

# OverRides

& SUBDIVIDING EXISTING CONDUITS



An Orbia Connectivity  
Solutions business.

## Do You Have Untapped Potential?

As our reliance on broadband reaches new heights every day, millions of new fiber connections are being made. But did you know there could be significant untapped connectivity potential in your existing network?

**There are lots of reasons to install new fiber in an existing duct:**



Meet increased capacity demands



Upgrade old cables and fiber



Add redundancy or backhaul



Sell dark fiber or bandwidth

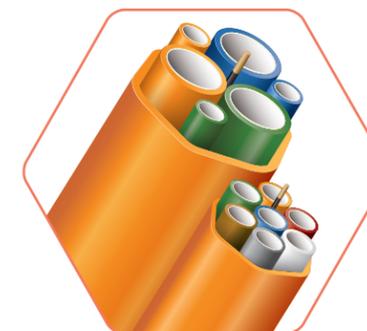
There's no better way to get the most out of legacy ducts than with MicroTechnology:

MicroDucts



Protective pathways for miniaturized fiber-optic cables

FuturePath



Multiple MicroDucts bundled under an overshield

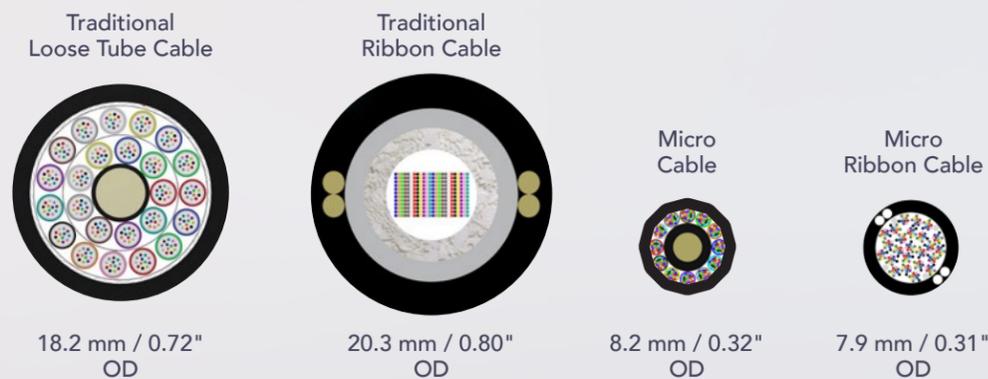
Accessories



For installing, opening, and coupling MicroDucts

# MicroTechnology unlocks the latest in fiber-optic cable technology

Micro cables are significantly smaller than traditional designs with the same number of fibers and constructions that enable single- or mass-fusion splicing:



Side-by-side comparison of different cable designs each containing 288 fibers

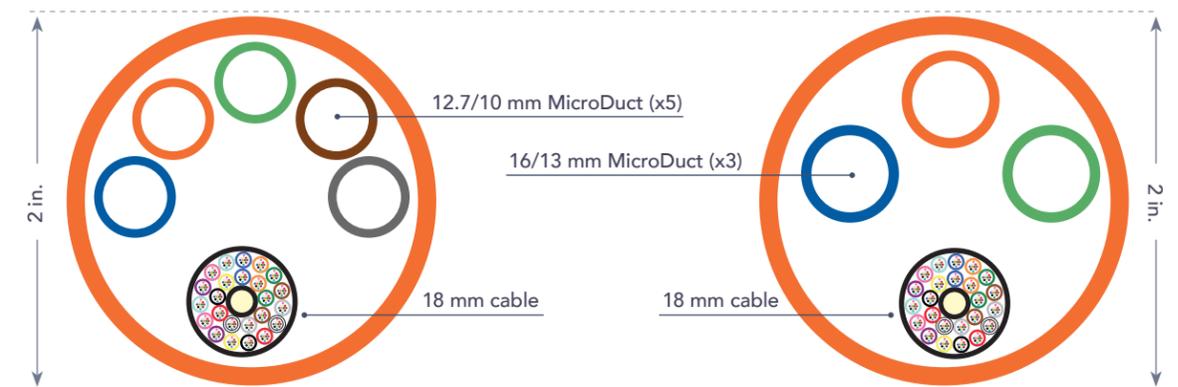
Images courtesy of Corning

## Benefits of rejuvenating existing infrastructure with MicroTechnology:

- ✓ No digging
- ✓ Lower cost
- ✓ Fewer/no permits required
- ✓ Instant additional fiber capacity
- ✓ Faster project timelines

