PROJECT MANUAL

for

Structured Cabling for A New Carroll High School

for

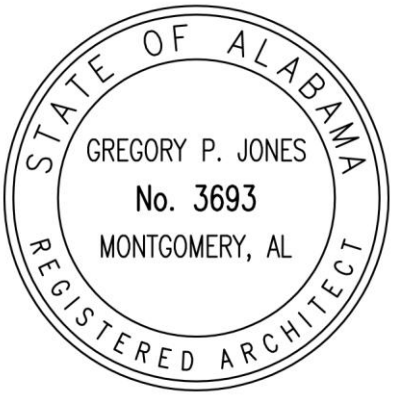
Ozark City Board of Education

Ozark, Alabama

Building Commission Job # TBD

Architect's Job # 09035a

December 1, 2011
100% Construction Set
Final



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SECTION 16710 - STRUCTURED CABLING AND CATV SYSTEMS

PART 1- GENERAL

SCOPE

This document defines the products and the execution requirements required to furnish and install a complete distribution system utilizing a structured cabling system.

All cables and related terminations, support and grounding hardware shall be furnished, installed, tested, labeled, and documented by the structured cabling contractor as detailed in this document.

The distribution system shall be all-inclusive and represent a complete installation at the sites shown on the attached drawings and in the attached specifications. The vendor shall be responsible for all parts, labor, and all other associated apparatus necessary to completely install, test and turnover for acceptance to the owner, the cabling system detailed herein.

Product specifications and general design considerations are provided in this document. Quantities of telecommunication outlets, typical installation details, cable routing and outlet types are indicated on the plans.

Refer to contract drawings for additional requirements to include color coding of faceplates, jacks and cables, labeling, installation, certification, etc.

APPLICABLE STANDARDS

Vendor performance of the work shall comply with all applicable federal, state, and local laws, rules, and regulations. The vendor shall give required notices, and procure necessary governmental licenses and inspections, and shall pay without burden to the Owner, all fees and charges in connection therewith unless specifically provided otherwise. In the event of violation, The vendor shall pay all fines and penalties including attorney's fees, and other defense cost and expenses in connection therewith.

Federal Communication Commission. Equipment requiring FCC registration or approval shall have received such approval and shall be appropriately identified.

Codes, Standards and Ordinances:

> All work shall conform to the latest edition of the *National Electrical Code*®, the Building Code, and all local codes and ordinances, as applicable. ANSI/TIA/EIA-568-B.1 through ANSI/TIA/EIA-568-C.1, TIA-569-B, TIA/EIA-606-A, ANSI-J-STD-607-A, NECS/BICSI-568-2006, NEMA 250, NEC Articles 770 and 800, ADA Americans with Disabilities ACT, and shall be adhered to during all installation activities. Methodologies outlined in the latest edition of the BICSI *Telecommunications Distribution Methods Manual* shall also be used during all installation activities. Should conflicts exist with the foregoing, the authority having jurisdiction for enforcement will have responsibility for making interpretation.

If this document and any of the documents listed above are in conflict, then the more stringent requirements shall apply. All documents listed are believed to be the most current releases of the documents. The contractor has the responsibility to determine and adhere to the most recent release.

This document does not replace any code, either partially or wholly. The contractor must be aware of local codes that may impact this project. All local, State and federal codes are to be followed.

All materials shall be UL Listed and shall be marked as such. If UL has no published standards for a particular item, then other national independent testing standards shall apply.

WARRANTY

The contractor shall provide a manufactures warranty to guarantee end-to-end high performance cabling systems that meet application requirements. The guarantee shall include cable, connectivity components, complete fiber optic cable system including connectors and have one point of contact for all cabling system issues. The system shall be warranted for a period of at least 25 years.

Materials and workmanship hereinafter specified and furnished shall be fully guaranteed by The vendor for one *year* from transfer of title against any defects. Defects which may occur as the result of faulty materials or workmanship within *one year* after installation and acceptance by the owner shall be corrected by the vendor at no additional cost to the owner. The vendor shall promptly, at no cost to the owner, correct or re-perform (including modifications or additions as necessary) any nonconforming or defective work within *one year* after completion of the project of which the work is a part.

