

From the morning commute, to a working lunch, to evening entertainment, the modern consumer expects seamless, fast, and reliable broadband connectivity. Fiber optics are greatly improving the speed of large commercial networks, and now, residential consumers expect their home connection to keep pace. Eager to meet this demand, broadband service providers are quickly expanding their networks to bring fiber connectivity into traditional residential homes – single-family units (SFUs) – and apartment or condominium buildings – multidwelling units (MDUs).

The expansion of residential fiber networks poses several installation challenges, from navigating cable around structural obstacles to unsightly leave-behinds, such as slack cable and debris from drilling. While residential consumers are pleased with new options for better connectivity, they are often displeased with the unappealing footprint left by fiber cable routing. A nearly invisible solution for residential fiber deployment that provides a pleasing aesthetic, with reliable and fast installations in challenging SFU and MDU applications is now available worldwide.

## Cable Routing and Bending

Typical residential fiber installations involve routing fiber cable from an exterior wall-mounted network interface device (NID) to an interior wall outlet box (wall jack) inside the home or apartment. The fiber route from outside to inside the dwelling often requires tight bending of the fiber at multiple corners to reach the indoor wall box.

A standard single-mode fiber is susceptible to macro-bend attenuation (optical power loss) when bent in radii below 30 mm, which can create systemwide reliability issues. Bend-insensitive single-mode fiber, however, is designed to operate in small bend radii – as small as 5 mm. Because of this, bend-insensitive fiber provides excellent performance consistently over its service lifetime. As a result, bend-insensitive fiber and ultra-bend-insensitive fiber are commonly used for residential installations.

## Current Offerings

One solution cable manufacturers have developed is a ruggedized 4.8 mm round drop cable with ultra-bend-insensitive fiber that mimics copper category 5 and CATV coaxial drop cables with preterminated connector ends. Using round-crown staples with these cables helps prevent compression and inducing attenuation, resulting in desired performance when recommended stapling practices are followed. However, the 4.8 mm cable typically requires stapling along baseboards, and around doorways, windows and other obstacles, resulting in a clearly visible pathway. Additionally, storage of slack cable is problematic as is stapling, which is noisy, messy, and sometimes impossible if the home has concrete walls.

Another solution involves using bare 900  $\mu\text{m}$  fiber with bend-control corner hardware. In this setup, the fiber is routed along the baseboard, wall, or ceiling and feeds into bend-control corner pieces for protection around angular obstacles, such as doorways. One of the pitfalls of this setup is that it requires securing the fiber in place with a caulk or fluid adhesive, a process that is both time and labor intensive. The skill of the installer is very important because it's possible to introduce microbends to the cable, compromising the signal or inadvertently causing damage to the property.

Other cable manufacturers have developed an adhesive-coated bend-insensitive single-mode fiber, which requires the use of a heat gun and/or battery-powered applicator to melt the adhesive and secure the fiber in place. In this installation, the fiber cable

is secured to the wall surface at a pace of one inch per second – a time-consuming process. The installation speed also needs to be slowed down when fiber is not attached to the wall or when the fiber is routed around both inner/outer corners. The risk of property damage increases due to the heating element and, once again, the installer’s skill level determines the quality of the installation.

## A Clearly New Solution

Several solutions meet the requirement of expanding residential fiber networks, but they’re falling short on aesthetics or fast installation processes. Customers aren’t always satisfied with how an installation looks, and clean, streamlined craftsmanship is highly variable among installers. Often times, customers are not satisfied with how long the installation job takes. As a result, broadband service providers struggle with consistency in installation quality and customer satisfaction.

## A comprehensive approach to address multiple concerns with residential fiber cable routing.

The result is the new Clear Fiber Drop Cable, an indoor/outdoor drop cable that routes the 900  $\mu\text{m}$  Clear Fiber, a clear-buffered ultra-bend-insensitive fiber, indoors where it slides and locks into the Clear Track Fiber Pathway, a clear-routing pathway. The Clear Track solution provides aesthetic, reliable, and fast installations in challenging SFU and MDU applications.



