UTP Installation Guide

- Category 5e
- Category 6A
- Category 6

UTP cables were developed and designed to be used independent of the system application. Set transmission performance criteria (Categories) have been established for the various grades of UTP cables.

What are these Categories?

Categories are a method of classifying UTP cables and related hardware within specific performance criteria.

Category 5e - Specifies cable and connecting hardware with transmission characteristics up to 100 MHz. It differs from Category 5 by having 3 dB tighter NEXT requirements and additional requirements for PS NEXT, ELFEXT, PS ELFEXT, and RL.

Category 6 - This document specifies cable and connecting hardware with transmission characteristics up to 250 MHz. In addition, Category 6 has tighter insertion loss, NEXT, PS NEXT, ELFEXT and PS ELFEXT over Category 5e.

Cable Handling

Length

The maximum horizontal cable length is 90 meters (295 feet). Ten meters is allowed for cords in the work area, and for patch cords or jumpers in the telecommunications closet.

The maximum backbone cable length is 90 meters (295 feet). This 90-meter length assumes that 5 meters (16 feet) are needed at each end for equipment cables connecting to the backbone.

Pulling Tension

Maximum pulling tension for a 4-pair horizontal cable is 25 lbf. Excessive pulling tensions may occur during installation. Once the damage is done, reversing the effect may not be sufficient enough to correct the problem and cable replacement is recommended. Intermediate cable pulls within the overall cable run may be necessary to avoid exceeding the maximum pulling force.

Minimum Bend Radius

4-pair UTP cables have a 1" Min. Bend Radius.

CAUTION: Exceeding the minimum bend radius can distort the cable geometry and result in degrading of transmission performance.

Repositioning of the cable to the proper bend radii may not correct the fault. Once the damage is done, the best option is replacement of the damaged run.

There are two common places where exceeding the minimum bend may occur:

- *At the workstation wall outlet*. After the cable is terminated, too often the remaining cable is jammed into the wall outlet, or worse, wrapped around itself and shoved into the outlet. A better practice would be to gently work the excess cable length back through the wall outlet into the wall.
- *At the wiring closet, during routing of the cable to the terminal block or patch panel*. Prior cable placement practices may have encouraged making the cable appear as formfitting or tight against the routing structure (cable tray or rack) as possible. A better practice would be to incorporate gently sweeping curves along the cable path avoiding sharp bends or changes in direction. Every effort should be made to ensure the path the cable follows has smooth gradual sweeps at any transition point.

Installation in Temperatures Below Freezing

The minimum installation temperature for plenum cables is 0°C (32°F). If the cable has to be installed when the temperature is below 32°F the following precautions should be taken to ensure that the jacket will not crack:

- Store the cable in a heated area whose temperature is above 50°F for 24 hours before installation.
- Transfer only enough cable to the job site for 4 hours work. The cable will retain enough heat to prevent cracking. Cable that has not been installed after 4 hours should be returned to a heated area.
- Coil service loops in 10" to 12" loops. A tight coil could cause the cable to crack.
- Normally the cables are terminated after the site is enclosed and heated. Do not attempt to terminate the cables when the temperature is below freezing.

Over Stressing

Eliminate cable stress caused by tension in suspended cable runs and tightly cinched cable bundles.

Excessive cable loading or stress can also occur if a cable is incorrectly suspended in a cable run. A recommended cable support spacing is 48" to 60" centers.

Avoid twisting of cable during installation. Excessive twisting may result in distortion of cable geometry, and in severe cases tears in the jacket.

In addition to the above guidelines extracted from TIA/EIA-568, Mohawk strongly recommends the following supplementary installation tips:

- Do not walk or step on high performance cable. Do not run over high performance cable with hand trucks or forklifts. This will exert excessive force on the cable, distorting the geometry and/or crushing the pairs, resulting in electrical shorts.
- Do not use staples, either from a staple gun or mounting in a traditional manner with a hammer. Staples can exert excessive force on the cable and distort the pair geometry.
- D-Rings, nail on clamps or Velcro® straps offer acceptable cable management techniques without compressing the cable.
- Do not run cable near sources of heat, as this may negatively impact cable attenuation.
- Maintain a 6" minimum spacing between cables and sources of EMI, such as fluorescent lights or unshielded power lines.