APPROVED CONTRACTOR

The structured cabling contractor must meet the following requirements:

The selected vendor shall be fully capable and experienced in the structured cabling system specified. To ensure the system has continued support, the owner will contract only with vendors having a successful history of sales, installation, service, and support. During the evaluation process, the owner may, with full cooperation of the vendors, visit the vendors' places of business, observe operations, and inspect records. The vendor must have a minimum of *five (5) years* of experience in structured cabling.

The vendor must have an RCDD® *(Registered Communications Distribution Designer)* on staff and said listed RCDD will be ultimately responsible for this project. The RCDD must have sufficient experience in this type project as to be able to lend adequate technical support to the field forces during installation, during the warranty period, and during any extended warranty periods or maintenance contracts. A resume of the responsible RCDD must be attached to the vendor's response for evaluation by the owner. Should the RCDD assigned to this project change during the installation, the new RCDD assigned must also submit a resume for review by the electrical engineer.

If, in the opinion of the electrical engineer, the RCDD does not possess adequate qualifications to support the project, the engineer reserves the right to require the vendor to assign an RCDD who, in the engineer's opinion, possesses the necessary skills and experience required of this project.

The RCDD shall be responsible for reviewing all aspects of the design, submittals and installation of all products.

The company performing the work must have been in business for a minimum of five (5) years.

The installing contractor must maintain an office, staffed with service and installation personnel within 100 miles from the project site.

References: The Owner/Engineer may, with full cooperation of the vendors, visit client installations to observe equipment operations and consult with references. Specified visits and discussion shall be arranged through the vendors; however, the vendor personnel shall not be present during discussions with references. The vendor must provide a minimum of three (3) reference accounts at which similar work, both in scope and design, have been completed by the vendor within the last three (3) years.

Safety: The vendor shall take the necessary precautions and bear the sole responsibility for the safety of the methods employed in performing the work. The vendor shall at all times comply with the regulations set forth by federal, State, and local laws, rules, and regulations concerning "OSHA" and all applicable state labor laws, regulations and standards.

INSTALLATION GUIDELINES

All work performed on this project will be installed in accordance with the current edition of the National Electrical Code®, the current edition of the National Electrical Safety Code® the current issue of the National Electrical Code®, the ANSI/NECA/BICSI-568-2006 Standard for Installing Commercial Building Telecommunications Cabling, the current edition of the BICSI Telecommunications Distribution Methods Manual, the current edition of the BICSI

Cabling Installation Manual, the latest issue of the ANSI/TIA/EIA Standards as published by Global Engineering Documents as ANSI/TIA/EIA Telecommunications Building Wiring Standards, and all local codes and ordinances.

Section Includes : Equipment, materials, labor, and services to provide telephone and data distribution system including, but not limited to:

Furnish and install a complete telecommunications wiring infrastructure.

Furnish, install, and terminate all UTP and Optical fiber cable.

Furnish and install all wall plates, jacks, patch panels, and patch cords as described.

Furnish and install all required cabinets and/or racks as required and as indicated.

Furnish any other material required to form a complete system.

Perform testing (100% of horizontal and/or backbone links) and certification of all components.

Furnish test results of all cabling to the owner on disk and paper format, listed by each closet, then by workstation ID.

Provide owner test results and documentation. (Testing documentation and as-built drawings).

Provide all equipment, materials, labor, and services, not specifically mentioned or shown, which may be necessary to complete or perfect all parts of the installation. Ensure that they are in compliance with requirements stated.

SUBMITTALS

Within thirty (30) days of notice to proceed the structured cabling contractor shall submit the following:

Submit copies of the certification of the company and names of staff that will be performing the installation and termination to provide proof of compliance of this spec.

Submit proof from manufacturer of contractor's good standing in manufacturer's certification.

Submit copy of RCDD certification and resume.

Submit listing of three (3) projects of similar size and scope to this projects that have been completed in the last three (3) years. Include in this submittal, owner's contact information for each project.

Submit appropriate cut sheets and samples for all products, hardware and cabling.

Submit 1/8" = 1'-0" drawings of floor plans and indicating all work outlets and labeling designation for each jack.

