Building Today's Fiber Deployments for Tomorrow

Microduct and Blowable Fiber

Microduct Installation

What is Micro Duct?

- Usually a bundles duct with multiple variations
- Place duct in various different locations and applications.
- Described in simple terms of Outside Diameter/Inside Diameter EXAMPLE: 12/10 mm

Microduct Installation

Installation Methods

By pulling
By blowing
By burying

Deployments:

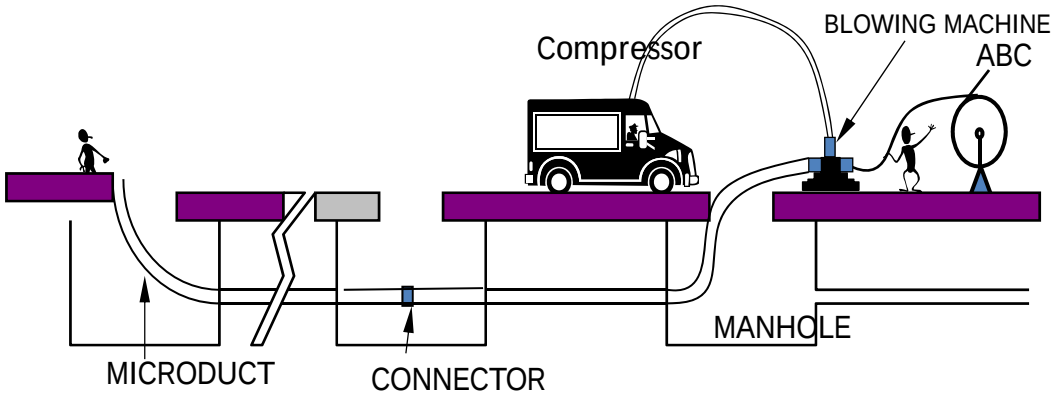
Underground directly:

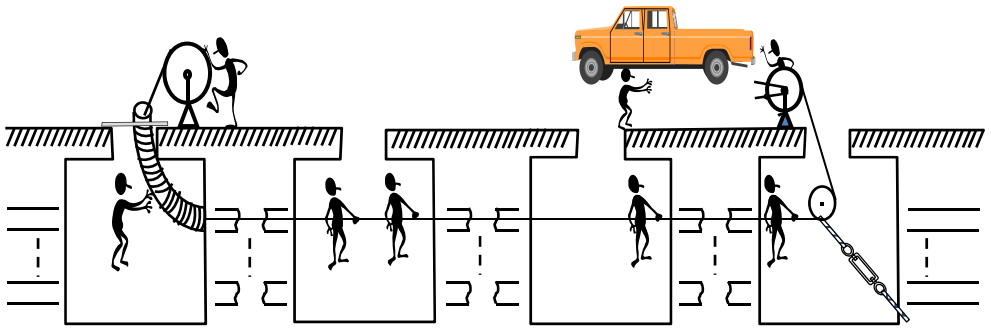
- Open trench
- Directional boring / Plowing
- Mini/Micro trenching

In sewer, railway, highway and other locations
In existing duct
Indoor
In the air

Air-Blowing vs Conventional Pulling

- Time Saving
- Manpower savings
- Future-proofing
- Less Splicing point





Air-Blowing vs Conventional Pulling

Deployment	Labor (persons)	Installation Length	Installation Speed/min
Pulling	5~ 10	1 ~ 1,000 ft	23 ft/ min
Air Blowing	2~3	1 ~ 6,500 ft	200 ~ 300 ft/min

Micro cable & Microduct

Recommended Tube Size

Fiber Counts installed	1-12C	24-72C	96-216C	288C
OD of Cable	1.0-2.3mm	5.3~6.0 mm	6.8 – 8.0mm	9.4- 9.7mm
Microduct tube Size (ID)	3.5mm	8mm	10mm	12mm /14mm

Smaller Ducts & Handholes

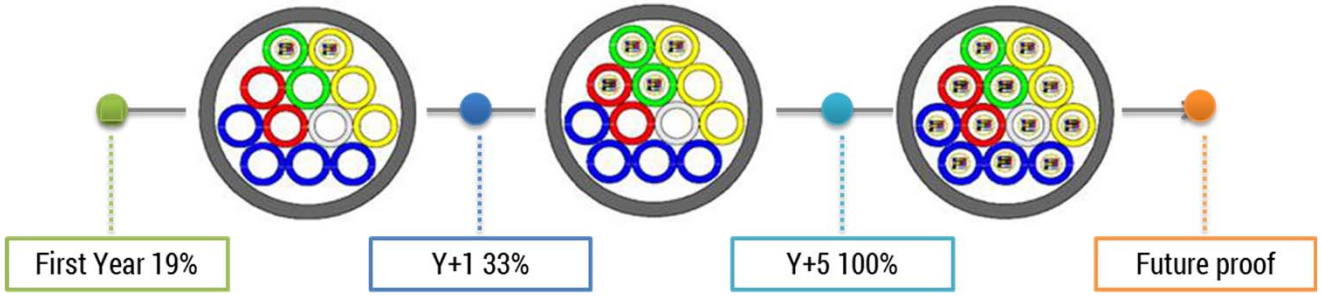
Smaller Reels (or more cable on a standard reel)