Figure 1. Clear Track Fiber Pathway



Figure 2. Clear Fiber Drop Cable

## Installation Methods Single-Family Unit

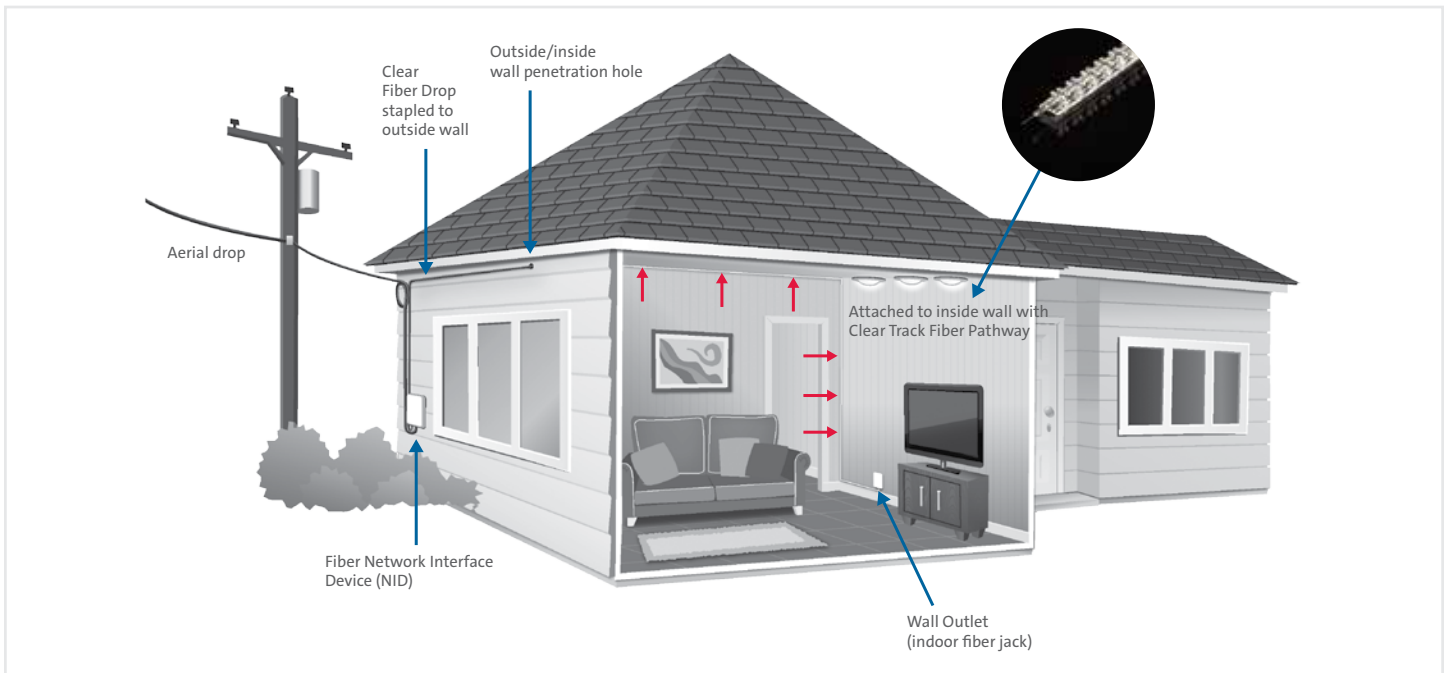


Figure 3. Outdoor-indoor routing pathway for SFU application

## The Future of FTTH Connections

Corning's three-part FTTH solution is designed to deliver fiber connectivity with fast, simple installations and a minimal network footprint.

### Clear Fiber Drop Cable

- Optical fiber nonconductive-riser (OFNR) rated
- Can be stapled
- Easy peel for easy access to Clear Fiber
- All dielectric
- Field terminated

### 900 $\mu\text{m}$ Clear Fiber

- Ultra-bend-insensitive fiber
- Clear buffered
- Field or factory terminated

### Clear Track Fiber Pathway

- Low-profile pathway
- Proprietary tape adhesive backing
- Contoured track diffuses light
- Simple installation
- Easy to remove fiber from track

Learn more about this solution and more at [corning.com/cleartrack](https://www.corning.com/cleartrack).

## Clear Fiber Drop Cable

Designed for the final drop service, the all-dielectric easy access Clear Fiber Drop Cable eliminates the need for bonding or grounding. The jacketed cable contains a single clear-buffered 900  $\mu\text{m}$  fiber with two parallel fiber reinforced polymer (FRP) strength members placed on the sides of the fiber. The cable measures approximately 2.5 x 4.0 mm and the internal fiber complies with ITU-T G657.B3 standard, meeting the 5 mm bend-radius requirement. The low-profile cable is designed to be UV resistant.

