Incab

Air-Jetted Cables Blowing Technology

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PURPOSE AND LEARNING OBJECTIVES

The purpose of this activity is to teach the basics of a blown cable network, the benefits of deploying in this method, and the technical details of blown cable types

After this class, you will be able to:

1. Obtain a basic understanding of a blown cable network
2. Explain the importance of selecting the correct cable diameter in relation to the duct diameter
3. State the benefits of using a blown cable network
4. Explain the difference between the network footprint between standard cable designs and blown cable designs
5. Know when it is beneficial to consider this type of deployment

Incab University “School of Excellence in Fiber Optics”
Agenda

- Introduction
- Learning Objectives
- PDH Information
- Presentation
- Q&A (Technical questions only)
- Let’s start!

Blowing Technology

Blowing fiber, also known as jetting, is when a machine is used to float fiber optic cable through the conduit run by using highly pressurized air to push it forward.

Blowing fiber is great for long distances and can go thousands of feet.

As a result, fewer splice points and handholes are needed, which can save on material costs.

Additionally, fewer crew members are needed for the fiber installation process which helps save on labor costs, the largest cost associated with fiber network build.

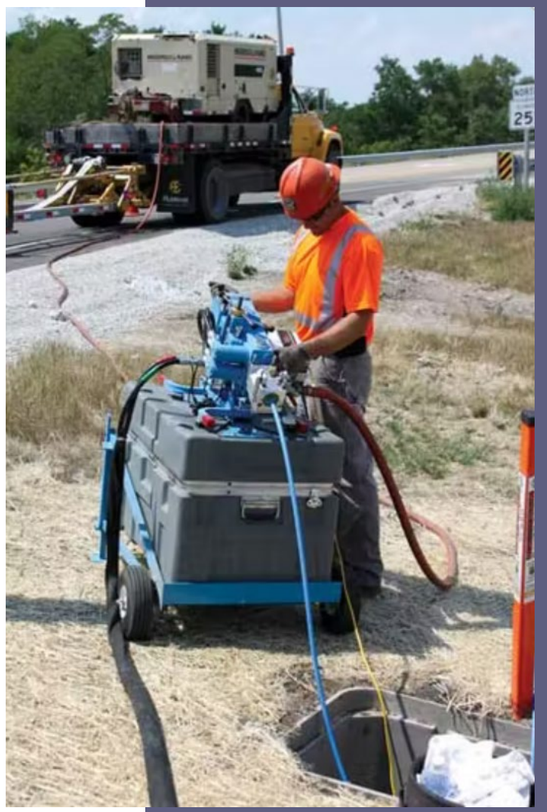
Blowing fiber is a relatively new technology and training is required for proper operation, installation, and maintenance of the equipment.

