

# Infrastructure Standards

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## General Specifications

### Racks

Where designated, install floor-mount and wall-mount 19" open frame relay racks for support of patch panels, data concentrators, and other data equipment.

All rack rails shall have front and back sides drilled and tapped, #12-24 threads on 5/8" - 5/8" - 112 centers.

All racks shall have electrical grounding installed, per NEC.

All racks shall be anchored with suitable fasteners in a suitable manner.

Floor-mount racks shall be 7-foot tall and shall have seismic bracing installed.

Wall-mount racks shall be 3-foot tall, minimum, and shall stand off a minimum of 12" from the wall.

### Patch Panels

Patch panels shall be 8-pin, modular, certified for EWTIA-568-B, category-5, 100-Mb/sec service.

Patch panels shall be sized to allow for 20% (minimum) growth.

For ease of wire management, no single panel shall exceed 48 ports.

Each panel shall have a unique designation as described under Labeling.

### Cable Management Devices

The front of patch panels or equipment racks shall be provided with cable management rings or other devices required for patch cable management.

Cable management devices shall be installed on the rear of each patch panel to facilitate strain-relief and kink-free cable installation.

### Concealed Cabling

All cabling shall be installed inside walls or ceiling space wherever possible.

Any exposed cable run must be enclosed in an appropriate raceway, as described below.

### Raceways

Cable that can not be run inside a protected space must be enclosed in a protective raceway such as Wiremold 400, 800, 2300 or Panduit type-L.

Raceways and fittings may be metal or plastic.

Raceways must be secured with mechanical fasteners; adhesive only is not acceptable.

All raceways are to be sized for 50% fill, maximum.

### Wall Penetrations

Cable penetrations of walls designed as fire barriers are to be sleeved with metallic conduit and packed with approved fire blocking material, in compliance with state fire and electrical codes.

## Fiber Optic Cabling (FOC)

### Cable Types

Any FOC installed in a conduit, not within a building, shall be suitable for underground/wet service.

FOC installed in risers and plenum spaces shall be certified for that service.

### Installation Specifications

At no time during installation shall more than 400 lbs of tensile load be placed on the fiber. If a power winch or other mechanical devices are used to pull the FOC into place, the FOC shall be protected with a mechanical fuse and a swivel.

At no time during installation shall the FOC be bent to a radius of less than 20 diameters.

All vertical runs shall be secured at the top of the run with a suitable strain relief system.

All FOCs installed in conduits, where it is reasonable to assume that additional cables will be installed in the future, shall be installed with an innerduct for protection.

All FOC not in a conduit shall be enclosed in a suitable innerduct.

Innerduct in basements and enclosed ceiling spaces shall be rodent-proof

Innerduct shall extend at least 1-foot into metal conduits.

### Termination

All fibers in each FOC shall be terminated with ST or SC connectors as specified.

All FOCs shall be installed into a suitable Fiber Integration Center (FIC).

The sequence of strand colors shall be identical at every FIC.

Provide a minimum 4-foot service loop at each end of each strand to allow for repairs or relocation.

FICs shall be designed for wall-mounting or rack-mounting, as appropriate for each closet.

## Category 5 Cabling

### General Specifications

All category 5 cable materials used shall be 4-pair, unshielded, 24 AWG solid copper designed and manufactured to EWTIA-568-B category-5, 100Mb/sec, standards.

Cable shall be UL approved.

All cables shall have the same outside sheath color.

Insulation materials shall be rated to comply with local building and fire codes.

Plenum rated cable shall be used in any plenum-rated space.

Riser rated cable shall be used in risers between closets.

### Installation Specifications

Install a minimum of two category-5, 4-pair cables from the designated wiring MDF to each designated workstation location.

Each cable shall be a single, unbroken run from closet to workstation location.

The installed length of all individual horizontal distribution cables shall be less than or equal to 100 meters (328 feet).

All wiring in occupied spaces shall be concealed within walls or within the surface-mounted raceway.

All cables shall be dressed neatly and physically secured to prevent accidental dislocation or damage.

It is not permissible to secure cabling to electrical, gas, plumbing, or steam pipes.

Wires shall not be secured to any other utility structures in any fashion that might prevent maintenance of or access to those facilities.

Cables installed above removable ceiling tiles shall be neatly-bundled, and suspended above the ceiling tiles. In no case may cables be supported by the ceiling tiles or by the ceiling tile support system.

