



Next Gen NETWORKS

Technicians' Best Practices: Handling Reduced Bend Radius Fiber



Technicians' Best Practices: **Handling Reduced Bend Radius Fiber**



Some monumental breakthroughs have taken place in optical fiber cables and their ability to bend around sharp corners without increasing attenuation – but today's technicians and installers may be receiving mixed messages. This paper will highlight the potential issues surrounding these new fibers as they apply to the people who handle and install the cables in fiber-to-the-premise (FTTP) applications.

The possibility of perceiving these new fibers as being virtually indestructible is a dangerous misperception. Technicians must be acutely aware that reduced bend radius fibers are, in the end, still glass and still subject to the same forces that have traditionally caused increased attenuation problems and failure in optical links. ADC's intent is to educate technicians and installers about the true attributes of reduced bend radius fibers while reinforcing the idea that proper fiber cable management techniques still apply.

Bend-proof isn't break-proof

Technicians should be aware that the new breed of reduced bend radius fibers can reduce minimum bend radius requirements significantly, but they can also still become damaged or even broken if mishandled or stressed beyond their limitations. The fibers are designed to reduce the minimum bend radius from the traditional 10 times the outside diameter of the jacketed cable (about 38 mm) to as low as 5 mm with negligible added attenuation.

Applications for reduced bend radius fiber began in the 1990s with specialized use in optical subassemblies and dense wavelength division multiplexing (DWDM) systems, including oceanic repeaters where reduced space is a critical issue. As WDM installations gain traction in access segments of optical networks, such as new WDM passive optical networks (WDM-PON), these new fibers are gaining even more momentum.

With the evolution of cable structures that provide better physical protection for the internal fibers, reduced bend radius fibers are exiting the laboratory and manufacturing environment and moving towards central office (CO), outside plant (OSP), headend, and premise locations. This migration requires that installers and technicians be trained in the actual limitations of these fibers, as well as the continued importance of fiber cable management practices in these new environments.

Beyond the hype

With the ambitious marketing campaigns for new reduced bend radius fiber products, installers and technicians may be led to believe these fibers are impervious to the forces that increase attenuation or actually damage glass fibers. Even the names of the fibers can be quite misleading – bend insensitive, bend resistant, bend optimized – and technicians could easily make false assumptions about durability and performance capabilities. These assumptions could have a serious impact on the long-term performance of an access network.

Bending fiber beyond traditional limits should never be construed as meaning the fiber is virtually indestructible. Nothing could be further from the truth. Although improvements to bend radius and physical protection are beneficial, the glass within is still subject to fracturing and even breaking with improper handling and a variety of outside forces. Still, some advances have been made in cable structures and designs that actually provide a measure of built-in bend limit protection – but glass is still glass.

The excitement surrounding reduced bend radius fibers is not their indestructibility, but rather the potential they provide in making installations much easier, particularly in terms of routing cables inside structures. The applications for multiple dwelling units (MDUs) are quickly catching on. MDUs typically require tighter turns and the need to conceal the fiber cable between rooms and around sharp corners. Careful planning will ensure the fiber still adheres to fiber cable management techniques for connecting, terminating, routing, splicing, storing and handling reduced bend radius fiber cables.

With that in mind, ADC believes it is still vital for technicians and installers to continue ensuring that all four elements of fiber cable management are part of the installation plan. These elements include bend radius protection, cable routing paths, accessibility, and physical protection. Let's review each element in light of the new capabilities touted by reduced bend radius fiber.

Impact on the elements

Even though reduced bend radius fiber, along with improvements in jacketing techniques, enables tighter bends without attenuation penalties, bend radius protection is still a viable element of a complete fiber cable management system. Technicians must still give consideration to a minimum bend radius, even though it may not be as stringent. Proper slack storage is also necessary to prevent potential problems on frames and along cable pathways.

Improper fiber cable routing continues to be a major cause of bend radius violations. Installers and technicians must still be concerned with neatness in order to promote rapid circuit routing, easier cable tracing, and less complex reconfigurations. Cable routing that is left to the technician's imagination leads to an inconsistent, difficult-to-manage network. By making sure that fiber handlers are aware of good cable routing practices, service providers will avoid congested chaos and ensure neatly-placed, easily accessible, and well-defined routing paths.

These benefits will be even greater with reduced bend radius fibers. They will enable technicians to actually put their hands into a fiber bundle along the raceway to physically trace a particular fiber – a risky procedure with traditional fiber. Thus, cable tracing procedures will be accomplished easier, resulting in much faster reconfigurations. Still, any benefit provided by using reduced bend radius fiber cabling will be dependent upon how well the cables were routed in the first place.

The third element of proper fiber cable management is cable access – referring to the accessibility of installed fiber and connectors. Technicians cannot assume that bending fibers to gain access is no longer a problem with reduced bend radius fiber. With higher fiber and connector densities dictated by today's broadband demands, the likelihood of accidentally removing a wrong cable increases significantly. With fiber connections increasing from 50 to 500 in a single active equipment rack, proper management and accessibility issues are even more critical for technicians, and reduced bend radius fiber will have little effect on mitigating these concerns.

Finally, the physical protection of the fiber is not diminished. Rather, all brands and types of fiber are equally subject to outside forces that can damage or break optical fibers. The ability to bend around corners does not alleviate physical limitations of rough handling or damage from nails, screws, staples, or external pressures. Even reduced bend radius fibers have limitations to excessive bending, pinching, or binding. Therefore, technicians should bear in mind that any fiber that traverses from one piece of equipment to another must be physically protected.

Skill or no skill

As service providers try to sort out the benefits of reduced bend radius fiber, the question is raised regarding the ability to use less-skilled installation technicians. Again, the belief that this fiber can be handled differently from any other fiber is incorrect. An installer's experience should be the paramount concern, particularly for the end user. Even though copper is relatively simple to handle, few people would choose to have an inexperienced technician install it in their home or office. Experienced technicians who are intimately familiar with building codes, standards, and specifications will always be preferred – and it should be no different with fiber, regardless of what type is being installed.

In the end, reduced bend radius fibers offer benefits and improvements for FTTP deployments, but with each improvement there is a responsibility to ensure technicians are also aware of any limitations. Insisting on proven fiber cable management techniques is the optimal method for protecting the network and enabling its long-term viability. This makes even more sense in light of the increased fiber densities that loom ahead with broadcast applications.

Continually educating fiber installers and technicians will help them remain focused on the importance of good fiber cable management practices while allowing long-term performance, efficiency, flexibility, and reliability of optical access networks. ADC believes that service providers have a responsibility to make sure every technician is acutely aware of the capabilities and limitations of the fiber products placed into their hands. It all begins with making a conscious decision to treat all fiber – including reduced bend radius fiber – as though it were made of glass.

WHITE PAPER



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