Submit ½" = 1'-0" drawings of each MDF and each IDF showing all racks, patch panels, wire management, equipment tray, etc.

Work shall not proceed without the engineer's approval of the submitted items.

The structured cabling contractor shall receive approval from the engineer on all substitutions of material. No substituted materials shall be installed except by written approval from the engineer.

DRAWINGS

It shall be understood that the electrical details and drawings provided within the specification package are diagrammatic. They are included to show the intent of the specification and to aid the structured cabling contractor in bidding the job. The structured cabling contractor shall make allowances in the bid proposal to cover whatever work is required to comply with the intent of the plans and specifications.

The structured cabling contractor shall verify all dimensions at the site and be responsible for their accuracy.

Federal, State and local codes, rules regulations, and ordinances governing the work, are fully part of the specifications as if herein repeated or hereto attached. If the contractor should note items in the drawings or specifications, construction of which would be code violations, promptly call them to the attention of the Engineer's representative in writing. Where the requirements of other sections of the specification are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

PART 2- PRODUCTS

EQUIVALENT PRODUCTS

Due to the nature and type of communications all products, including but not limited to racks, patch panels, jacks, faceplates, patch cords, J-hooks shall be manufactured by Panduit, Ortronics or Amp .

All copper and optical fiber shall be manufactured by General Cable, Panduit, Amp or Berk-Tek.

SCOPE OF WORK

The owner desires a Category 6 cabling system. All voice and data horizontal cables shall be Category 6.

All horizontal and backbone cables (that will be installed above ceiling) for this project shall be plenum rated.

All voice cables and modular jacks shall be white in color unless otherwise indicated on prints.

All access point cables and modular jacks shall be green in color unless otherwise indicated on prints.

All data cables and modular jacks shall be blue in color unless otherwise indicated on prints.

The wiring scheme shall be T568B unless otherwise indicated on prints.

All horizontal cables, jack modules, patch cords shall be designed to support Category 6 applications. The contractor shall install stainless faceplates in work area to match electrical outlets unless otherwise specified.

The contractor shall install wireless access point drops each with two (2) Category 6 cables and jacks green in color at each location above ceiling. The contractor shall install green jacks at each end and install in patch panel in each TR in data rack. The contractor shall install jacks above ceiling to meet appropriate codes.

The contractor shall terminate all jack modules in each patch panel by color as indicated on prints. The mixing of colors in the same patch panel will not be allowed. The owner desires to separate each network type by color. All modular patch panels installed shall be 24 or 48 port. Confirm exact placement of patch panels with owner prior to installation.

Terminate backbone voice high pair count cables in MDF and each IDF on 110 Category 5e wall mount 110 wiring blocks.

Furnish and install 24 port Telco Patch Panels utilizing pins 4,5 in top position of voice rack. Install 25 pair Telco cable(s) from 110 wiring block to each 24 port Telco patch panel. Owner desires to cross connect all voice horizontal cables using Category 6 patch cords.

Install appropriate lightning protection for any copper communication cable that enters or leaves the building that is susceptible to lightning that is installed under this contract.

Furnish and install a minimum of one six-strand multi-mode fiber 50/125 for data from MDF to each IDF unless otherwise indicated on prints. All indoor fiber shall be Interlocked armored and shall be rated for the appropriate application.

Furnish and install all fiber in 19" rack mount fiber patch panel. Install fiber patch panel in top position of data rack. Where voice and data cables are installed in the same rack install fiber in top position. Separate single mode and Multi-mode fiber cable in separate rack mount enclosures in MDF. Label appropriately.

Furnish and provide to owner four (4) 50/125 multi-mode fiber patch cords for each MDF/IDF. Coordinate fiber connector type to match electronic equipment with owner prior to ordering.

The contractor shall furnish and install plywood backboard in each MDF/IDF wrapping a minimum of two walls with plywood or as indicated on prints. Plywood backboard shall be ¾"X4'X8' AC grade, painted all over with two coats of grey fire retardant paint.

Furnish and install all voice and data cabling in 7ft floor mount racks unless otherwise noted on prints. The contractor shall install vertical cable management on each side and between each 7' floor mount rack.