Blowing Infrastructure

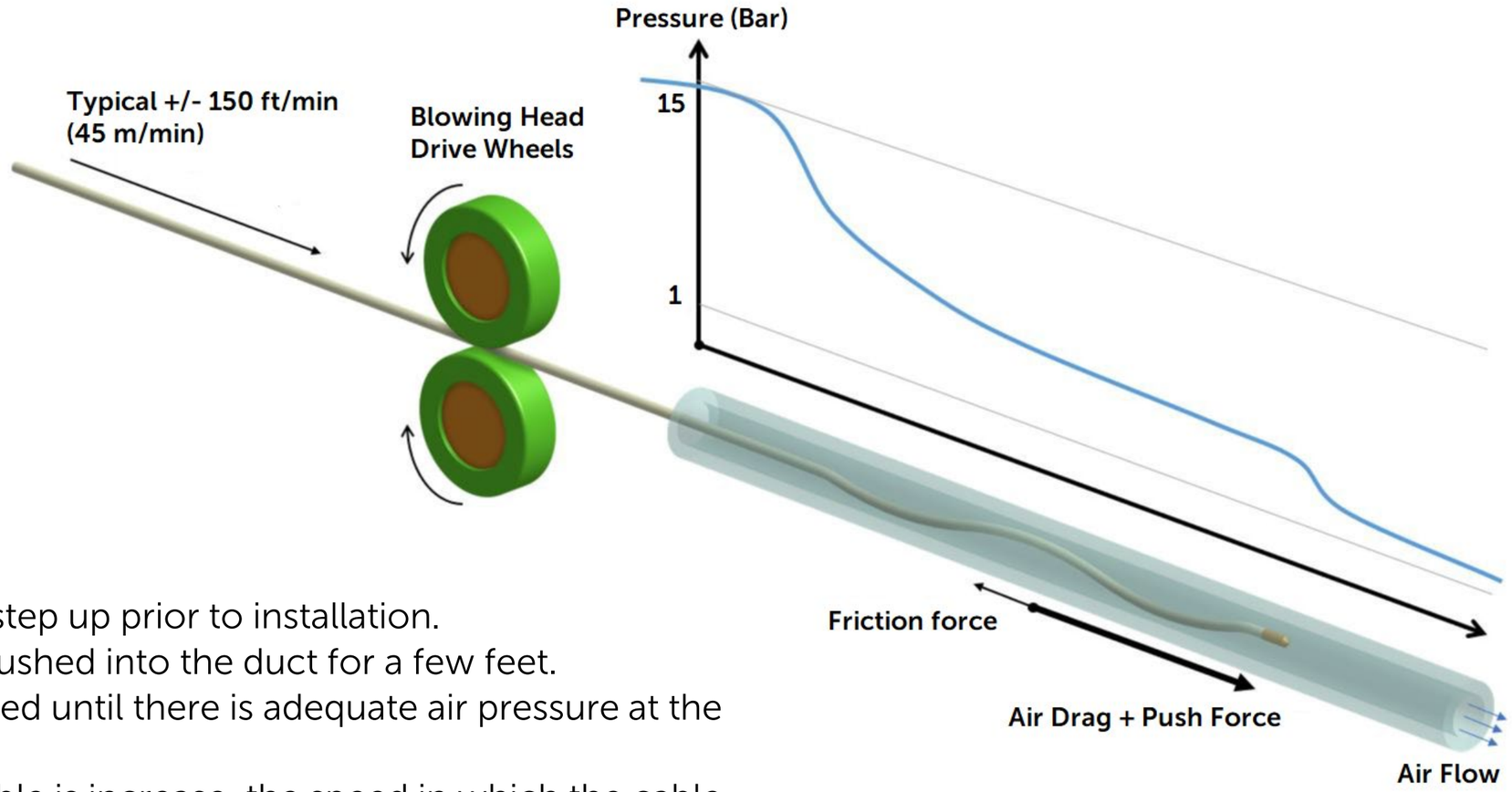
Fast deployment with blown fiber cables up to 196 feet / min (60 meters / min)