Designed for the blowing

Microduct benefits

Initial capital investment will boost future revenues

1. Fibers can be deployed as per needed basis along with traffic and subscribers
2. Minimized upfront capital expenditure



Microduct benefits

Micro duct networks provide secured future growth

1. Unused Microduct are available for additional fibers / cables upgrade later
2. Easy to upgrade- add latest technology/ fiber types
3. Scalability and phased implementation

Microduct benefits

Micro duct Options and Selections

Microduct Buried

Direct Buried Applications

TWD (Thick Walled Duct
Flat Duct
Link Duct
DB HS (Direct Buried High Strength)
DB AL (Direct Buried Aluminum)

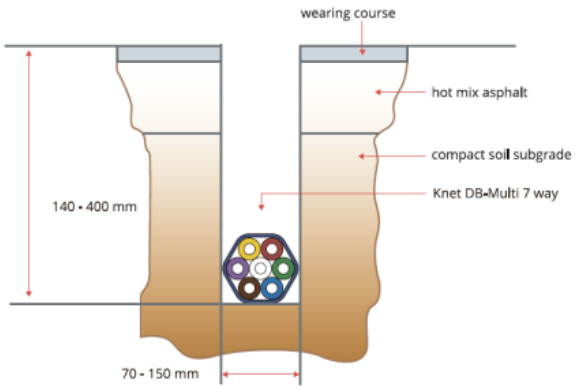
Direct Buried Application

MICRO/ MINI-TRENCHING

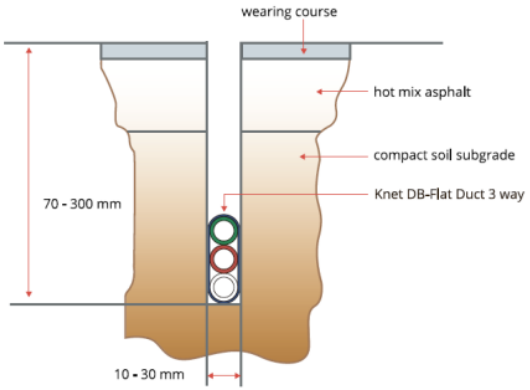
Fast & Economic Installation Method to minimize
- Traffic disruption
- Road surface damage
- Time of Excavation & Recovery
- Tons of Waste

Very Useful in Urban area

Mini Trenching
- 6~20 inch depth
- 2.7~6 inch mm width



Micro Trenching
- 2.7~12inchdepth
- 0.4 ~1.2 inch width



Direct Buried Application

HDD(HORIZONTAL DIRECTIONAL DRILLING)/PLOWING

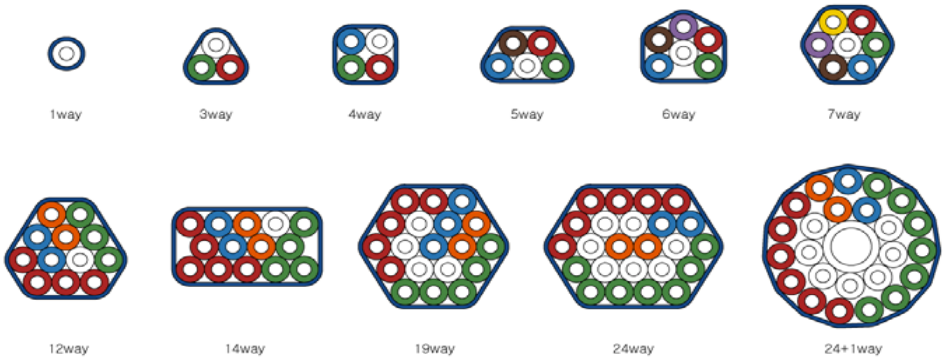
HDD(HORIZONTAL DIRECTIONAL DRILLING)/PLOWING

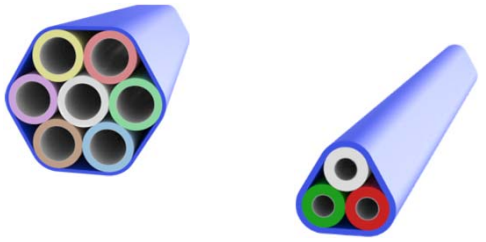
OPEN TRENCHING

Useful in Rural area with no paved area

TWD (Thick Walled Duct)

Thick walled type is designed with thickness of each inner tube that allows individual tubes to be buried underground.