Furnish and install 18" communication cable tray from each floor mount rack/server cabinet to wall. Furnish and install 18" communication cable tray around wall as required to support cables unless otherwise indicated on prints. Furnish and install cable retaining post on each side every 4ft or as required to support cables.

Furnish and install horizontal wire manager with front & rear management above, between and below each copper 48 port patch panel.

Furnish and install Category 6 patch cables as specified herein.

The use of TY-wraps or cable TY's will not be allowed in telecommunication closets. The contractor shall use product similar to Panduit's TAK-TY's Velcro TY.

All fiber connectors shall be in accordance with hardware configuration.

Furnish and install a telecommunication grounding busbar in MDF and each IDF and ground equipment per NEC and EIA/TIA standards.

Furnish and install one (1) rack mount horizontal power strip in each rack or cabinet.

Where indicated on prints install a 4' wall mount cabinet in IDF with keyed lock. Contractor shall install backboard as required to support cabinet.

Where indicated on prints install a 78" wall mount swing rack. Install backboard as required to support rack and equipment.

Coordinate exact placement of racks with owner prior to installation.

Cross Connect all 110 Voice Wiring blocks and leave owner two (2) rolls 500' each in MDF for future use.

Furnish and install all products as required either called out specifically or omitted to provide a complete working structured cabling system.

All outdoor conduits for communications shall have a manhole or handhole at a maximum of every 400'and/or after every 180 degrees of bend in the conduit system. All handholes, conduit elbows and/or LB's must be designed for use with fiber optic cabling and shall not exceed EIA/TIA standard bend radius.

All outdoor communication conduits shall have a 4" three cell Maxcell innerduct or equal product installed in each conduit communication conduit.

Close out documents:

Provide copy of manufacturer's 25 year warranty.
Provide three (3) copies of as-built drawings in hard copy and one (1) copy Auto Cad format listing each cable number.
Provide test documentation in hard copy and in electronic format.

SCOPE OF WORK CATV

Install outlets at 18" to centerline above finished floor (unless noted otherwise). Outlets shall have stainless cover plates.

Provide one RG 6 coax cable per outlet location indicated on prints back to the nearest MDF/IDF for future connection.

Provide one RG11 coax cable from MDF to each IDF as per Riser Diagram for future connection.

APPROVED PRODUCTS

Voice/ Data Jacks:

Category 6 Jack Modules: The eight position modules shall be used in all work areas and in all modular patch panel frames.

All terminations shall be T568 (B) for this project unless directed otherwise by owner.

Approved Product:

Panduit: Mayer Electric Part #PANCJ688TG-XX Color as indicated on drawings.
Amp: Mayer Electric Part #AMP1375055-X Color as indicated on drawings.
Ortonics: Mayer Electric Part #ORTOR-XX Color as indicated on drawings.

Patch Cords:

The Category 6 patch cords shall be manufactured by the same manufacturer as the connectivity products. Contractor shall provide the following in the Telecommunication Room.

One (1) Category 6 patch cord for each voice and data cable in the MDF/IDF. Color to match jack color.

25 % shall be 3'
50% shall be 5'
25 % shall be 7'

Contractor shall provide the following in the work area:

One (1) Category 6, white patch cord for each data cable in the work area.
100 % shall be 10' in length.

Approved Products:

Panduit: XX designates color.
Mayer Electric Part #PANUTPSP3XX
Mayer Electric Part #PANUTPSP5X
Mayer Electric Part #PANUTPSP7XX
Mayer Electric Part #PANUTPSP10XX

Amp
Ortronics

Modular Patch Panels:

All voice and data cable(s) shall be terminated in the closet in a 19" rack mount patch panel. Patch panels shall be of modular design and shall use standard Category 6 jack modules. Jack module color shall match color of cable and workstation outlet. Each 24 or 48 port modular patch panel shall be filled completely with Category 6 jack modules and no port shall be left empty.

Approved Product:

Panduit:
Mayer Electric part#PANCPPL24WBLY 24 port
Mayer Electric part#PANCPPL48WBLY 48 port

Amp:

Mayer Electric part#AMP19333072 24 port
Mayer Electric part#AMP19333082 48 port

Ortronics

J-Hooks:

The J-hook cable support shall be manufactured from a non-conductive material suitable for use in air-handling space. The cable support must maintain complete horizontal and vertical 1" bend radius control and must manage up to 50 four pair UTP cables.

