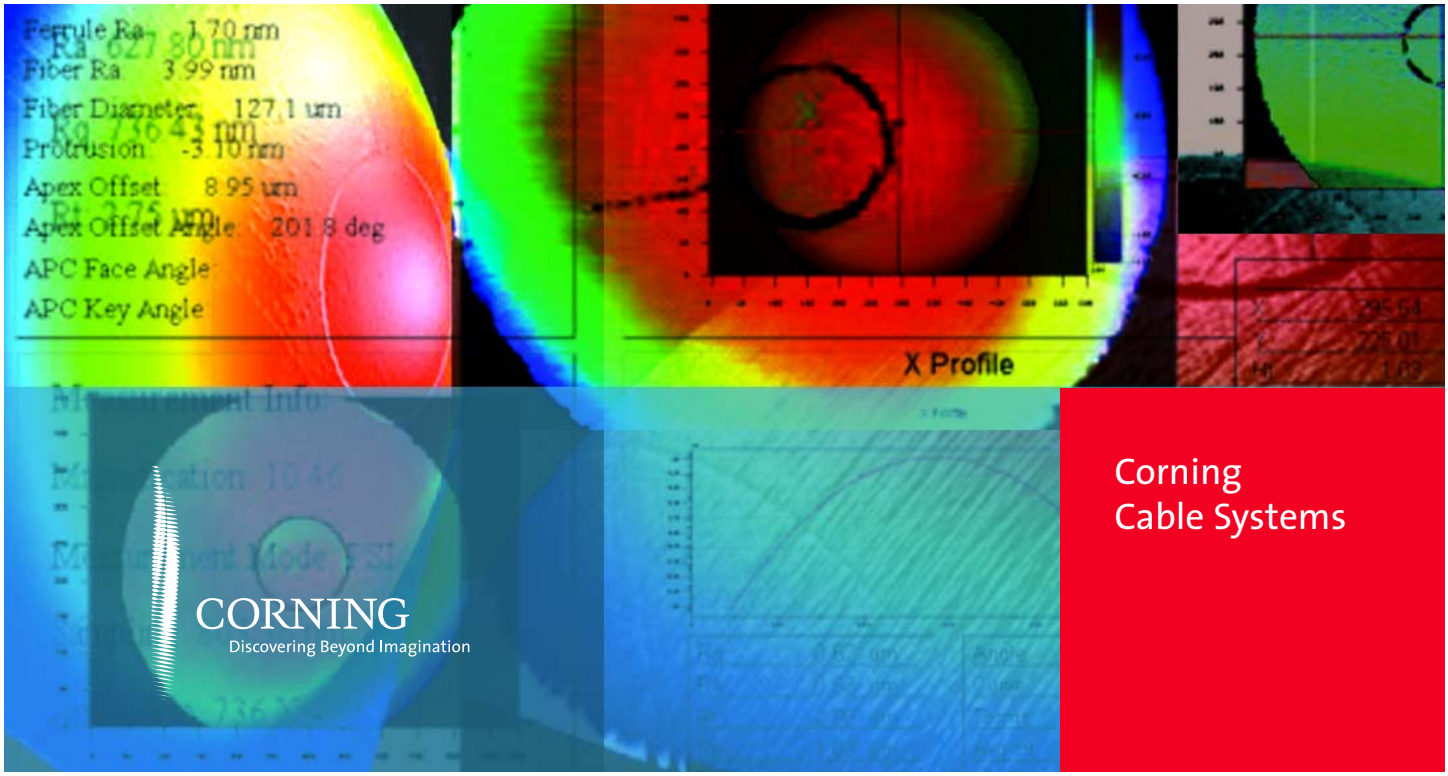

The Importance of Geometry for Fiber Optic Connectors

The success of fiber optic connectivity in your network is ultimately dependent on the quality of the physical contact of the fibers being connected. This physical contact is a function of the end-face geometry of the connector itself. If it is not rigorously controlled, long-term network reliability is not assured.

Telcordia GR-326, the guiding document for fiber optic standards, specifies three critical parameters for connector end-face geometry: radius of curvature, apex offset and fiber undercut. Fiber optic connectors that do not meet the Telcordia GR-326 end-face geometry standard are at greater risk of contributing to system failure. Factory-controlled and -tested, no-epoxy, no-polish (NENP) connectors are most likely to meet these parameters. In fact, Corning Cable Systems UniCam® Connectors exceed the Telcordia GR-326 standards for end-face geometry.

First, it's important to understand the three geometry parameters and their impact.

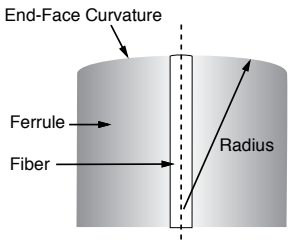

Figure 1. Radius of Curvature
| Drawing ZA-1269

Radius of Curvature

Radius of curvature describes the radius of the end-face ferrule surface measured from its axis; in other words, the roundedness of the ferrule's end-face surface. Connectors use compressive force, typically via springs, to keep the connecting fiber end-faces abutted. The curvature of the ferrule end-face controls this compressive force to keep it centered where the fibers mate. Telcordia GR-326 identifies the minimum and maximum values for radius of curvature at 7 to 25 mm. Values outside of this range increase the risk of fiber damage and reflection and insertion losses.