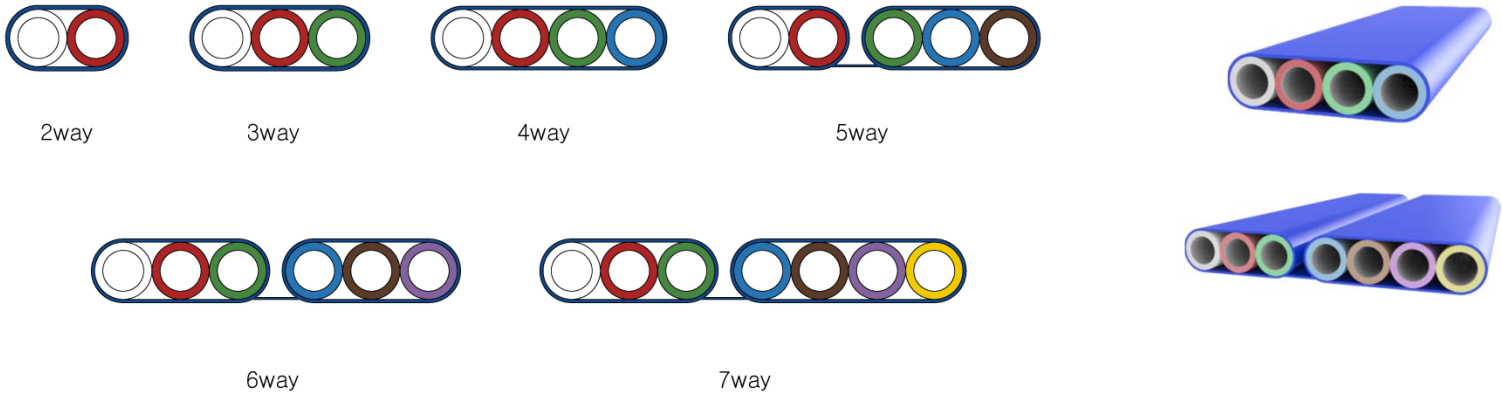




Tube dimension (OD/ID) : 7/3.5, 10/6,12/8,14/10,16/12,18/14, 20/16mm
Other dimension available on request

Flat Type

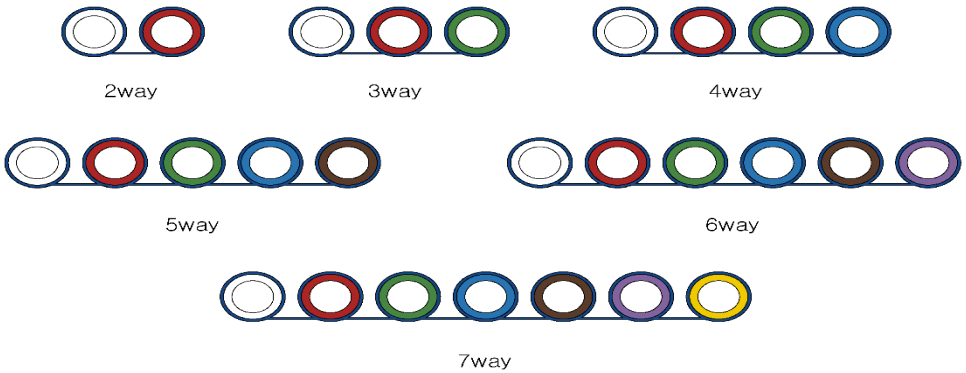
Flat Type is designed for construction in a high density area where trenching must be done in a very small dimension.

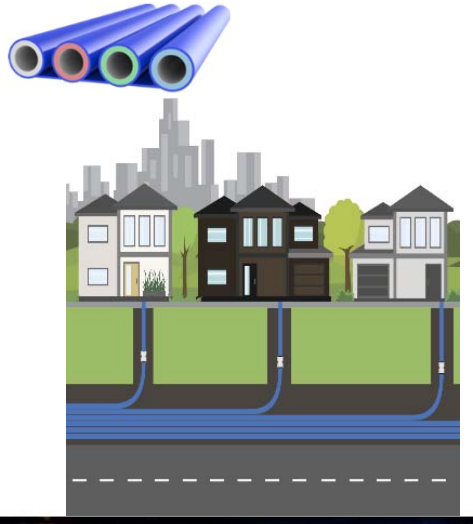


Tube dimension (OD/ID) : 7/3.5, 10/6,12/8,14/10,16/12,18/14, 20/16mm
Other dimension available on request

Link Duct

Linked Duct is designed with high technology to provide easy branching without any additional branch closure needed.

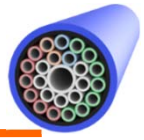


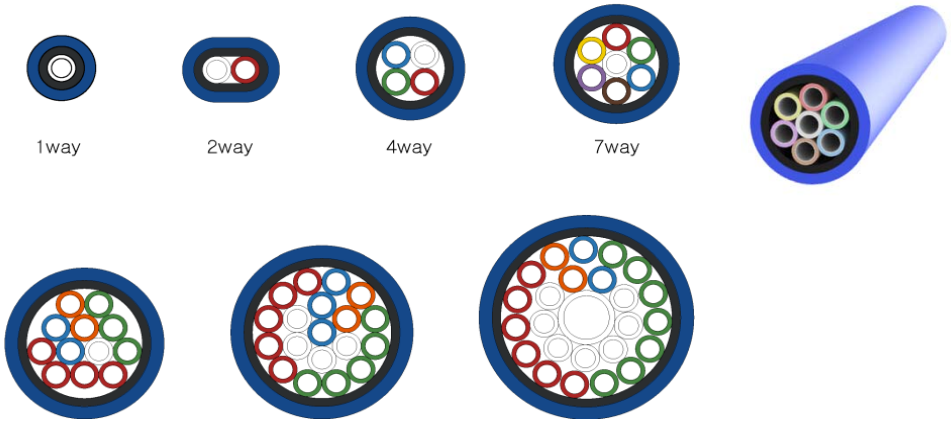


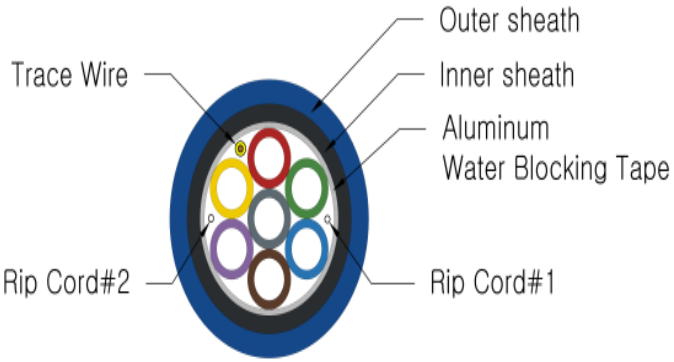
Tube dimension (OD/ID) : 7/3.5, 10/6,12/8,14/10,16/12,18/14, 20/16mm
Other dimension available on request

