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
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
<table>
<thead>
<tr>
<th>Deployment</th>
<th>Labor (persons)</th>
<th>Installation Length</th>
<th>Installation Speed/min</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pulling</td>
<td>5~10</td>
<td>1 ~ 1,000 ft</td>
<td>23 ft/ min</td>
</tr>
<tr>
<td>Air Blowing</td>
<td>2~3</td>
<td>1 ~ 6,500 ft</td>
<td>200 ~ 300 ft/min</td>
</tr>
</tbody>
</table>
## Recommended Tube Size

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

- **Micro cable & Microduct**
- **Micro cable & Microduct**
- **Recommended Tube Size**

![Smaller Ducts & Handhole](image1.png)
![Smaller Reels (or more cable on a standard reel)](image2.png)
![Dedicated for the blowing](image3.png)
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
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

Microduct Options and Selections
Direct Buried Applications

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

Direct Buried Application

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

Very Useful in Urban area

MICRO/ MINI-TRENCHING

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

Micro Trenching
- 2.7-12 inch depth
- 0.4-1.2 inch width
Direct Buried Application

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 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, 20/16 mm
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
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, 5/6, 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 install 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 the 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
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
Microduct benefits

Direct Install Application

Accessories

Coupler/Endcap

Sealing Unit

Duct Seals

Fiber optic Seals

Tools

Duct cutter

Slitter

Tube cutter

Air-blowing Machines
Brand New developed closure
Easy and Quick installation at site
I/Y Type
Brand New developed closure
Easy and Quick installation at site

T Type
Mini-trench and Micro Trench

- Description
- Comparison
- Benefits
- Use Cases
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
Microduct benefits

Direct Install Application

- 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

Microduct 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
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
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
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.
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.
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