Optimized infrastructure footprint – higher fiber count in a reduced diameter

Economic benefits – reduced costs on logistics, manpower and time

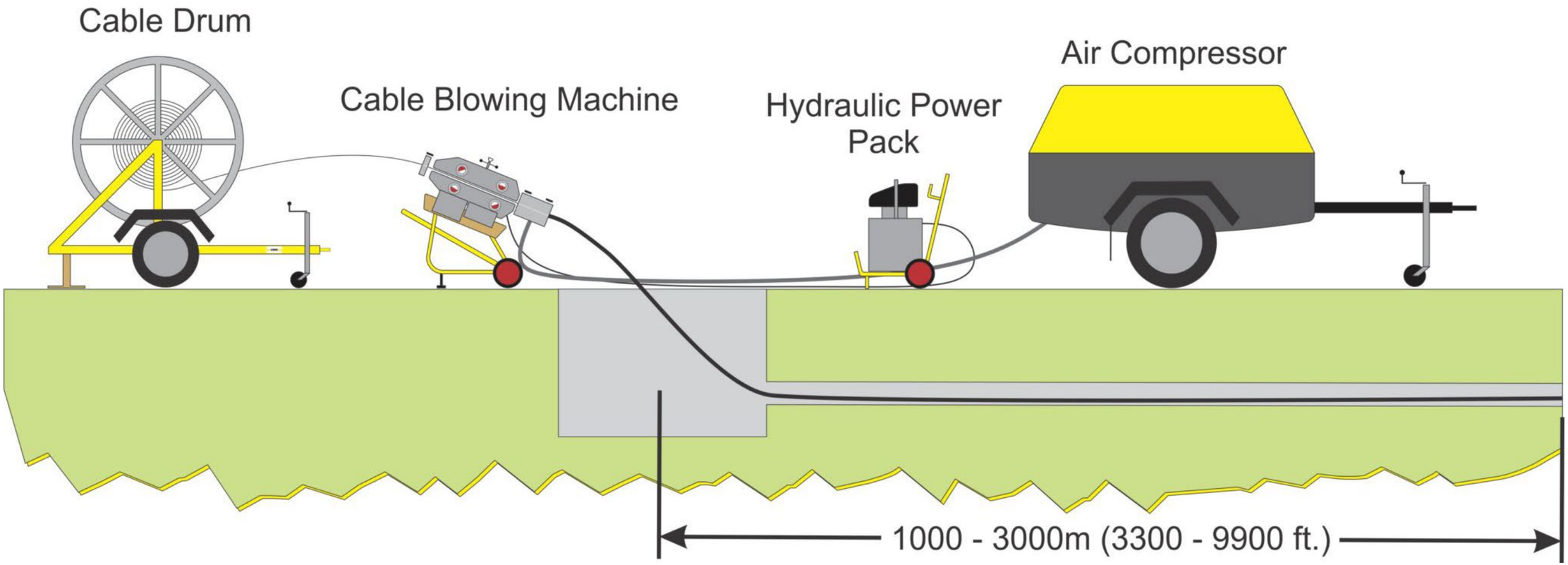


Blowing Principle

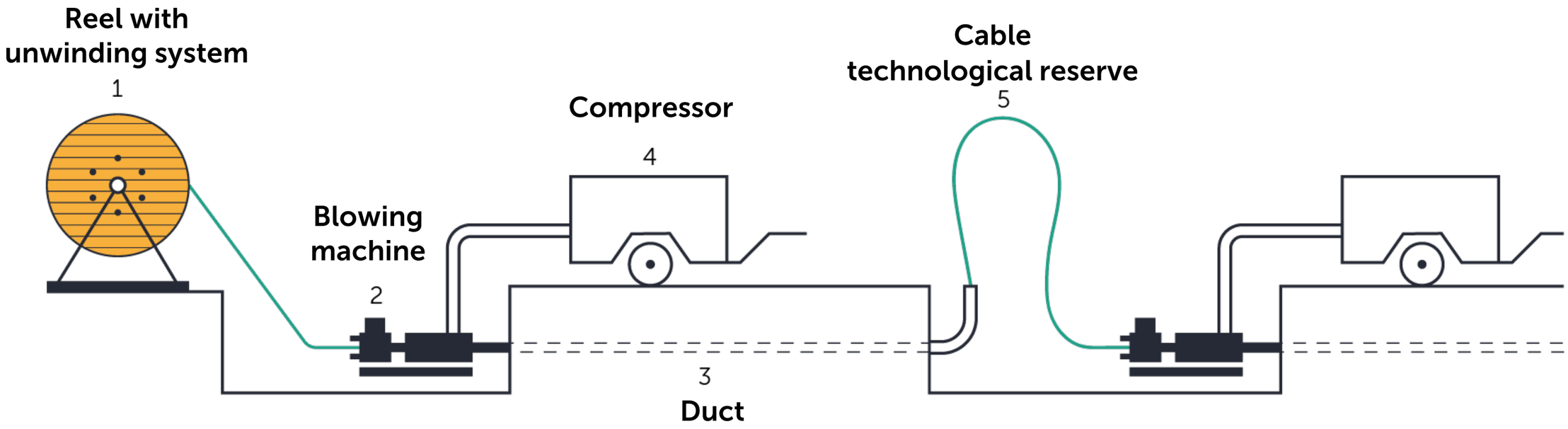


- The pushing force is step up prior to installation.
- The cable is initially pushed into the duct for a few feet.
- Air pressure is increased until there is adequate air pressure at the other end of the duct
- As the drag on the cable is increase, the speed in which the cable can be blown will increase, eventually matching the speed in which the cable can be pushed into the duct.
- Eventually, drag and friction inside the duct come to a meeting point, in which maximum distance will have been achieved

Single Length Cable Blowing



Cascade Installation



Blowing Distance

How far can you go on a single run?

Extreme Route with multiple bends and less than ideal fill ratio - 1,641ft (500m) with average speed 160ft/min (49m/min)

Normal installation with few bends and an ideal fill ratio= 4,920ft to 6,561ft (1500-2000m)

Benefits of Blowing Fiber

- Blown Fiber cables are smaller, lighter and more flexible which allows for installations in tighter spaces and situations with tighter bends
- A blown cable system gives your network more flexibility on install and allows for better expansion
- A blown cable system gives you the ability to run multiple new cables years down the road without the need to bury new duct
- Extremely long installation distances up to 6,561ft (2,000m) – This lessens the potential quantities of splice enclosures and hand holes needed
- With a blowing speed of up to 196 feet per minute (60meters per min), you can drastically cut down on installation time (set up does take longer).
- Save space and cost: The smaller footprint of blown cables allows higher count cables to be used in smaller splice enclosures than usual, also allowing the use of smaller vaults, which then lowers your cost across the board on material, logistics, and installation
- Spare duct capacity gives your company the ability to obtain multiple revenue streams

Benefits of Blowing Fiber

- While it may take longer for the initial set-up, the installation is faster.
- The cable can go a few thousand feet in one run, making it very efficient. This means there are fewer touch points along the run and therefore less time is spent on set-up.
- You can also set up mid-distance assist blowers to go even farther.
- Blowing also puts less strain on the fiber resulting in a smaller chance of damage to the fiber and is the preferred method if the duct run has multiple bends and undulations.
- It is also possible to overblow cable, which is blowing in more fiber into an existing occupied duct since there is a reduced chance of friction as the cable floats in the air.

