CONSOLIDATION POINT ›
ARCHITECTURES

TECHNICAL ARTICLE

Molex Premise Networks

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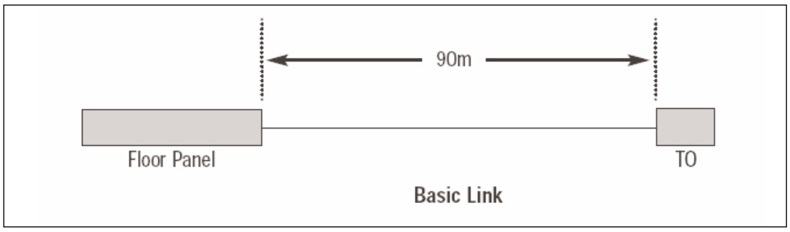
The need to deliver more user-friendly cabling networks has led to a change in the infrastructure model for structured cabling systems. This white paper examines some of the issues involved with the new architecture and provides guidance on design and testing of such systems to facilitate successful implementation.

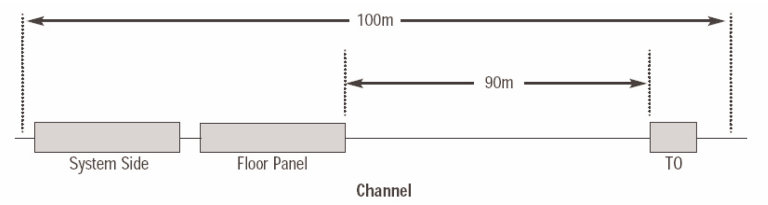
EXECUTIVE SUMMARY

Until recently the fixed portion of a cabling system (the sub-system installed by a cabling contractor and known as a 'basic link') consisted of a patch panel, up to 90m of horizontal cable and a work area outlet. This is shown diagrammatically below:-

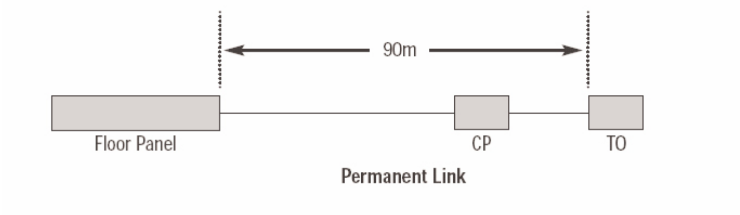


"This system model is changing"

The link is configured for active equipment connection by the addition of patch cords and work area cords to form a 'channel'. The channel may also require a 'system-side panel' or cross-connect, for example if the active equipment had a telco connector presentation.



This system model is changing. There has always been, within the relevant standards, an option to have a connection point within the horizontal cable segment. This is known as a transition point and the original rationale behind its inclusion was to facilitate a change of cable type (from round cable to flat under-carpet cable or from multi-pair to four pair cable for example). It is this additional connection which has been developed into what will be called a consolidation point. The basic link definition is being removed from the standards to be replaced by a new term the 'permanent link'.



So what is a Consolidation Point?
A consolidation point (CP) is a piece of connecting hardware allowing interconnection between the permanently installed horizontal cables extending from the floor distributor (patch panel) and the movable horizontal cables extending to the telecommunications outlets (TOs). A CP should not be used as an active equipment or user interface. CPs usually take the form of an enclosure with either an IDC-to-RJ45 connection for each communications channel, or incoming and out-going IDC connections. Functionally, a CP provides a convenient means of rearranging horizontal cabling in open office environments, to connect between fixed cabling and movable furniture system layouts, for example. It is important to note that a CP is not a point of administration, so reassignment of services must still take place at the patch panel.

".. provides a convenient means of rearranging horizontal cabling in open office environments"

Why would I use a CP based infrastructure?
The essential feature which explains the rise in popularity of CP based architectures is the ability to deliver enhanced configuration flexibility at an equal, or even reduced cost of ownership. CP based architectures offer a number of advantages. They provide an easily replaceable work area cable, which lessens the on-going cost of replacement due to damage. They can decrease work area cabling installation time. They also include a portion of the cabling infrastructure which is permanent and re-useable, and which can be reconfigured quickly with minimum of disruption.

