Jewels in a haystack

Two studies unveiled at a recent TIA deliberation in Houston successfully examined the effect of installation on cable performance.

One of the benefits of participating in standards meetings is that every so often an excellent technical contribution comes along that sheds new light on some aspect of cabling performance that was unknown or not well understood.

It makes up for all the hours spent in ballot comment resolution debating the moot points of a particular recommendation or whether something should be normative or informative.

Two such contributions were presented at our last TIA TR 42.7 and 42.1 meetings in Houston. Both are the result of a comprehensive set of controlled experiments to observe the effect of installation on cable performance.

The first is from Beast Cabling Systems and the purpose was to determine the appropriate minimum bend radius that should be respected under load during installation of twisted pair cable.

Return Loss parameter

Five different brands of augmented Category 6 cables were pulled under different conditions. For each condition, 40 metres of cable were pulled unto an overhead tray without exceeding a pulling tension of 110 N (25 lbf) force.

The cable was passed over a rod or a roller of different diameters before entering the cable tray and also pulled directly over the edge of the tray itself.

Transmission measurements were performed before and after pulling the cable at frequencies up to 500 MHz. The largest impact on cable performance was on the Return Loss parameter, which is a measure of signal reflections due to impedance variations along the length of cable.

Although there were notable differences between different manufacturers products, the worst cable results showed that static rods smaller than 76 millimetres in diameter can negatively impact cable performance.

The results also showed that rollers 50.8 millimetres in diameter exhibited similar performance as a 76-millimetre static rod.

Based on these results, it is recommended that the minimum inside bend radius, under load for 4-pair UTP cable shall be 38 millimetres if established by a static rod or 25 millimetres if established by a roller.

The second study is from American Polywater Corp. and its purpose was to determine the effect of pulling lubricant on the performance of high frequency data cables.

This work was performed in response to an industry problem that was reported in a letter to TIA TR 42 from Dan Howell of Fisk Technologies and Dave Callahan of Bombard Electric.

The letter indicated that data cables pulled into conduit using common commercial pulling lubricants failed insertion loss testing after installation.

Sheri Dahlke of American Polywater reported on an extensive set of measurements that were performed in their laboratory.

Different types and amounts of lubricants were applied on different brands and categories of cable.

The insertion loss was measured before and after the application of the lubricant and over a period of time ranging from days to weeks, while the testing was in progress.

In a first series of tests the lubricant was applied in different amounts and the cable was allowed to dry in the air.

Certain lubricants showed a larger initial increase in Insertion Loss but recovered fully after a few days to a week of drying in the air.

In a second series of tests, the cables were lubricated and installed in a conduit and the ends of the conduit were sealed.

TIA response drafted

The insertion loss was monitored over a period of time for up to 70 days. Some cable designs showed a larger increase than others when exposed to certain commonly used lubricants in the industry.

I won't mention any brand names in this article. It seems that certain lubricants that are formulated to disperse and retain water to improve lubricity can also have a more adverse affect on insertion loss performance.

American Polywater showed that one type of thin film lubricant applied with a wipe performed better than the others, even under the most severe conditions in a sealed conduit.

Based on these results and other tests performed by another cable manufacturer, TIA TR 42.7 drafted a letter in reply to Howell on the Use of Pulling Lubricant for Telecommunications Cabling providing a general summary of the findings and recommendations.

As you can see there is a lot more to cable performance than a set of parameters and requirements specified in a data sheet.

Cable performance is affected by the cable design, materials, manufacturing process and installation conditions.

All of these factors can have a bearing on the results obtained under particular conditions. For those who are looking for answers, sometimes there are a few gems in the relative obscurity of a standards forum thanks to the efforts of those individuals who undertake to do the work and make it happen. CNS

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