The Importance of Geometry for Fiber Optic Connectors

Apex Offset

Apex offset is the displacement between the highest point (or apex) of the rounded end-face of the ferrule and the center of the fiber core. Excessive apex offset can lead to lack of physical contact of the fiber cores and an increase in insertion loss. Telcordia GR-326 specifies a maximum value of no greater than 50 µm for apex offset. Values greater than this can reduce fiber-to-fiber contact and cause increases in reflectance over the operating temperature.

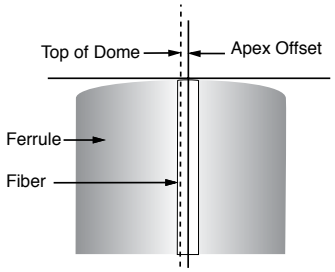

Figure 2. Apex Offset | Drawing ZA-1269

Fiber Undercut/Protrusion

Fiber undercut is the distance of the fiber below the rounded end-face of the ferrule. Its opposite is fiber protrusion, in which case the fiber juts above the ferrule end-face. A proper undercut/protrusion guarantees that fiber-to-fiber contact will always be maintained over the operating temperature range, when materials can expand and contract. Undercuts that are too extreme can result in air gaps between the connecting fibers' end-faces, which can cause changes in reflectance and insertion loss. Excessive fiber protrusion can increase the compressive load at the end of the fiber, causing fiber damage or failure of the fiber-ferrule epoxy bond. Telcordia GR-326 specifies an undercut value of +/- 55 nm.

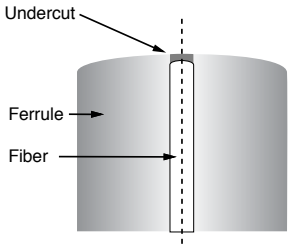

Figure 3. Fiber Undercut | Drawing ZA-1269

Connector Type and End-Face Geometry

During field installation of epoxy-and-polish connectors, the installer must hand polish the ferrule end-face. Even with the most experienced installer, a precise, consistent polish cannot be achieved by hand, introducing imperfections on the end-face of the ferrule, particularly if the radius of curvature or apex offset are not ideal, and even the fiber itself if the fiber is protruding beyond the specification.

On the other hand, no-epoxy, no-polish connectors are polished in the factory, where machine precision rigorously controls the level of the polish, rather than by hand. As you can see in Figure 4, the result is an end-face that is nearly pristine.

The very nature of hand polishing epoxy-and-polish connectors makes them incapable of consistently meeting the Telcordia GR-326 standard. UniCam® Connectors are factory tested and quality inspected for end-face geometry to ensure that Telcordia GR-326 standards are met.

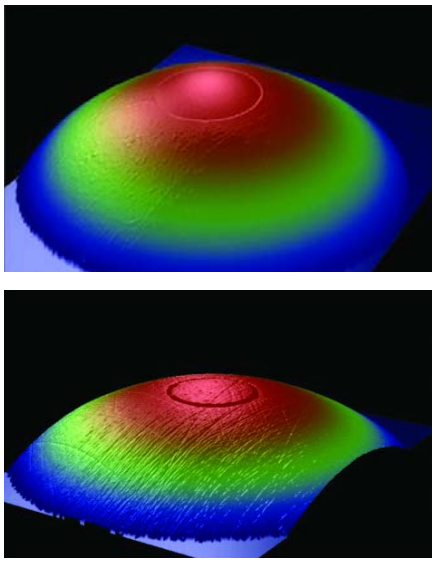

Figure 4. In the top image (a three-dimensional image of a UniCam Connector ferrule), fiber undercut has been precisely maintained to create a nearly smooth end-face. The factory-controlled polish leaves the surface nearly perfect. In the bottom image, this anaerobic connector ferrule end-face shows visible fiber protrusion and the hand polish has resulted in scratches over the entirety of the end-face.

Protecting the Integrity of the System

Clearly, the Telcordia standards body has identified end-face geometry as a key factor in connector performance. The best way to ensure the long-term performance and reliability of a network is to ensure that the connectors meet or exceed the Telcordia GR-326 specifications for end-face geometry.

In order to protect the integrity of the system and ensure end-user customers will achieve superior system performance in the near and long term, many designers specify connectors that meet or exceed this standard.

For more information, contact Corning Cable Systems at 800-743-2675; International: +1-828-901-5000.

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Corning Cable Systems LLC • PO Box 489 • Hickory, NC 28603-0489 USA • 800-743-2675 • FAX: 828-901-5973 • International: +1-828-901-5000
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