthing and bonding shall be in accordance with applicable codes and regulations. It is recommended that the requirements of IEC/TR3 61000-5-2 - Ed. 1.0, ANSI-J-STD-607-A, or both be observed throughout the entire cabling system.
- The entrance facility shall not be shared with building services that may interfere with the telecommunications systems or be used for custodial services.
- The entrance facility shall be located in a dry area not subject to flooding and should be as close as possible to the electrical service room in order to reduce the length of the bonding conductor to electrical grounding system.
- Lighting in the entrance facility should be a minimum of 500 lx (50 foot candles) at the lowest point of termination.
- A minimum of two dedicated duplex or two dedicated simplex electrical outlet each on a separate circuit should be provided for equipment power. Additional convenience duplex outlets should be placed at 1.8 m (6 ft) intervals around the perimeter walls.

8 INSTALLATION

02 22 00: SITE SURVEY

Prior to placing any cable pathways or cable, the contractor shall survey the site to determine job conditions will not impose any obstructions that would interfere with the safe and satisfactory placement of the cables. The arrangements to remove any obstructions with the Project Manager need to be determined at that time.

27 05 28.29: CABLE PATHWAYS

- Pathways shall be designed and installed to meet applicable local and national building and electrical codes or regulations.
- Grounding / Earthing and bonding of pathways shall comply with applicable codes and regulations.
- Pathways shall not have exposed sharp edges that may come into contact with telecommunications cables.
- The number of cables placed in a pathway shall not exceed manufacture specifications, nor, will the geometric shape of a cable be affected.
- Pathways shall not be located in elevator shafts.

27 05 28.33: INTRABUILDING CABLE ROUTING

- The backbone subsystem shall include cable installed in a vertical manner between floor telecommunications rooms and the main or intermediate cross-connect in a multi-story building and cable installed horizontally between telecommunications rooms and the main or intermediate cross-connect in a long single story building like a school or factory.
- Unless otherwise recommended by the manufacturer, all fiber cables will be run in innerduct.
- Fibers will be terminated in the telecommunications rooms using SC, ST, or LC connectors in wall mounted interconnect centers or rack mounted panels equipped with sufficient ports, slack storage space and splice trays if required to terminate and secure all fibers.
- Adequate riser sleeve/slot space shall be available with the ability to ingress the area at a later date in all telecommunications rooms, such that no drilling of additional sleeves/slots is necessary.
- The backbone cables shall be installed in a star topology, emanating from the main cross-connect to each telecommunications room. An intermediate cross-connect may be present between the main cross-connect and the horizontal cross-connect. This is known as a hierarchical star topology.
- At least one 4-pair balanced twisted-pair, hybrid/bundled or multi-pair cable should be run for each Intrabuilding backbone segment.
- Backbone pathways shall be installed or selected such that the minimum bend radius and pulling tension of backbone cables is kept within cable manufacturer specifications both during and after installation.

27 15 00: HORIZONTAL CABLE ROUTING

- All horizontal cables, regardless of media type, shall not exceed 90 m (295 ft) from the telecommunications outlets in the work area to the horizontal cross connect.
- The combined length of jumpers, or patch cords and equipment cables in the telecommunications room and the work area should not exceed 10m (33 ft) unless used in conjunction with a multi-user telecommunications outlet.
- Two horizontal cables shall be routed to each work area. At least one horizontal cable connected to an information outlet shall be 4-pair, 100 Ω balanced twisted-pair.
- It is recommended that a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and the work area.
- For installations with consolidation points, a minimum horizontal cable distance of 15m (49 ft.) shall be maintained between the telecommunications room and consolidation point, and 5m (16 ft.) between the consolidation point and the work area.
- Horizontal pathways shall be installed or selected such that the minimum bend radius of horizontal cables is kept within manufacturer specifications both during and after installation.

