Not an Open and Shut Case

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Q. WITH THE LARGER, ROBUST CABLES, SUCH AS AUGMENTED CATEGORY 6, ARE THERE ANY REGULATIONS OR "BEST PRACTICES" FOR THE SELECTION OF CABLE TRAYS FOR HORIZONTAL DISTRIBUTION – FOR EXAMPLE SOLID BOTTOM VERSUS WIRE BASKET OR EVEN J-HOOKS?

A. Recently there has been some debate over which style of cable pathway is best suited for Augmented Category 6 (6a). Depending on the manufacturer, the cable can be as little as 15-percent larger in size and in weight, (e.g. Berk-Tek's LANmark™ -2000 premium Category 6 is .250" and its LANmark™-10G2 Augmented Category 6 is .300"), which decreases the number of cables that can be installed and increases the bend radius requirement – important factors in determining what pathways should be used. The reason for the increased size of Category 6a over Category 6 is due to the added separation of pairs not only within the same jacket, but also with other adjacent cables due to the threat of alien crosstalk (interference from other cables residing in the same pathway).

The most popular cable tray choices are solid trough, wire mesh, center spine and ladder racking. Selecting the type of cable tray and support is not an "open and shut case" as there are many variables. In fact, according to the BICSI "bible" (the TDMM), many buildings may require a combination of pathway systems to meet the cable horizontal distribution needs. Let's look at some issues and best practices.

THE VERDICT IS STILL OUT

In looking for rules and regulations, I heaved out Volume 1 of the 11th edition of BICSI's "Telecommunications Distribution Methods Manual" (TDMM) that addresses horizontal pathways to see if there was anything specific to the cable Category. Actually, there are no specified rules and regulations by BICSI recommending the type of cable tray, nor do they choose which one gives the most support. The TDMM does not specify the working load capacity but states that the cable tray system is determined by both the static load capacity of the tray and the length of the support spans… in other words, it will be determined by the manufacturers' specifications for the tray load. The selection of cable tray will be dependent on the number of cables (cable density) required, cable diameter, pathway capacity, maximum occupant density, the distance, and the installation environment.

It is the cable designer's role to ensure that horizontal pathway systems have built-in flexibility to accommodate tenant movement and expansion – to make maintenance and reallocating as easy as possible. According to the TDMM, the two critical factors are: 1) consider the quantity and size of cables that the pathway is intended to support; and, 2) allow for growth of the area served over the planning cycle.

For best practices, the TDMM recommends that the pathway design should allow for a minimum of three four-pair cable runs per individual work area. Although, only two cables per work area are typically required for data and voice, and as few as one if using VoIP, but the additional pathway capacity is needed to facilitate future additions and changes as the users' needs evolve. With the convergence of more than just data and voice going over the network, consideration for BAS (building automation systems), such as security and access control should be factored in to the equation.

As a rule of thumb, the TDMM recommends: "Trays and wireways are usually supported on five foot centers and a support must also be paced within 24 inches on each side of any connection to a fitting." Bend radius and cable weight in the pathway also affect reliability of the cable. For example, in a J-hook scenario with a span of 12 inches between J-hooks, the sag of the cable can alter the allowable distances and the reliability of the cable.

TESTED TRIED AND TRUE

When selecting a cable pathway, it is important to see if there are any test reports that verify the reliability of the cable in "real life" installation scenarios. For instance, Cablofil/Legrand, a major manufacturer of wire mesh basket tray developed a test program through third-party ETL SEMKO, a division of Intertek Testing Services, Ltd., involving the Cablofil® mesh cable tray as a containment system to support their installer's quality guarantee. "The purpose of these tests was to look at the short-term and long-term effects of the cable in wire mesh basket containing the total weight of Category 5e and Category 6," states Bob Crain, technical sales manager with Cablofil/Legrand. "And, although the tests did not include Category 6a, the same principles would apply," he adds.

For the test, 300-foot lengths of Category 5e and Category 6 cables were placed in Cablofil cable tray – first with zero load and second with a load of Lexan strips added, which were equal to 40-50 pounds per foot. "Actually this load is the equivalent to eight inches of cable depth, which is two inches more than the allowable fill rules set by the NEC electrical code as well as TIA-569-A standards for pathways and spaces," states Crain. "Most people

are worried about crushing the cable and over time the cable could be crushed in a solid bottom tray," he adds. ETL tested the cable according to the latest EIA/TIA-568-A standards before and after the loads for attenuation, NEXT, FEXT, return loss and input impedance for both Category 5e and 6. The tests show that even with this cable depth, when installed in the wire mesh basket tray, there was no identifiable difference in performance.

The second set of tests involved putting the same cables in an environmental chamber and subjected them to a -40°F to +185°F temperature cycle, 200 times over a two-week period. This simulates aging up to 15 years. The cables were tested by ETL again before and after the loads for attenuation, NEXT, FEXT, return loss and input impedance for both Category 5e and 6. The tests show that even with heavy loads and high heat aging, when installed in the wire mesh basket tray, there was no identifiable difference in cable performance.

"When cables are stacked in a solid bottom tray, the impedance of the cables on the bottom of the tray may be affected, essentially because the solid tray acts as a ground plane, if installed correctly," states

These two photos demonstrate the difference in fill ratio when loading cable trays with 50 Berk-Tek Category 6 cables (yellow) and 50 Berk-Tek LANmark-10G2 Augmented Category 6 cables (white).

Lisa Huff, data center applications engineer for Berk-Tek. "In addition, in critical locations, such as data centers, where airflow is a major concern, a preference would be to install mesh cable baskets or ladder racking for overhead cable management between racks and rows," she adds.

PROS AND CONS

There are pros and cons to all of the cable trays and pathway methods. In addition to the visual differences, take a look at the ease of installation and whether the method is trouble-free to replace as the building and cabling requirements change.

"NECA has stated that wire mesh basket tray takes 20-30 percent less labor time over solid tray," notes Crain. "Solid trays can be ordered to size or adjusted at the job site but that sometimes entails cutting the tray and drilling new plate holes, whereas with a mesh wire cable tray you can cut the wires and just bend the tray at the site," he adds.

The reality is if you are faced in a design situation where you are not sure of the best method, learn by other people's experiences and testimonials. Since there are no concrete rules and regulations, other than fill ratios, explore all your options. Contact the different manufacturers or distributors to get hands-on training and best practices with the different materials and styles, so that you can make an educated first-hand decision. ■