Approved product:

Panduit: J-MOD OR J-PRO Cable support system
Or approved Equal

Faceplates:

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Approved Products:

Panduit:

CFPL6-XX Color as indicated on drawings.
CFPLS6-XX Angled Color as indicated on drawings.
CFPL2SY, CFPL4SY, CFPL6SY- Stainless steel faceplate type and number of ports to match application.
Furniture faceplates to match system furniture.

Amp
Ortronics

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Blank Filler Plate:

Approved Product: Panduit: DPFP2 or approved equal

Wiring Blocks:

Approved Products:

Panduit:

Mayer Electric Part #PANP110KB1005Y - Category 5e 100 pair wiring block
Mayer Electric Part #PANP110KB3005Y - Category 5e 300 pair wiring block
Mayer Electric Part #PANP110JTW-X - Jumper Trough
Mayer Electric Part #PANP110CB4-X - Category 5e 4 pair connecting block
Mayer Electric Part #PANP110CB5-X - Category 5e 5 pair connecting block

Telco Patch Panel

Approved Product:

Panduit: Mayer Electric Part #PANVP24382TV25Y
Ortronics
Amp

Fiber Patch Panel

Approved Products:

Panduit:

Mayer Electric Part #PANFRME1U
Mayer Electric Part #PANFRME2U
Mayer Electric Part #PANFRME3
Mayer Electric Part #PANFRME4

Amp:

Mayer Electric Part #Amp116570147
Mayer Electric Part #Amp5595422
Mayer Electric Part #Amp5596142
Mayer Electric Part #Amp5595522

Ortronics:

Mayer Electric Part #ORTFCO1UP
Mayer Electric Part #ORTFCO2UP
Mayer Electric Part #ORTFCO4UP

Fiber Adapter Panel:

Approved Products:

Panduit: Mayer Electric Part #PANFAP3WAQDSCZ Multi-mode SC 10Gig
Amp: Mayer Electric Part #AMP5595586
Ortronics: Equal

Fiber Connector: Factory pre-polished cam style fiber optic connectors SC Aqua 10Gig 50/125

Approved Products:

Panduit: Mayer Electric Part #PANFSCMCXAQ Multi-mode SC 10Gig 50/125
Amp: Mayer Electric Part #AMP65882912
Ortronics: Equal

Communication Cable Tray: 18" UL Listed

Approved Products:

Panduit
Bline: Mayer Electric Part #BLBSB17U18BFB
Hubbell

Rack System:

Cable management shall be provided using the Patch Runner Vertical Cable Management Rack System. The rack shall be UL listed for 1000-pound load rating. The rack shall be installed to support 19" equipment.

Approved Product: Two (2) Post Rack

Panduit:

Mayer Electric Part #PANCMR19X84
Misc. components

Bline: Mayer Electric Part #BLNSB556084XUFB

Four (4) Post Rack:

Bline: Mayer Electric Part #SB837084BFB

Wall Mount lockable Cabinet:

Bline: Mayer Electric Part #VLWM4825FB
Ortronics
Amp

Vertical Cable Management and Doors:

Panduit:
Mayer Electric Part #PANWMPV45E
Mayer Electric Part #PANWMPVCBE

Amp: Mayer Electric Part #AMP13751661
Ortronics

Horizontal Wire Management

Approved Products:

Panduit: WMP1E, front and rear
Amp: Mayer Electric Part #13751581
Ortronics

Rack Mount Power Strip

Approved Product:

Panduit: CMRPSH20

Telecommunication Grounding Busbar and Accessories

Approved Product:

Panduit:
GB4B0624TPI-1 TMGB
GB2B0312TPI-1 TGB

Bline

Horizontal Cabling Subsystem:

Copper UTP Horizontal Plenum Cable

Approved Product:

General Cable:
Mayer Electric Part #GS6000 for data, color to match jack/icon color.
Mayer Electric Part #GS6000 for voice, color to match jack/icon color.
Mayer Electric Part #GS6000 Enhanced Outdoor Cable for outdoor or wet locations. Part #7136100

Amp:
Mayer Electric Part #AMP1933047-X for data. Color to match jack icon
Mayer Electric Part #AMP1933047-X for voice. Color to match jack icon

Berk-Tek:
Mayer Electric Part #LanMark 1000 for data, color to match jack/icon color.
Mayer Electric Part #LanMark 1000 for voice, color to match jack/icon color.