The potential downside is that the original installation time can be increased, leading to a higher initial installation cost. The labeling and documentation requirements are more complex also, and there can be problems during acceptance testing if the design and planning phase is not carefully controlled.

Design Issues
When designing the cabling infrastructure the first issue to be addressed is the choice of solid or stranded cable in the CP-TO link. This choice is pivotal and has a fundamental effect on which design rules should be applied to the cabling system. Originally, the rule of thumb was that a cabling system could comprise a maximum of 90m of horizontal cable and up to 10m of patch cord. This rule is in part because of the difference in attenuation between horizontal (solid conductor) cable and patch cable. The more flexible stranded construction used for patch cable means that the attenuation of 1m of patch cable is approximately equal to that of 1.5m of horizontal cable. This difference must be accounted for within the length rules if the complete channel is to meet the standard limits.

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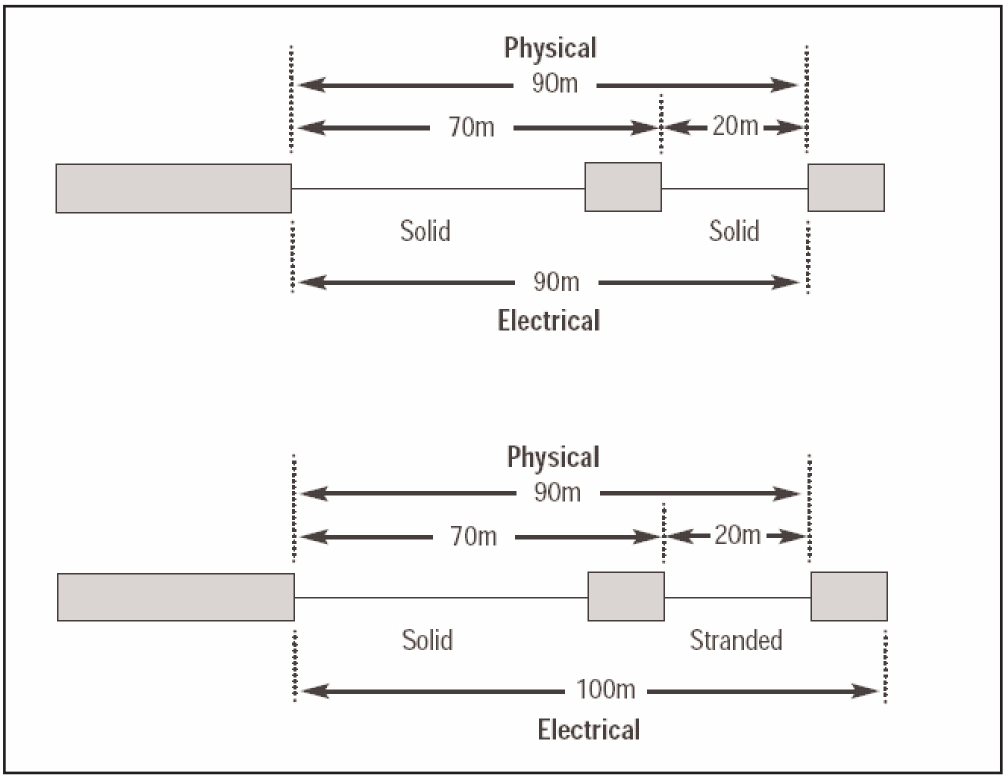


There are other design rules to be taken in to account. To avoid the summation effects of crosstalk in adjacent connectors (analogous to short link resonance problems sometimes encountered in the mid-nineties) the CP is required to be sited at least 15m from the horizontal patch panel. In practice this should pose few problems because CP architectures are unlikely to be cost effective with such short cable runs.

However there is a similar problem at the TO end of the cabling system which is potentially more problematic.

The current, relevant standards for field test equipment require that a tester perform the same tests against the same limits in either direction. As has been discussed previously, crosstalk (and return loss) can cause problems when connectors are only separated by a short length of cable. Hence the ‘15m rule’ from patch panel to consolidation point. If the tester is testing in the same way from each end of the cabling system then surely the same must hold true at the work area end. The current drafts of the 2nd editions EN 50173 and ISO 11801 don’t apply such a rule but there are some alternative suggestions. See testing issues below.