- In open ceiling cabling, cable supports shall be provided by means that is structurally independent of the suspended ceiling, its framework, or supports. These supports shall be spaced no more than 1.5 m (5 ft) apart.
- **UTP ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is less than 3kVA, shall be installed with a minimum clearance of 50 mm (2 in).
- **UTP ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is more than 3kVA but less than 6kVA, shall be installed with a minimum clearance of 1.5 m (5 ft).
- **UTP ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is more than 6kVA, shall be installed with a minimum clearance of 3 m (10 ft).
- **F/UTP (ScTP) ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is less than 3kVA, shall be installed with a minimum clearance of 0 m (0 ft).
- **F/UTP (ScTP) ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is more than 3kVA but less than 6kVA, shall be installed with a minimum clearance of 0.6 m (2 ft).
- **F/UTP (ScTP) ONLY**: Telecommunications pathways, spaces and metallic cables, which run parallel with electric power or lighting, which is more than 6kVA, shall be installed with a minimum clearance of 1 m (3 ft).
- For voice or data applications, 4-pair balanced twisted-pair or fiber optic cables shall be run using a star topology from the telecommunications room serving that floor to every individual information outlet. The customer prior to installation of the cabling shall approve all cable routes.
- The Contractor shall observe the bending radius and pulling strength requirements of the 4-pair balanced twisted-pair and fiber optic cable during handling and installation.
- Each run of balanced twisted-pair cable between horizontal portion of the cross-connect in the telecommunication closet and the information outlet shall not contain splices.
- In a false ceiling environment, a minimum of 75 mm (3 in) shall be observed between the cable supports and the false ceiling.
- Continuous conduit runs installed by the contractor should not exceed 30.5 m (100 ft) or contain more than two (2) 90 degree bends without utilizing appropriately sized pull boxes.
- All horizontal pathways shall be designed, installed and grounded to meet applicable local and national building and electrical codes.
- The number of horizontal cables placed in a cable support or pathway shall be limited to a number of cables that will not cause a geometric shape of the cables.
- Maximum conduit pathway capacity shall not exceed a 40% fill. However, perimeter and furniture fill is limited to 60% fill for move and changes.
- Horizontal distribution cables shall not be exposed in the work area or other locations with public access.

27 15 43: WORK AREA TERMINATION

- All balanced twisted-pair cables wired to the telecommunications outlet/connector, shall have 4-pairs terminated in eight-position modular outlets in the work area. All pairs shall be terminated.
- The telecommunications outlet/connector shall be securely mounted at planned locations.
- The height of the telecommunications faceplates shall be to applicable codes and regulations.

PULLING TENSION

- The maximum cable pulling tensions shall not exceed manufacturer's specifications.

BEND RADIUS

- The maximum cable bend radii shall not exceed manufacturer's specifications.

- In spaces with balanced twisted-pair cable terminations, the maximum bend radius for 4-pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.
- During the actual installation, bend radius on 4-pair cable shall not exceed four times the outside diameter of the cable and ten times for multi-pair cable. This shall be done unless this violates manufacturer specifications.

SLACK

- In the work area, a minimum of 300 mm (12 in) should be left for balanced twisted-pair cables, while 1 m (3 ft) be left for fiber cables.
- In telecommunications rooms a minimum of 3m (10 ft) of slack should be left for all cable types. This slack must be neatly managed on trays or other support types.

27 11 23: CABLE TIE WRAPS

- Tie wraps shall be used at appropriate intervals to secure cable and to provide strain relief at termination points. These wraps shall not be over tightened to the point of deforming or crimping the cable sheath. Velcro style straps are required.
- Hook and loop cable managers should be used in the closet where reconfiguration of cables and terminations may be frequent.

Siemon Company VCM Series Recommended

27 05 26: GROUNDING

- All grounding / earthing and bonding shall be done to applicable codes and regulations.

07 84 00: FIRE PROTECTION

- Properly installed firestop systems shall be installed to prevent or retard the spread of fire, smoke, water, and gases through the building. This requirement applies to openings designed for telecommunications use that may or may not be penetrated by cables, wires, or raceways.
- Fire stops shall be done to applicable code.

01 71 00: WORKMANSHIP

- All work shall be done in a workman like fashion of the highest standards in the telecommunications industry.
- All equipment and materials are to be installed in a neat and secure manner, while cables are to be properly dressed.
- Workers must clean any debris and trash at the close of each workday.

9 TESTING

Testing of all newly installed cable channels shall be performed prior to system cutover.

01 33 19: COPPER TESTING

- All category 6 field-testing shall be performed with an approved level III balanced twisted-pair field test device.
- All installed category 6 channels shall perform equal to or better than the minimum requirements as specified by the table below:

Parameter	Performance @ 100MHz	Performance @ 200MHz	Performance @ 250MHz
Insertion Loss	20.3 dB	29.7 dB	33.7 dB
NEXT Loss	42.1 dB	37.5 dB	36.1 dB
PS NEXT Loss	40.6 dB	36.1 dB	34.6 dB
ACR	21.8 dB	7.8 dB	2.4 dB
PS ACR	20.3 dB	6.4 dB	0.9 dB
ACR-F	23.9 dB	17.9 dB	15.9 dB
PS ACR-F	20.9 dB	14.9 dB	12.9 dB
Return Loss	14.0 dB	11.0 dB	10.0 dB
Propagation Delay	528 ns	527 ns	526 ns
Delay Skew	40 ns	40 ns	40 ns