DB HS(Direct Buried High Strength)

This type of microduct is designed with two layers of outer sheath to endure harsh environment with high crush resistance.



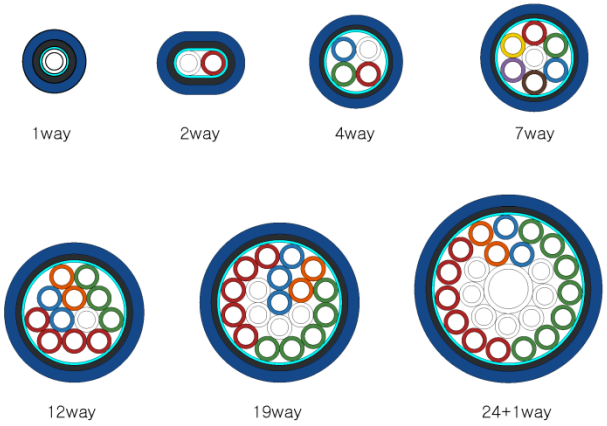


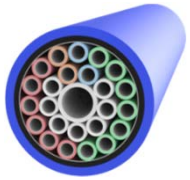


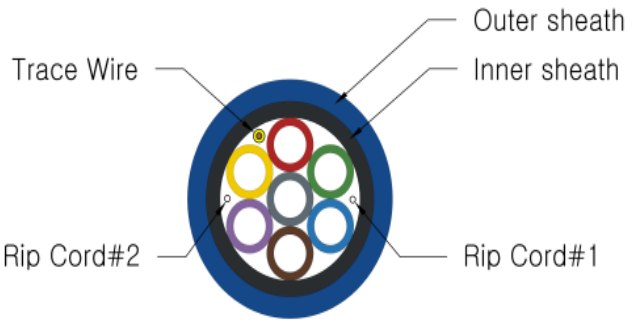
Tube dimension (OD/ID) : 5/3.5,8/6,10/8,12/10 mm
Other dimension available on request

DB AL (Direct Buried Aluminum)

This type of microduct is designed with two layers of outer sheath to endure harsh environment with high crush resistance. As a Direct buried product, Direct Buried Aluminum has the Aluminum tape which helps to block the water from the extreme wet soil condition.







Tube dimension (OD/ID) : 5/3.5,8/6,10/8,12/10 mm
Other dimension available on request

Direct Install Application

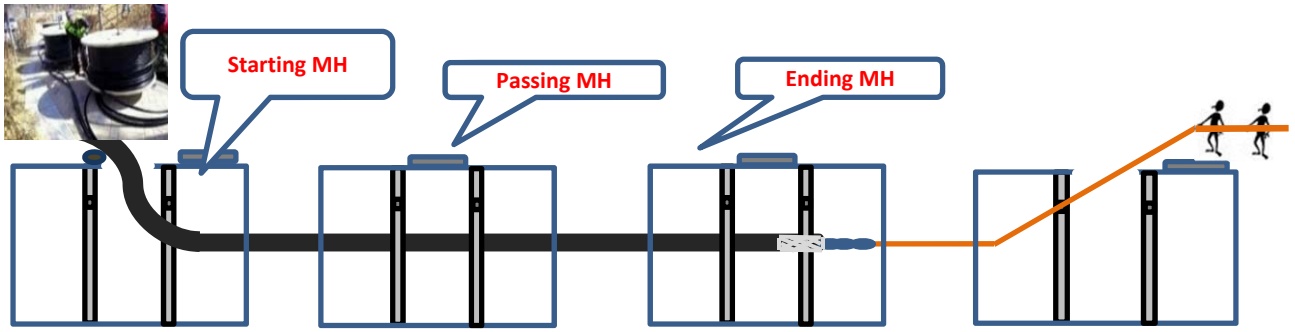
DI HS - Direct Install High Strength

DI AL - Direct Install Aluminum

Direct Install Application

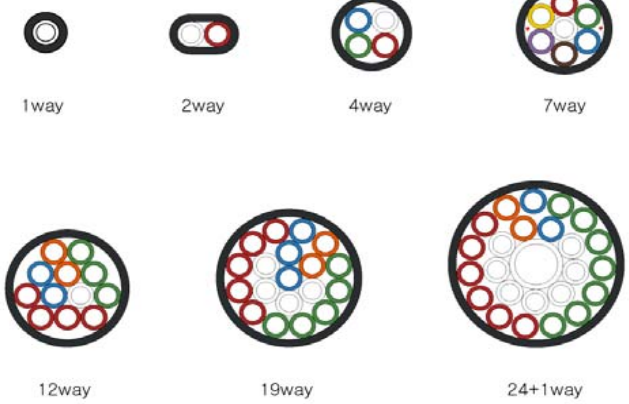
This type of microduct is designed for installation inside **existing duct or sub duct.**