Outdoors, the Clear Fiber Drop Cable holds up to tough -40°C to 70°C (-40°F to 160°F) conditions. The sturdy jacketing makes it easy to staple the cable to the outside of the premises without inducing any optical loss. With OFNR rating, the cable can enter into basements or attics before transitioning to living spaces. Plus, the cable is designed to meet the ICEA-S-110-717 standards.

Indoors, the Clear Fiber Drop Cable jacket peels open by hand to expose the 900  $\mu\text{m}$  Clear Fiber. The fiber inconspicuously routes to the optical network terminal (ONT) or wall outlet box, where it can be terminated with field-installable connectors. Optionally, factory-terminated versions of the drop cable are available.

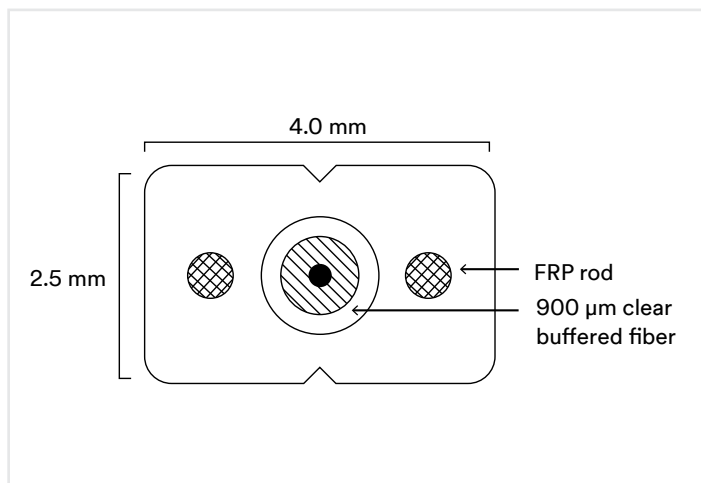


Figure 4. A diagram of the jacketed easy access fiber drop cable.



Figure 5. The easy access fiber drop cable peeled open without tools to expose the clear buffered fiber.

## Clear Track Fiber Pathway

Intended for home and office installations, Clear Track Fiber Pathway diffuses reflected light, resulting in near invisibility.

The clear translucent tape adhesive-backed pathway is delivered on a spool with a protective red-liner backing. When installed, it is clear, flexible, and has a small footprint without any visible seams. It installs directly onto a wall surface using the preattached tape adhesive without the use of a raceway, conduit, or micro duct.

Clear Track Fiber Pathway has two rows of clear, flexible, and mushroom-like features with precise lengthwise separation that form a track. Through diffuse reflection, the contours of these features create the pathway's low visual profile, while their precise pitch holds the 900  $\mu\text{m}$  Clear Fiber in place. The pathway enables easy removal of the fiber to extend or reroute the fiber as needed.

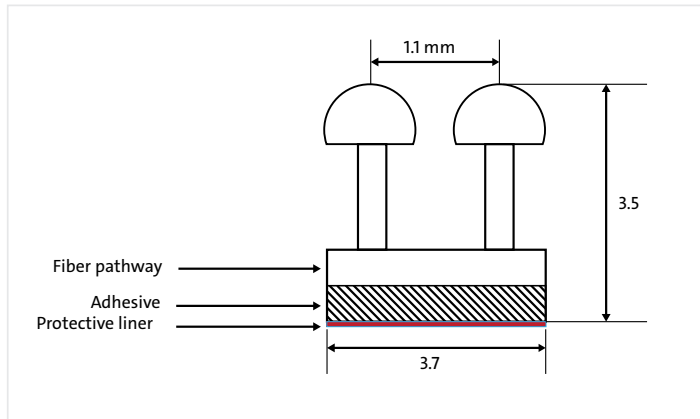


Figure 6. A diagram of the clear routing micro fiber pathway.



Figure 7. A close-up of the clear pathway. The clear buffered fiber is held in place by the mushroom-like features.

For easy installations, the clear pathway has an adhesive backing that mounts directly to the wall. It is flexible for routing around corners or on irregular surfaces. No corner hardware is needed, and planar routing can be formed by cutting the pathway and continuing another pathway section at a 90-degree offset. The installation tool helps installers maintain consistent spacing from ceilings or baseboards and prevents uneven rounded corners, as well as applying appropriate pressure to the adhesive.