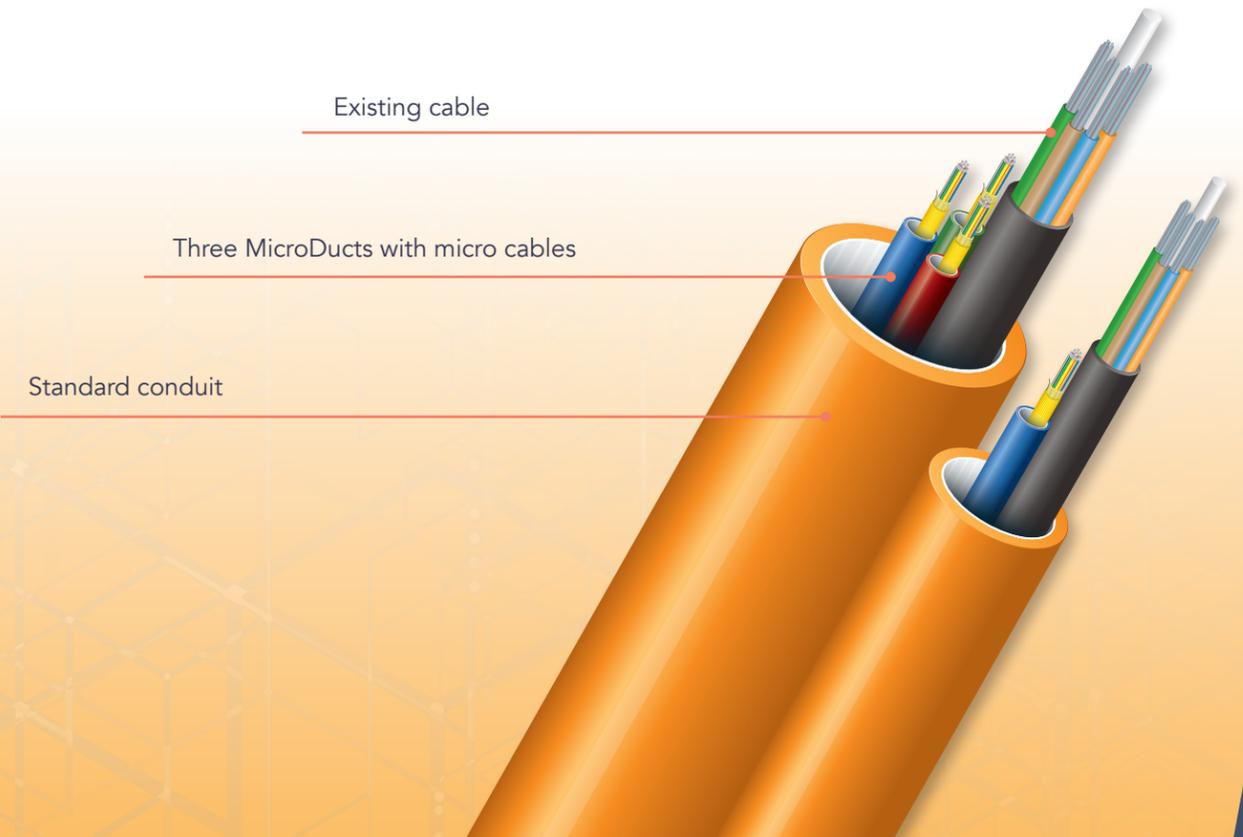
## Even occupied ducts can be upgraded with a MicroDuct OverRide:

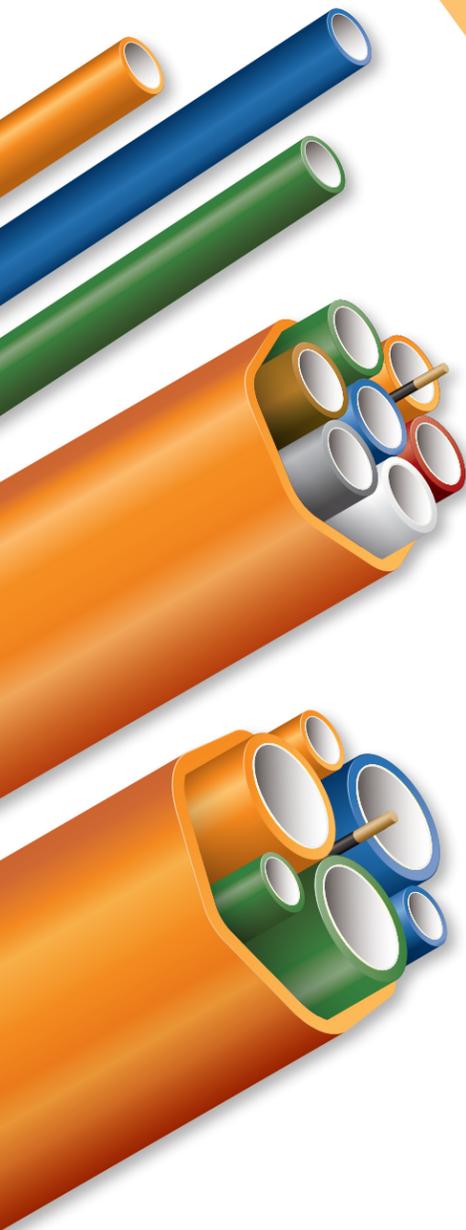
MicroDucts can be installed alongside an existing cable quickly and easily. The exact number and sizes of MicroDucts depends on your fiber count and routing requirements. Always install all your MicroDucts at the same time.



