



CORNING

The Value of the Corning OptiTap[®] Connector

Hardened Connector Choices

The use of hardened connectors is the most common product choice for worldwide fibre-to-the-home (FTTH) deployments in both single-family units (SFUs) and externally cabled multidwelling units (MDUs). However, within the hardened connector offerings, there are a range of products available. This document provides an explanation of Corning's OptiTap[®] connector-based products and demonstrates how these products provide a reliable and cost-effective solution for FTTH rollouts.

1. Invention of the OptiTap® Connector

More than 14 years ago, when FTTH technology was in the very early stages of development, Corning recognised that hardened connectors would be the most cost-effective solution. Since Corning's invention and release of the OptiTap connector, which met the need of providing cost-effective FTTH deployments, it has been adopted as the most widely used externally hardened connector used in FTTH networks.

Corning and its affiliates have innovated numerous FTTH products, many of which pertain to OptiTap connector technology.



OptiTap Hardened Connector

2. Global Installed Base of the OptiTap Connector

OptiTap connector technology has been a huge success since its launch. In almost every large-scale FTTH deployment, primarily SFUs or external MDUs, OptiTap connectors have been installed.

- In the United States, major operators have passed more than 25 million premises, primarily with the OptiTap connector.
- In Canada, three large incumbent operators are building extensive FTTH networks using OptiTap connectors.
- An initiative by a large Australian company uses OptiTap connectors.
- In Europe, four large operators have deployed widely using OptiTap connectors.

Two numbers are important to remember:

- Approximately 45 million: The number of OptiTap ports Corning has shipped and are now used in FTTH systems worldwide.
- Approximately 21 million: The number of outside plant drop cable assemblies Corning has shipped and are now used in FTTH systems worldwide.

No other supplier can make such statements.

3. Compatibility with the Installed Base

In many countries, more than one large operator has deployed FTTH networks on a competitive basis, sometimes in the same areas. In these areas, there may be a need to interconnect networks, for example, where the drop portion of the network may be shared between a number of operators. In these cases, it is important to have a common interconnect point where a number of vendors can provide compatible products. Installation contractors are familiar with the products and processes, and the availability of test equipment is well established in the field.



| Solution | Application | Number Shipped (approximate) |
|--------------------------------------------|------------------------|------------------------------|
| OptiTap® Single-Fibre Connectors | Drops | 21 million |
| OptiTap Single-Fibre Adapters | Terminals, ONTs | 29 million |
| OptiSheath® MultiPort Terminals (in ports) | Terminals | 35 million |
| OptiSheath SCA/UCA Terminals (in ports) | Terminals | 8 million |
| OptiTip® MT Multifibre Connectors | FlexNAP System Tethers | 2 million |
| FlexNAP™ System Access Points (in ports) | Terminal Systems | 22 million |
| FlexNAP Terminal Systems | Terminal Systems | 448,000 |

Also, no extra adapters or extension pieces are needed to interconnect the product with the existing network infrastructure.

4. Connector End-Face Protection with OptiTap® Connectors

The OptiTap connector has been designed to provide reliability in the field. The connector body features two keys that guide the connector into the adapter and serve to protect the polished connector ferrule end face by protruding beyond the ferrule. If the OptiTap connector is banged against a hard or dirty surface, the end face will be protected from damage or contamination.