- For Brown field and In-building installation
- Has one layer sheath that sufficient to protect against external inside outer duct



DI HS (Direct Install High Strength)

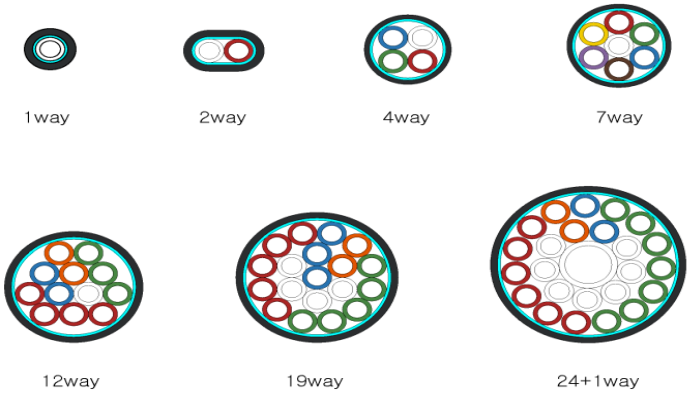
DIRECT INSTALL HIGH STRENGTH DUCT is designed for installation duct and sub duct.
This product will install in the existed infrastructure with high crush resistance.



Tube dimension (OD/ID) : 5/3.5,8/6,10/8,12/10 mm
Other dimension available on request

DI AL (Direct Install Aluminum)

DIRECT INSTALL ALUMINUM duct is for installation duct and sub duct. This product will i nstall in the existed infrastructure to maximize DI-AL advantage with the Aluminum tape which helps to block the water from the extreme wet soil condition.



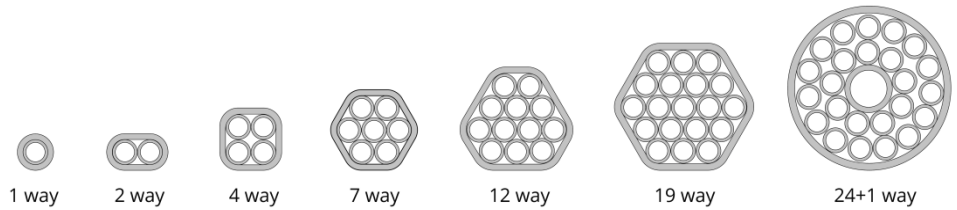
Tube dimension (OD/ID) : 5/3.5,8/6,10/8,12/10 mm
Other dimension available on request

Special Applications

- Indoor Application
- Aerial Application
- Ruggedized Duct
- Micro Drop Duct
- Hybrid Coaxial Duct
- Pre-Connectorized ABF Cable
- Accessories

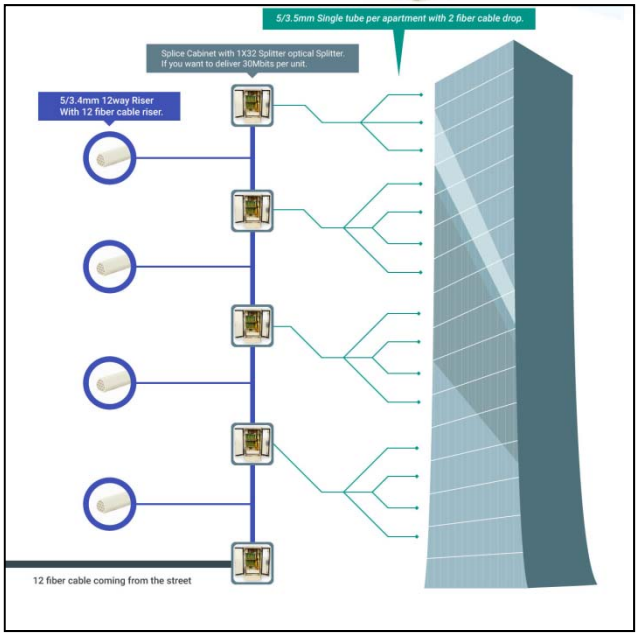
Indoor Application - LSZH

This type of microduct is designed to provide safety to the building. LSZH microduct can retard the spread of flame on its own body and can minimize smoke when it is exposed to fire.



Indoor Application - LSZH

- For In-building and telecom tunnel construction
- Flame retardant
- Temperature resistant in very hot and cold areas



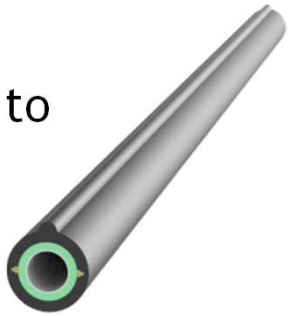
Indoor Application – LSZH Link

This type is a highly advance product which is designed to meet growing last mile demand

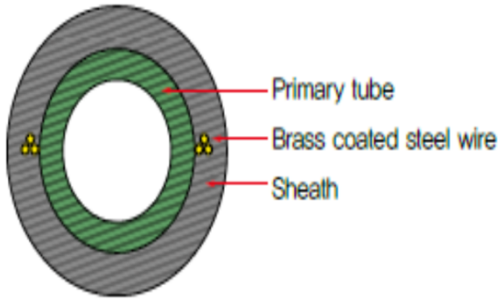
- Light and easy to handle for Installer
- Elastic sheath.
- Easy to be torn off during installation.
- No need to mid-span for installation
- Saves Installation time and cost
- Good for indoor purpose.
- Fully low smoke zero halogen material

Ruggedized Duct

Ruggedized Duct is brass coated steel wire duct which is designed to enhance crush resistance in drop area.