Option 1: More pathways, lower fiber counts  
Example: dense urban network with distributed connectivity.

Option 2: Fewer pathways, higher fiber counts  
Example: backhaul network providing express transport.



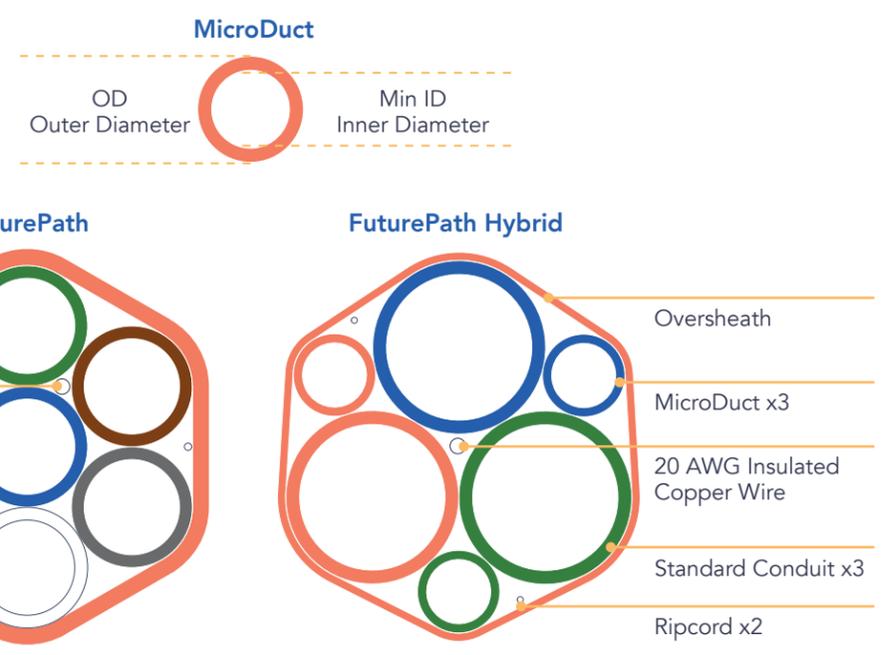


## MicroDucts and FuturePath

**MicroDucts** are small pathways whose sizes are identified by their outer diameter (OD) and inner diameter (ID) with standard sizes from 5 mm to 27 mm OD.

**FuturePath** is a bundle of MicroDucts with a protective oversheath and can be manufactured in HDPE, Riser, Plenum, LSZH, and Armored materials. In addition to single MicroDucts, FuturePath configurations are available with 2 to 24 pathways that allow for rapid deployment of fiber today with permanent pathways in place for future growth.

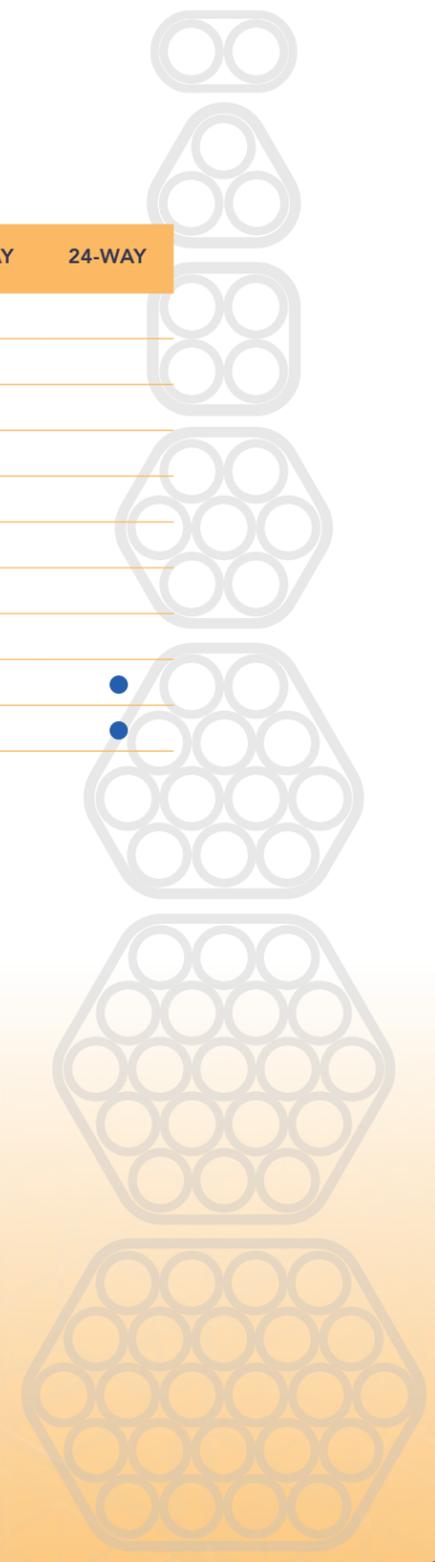
**FuturePath Hybrid** mixes variations of popular MicroDuct sizes with common larger standard duct sizes and materials.