“..CP-TO links of approximately 10 to 15m yield good results.”

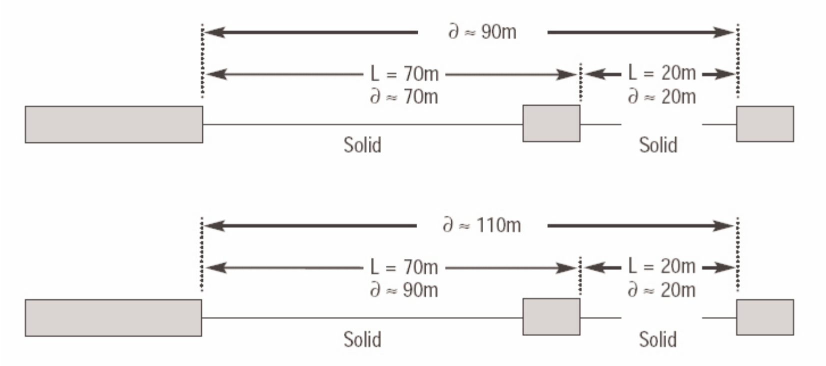
The standards do not apply limits to the length of cable from the CP to the TO, so from the cabling system designer’s perspective some guidance is in order. The summation effects can obviously be minimised by increasing the length of the CP-TO assembly but as the length is increased, the assembly becomes somewhat unwieldy. As ever, a compromise is required. Electrically, longer CP-TO links are desirable so the pragmatic approach is to make these links as long as is manageable. Research shows that whilst a pass can be achieved with CP-TO links as short as 3m, 5m is a more realistic minimum in order to achieve an acceptable margin over the test limits.

When designing for optimum performance, CP-TO links of approximately 10 to 15m yield good results.

Testing Issues

Field-testing is the area in which consolidation point architecture has had the most significant impact. There are a number of issues to be addressed.

The first concerns the testing of the patch panel to consolidation point link. In most cases, the current procedure for testing this portion of the cabling system involves the use of the basic link limits for each of the measured parameters. This approach is fundamentally flawed. Let’s assume, as an example, that the patch panel to CP link is physically 70m long. If this link is tested against the basic link limit for attenuation (which assumes a 90m length) then there is no guarantee that the final channel will meet the attenuation limits. The addition of CP-TO cable, equipment cords and work area cords in this instance may not equate to a compliant channel. Some way of applying a limit for those parameters, which are length dependent, must be found. Unfortunately this is not a straightforward problem for the manufacturers of test equipment; currently the only way to assess the test results for a patch panel to CP link is to do so manually. It is prudent to seek design guidance in the application of these length dependant parameters.



"The CP connection is an additional item, which must be covered by the documentation system."

∂ = Attenuation equivalent length
L = Physical length

The near-end crosstalk issues, which are part-and-parcel of this type of architecture, have already been discussed. Equally important are the related issues with respect to return loss and again research shows that longer is generally better. Return loss issues can be overcome with careful consideration of this issue at the design phase.

Administration Issues
The implications of CP-based architectures on documentation are significant. The CP connection is an additional item, which must be covered by the documentation system. There is scope for the unwelcome interconnection, and therefore damage, of incompatible active equipment.

It seems almost trite to explain that careful attention to documentation at the hand over stage is vital. Certainly any time spent ensuring the documentation system is maintained accurately will be repaid many-fold in preventing problems during the operational life of the cabling system.

Labelling will also play an important part in this process and the essence is to keep to a simple numbering scheme for panel ports, CPs and work area outlets. It is advisable to ensure that each connection in the channel bears the same, unique identifier as this negates the requirement for complicated (and often unnecessary) cross-referencing.

To avoid potential problems with over-length conditions and the resultant attenuation failures it is important that the CP outlet is marked with the maximum length of cable which can be attached in the work area. The other option for avoiding this problem is to decide at the design stage that only one chosen length of CP-TO link will be used. This length would then be the only one allowed on site.

Whilst not suitable for all customers, a cabling infrastructure utilising a consolidation point in the horizontal cable run can represent a major cost saving, whilst adding significantly to the flexibility and user friendliness of the cabling.

CONCLUSION