Firestop System:

All horizontal cable penetrations fire stops must be re-enterable without the use of additional firestop sealant material. The product must use intumescent material and shall expand blocking out smoke and harmful gasses.

Approved Product STI: Mayer Electric Part #STIEZDP44

APPROVED PRODUCTS FOR CATV

Coaxial cable shall be 75 ohms nominal impedance and shall be marked with the manufacturer's name. It shall be sweep tested by the marker before shipping. The cable shall be of the CAC-6 and the CAC-11 type. Conduit size per manufacturer's recommendation. Cable by General, West Penn, or Belden.

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BACKBONE CABLING SUBSYSTEM

Backbone Copper:

Furnish a minimum of a 50 pair Category 3- 24 awg. Backbone voice cable from MDF to each IDF. Install plenum where required.

Approved Vendor:

General Cable:

50 pair Plenum 2131757
100 pair Plenum 2131758
200 pair Plenum 2132442
50 pair Riser 2133161
100 pair Riser 2133144
200 pair Riser 2133323
50 pair PE89 7525793
100 pair PE89 7525819
200 pair PE89 7525835

Backbone Fiber:

All multimode fiber shall be 50/125 rated at 10 Gbps link lengths at 850 nm at 550 meters between MDF and each IDF. All indoor fiber shall be interlock armored and shall be plenum rated.

Approved Vendor

General Cable:
Mayer Electric Part #GCCBL0061PNU-ILPA Multi-mode 50/125 6 strand 10Gig 550 meters
Mayer Electric Part #GCCBL0121PNU-ILPA Multi-Mode 50/125 12 strand 10 Gig 550 meters
Mayer Electric Part #GCCBL0181PNU-ILPA Multimode 50/125 18 strand 10 Gig 550 meters.
Mayer Electric Part #GCCBL0241PNU-ILPAS Multi-Mode 50/125 24 strand 10 Gig 550 meters

Panduit
Amp

Indoor/Outdoor Fiber:

Approved Vendor:

General Cable:
Mayer Electric Part #GCCBL0061ANU.BK
Mayer Electric Part #GCCBL0121ANU.BK
Mayer Electric Part #GCCBL0241ANU.BK

Panduit
Amp

Outdoor Fiber

Approved Vendor:

General Cable:
Mayer Electric Part #GCCBL0064M1A-DWB
Mayer Electric Part #GCCBL0124M1A-DWB
Mayer Electric Part #GCCBL0244M1A-DWB

Panduit
Amp

PART 3 – EXECUTION

GROUNDING AND BONDING

The facility shall be equipped with a Telecommunications Building Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment racks, cabinets, raceway, and other associated hardware that has potential to act as a current carrying conductor. The TBB shall be installed independent of the building's electrical and building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIS/EIA 607 Telecommunications Building and Grounding Standard.

The main entrance facility/equipment room in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each telecommunications room shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential in minimized between telecommunication equipment and the electrical system to which is attached.

All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering in the TR or ER shall be grounded to the respective TGB or TMGB using a #6 AWG stranded copper bonding conductor and compression connectors.

All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-Insulated wires shall be identified at each termination point with a wrap of green tape. All cables and bus bars shall be identified and labeled in accordance with the System Documentation Section of this specification.

FIRESTOP

A firestop system is comprised of the items penetrating the fire rated structure, the opening in the structure and the materials and assembly of the materials used to seal the penetrated structure. Firestop systems comprise an effective block for fire, smoke, heat, vapor and pressurized water stream

All penetrations through fire-rated building structures (walls and floors) shall be sealed with an UL Listed firestop system. This requirement applies to through penetrations (complete penetrations) and membrane penetrations (through one side of a hollow fire rated structure). Any penetrating item (i.e. riser slots and sleeves, cables, conduit, cable tray and raceway, etc.) shall be properly firestopped.

