

Design Guidelines for Facilities Construction:

DESIGN GUIDELINE DG17-4 Building Riser Cable Systems

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I. GENERAL

Under the structured cabling system used by WMU, each CDR must be connected to the BEF through riser cables. Most communications now use fiber optic cabling, but a limited UTP riser system with RJ terminations at both ends is also installed to support legacy requirements. Some sort of backbone system to distribute the EDUcable CATV signal to users is normally also required. This may use the fiber optic cables or a separate coax cable, depending on the overall arrangement of the building.

II. GENERAL DESIGN CONSIDERATIONS

Fiber optic inside backbone / riser cables will have a minimum of 12 single-mode fibers for a closet serving up to 200 user jacks. Six additional fibers will be added for each additional part of 100 user jacks, up to a total of 24 fibers. Six additional single-mode fibers will be added if the number of user jacks exceeds 300.

- All backbone fibers (outside and riser) are terminated with ST connectors except for the top 6 of each single mode cable, which are terminated with FC/APC to allow support for broadband analog (video) signals.

A UTP Category 5e copper UTP backbone riser system will be installed capable of supporting the current conventional current loop or digital copper-based communications requirements within the building using an RJ-based riser system.

- An internal Category 5e copper UTP riser system will be installed between the main communications closet (BEF) and all secondary communications rooms.

- The internal backbone copper cable system will be terminated directly on RJ-45 panels with 2 pairs per jack.

WMU currently distributes video across campus using a CATV-type sub-split system with 450 MHz capability. Most new buildings may be fed by fiber optic links using the single mode fiber optic backbone cables. The video backbone for distribution within the building may be by fiber or standard coax, depending on the project. The design for the video system need to be coordinated with WMU OIT early in the design phase in order to minimize planning overlap and obtain the best possible product for the program.

If the building is divided in such a way that riser cables must run underground between sections or consists of different sections with separate grounds, there needs to be a special design evaluation of cabling. Cables may require additional protection. In any event, cables will be installed in accordance with applicable codes.

III. FIBER OPTIC BACKBONE SYSTEM

A. Products

Inside fiber cable will be Corning MIC or Fan-Out type with riser or plenum rating appropriate to cable path in accordance with codes.

- Multimode fibers will be Corning brand 62.5/125 Inifinacor 600 quality or better.

Terminating connectors will be good quality Corning ceramic pre-radiused tip, epoxy fiber attachment.

Rack-mount termination cabinets will be Corning CFD series or CCH series with optional top cover where area above user-side terminations is openly exposed.

ST bulkhead connectors will be Corning models specified for use with single mode fibers, or single mode and multimode, with ceramic or metal alignment inserts.

Cabinet, cable and jack labels will be Panduit permanent style or may be Corning if used as intended with Corning products.

Fiber optic jumpers will be factory constructed of Corning components unless otherwise approved by owner.

- Manufacturer will be a company which has been engaged in the manufacture of fiber jumpers for at least three years and which is certified as using Corning-approved procedures.
- Fiber specifications will match those of fibers being interconnected.

- Connectors will have ceramic polished ferrules.
 - ST connectors will be polished to UPC finish.
 - SC connectors will be polished to PC or UPC finish.
- Jumpers will be ST-ST, ST-LC, FC/APC-FC/APC, or other as required for specified application.

B. Execution: (Generally common to all fiber optic cables and equipment)

Fiber cables will be installed in full accordance with Corning, and applicable TIA and BICSI specifications and good practices.

All fiber system work will be carried out by Corning certified installers.

Fiber cables will be continuous, without splices or junctions, between defined termination points.

Fiber cables will be enclosed in innerduct over the entire path, except for excess coils.

Thickwall innerduct will be used for interior paths within 4" conduit runs of 25 feet or longer or where damage may be likely.

Fiber cables will be terminated in rack-mounted fiber termination cabinets of appropriate size for fiber counts.

- All inter-building and intra-building backbone cables will be terminated with connectors rated for the type of fiber terminated.
 - All but the top 6 fibers in each cable will be terminated with ST-style connectors.
 - The top 6 (highest numbered) fibers in each cable will be terminated with FC/APC connectors. Direct-connectorization or spliced-pigtail terminations are acceptable.
 - Hardware selected, fiber dressing, etc., will be appropriate to the termination type.
 - Terminations must be clearly labeled as to cable destination and type of fiber for each set of terminations.
 - Multiple cables may be terminated in one cabinet where appropriate.
 - Rack mounted cabinets will be mounted high (approx 6 feet) in the rack when possible. Multiple cabinets may be stacked downward in racks where fiber count demands.

- All fiber cabinets will be labeled with bright stickers warning of possible eye damage.
- Bulkhead connectors used for termination of cables at cabinets will be rated for the type of fiber (MM, SM) installed in them. (Universal MM/SM bulkheads are acceptable and encouraged.)
- All bulkhead connectors will have dust caps installed over unused openings at all times.
- At completion of work, cable terminations, cables, and individual fibers will be arranged in a manner that assures protection of all fibers from the possibility of damage from normal activities in the surrounding area and during normal maintenance of cabinets.

All inter-building and intra-building backbone cables will be terminated with connectors rated for the type of fiber terminated.

- All but the top 6 fibers in each cable will be terminated with ST-style connectors.
- The top 6 (highest numbered) fibers in each cable will be terminated with FC/APC connectors. Direct-connectorization or spliced-pigtail terminations are acceptable.
 - Hardware selected, fiber dressing, etc., will be appropriate to the termination type.
- Connectors will be free of surface defects and polished to a degree resulting in approximately 0.5dB mating loss.
- Connectors will be optically clean when installed in bulkhead connector.
- Install fibers from all cables to bulkhead connectors in direct numerical order at each end. (The crossover per pair pattern defined in TIA-568A section 12.7.1 will not be used.)
 - All fusion splices used will use heat-shrink sleeves for protection and support installed in appropriate splice trays.