An array of sizes and configurations to meet an array of needs.

OD/ID (MM)	2-WAY	3-WAY	4-WAY	7-WAY	12-WAY	19-WAY	24-WAY
27/20	●	●	●	●			
22/16	●	●	●	●			
18/14	●	●	●	●			
16/13	●	●	●	●			
16/12	●	●	●	●			
14/10	●	●	●	●			
12.7/10	●	●	●	●	●	●	
10/8	●	●	●	●	●	●	
8.5/6	●	●	●	●	●	●	●
5/3.5	●	●	●	●	●	●	●

MICRODUCT SIZE (OD/ID MM)	ESTIMATED FIBER COUNT (# FIBERS IN CABLE)	FIBER CABLE (OD RANGE MM)
27/20	up to 432	10.0 - 15.0
22/16	up to 432	8.0 - 12.0
18/14	up to 432	7.0 - 10.5
16/13	up to 288	6.5 - 9.8
16/12	up to 192	6.0 - 9.0
14/10	up to 144	5.0 - 7.5
12.7/10	up to 144	5.0 - 7.5
10/8	up to 96	4.0 - 6.0
8.5/6	up to 96	3.0 - 4.5
7/5.5	up to 48	2.8 - 4.1
5/3.5	up to 12	1.8 - 2.6



# What makes Dura-Line MicroTechnology different?

Dura-Line's SILICORE® ULF is an ultra-low friction, permanent, co-extruded lining that allows cable to be installed safer, faster, and farther than ever. The super-slick, non-greasy lining boasts a greater than 60% lower coefficient of friction<sup>1</sup> than standard HDPE conduit.

Testing at Dura-Line's state-of-the-art, world-class test track has shown that you can air-jet fiber optic cable into a MicroDuct lined with SILICORE ULF almost 5 times farther than without it. All Dura-Line MicroDucts feature SILICORE ULF as standard.

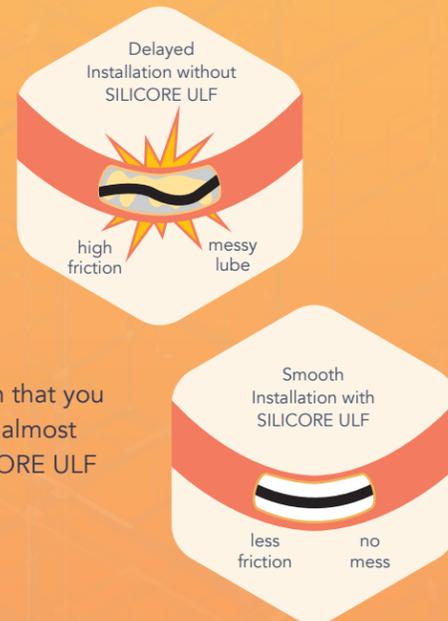
## Features

- > Permanent. Remains unchanged for life of conduit.
- > Lowest coefficient of friction available.
- > No performance loss in all temperature conditions.
- > Identifiable by its contrasting white color.
- > Available on HDPE MicroDucts only (regular SILICORE on Riser and Plenum).

## Benefits

- > Bypass or eliminate handholes.
- > Reduce the need for permitting.
- > Scale down environmental impact.
- > Save time and money on messy lubricants.
- > Enjoy fewer jetting setups.

<sup>1</sup>Compared to Dura-Line's SuperSilicone-lined conduit. Internal lab testing performed on 1.25" SDR Smoothwall conduits.



# SILICORE<sup>ULF</sup> Field-test Results

## Air-Jetting Distance

16/12 mm MicroDucts (internal ribs)  
HDPE vs SILICORE ULF

HDPE MicroDucts (no lining)

1,044 ft.

HDPE MicroDucts with SILICORE ULF

5,134 ft.



## Pulling Tension

1" SDR 13.5 HDPE Smoothwall Conduit  
HDPE vs SILICORE ULF

637 lbs.  
HDPE Conduit (no lining)

288 lbs.  
Conduit with SILICORE ULF



# We have wisdom from experience.

For more than two decades, Dura-Line has worked with customers to complete OverRides in environments including dense cities, intercity metro areas, and transcontinental networks – resulting in quick installations and millions in cost savings.