- Easily installation with Soft trenching
- High crush resistance with brass coated steel wired
- Good for concrete wall, wooden wall and other fence Installation
- Side walk with GI pipe
- Cost Effective solution to installation time



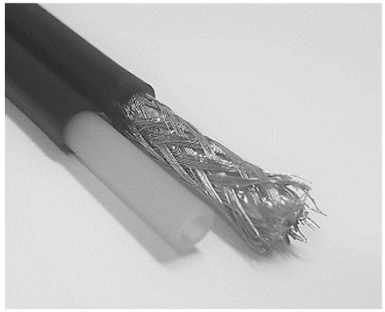
Micro Drop Duct

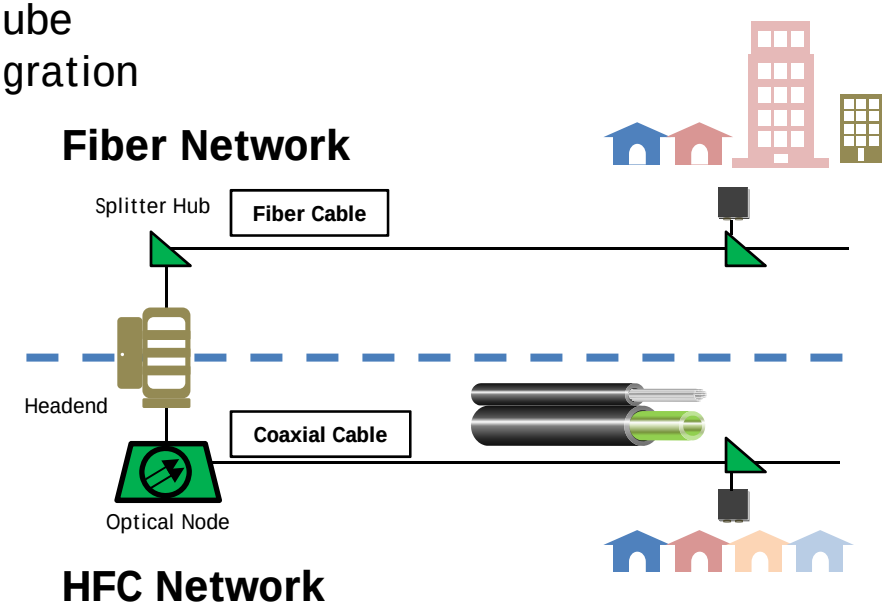
Installed outside building in case inside conduit does not exist . Self-supporting wire for easy installation can save installation time.

- Some operators have adopted product due to cost savings.
- Brown field Purpose.
- Easy and quick installation with supporting wire
- Current drop cable insertion
- Flame retardant PVC material

Hybrid Coaxial Duct

Combination of coaxial cable and microtube
HFC network to optical fiber network migration
Utilization of existing CATV network
Cost saving

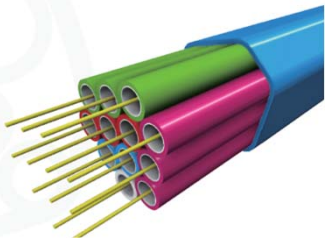




Pre-installed Application -Pre-cabled Duct

Fiber cable was already installed inside microduct by Factory side for installer's convenience.

- Different tube sizes and configurations
- No additional air blowing at the site



Direct Buried Application
TWD 24way/12way
ABF(EPFU) G652D, G657A1

Drop Application
Aerial Brass wire 7/4mm
ABF(EPFU) G652D, G657A1

Indoor Application
LSZH 5/3.5mm 1way
ABF(EPFU) G652D, G657A1

Pre-installed Application -Pre-cabled Duct

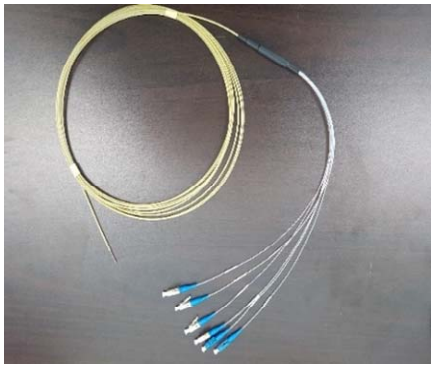
Fiber cable was already installed inside microduct by Factory side for installer's convenience.

- Suitable for In-building, aerial and last miles connection (SDU, MDU)
- Air blowing installation cost & time saving

Pre-Connectorized ABF Cable

Since the fiber cable is already attached to factory terminated connector, it can save splicing time and installation cost.