All cables will be dressed and retained neatly between space entry and termination cabinet.

- Excess will be neatly coiled and retained at an out-of-the-way location that will not interfere with access to equipment or working of other cables in the space.
- Excess coil will be protected in some manner if in locations where damage could be likely.

- Within CDRs, cables may be enclosed in thin-wall innerduct or split duct as appropriate.

Cabinets and panels where cables are terminated will be clearly labeled with destination/source and fiber number (See 17172).

Interior cables may be installed in thinwall innerduct 1-inch or larger.

- Multiple cables may be contained within one innerduct where this appropriate and will not present undue difficulties in removing/replacing individual cables if required.

Panels where cables are terminated will be clearly labeled with destination/source and fiber number (See 17172).

IV. COPPER TWISTED PAIR RISER SYSTEM

A. Products

Riser Cables will be Category 5e Power Sum rated.

- Riser grade is acceptable unless plenum is required by code.
- Cable will be Superior Essex 51-478 series.

Rack mount RJ panels will be Panduit Mini-Com all-metal 24-jack or 48-jack panels, part CP48BL, CP24BL, CP48WSBL or CP24WSBL.

RJ jacks will be Panduit brand Mini-Jack TX-5e series (CJ5E88T or better).

- Default jack color will be black for jacks with two pairs terminated.
- Default jack color will be gray for jacks with one pair terminated.

Labels:

- Cable and jack labels will be Panduit permanent style.

B. Execution

All cable installation will be completed by technicians with training appropriate for the type of cable being handled and related installation standards.

- All RJ jack terminations will be performed by Panduit-certified technicians.

All cables will be routed neatly within closets between conduit or cable tray entry and termination panels. Individual pairs will be neatly distributed across RJ jacks and will maintain twists as required to meet cable quality standards.

RJ panels will be sized to match requirements of specific cable and system being terminated.

- In BEF, riser cables from all CDRs may be terminated on a single group of panels with labeling to differentiate individual risers as specified. (Subdivide by no less than 12 jack sections.)
- For all panels, horizontal 1- or 2-unit cable management units will be installed to support and separate each group of up to 48 jacks.
- See elsewhere for labeling requirements.

RJ jack panels will have terminated pairs and cables dressed and routed neatly. Cables and pairs will be retained to rear support brackets to assure full strain relief support and proper bend radius.

- Cables will be supported either by individually securing them to integral strain relief bars on Panduit RJ patch panels or by securing them to rear support bar spaced from patch panels to assure proper bend radius, or both.

Install a separate cable or cables totaling specified count as the copper riser connection between BEF and each CDR.

Riser cables will connect designated endpoints directly, with no intermediate splices or junctions of any kind.

Riser cables will be terminated on Panduit brand rack-mounted RJ panels at both ends.

- Riser RJ panels will be placed high in rack in which they are installed, below fiber termination and above horizontal distribution panels if they share the same rack.
- Riser cables will have two pairs connected to each jack (pairs 1 & 2). One pair in each 25-pr. Cable will remain unused to allow use of RJ panels in increments of 24 jacks.
- Jack panels will be clearly labeled indicating closet destination or source space at far end of cable and a unique sequential jack number within the cables for each closet.

V. VIDEO BACKBONE SYSTEM

A. Products

Hard line coaxial cable will be MC² brand 0.500 (1/2-inch) coax.

Flexible coaxial cable will be Belden type 1189A RG-6 quad-shield.

Hard coax connectors, junctions, and other accessories will be Gilbert Engineering brand.

F connectors will be Paladin RG6 Quad-shield Gilbert SEALTITE type.

Case-and-faceplate directional couplers and associated passives will be RMS Communications brand Ultrapower series or current physical equivalent.

Case-and-faceplate taps will be 8-port RMS Communications brand series 5500 or current physical equivalent.

Single-piece passive components will have a minimum bandwidth of 600 MHz and will be from a manufacturer who has successfully built such components for at least five years.

- Single piece passive components will be fully shielded, hermetically sealed, and corrosion resistant and have appropriate mounting and grounding fittings.

In-line Power Supplies will be Alpha Technologies.

All fiber optic components will use FC/APC or FC/AUPC connectors

Labeling will be permanent Panduit or Brady labeling system.

B. Execution

All work will be completed by a technician properly trained in CATV and hard coax cable techniques.

Entire video distribution system will be properly bonded and grounded according to code and standards.

The system will be installed and adjusted to provide a signal level of at least +5.0 dbmv as measured at the outlet in the field for all channels through 600 MHz.

Hard Coaxial Cable

- All hard coax will be installed neatly in straight paths with neat, smooth, well-positioned bends.
- Hard coax will be supported at least every 8 ft. using dedicated support brackets or brackets attached only to suspension or braces intended for multiple uses.
- Other cables, conduit, ceiling hanging hardware, etc., will not be used for support.
- Cable junctions will be kept to the minimum number required for proper installation of the system.

Components

- All video components will be located in close proximity within each communications closet. Location will be selected with access to both riser cable paths and horizontal distribution system in mind to allow a clean, neat system on completion.
- Directional couplers, multi-taps, etc., will be neatly mounted to plywood backboard using manufacturer-approved methods or wall brackets.
- Adjacent directional couplers, multi-taps, etc., will be directly and neatly connected together in straight vertical or horizontal line configuration whenever possible.

END OF SECTION