## DIGITAL TOOLS & CALCULATORS

Selecting the best combination of duct and cable can be tricky. Check out Dura-Line's digital tools and calculators to help you make the best decision for your project. [www.duraline.com/tech-center/digital-tools/](http://www.duraline.com/tech-center/digital-tools/)



## There are two main MicroDuct installation methods for existing networks:

Both can be used to subdivide an empty conduit or perform an OverRide:

- › **Mechanical Insertion:** which uses a winch or rod to pull the MicroDucts.
- › **Air-Jetting:** which uses high-speed air, in combination with a tractor pusher, to propel the MicroDucts into the duct.

## The most appropriate MicroDuct installation method depends on:

- › The **material** of the existing duct
- › The **size** of the existing duct
- › The **space** available inside
- › The **distance** you need to deploy

Open the spread to learn more



## Method 1: Mechanical Insertion

A long-established installation method with two variations:

### 1. Pulling:

MicroDucts are pulled through the duct with a rope or tape using a winch and capstan. Installation is relatively slow, but setup is minimal making pulling ideal for larger, older duct structures over relatively short distances, e.g., a congested downtown location.



### 2. Rodding

A fiberglass rod is pushed through the duct by hand or a powered tractor belt and MicroDucts are pulled back through. Power rodding is typically twice as fast as winch pulling and can be particularly productive over relatively short distances of 1,000 feet, or less.



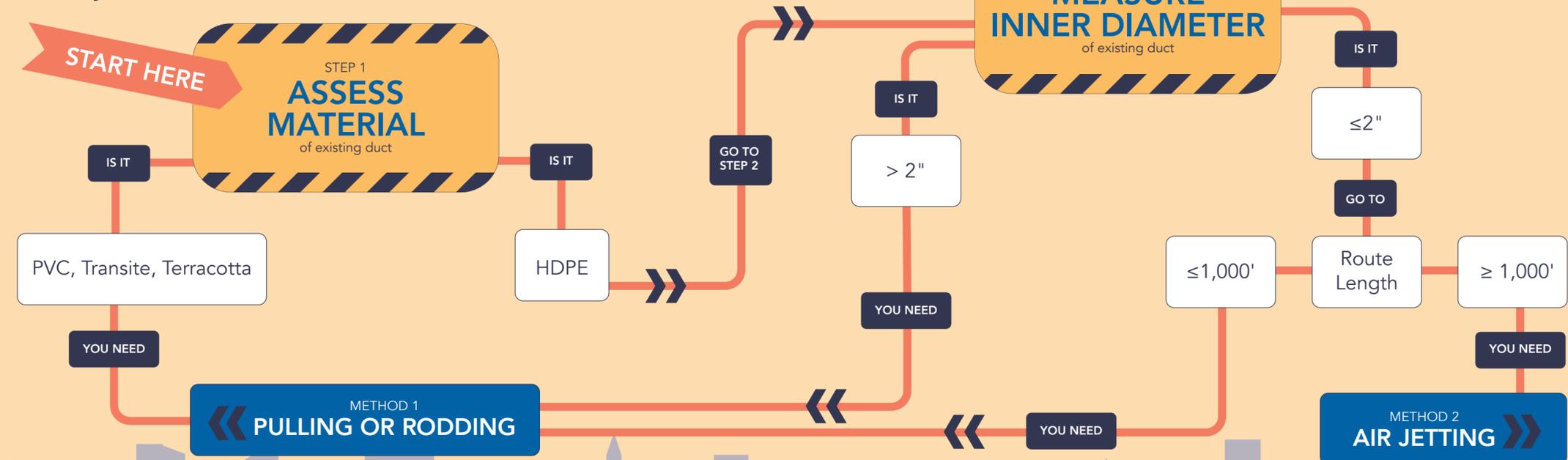
### KEY STEPS:

- 1 Feed pull rope, tape, or rod through the existing duct
- 2 Attach pulling eye(s) and harness to the MicroDuct(s)
- 3 Pull MicroDuct(s) back through the duct

### SAFE WORKING PULL STRENGTH (SWPS)

The maximum pulling force to be exerted on a MicroDuct or bundle, after which deformities can occur and impact jetting performance. SWPS varies by product, so always consult product information before installation.

## DETERMINE your Installation Method



## Method 2: Air-Jetting

Enables faster fiber placement over longer distances than mechanical insertion, with three variations:

### 1. Jetting MicroDucts into an empty duct (subdivision):

A one-pass process which eliminates the need to rope or rod the existing duct. MicroDucts are propelled by a tractor belt and high-speed compressed air.

### 2. Jetting MicroDucts into an occupied duct (Override):

A legacy cable can be isolated with a "Y-block" so that an already-occupied duct can be pressurized for MicroDuct jetting.

### 3. Jetting micro cables into a MicroDuct:

With MicroDucts in place, fiber can be installed up to three times faster with air-jetting than mechanical insertion methods, over distances exceeding 6,000 ft.

**MICRODUCT PLACEMENT**

Always install all your MicroDucts at the same time to avoid twisting and to optimize installation distance and speed – whether your existing duct is empty or occupied.