- Category 3, balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the permanent link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1. Test parameters include wire map plus ScTP shield continuity (when present), insertion loss, length and NEXT loss (pair-to-pair). NEXT testing shall be done in both directions.
- All balanced twisted-pair backbone cables exceeding 90 m (295 ft) or 100 m (328 ft) shall be 100% tested for continuity if applications assurance is not required.
- Category 6 balanced twisted-pair horizontal and backbone cables, whose length does not exceed 90 m (295 ft) for the permanent link, and 100 m (328 ft) for the channel shall be 100 percent tested according to ANSI/TIA/EIA-568-B.1. Test parameters include wire map plus ScTP shield continuity (when present), length, NEXT loss (pair-to-pair), NEXT loss (power sum), ELFEXT loss (pair-to-pair), ELFEXT loss (power sum), return loss, insertion loss, propagation delay, and delay skew.

TEST EQUIPMENT CRITERIA

- All balanced twisted-pair field testers shall be factory calibrated each calendar year by the field test equipment manufacturer as stipulated by the manuals provided with the field test unit. The calibration certificate shall be provided for review prior to the start of testing.
- Autotest settings provided in the field tester for testing the installed cabling shall be set to the default parameters
- Test settings selected from options provided in the field testers shall be compatible with the installed cable under test.

10 ADMINISTRATION & DOCUMENTATION

27 05 53: LABELING

- Horizontal and backbone cables shall be labeled at each end. The cable or its label shall be marked with its identifier.
- A unique identifier shall be marked on each faceplate to identify it as connecting hardware.
- Each port in the faceplate shall be labeled with its identifier.

- A unique identifier shall be marked on each piece of connecting hardware to identify it as connecting hardware.
- Each port on the connecting hardware shall be labeled with its identifier.

01 33 23: DRAWINGS

As-built drawings shall be supplied by the contractor showing the locations of and identifiers for all:

- Horizontal cable routing and terminations
- Telecommunications outlets/connectors

01 33 29: RECORDS AND REPORTS

All records shall be created by the installation contractor and turned over at the completion of work The format shall be computer based and both soft copies and hard copies shall be part of the As-built package. The minimum requirements include:

- Cable records must contain the identifier, cable type, termination positions at both ends, splice information as well as any damaged pairs/conductors.
- Connecting hardware and connecting hardware position records must contain the identifier, type, damaged position numbers, and references to the cable identifier attached to it.
- Test documentation on all cable types shall be included as part of the As-built package.

All reports shall be generated from the computer-based program used to create the records above. These reports should include but not limited to:

- Cable Reports
- Cross-connect Reports
- Connecting Hardware Reports

11 WARRANTY

Either a permanent link or channel model configuration may be applied to the horizontal and/or backbone sub-systems of the structured cabling system. Applications assurance is only applied to a channel model configuration. All channels are to be qualified for linear transmission performance up to 250 MHz to ensure that high-frequency voltage phase and magnitude contributions do not prove cumulative or adversely affect channel performance.

01 33 13: SYSTEM WARRANTY

A twenty (20) year warranty available for the category 6 structured cabling system shall be provided for an end-to-end channel model installation which covers applications assurance, cable, connecting hardware and the labor cost for the repair or replacement thereof.
Additional features of the warranty shall include:

- Margin over category 6 channel specifications on all parameters across the entire frequency range of 1-250MHz as noted below:

Parameter	Guaranteed Margin 1-250MHz
Insertion Loss	0.1 dB
NEXT Loss	0.9 dB
PS NEXT Loss	1.9 dB
ACR	1.1 dB
PS ACR	2.1 dB
ACR-F	0.6 dB
PS ACR-F	0.6 dB
Return Loss	0.5 dB
Propagation Delay	20 ns
Delay Skew	10 ns

- Performance claims based on worst case testing and channel configurations

01 33 13: PRODUCT WARRANTY

The manufacturer of passive telecommunications equipment used in a manner not associated with the Systems Warranty must have a minimum five (5) year Component Warranty on all its product. The Products Warranty covers the components against defects in material or workmanship under normal and proper use.

01 86 29: APPLICATIONS SUPPORTED

Existing and future applications supported for a channel model warranty include those approved by the Institute of Electronic and Electrical Engineers (IEEE), the Asynchronous Transfer Mode (ATM) Forum, the American National Standards Institute (ANSI) or the International Organization of Standards (ISO) that specify compatibility with the cable referenced herein.