EXECUTION

Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius. In hollow wall installations where box-eliminators are used, excess wire can be stored in the wall. No more than 12" of UTP and 36" of fiber slack shall be stored in an in-wall box, modular furniture, raceway or insulated walls. Excess slack shall be loosely coiled and stored in the ceiling above each drop location when there is no enough space present in the outlet box to store slack cable.

Cables shall be dressed and terminated in accordance with the recommendations made in the ANSI/TIA/EIA-568-B.1 document, manufacturer's recommended and best industry practices.

Pair untwist at the termination shall not exceed 12mm (one-half inch).

Bend radius of the horizontal cable shall not be less than 4 times the outside diameter.

The cable jacket shall be maintained to within 25mm of the terminating point.

Data jack unless otherwise noted in drawings, shall be located in the bottom position(s) of each faceplate. Data jack in horizontally oriented faceplates shall occupy the right-most position(s).

HORIZONTAL DISTRIBUTION CABLE INSTALLATION

All wiring above ceilings or below raised floor shall be installed in cable tray, open top cable hangers or in provided conduit.

Cable above accessible ceiling shall be supported 3’ on center from cable support attached to building structure.

The contractor shall be responsible for replacing all cables that do not pass appropriate cabling standards for which the equipment is designed. Example 10 Gig , Cat 6, Cat 5e.

Maximum horizontal cable length shall be 90 meters.

Cable shall have no physical defects such as cuts, tears or bulges in the outer jacket. Cables with defects shall be replaced.

Install cable in neat and workmanlike manner. Neatly bundle and tie all cables in closets. Leave sufficient cable for 90° sweeps at all vertical drops.

Test, label and document as called for in the contract documents.

Firestop all openings where cable is installed through a fire barrier.

RACKS

Racks shall be securely attached to the concrete floor using a minimum 3/8” hardware or as required by codes.

Racks shall be placed with a minimum of 36” clearance from the walls on at least one side of the racks. When mounted in a row, maintain a minimum of 36” from the wall behind and in front of the row of racks.

All racks shall be grounded to the telecommunications ground bus bar.

Rack mount screws not used for the installing patch panels and other hardware shall be bagged and left with the rack upon completion of the installation.

Wall mounted termination block fields shall be mounted on 4’ x 8’ x .75 void free plywood. The plywood shall be mounted vertically 22” above finished floor. The plywood shall be painted with two coats of grey fire retardant paint.

GROUNDING SYSTEM

The TBB shall be designed and/or approved by a qualified PE, licensed in the state that the work is to be performed. The TBB shall adhere to the recommendations of the ANSI/TIA.EIA-607 standard and shall be installed in accordance with best practices.

Installation and termination of the main bonding conductor to the building service entrance shall be performed by the electrical contractor.

IDENTIFICATION AND LABELING

The contractor shall develop and submit for approval a labeling system for the cable installation. The owner with negotiate and appropriate labeling scheme with the successful structured cabling contractor. At a minimum, the labeling system shall clearly identify all components of the system, racks, cables, panels and outlets. The labeling system shall designate the cables origin and destination and a unique identifier for the cable within the system. Racks and patch panels shall be labeled to identify the location within the cable system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. Labeling shall follow the guidelines of ANSI/TIA/EIA-606-A.

All label printing will be machine generated. No hand written labels will be allowed. Self laminating labels will be used on cable jackets, appropriately sized to the OD of the cable, and placed within view at the termination point on each end. Outlet, patch panel and wiring block labels shall be installed on or in the space provided on the device.

TESTING AND ACCEPTANCE

All cables and termination hardware shall be 100% tested for defects in installation and to verify cabling system performance under installed conditions according to the requirements ANSI/TIA/EIA-568-B. All pairs of each installed cable shall be verified prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed through couplers, patch panels, and connector blocks shall be replaced in order to ensure 100% useable conductors in all cables installed.

All cables shall be tested in accordance with this document, the ANSI/TIA/EIA standards and best industry practice. If any of these are in conflict, the contractor shall bring any discrepancies to the attention of the project team for clarification and resolution.