	Mechanical Insertion: Pulling	Mechanical Insertion: Rodding	Air-jetting
Material of Existing Duct	HDPE, PVC, Transite, Terracotta	HDPE, PVC, Transite, Terracotta	HDPE
Size of Existing Duct	Any standard duct size	Any standard duct size	≤2 in. ID
Route/Section Length	≤ 1,000 ft.	≤ 1,000 ft.	≥ 1,000 ft.
Installation Speed	Good	Better	Best
Best for...	Short distances in older structures	Faster installs over short distances	Longer distances at high-speed

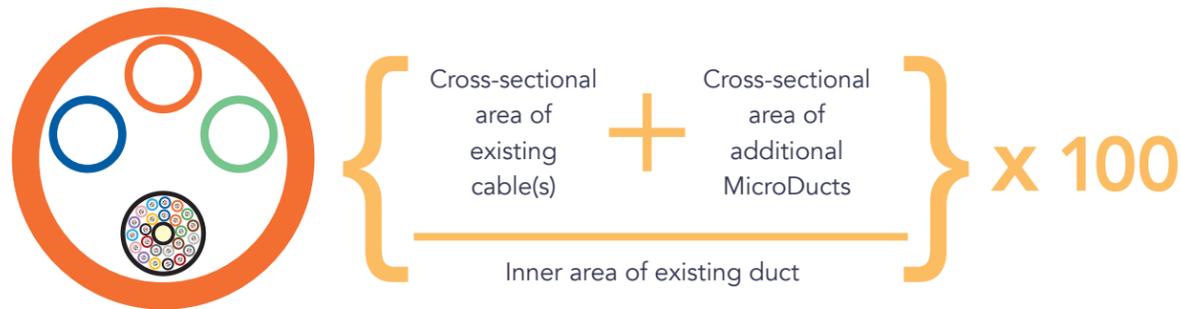


## Consideration 1: Fill Ratio

Two key calculations when populating ducts and MicroDucts with fiber:

### For MicroDucts in Existing Ducts (including OverRides):

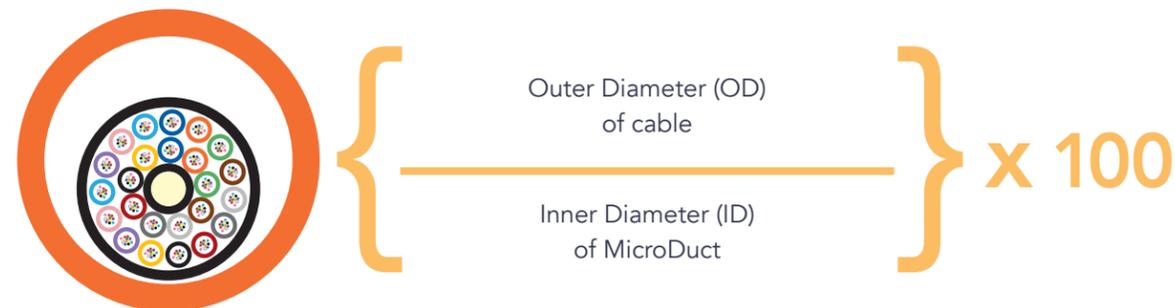
The ratio between the inner area of the existing duct and the area of any existing cables and the new MicroDucts should not exceed 55%:



Cross-sectional area of cables, ducts, and MicroDucts is calculated using  $Area = \pi r^2$

### For Micro Cable Jetting:

For optimal jetting performance, the ratio between the inner diameter of a MicroDuct and the outer diameter of a micro cable should be between 50% and 75%:



## Fill Ratio Calculator

The days of "back of an envelope" calculations are gone! Check out Dura-Line's fill ratio calculator and find the best duct and cable solution in seconds.

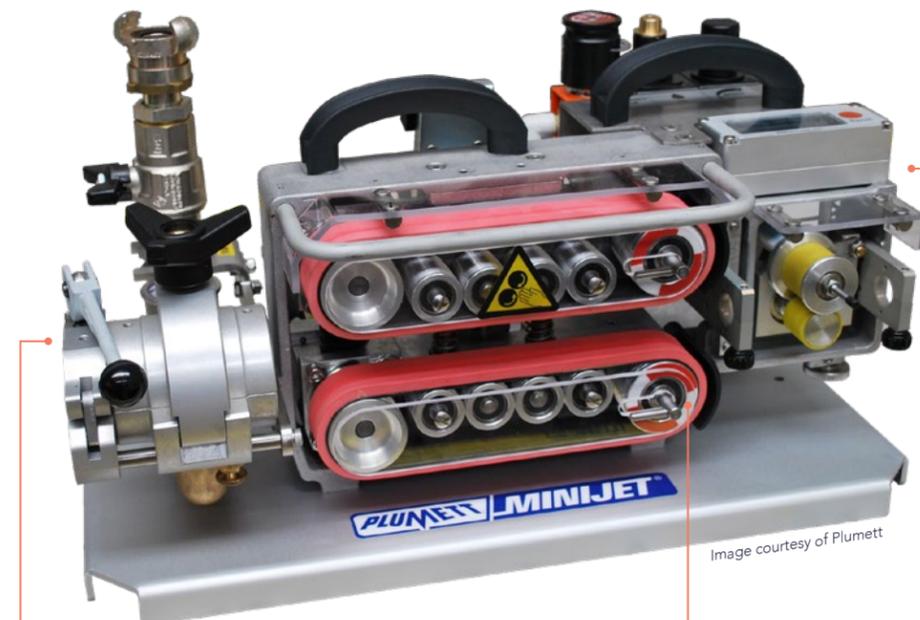
[www.duraline.com/odid-calculator](http://www.duraline.com/odid-calculator)