- Length and connector type can be customized
- Handle light reel ABF package box
- Suitable for last miles connection (SDU, MDU)
- No fiber splicing at the site.
- Installation time and cost saving



Accessories

Coupler / Endcap

Sealing Unit

Duct Seals

Fiber optic Seals

Tools

Duct cutter

Slitter

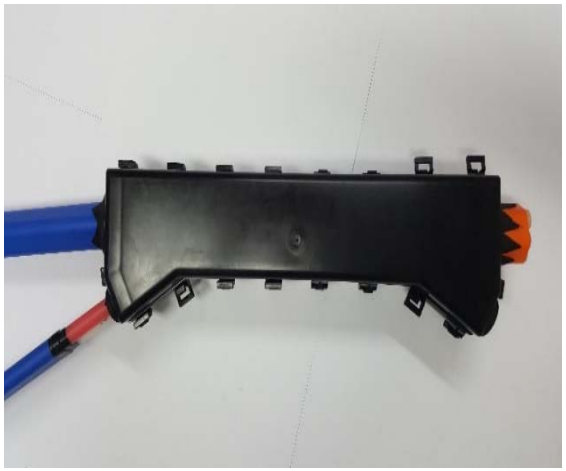
Tube cutter

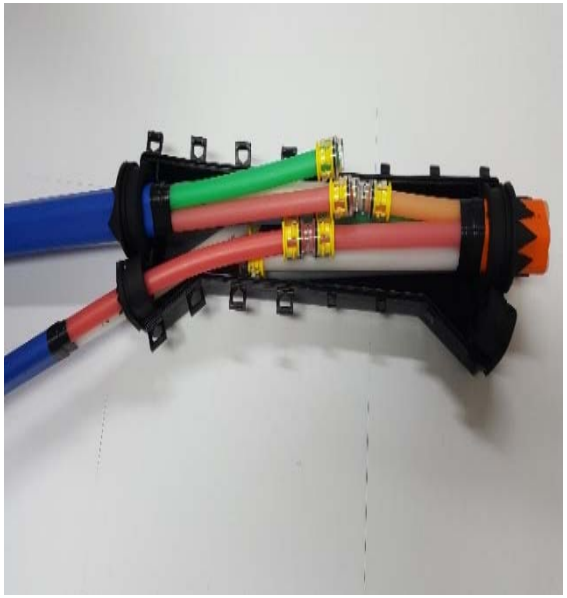
Air-blowing Machines

Duct Branching Unit

Brand New developed closure
Easy and Quick installation at site

I/Y Type

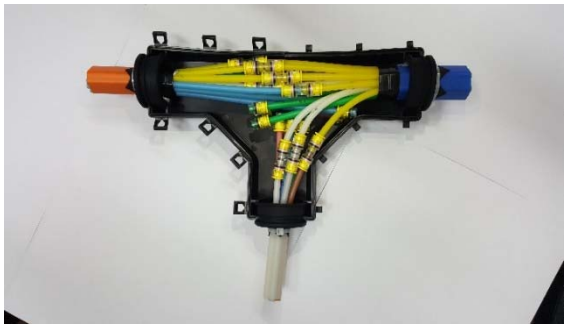


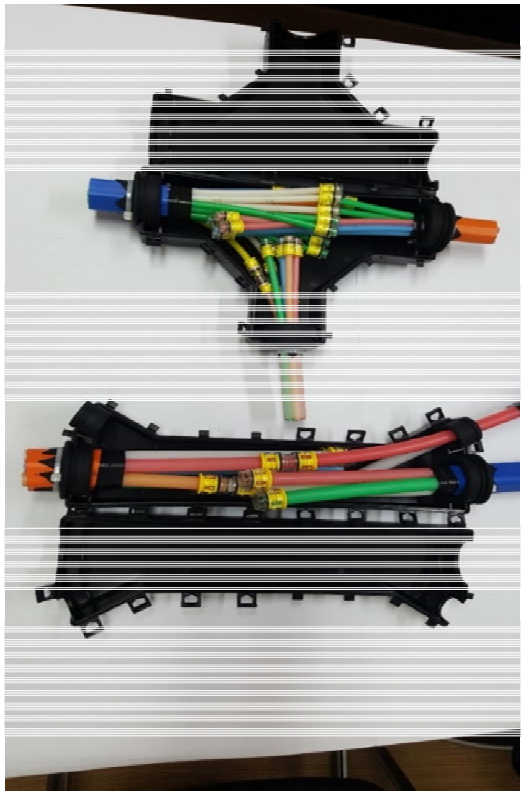


Duct Branching Unit

Brand New developed closure
Easy and Quick installation at site

T Type





Mini-trench and Micro Trench

- Description
- Comparison
- Benefits
- Use Cases

Mini-trench and Micro Trench

Micro Trench 150~400mm depth / 70~150mm width

Mini Trench :70~300mm depth / 10~30mm width

Done by dedicated equipment

Dry cut with Tungsten Carbide tipped wheel

Backfill with fast-set mortar

Fast and inexpensive

Mini-trench and Micro Trench Machines

Conventional vs Micro Trenching

- Causes more dirt removal
- Larger work area
- Usually more noise, dust control
- Slower trenching time

Mini-trench Efficiencies

- Conventional: 30~50m/day ,
- Micro-trench: 150~200m/day with GBP10~15/m

- 30 times faster, 20% cost of conventional trenching
- Source: Stirling Lloyd Technical advice note, 2011

- 70% time cut, 30% cost cut
- Source: Alcatel-Lucent Whitepaper, 2011

Microduct benefits

Micro duct Use Case Scenarios

Application case #1: Indonesia

- **Small sample: 12/10 mm 1 way duct X 6**
- **Air blown 144 Micro Cable**
- **Total distance 150 meters.**