Category 6 testing shall conform to requirements set forth in manufactures 25 year warranty program.

Backbone Copper Testing: Test each pair and shield of each cable for opens, shorts, grounds and pair reversal. Correct grounded and reversed pairs.

If horizontal cable contains bad conductors or shield, remove and replace cable.

Initially test optical cable with a light source and power meter utilizing procedures as stated in ANSI/TIA/EIA-526-14A: *OFSTP-14A Optical Power Loss Measurements of Installed Multimode Fiber Cable Plant* and ANSI/TIA/EIA-526-7 *Measurement of Optical Power Loss of Installed Singlemode Fiber Cable Plant*. Measured results shall be plus/minus 1 dB of submitted loss budget calculations. If loss figures are outside this range, test cable with optical time domain reflectometer to determine cause of variation. Correct improper splices and replace damaged cables at no charge to the owner.

Cables shall be tested at 850 and 1300 nm for multimode optical fiber cables. Cables shall be tested at 1310 and 1550 nm for singlemode optical fibers.

Testing procedures shall utilize “Method B” – One jumper reference.

Bi-directional testing of optical fibers is required.

Submit electronic media with test results and program to view results.

Where any portion of system does not meet the specifications, correct deviation and repeat applicable testing at no additional cost to the owner.

All copper and fiber optic testing shall comply with manufacturer’s warranty testing requirements.

SYSTEM DOCUMENTATION

Upon completion of the installation, the structured cabling contractor shall provide three (3) full documentation sets to the owner;s for approval. Documentation shall include the items detailed in the sub-sections below.

Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.) This is inclusive of all test results and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the engineer, the structured cabling contractor shall provide copies of the original test results.

The engineer may request that a 10% random field re-test be conducted on the cable system at no additional cost, to verify documented findings. Test shall be a repeat of those defined above. If findings contradict the documentation submitted by the structured cabling contractor, additional testing can be requested to the extent determined necessary by the engineer, including 100% re-test. This re-test shall be at no additional cost to the owner.

TEST RESULTS

Test documentation shall be provided on disk within three weeks after completion of the project. The disk shall be clearly marked on the outside front cover with the words “Project Test Documentation”, the project name, and the date of completion (month and year) The test results shall include a record of test frequencies, cable type, conductor pair and cable (outlet) I.D, measurement direction, reference setup, and crew member name (S). The test equipment name, manufacturer, model number, serial number, software version and latest calibration date will be provided at the end of the document. Unless the manufacturer specifies a more frequent calibration cycle, an annual calibration cycle is anticipated on all test equipment used for this installation. The test document shall detail the test method used and the specific settings of the equipment during the test as well as the software version being used in the field test equipment.

AS-BUILT DRAWINGS

The drawings are to include cable routes and outlet locations. Outlet locations shall be identified by their sequential number as defined elsewhere in this document. Numbering, icons, and drawing conventions used shall be consistent throughout all documentation provided. The engineer will provide floor plans in paper and electronic (DWG, AutoCAD Rel 2002) formats on which as-built construction information can be added. These documents will be modified accordingly by the structured cabling contractor to denote as-built information as defined above and returned to the owner.

The contractor shall annotate the base drawings and return a hard copy (same plot size as originals) and electronic (AutoCAD rel. 2003) form.

WARRANTY

The manufacturer shall provide a 25 year extended product warranty with a 25 year application assurance warranty. Manufacturer shall provide warranty directly to the end user.

An extended product warranty shall be provided which warrants functionality of all components used in the system for 25 years from the date of registration. The extended product warranty shall warrant the installed horizontal copper and the backbone optical fiber portions of the cabling system.

The application assurance warranty shall cover the failure of the wiring system to support current or future applications that are designed for the link/channel specifications of the ANSI/TIA/EIA-568-B.1. These applications include, but are not limited to, 10 BASE-T, 100BASE-T, 1000BASE-T.

The contractor shall provide a warranty on the physical installation.

FINAL ACCEPTANCE & SYSTEM CERTIFICATIONS

Completion of the installation, in-progress and final inspections, receipt of the test and as-built documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided a numbered certificate, from the manufacturer, registering the installation.

END OF SECTION 16710