## Consideration 2: Jetting Equipment

Three essential pieces of equipment:

**1. Jetting Machine** Used to jet both MicroDucts and optical fiber cable. Machines differ in size according to what they need to install but all typically have three key features:



### Cable Guide

Aligns the MicroDuct(s) or cable to be placed with the forward duct or cable seal insert

### Seal

Duct clamp, cable insert, and seals to secure the duct to the jetting unit and prevent air loss around the cable and duct

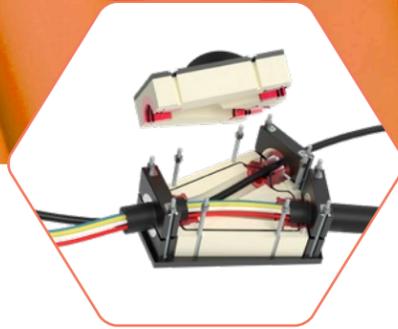
### Tractor Drive

Propels MicroDuct/cable through pathway

Image courtesy of Plumett



**2. Air Compressor** Supplies high-speed compressed air for jetting. A chiller and water separator may be required to optimize performance in humid climates.



**3. Y-Block** Isolates an existing cable in a duct so the duct can be pressurized and MicroDuct can be guided from the pusher to the Y-Block through a feed tube, thus "over-riding" the existing cable.

*Image courtesy of Plumett*

## Consideration 3: MicroDuct Preparation

Three best practices for flawless MicroDuct installation and cable jetting:

### 1. MicroDuct Inflation

Prior to MicroDuct insertion, place an end cap on the free end of each MicroDuct and inflate to 90-100 psi to provide stiffness for jetting.



### 2. MicroDuct Coupling

Make clean, straight cuts with an appropriate MicroDuct cutter and ensure MicroCoupler and MicroDuct sizes match.

### 3. MicroDuct Proofing

After MicroDucts have been installed, recommended proofing steps include:

1. Applying air pressure to validate the open-ended section's point-to-point connection
2. Jetting a sponge or foam spreader to clear out any water and debris
3. Pressurizing to approx. 100 psi and observing for significant pressure loss due to cuts in the duct or leaks at in-span couplers
4. Jetting through a proofing ball (plastic BB) sized 80% of the duct ID to ensure no kinks or flattening issues



## IMPORTANT CONSIDERATIONS: JETTING MACHINES

- > Machines vary in size and power source requirements (hydraulic, pneumatic, or electric) according to the type of installation
- > Some machines can be used to jet both MicroDucts and optical fiber cable
- > Ensure appropriately sized fittings and seals for MicroDuct/cable
- > Speed and duct air pressure controls vary according to machine and manufacturer. Most machines are also equipped with electronic speed/distance displays and some have specialized data logging capabilities

## JETTING MACHINE MANUFACTURERS



**Plumettaz America Corporation**

Soddy Daisy, TN 37379  
ussales@plumettaz.com  
1-855-PLUMETT (758-6388)



**GMP (General Machine Products (KT), LLC**

Trevose, PA 19053  
www.gmptools.com  
(215) 630-2366



**Condux International**

Mankato, MN 56001  
www.condux.com  
(800) 533-2077



**Fremco Fiber Blowing Machines Inc.**

Tucker, GA 30084  
www.fremco-usa.com  
(770) 910-5010



## Popular Accessories

Dura-Line offers a complete line of accessories designed to make your cable jetting and MicroDuct installation successful.

Highlighted below are a few of our most popular products. Please visit our website or contact your sales representative for more details.



a. MicroDuct Round Cutter  
 b. MicroDuct Straight Cutter  
 c. Conduit Slitter  
 d. Longitudinal Sheath Slitter  
 e. Large MicroDuct Cutter

### MicroDuct Cutters

- Using the correct tool for the job makes all the difference. Choose from a variety of cutters designed with a special purpose in mind – making the job go safely, smoothly, and quickly.