- **Trenching 2 hours total**
- **Placing Microduct 1 hours**
- **Airblowing Cable: 10 minutes**

Application case #2: Wi-Fi Backhaul Project

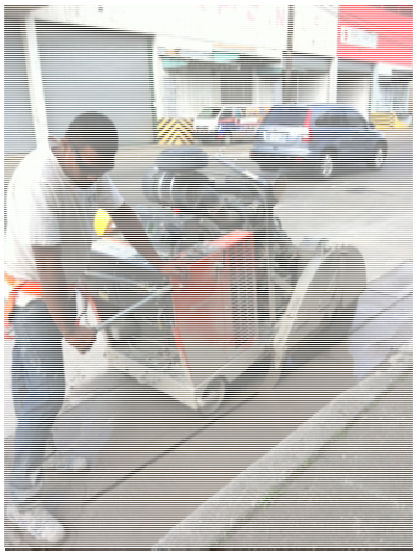
- **Microduct: Hybrid DB 7/3.5 mm 2 way**
- **Air blown 4 count micro fiber**
- **Total distance 5000 meters (5 Km)**

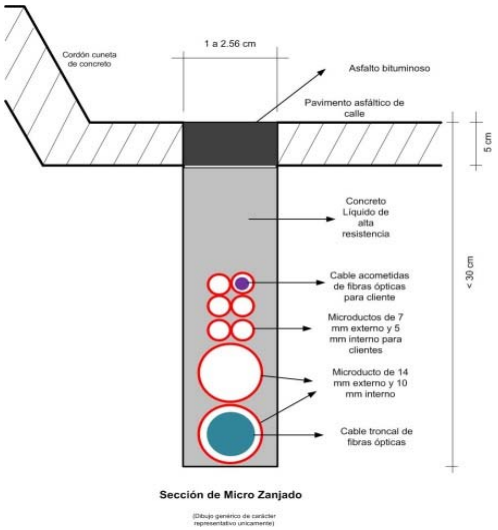
- **Trenching: 25 days (200 meters /day)**
- **Airblowing Cable: 4 days**

Application case #3A: Panama

- **Smart City Application: Needed new fiber down a narrow street, large truck traffic and concrete slabs**

- **Designed with Micro-trenching**
- **Used TWD 7/3.5 mm 6 way with a 14/10 mm 2 way**





Application case #3B: Panama

Background:

- **No space available on the poles**
- **Needed a high count fiber to feed 38 pop sites.**
- **Ran Mini trench 500 mm deep underground with TWD 16/13 mm 7 way duct.**
- **Service provider estimates they saved $2,000,000 US**

TWD 16/13 mm 7way

Application case #3: New York City

- **Microduct: Flat 16/12mm 7 way duct**
- **City is using 2 of the tubes**
- **5 other tubes for providers or other city agencies.**

Application case #4: Indonesia Open Access Project

Background:

City Mayor put a stop to all new fiber construction projects.

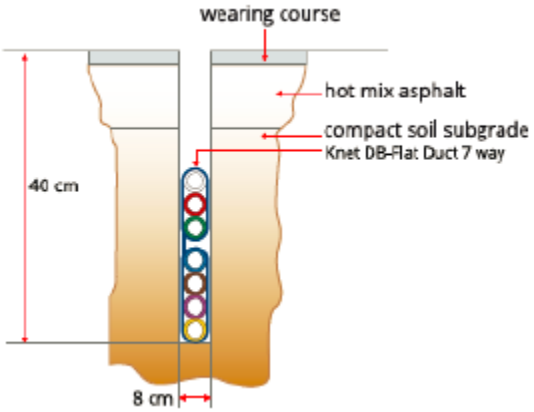
Too many issues with complaints, overbuilds, multiple rebuilds. Caused major traffic jams.

Required an open access infrastructure project. Wanted a quick timeline on construction

Application case #4: Indonesia

Direction given:

- **Needed minimum traffic disruption. Used Mini Trenching**
- **Needed a way to add fiber as needed for future: used Flat 14/10 mm 7 way duct.**
- **Minimize labor for all parties: Use blown fiber cable**
- **3 tubes were reserved for the city: 4 tubes for future telecom providers.**



Application case #5: MDU solution Korea

Background:

- **MDU building allows residents to pick their own operator.**
- **Building had to be wired to allow each unit to be fed by multiple providers.**
- **Solution: 7 way Microduct. 3 Ducts for the providers, one duct for surveillance camera and 3 ducts for future.**

1 — «A» provider
2 — «B» provider
3 — «C» provider
4 — CCTV surveillance
5 — Future Expansion
6 — Future Expansion
7 — Future Expansion

Challenges facing Canadian Telecom providers and Cities

- **Congested underground areas**
- **Multiple providers**
- **Congested aerial plant and high cost of aerial installation.**
- **Overbuilding Apartments**
- **Downtown areas needing to be built with fiber**
- **MICRODUCT GIVES A SOLUTION TO THESE ISSUES !**

Conclusion

Challenges:

- **Training**
- **Upfront Machine costs.**

ADVANTAGES

- **Future Proofing**
- **Proven Technology**
- **Using new construction methods saves time and money**
- **Many different Options.**
- **Blowing fiber is a proven time saver.**

Conclusion

Thank You