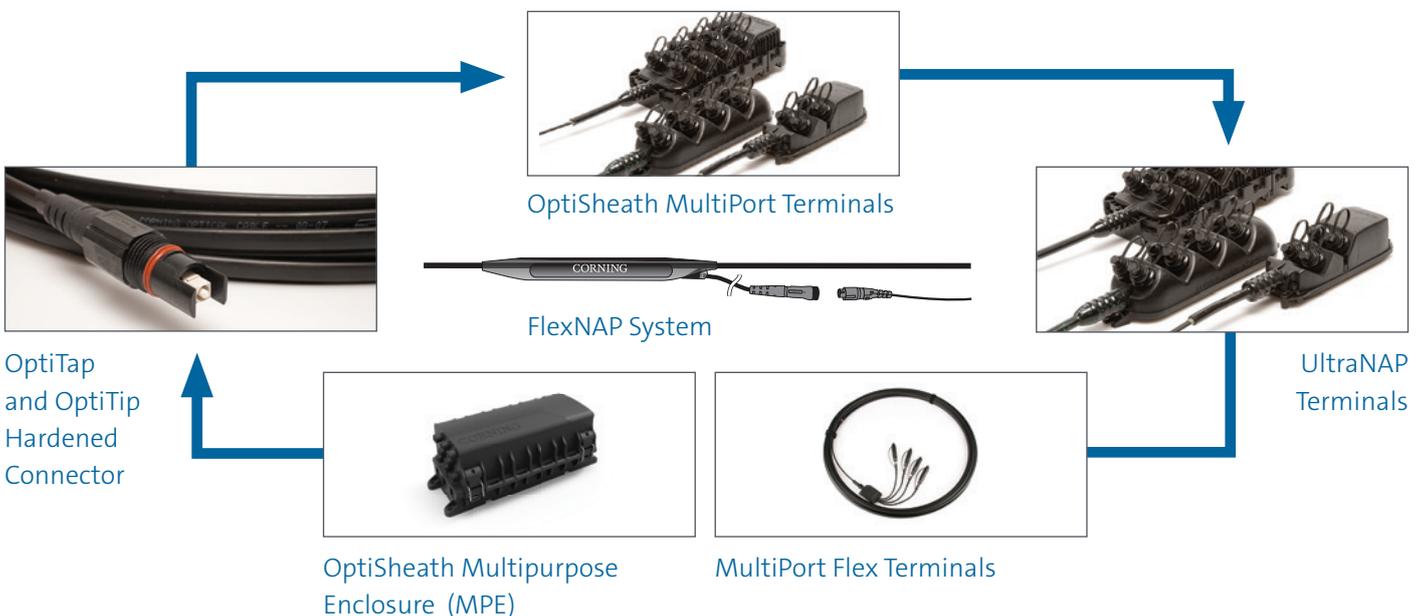
5. Range of Cable Types and Supporting Products

The OptiTap connector is at the heart of the Corning outside plant product portfolio. We understand the wide range of civil environments and network architectures used in FTTH deployments and have therefore developed a wide range of products to support that diversity. For example, we offer drop cables based on an array of alternative constructions to meet aerial, duct, and direct-buried requirements.



In some other hardened connectors, the ferrule end face has no such protection and is easily damaged in the field.

Additionally, we offer a range of drop cables which feature peelable jackets that provide easy cable stripping by hand in long lengths. These drop cable constructions are all compatible with OptiTap connectors. Corning has also developed a wide range of terminals and closures that incorporate OptiTap connectors. For example, OptiSheath® multiport terminals contain splitters, and UltraNAP™ terminals allow multiports to be cascaded with one terminal feeding another. The MultiPort Flex Splitter Terminal allows the placement of terminals in restricted spaces by using in-line female connectors, which fan out from the main cable.



6. Reliability and IP Rating

Corning has dedicated more than 100,000 hours to the testing of its pre-connectorised solutions. While IP65 gives a reasonable degree of protection for façade deployments, it only covers resistance to water jets. The added resistance to water ingress from full immersion provided by IP68 means that the products can be used in underground applications, so they provide added flexibility and security to any FTTH installation. Corning products are tested to Telcordia GR-3120, a U.S. specification which exceeds even IP68 for environmental protection.



This laboratory testing and extreme performance is backed up by deployment experience, with many operators reporting higher than expected operational savings using OptiTap products. While it is the intention of any optical connector licensing agreement to ensure interconnect compatibility between manufacturers, the long-term reliability can be influenced by the manufacturers' approach to quality and performance. These are key to Corning's operating values.

7. Semi-Pre-Connectorised Solutions

Some operators have deployed what we call "semi-pre-connectorised" solutions. That means the use of terminals based on standard SC or LC connectors mounted inside conventional closures, which have to be opened each time a customer is connected. While this approach might seem to offer some advantages, particularly in that very low-cost basic products are available from many suppliers, the total cost of ownership will be higher because repeated re-entry into the closure could damage the active fibres, causing failures and rework. Most operators differentiate between installation teams for the network build and the customer connection staff. When the customer connection staff is required to work inside closures, the level of workmanship can be neglected. For example, one incumbent operator using semi-pre-connectorised terminals reported that they have to perform rework on 12 percent of all their active FTTH lines each year, and a big portion of that is due to the terminals being re-entered for customer installs.



Poor installation becomes worse over time and faults accumulate. A typical installation is shown here. The low IP rating of the components also contributes to this high fault rate. Hardened connectors would avoid this problem.

The Advantages of Pre-Connectorised Solutions

Fast deployment

Scalable

Invest as you connect customers

Best-in-class TCO in countries with average labour costs

No need for skilled installation crews

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