The minimum bend radius for installed cable at the patch panel and at the modular jack is 4 times the diameter of the cable, or approximately 1 inch. Slight deformations of category-5 cable can degrade data transmission. It is, therefore, necessary to avoid stressing the cable. Tight 90-degree bends are not permissible.

Wire wraps or other securing straps must not be cinched too tightly.

Care must be taken to avoid routing cables next to electrical noise-generating devices such as transformers and lighting ballasts. Four-feet is the minimum recommended distance to these devices.

Leave an 18-inch service loop in cables behind the patch panels for ease of emergency repairs.

Leave an 18-inch (minimum) service loop at the workstation-end of cables concealed within the walls for service of the jack. Do not coil this loop tightly inside of the closed box. The coil must be left as large and loose as the situation permits.

The factory twist is to be maintained at all times.

Category-5 methods and materials must be maintained end-to-end, particularly regarding jacket stripping and pair fan-out at the jack and at the patch panel. It is vitally important that the twist of each individual pair be maintained right up to the connection point. Carefully follow procedures recommended by equipment manufacturers. Do not remove any more of the sheath than is absolutely necessary. The nominal maximum strip is  $\frac{1}{2}$  inch.

## Jacks

### Type

Modular jacks shall be two-port (minimum), 8-position, EWTIA-568-B, category-5, IIO-back.

Flush mount jacks are preferred; surface-mount are acceptable where necessary.

### Installation Specifications

Modular jacks shall be plumb and at the same height as existing installed devices, such as electrical receptacles in each building, unless otherwise directed.

Surface mounted outlets are acceptable if well secured with screws (not adhesive).

Recessed outlets require fully-enclosed metal mounting boxes in any wall designed as a fire barrier.

Replacement of existing voice jacks with multi-port, voice/data jacks is acceptable where necessary due to limited space or access.

The contractor assumes liability for any damage to telephone equipment caused by improper installation or re-termination of live voice cables onto new jacks.

# Labeling

## Patch Panels

Patch panel ports shall be labeled with the Port Number.

Patch panel ports shall be numbered by the manufacturer or contractor.

Labels on patch panels and equipment racks are to be machine-printed with  $\frac{1}{2}$ " high, minimum lettering.

This number shall also be written on a working copy of the floor plan in the corresponding location of the jack.

## Station Modular Jacks

Station ports shall be labeled with Port Number.

Multiple jacks in the same faceplate shall have sequential numbers, from left to right and top to bottom.

Station jacks shall be numbered by the manufacturer or contractor.

This number shall also be written on a working copy of the floor plan in the corresponding location of the jack.

Each cable shall be permanently labeled with the same number at each end. All cable numbers within a given building must be unique. Numbers may be duplicated in different buildings.

## Fiber Optic Cable

The contractor shall label all FOCs, FICs, splice cases, innerducts, and conduits with IDs

Innerducts and conduits containing FOC shall be labeled at maximum intervals of 20-feet with "Fiber Optic Cable" and the ID of the FOC.

Labels for FICs and splice cases shall be machine-printed with 1" high, minimum lettering.

Other labels are as desired, providing they are legible and weather proof.

## Testing

### General Specifications

The contractor shall perform and document quality tests of every pair of every installed cable.

Test results shall be printed-out and submitted for review and approval. The printout shall include the identity of the cable, date tested, initials of the person performing test, and full test results.

If an installed cable fails to pass a test for any reason other than incorrect pinout, the contractor will be required to replace the failed cable and then test and certify it to the satisfaction of the Contractor.

### Fiber Optic Cable

The test must include the length total dB loss for each strand and dB loss for each connector.

End-to-end attenuation of less than 1.5dB/km @ 1300nm. Maximum attenuation of 0.5 dB for any splice or termination.

### Category 5 Cable

Category 5 cable will first be tested for shorts, opens, crosses, and swaps.

The contractor shall test and certify all installed cables with a category-5 pair scanner, such as a Microtest PentaScanner.

Tests shall be run from the patch panel port, through the modular jack at the workstation end of the cable. All four pairs of each tested cable shall meet or exceed EWTIA-568-B specifications for category-5 cabling.

## Documentation

At the completion of the project, the contractor shall deliver following documents in duplicate:

Marked-up floor plans, showing MDF, IDF and station jack IDs and locations.

Marked-up floor plans, showing the general path of installed cables.

Binder(s) containing copies of all cable tests and printouts of all cable scans.

All documents shall be clean and legible. Black ink on white paper, only. Machine-printed is expected, but hand-written is acceptable if machine print is unavailable.