DESCRIPTION	PART #
MicroDuct Round Cutter	20005284
MicroDuct Straight Cutter	20001856
Conduit Slitter	20005686
Replacement Blade for Conduit Slitter	20005687
Longitudinal Sheath Slitter	20003768
Large MicroDuct Cutter for up to 28 mm OD MicroDuct	20005684
Replacement Blade	20005748

### MicroCouplers and End Caps



a. Straight Coupler  
 b. End Cap

- MicroCouplers are used to join two sections of MicroDucts; straight and transition couplers are available
- End caps keep MicroDucts clean and free of debris

DESCRIPTION	PART #
8.5/6 mm Straight Coupler	20001834
12.7/10 mm Straight Coupler	20001832
14/10 mm Straight Coupler	20003430
16/12 mm Straight Coupler	20001517
16/13 mm Straight Coupler	20005735
18/14 mm Straight Coupler	20001518

DESCRIPTION	PART #
8.5 mm End Cap	20001819
12.7 mm End Cap	20001482
14 mm End Cap	20003431
16 mm End Cap	20001908
18 mm End Cap	20001485



a. Pulling Eye  
 b. Pulling Harness

### Pulling Eyes, Pulling Harnesses, and Pulling Grips

- Pulling grips are extremely strong, made from dual polymer and kevlar construction and rated up to 700 lbs. They measure 60" total length and are abrasion-resistant with a convenient pulling loop. Can be used repeatedly.
- Made from zinc-coated carbon steel, MicroDuct pulling eyes facilitate the quick placement of MicroDucts. The hex head design allows for faster and safer installation and removal from the duct.
- The pulling harnesses can accommodate up to four MicroDuct pulling eyes at a time and have staggered eyelets every four inches.

DESCRIPTION	PART #
MicroDuct Pulling Eye 4 mm – 8 mm ID	20005772
MicroDuct Pulling Eye 8 mm – 13 mm ID	20005773
MicroDuct Pulling Eye 12 mm – 15 mm ID	20005774
MicroDuct Pulling Eye 14 mm – 20 mm ID	20005775

DESCRIPTION	PART #
MicroDuct Pulling Harness 2 mm cable	20005777
MicroDuct Pulling Harness 4 mm cable	20005776
0.50" MicroDuct/Cable Pulling Grip	20005614
0.75" MicroDuct/Cable Pulling Grip	20005615

# MicroDuct Installations Key Equipment List

Mechanical Insertion: Pulling	Mechanical Insertion: Rodding	Air-Jetting
<ul style="list-style-type: none"> <li>✓ Winch and capstan</li> <li>✓ Pull rope/tape, harness, and swivel</li> <li>✓ MicroDuct pulling eyes</li> <li>✓ MicroDuct couplers and end caps</li> <li>✓ Appropriate MicroDuct cutters</li> <li>✓ Reel stand</li> <li>✓ Power supply (if using electric capstan)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Rodder (may be accompanied by powered tractor unit)</li> <li>✓ Feed tube</li> <li>✓ MicroDuct pulling grips</li> <li>✓ MicroDuct couplers and end caps</li> <li>✓ Appropriate MicroDuct cutters</li> <li>✓ Reel stand</li> <li>✓ Power supply (if using powered rodder)</li> </ul>	<ul style="list-style-type: none"> <li>✓ Jetting machine with appropriate belt and inserts for MicroDuct jetting</li> <li>✓ Air compressor (with cooler and water separator for humid climates)</li> <li>✓ Feed tube</li> <li>✓ Y-Block</li> <li>✓ MicroDuct couplers and end caps</li> <li>✓ Appropriate MicroDuct cutters</li> <li>✓ Reel stand</li> <li>✓ Power supply</li> </ul>

There is significant untapped connectivity potential in existing duct assets.

Revitalizing them with MicroTechnology bypasses some of the major challenges facing network expansion via lower labor and material requirements compared with new-build infrastructure.

And doing so is easy with two installation methods that can be employed according to the material and size of the existing duct, the space available inside, and the distance you need to deploy.

Learn more about MicroTechnology and OverRides at [www.duraline.com](http://www.duraline.com)

# Further your education with Dura-Line Academy

Dura-Line Academy provides industry-leading training to design, deploy, and maintain networks flawlessly around the world.



## New & Improved Courses

1. Interactive and Relevant Content
2. Mobile-Friendly
3. Available 24/7
4. Mini and Full Courses
5. Industry-Recognized Credentials

## Mini Courses

- > MicroTechnology, Accessories and Networks
- > Dura-Line Products and Tools
- > Fiber Optics 101
- > FuturePath 7-way Coupling Procedure
- > HDPE vs PVC
- > SILICORE® ULF and Coefficient of Friction
- > Understanding Bend Radius
- > Clear-Lock Installation

## Full Courses

Installation Fundamentals	MDU Installations	MicroTrench Installations	Trench Installations



For more information: contact [academysupport@duraline.com](mailto:academysupport@duraline.com)  
 Visit our website at [www.duraline.com/academy](http://www.duraline.com/academy)





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Connectivity  
Solutions