Because a tape-like adhesive is used to mount the fiber pathway to the wall, installation is less disruptive than traditional methods such as stapling. The pre-attached adhesive backing of the fiber pathway has been engineered for compatibility with a broad range of indoor wall surfaces such as latex and oil paints and wallpaper.



Figure 8. A photo of the installation tool in use.



Figure 9. A photo of the installation tool in use, rounding a corner.

## Clear Track Hallway Fiber Pathway

For multitenant units like office buildings, apartments, and mixed-use business/residential applications, the Clear Track Hallway Fiber Pathway provides larger adhesive-backed tracks that hold 12-fiber micromodule cable. A complimentary suite of small, unobtrusive access terminals allows access to individual fibers for routing to individual residential or business units. The Clear Track Hallway Fiber Pathway is particularly valuable in multitenant applications where alternative pathways either don't exist or are too congested to overbuild without costly renovation.

## Putting It to the Test

The 900  $\mu\text{m}$  Clear Fiber, Clear Fiber Drop Cable, and Clear Track Fiber Pathway underwent rigorous tests to ensure field performance and instill confidence for network operators, installers, and customers.

### 900 $\mu\text{m}$ Clear Fiber tests

High-performance fiber must maintain signal integrity in tough environmental conditions. From strip force, to temperature cycling to flame and UV tests, the fiber passed and met all applicable requirements.

### Clear Fiber Drop Cable tests

A series of installation and environmental impact tests were conducted on the Clear Fiber Drop Cable to simulate outdoor exposure and installation/service scenarios, including stapling. All tests results show the cable is compatible with the intended use.

### Clear Track Fiber Pathway tests

New tests were developed for the Clear Track Fiber Pathway to ensure long-term adhesion and optical performance.

### Flammability

The fiber pathway and fiber met the requirements for UL 2024/UL1685 FT4 & CAN/ULC S143, and FT4 flame-test standards.

### Adhesive Shear

Test results indicate that a highly textured wall surface would not be a good candidate for a pathway attached with adhesive. A convenient Wall Surface Compatibility Test Kit is available to evaluate prior to installation in the field.

### Environment

Both aged and unaged samples were run through environmental test series, resulting in maximum change of less than 0.1 dB.

### Airborne Contaminants

The pathway can be cleaned easily without any degradation or delamination using a common household vacuum cleaner with brush attachment.

### Chemical Exposure

All samples met the acceptance criteria of 75 percent tensile strength retention when exposed to common household chemicals.

### Paint-ability

The pathway met the paint-ability specifications, including oil and latex paints.

## Out in the Field

The Clear Track Fiber Pathway solution is designed to provide ease of installation in challenging SFU and MDU residences. It's also made to present a nearly invisible footprint, conforming to challenging obstacles and blending in with the environment.

The Clear Fiber Drop Cable typically runs from a wall-mounted NID, entering SFUs and MDUs through a small hole. The cable can also be utilized below grade using a preplaced conduit from a pedestal or handhole directly to house. The Micro Point of Entry Wall Cover provides low-profile concealment and protection. Once inside, the cable jacket splits open (by hand), exposing the 900  $\mu\text{m}$  clear fiber. The Clear Track Fiber Pathway routes from the entry hole to a wall outlet using a handheld installation tool. The exposed ultra-bend-insensitive fiber zips into the pathway, eliminating the need for an indoor-outdoor wall transition or splicing point. The fiber terminates using an SC connector at the wall outlet, and a jumper cable connects the optical network terminal (ONT) or a set-top box to complete the connection.



Figure 10. MDU residence with Clear Track Fiber Pathway installed.

## A Nearly Invisible Footprint

In the age of seamless internet connectivity, Corning offers an FTTH solution that's nearly as seamless, in terms of installation and leave-behinds. Using Clear Track Fiber Pathway products, fiber networks make a smooth and agile transition from outside to inside SFUs and MDUs, leaving no more than a small entry point. Once inside, the fiber routes with near invisibility along baseboards or ceilings and around obstacles, with high resistance to attenuation. Adhesive-backing and a single installation tool simplify the installation process, minimizing the chance of property damage and disparity among installers' skill levels. This solution can help service providers reach more customers quickly, helping pave the way to a future of larger and more cost-effective FTTH networks.

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