Termination

The installer must be acquainted with the Connector Manufacturer's installation instructions. The correct tools, wire layout and untwist length are critical, especially in Category 6 installations. Modular jacks usually have the Pair color code marked on the jack. The color code can be either T568A or T568B wiring methods. Maintain the same pin to pair combination throughout the installation. Changing pin pair assignment can result in crossed pairs. Modular jacks and cross-connect blocks employ IDC connectors to complete the circuit between the cable and the hardware. The manufacturer will recommend the tools needed to terminate the cable.

Terminate with connecting hardware of the same category or higher. Any link that has substituted a lower category component is automatically classified to that lower category.

The maximum allowable amount of untwisting during cable termination to connecting hardware is 0.5" for Category 5e and Category 6 cables. Exceeding the recommended length of untwisting may cause performance problems. The same techniques should be employed when terminating cross-connect blocks. Maintaining jacket integrity to the point of termination aids in maintaining cable geometry and NEXT isolation from adjacent cable pairs.

Bridged taps and splices are not permitted as part of copper horizontal cabling requirements.

Testing

It is best to determine the lengths of several representative cable runs and adjust the NVP to correspond to the known cable lengths. If the readout for the cable length is longer than the known length, the NVP should be decreased. Conversely, if the readout for the cable length is shorter than the known length the NVP should be increased.

The NVP values for Mohawk's products are as follows:

	Non-Plenum	Plenum
Category 5e	68%	72%
Category 6	68%	72%
Category 6A	68%	72%

A Note of Caution:

Level II or Level III Testers will be required to accurately measure Category 5e and 6 permanent links and channels.

Consult the manufacturer of your test set for clarification.

Category 5e, 6 and 6A - Permanent Link Requirements at Specific Frequencies

Freq	Insertion Loss		PSAACRF	NEXT		
(MHz)	5e	6	6A	5e	6	6A
1.0	2.1	1.9	1.9	60.0	65.0	65.0
4.0	3.9	3.5	3.5	54.8	64.1	64.1
10.0	6.2	5.6	5.5	48.5	57.8	57.8
20.0	8.9	7.9	7.8	43.7	53.1	53.1
25.0	10.0	8.9	8.8	42.1	51.5	51.5
31.25	11.2	10.0	9.8	40.5	50.0	50.0
62.5	16.2	14.4	14.0	35.7	45.1	45.1
100.0	21.0	18.6	18.0	32.3	41.8	41.8
200.0	–	27.4	26.1	–	36.9	36.9
250.0	–	31.1	29.5	–	35.3	35.3

Freq	ACRF		PSAACRF	RL		
(MHz)	5e	6	6A	5e	6	6A
1.0	58.6	64.2	67.7	19.0	19.1	19.1
4.0	46.6	52.1	65.7	19.0	21.0	21.0
10.0	38.6	44.2	57.7	19.0	21.0	21.0
20.0	32.6	38.2	51.7	19.0	21.0	21.0
25.0	30.7	36.2	49.7	18.0	19.5	19.5
31.25	28.7	34.3	47.8	17.1	18.5	18.5
62.5	22.7	28.3	41.8	14.1	16.0	16.0
100.0	18.6	24.2	37.7	12.0	14.0	14.0
200.0	–	18.2	31.7	–	11.0	11.0
250.0	–	16.2	29.7	–	10.0	10.0

The Permanent Link requirements include 90 meters of horizontal cable and the connectors at each end. The cables to the test equipment are not part of the permanent link and are subtracted out by the test equipment.

Channel requirements include 90 meters of horizontal cable and 10 meters of equipment cords, patch cords and jumpers. The maximum length of cross-connect jumpers and patch cords in the cross-connect facility should not exceed 5 meters.

For additional information and an ANSI referenced list, please contact: GLOBAL ENGINEERING DOCUMENTS at 1-800-854-7179.

For additional information on cable selection, please call 1-800-422-9961 or email techsupport@mohawk-cable.com.

These guides have been prepared by Mohawk as an aid for installers of Mohawk Category and Fiber Optic Cables and are not a warranty by Mohawk and should not be construed as such.

Mohawk's sole warranty with respect to its cables is set forth in the document entitled "Mohawk Warranty," which has been or will be provided separately to installers of Mohawk Category and Fiber Optic Cables.