Jetting vs Pulling

	Pulling Method	Blowing Method
Recommended distance	A few hundred feet	A few thousand feet ✓
Duct route	Straight	Straight, bends, elevation changes ✓
Potential fiber damage due to friction	High	Minimal ✓
Set-up time	Moderate ✓	Slow
Footprint needed for equipment	Small to moderate ✓	Moderate to large
Typical crew size	3-4 people	2 people ✓
Efficiency	Low to moderate	Moderate to high ✓
Initial equipment costs	High	High
Recuperating costs	Slow	Fast ✓

Blowing Test Track

All cables are tested to confirm the blowing distance

Track length up to 6562 ft (2000 m)

Cable diameter 0.1–0.63 in (2.5–16 mm)

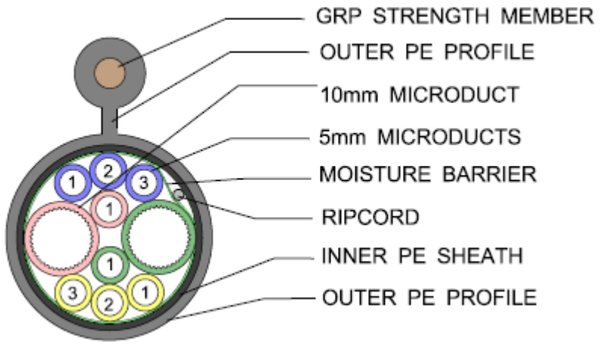
Microduct bore 0.16–0.79 in (4–20 mm)

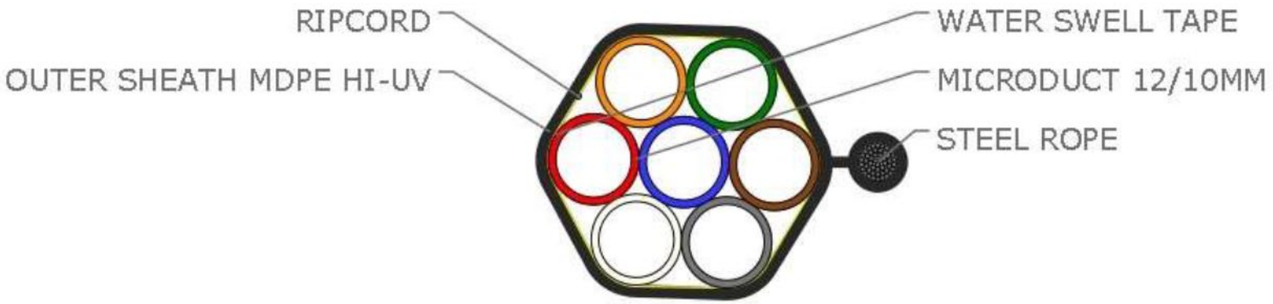
Parameters to be checked:

- Possible blowing distance
- Signal preservation and attenuation

Aerial Jetted Cable Application

- It is possible to deploy jetted cables aerially
- Utilize a multi-path duct designed with a strength member similar to a figure-8 type cable
- Strength member can be a stranded steel wire, or a dielectric strength member depending on your specific build
- This method is limited by span lengths, with maximum spans just under 300ft. Also depends on load rating, weight of duct and cable





Things to Consider

before deciding on what type of fiber cable to deploy:

- **Aerial vs underground** – If you are an electric utility, ADSS will almost always be a more cost affective option

- **Population density and potential growth** – When deploying blown fiber, you must anticipate how much future growth is possible to allow you to select the proper micro duct combination (Also consider 5G and dark fiber/dark duct leasing)

- **Type of OSP enclosures** – Some splice enclosures and pedestals may work better with blown cables than the standard material you have been using. It is important to explore all options to allow for easier install for your crew.

- **Rural setting vs urban** – If deploying in a urban setting, micro trenching may be a much better option than traditional cable and duct deployment

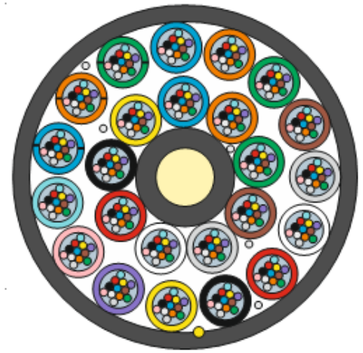
Main features of Blowing cables

Main Features of Blowing Cable

Minimized diameter to use a smaller duct (microduct)

Compare 2 cables representing 288F design:

Standard dielectric cable: .791”

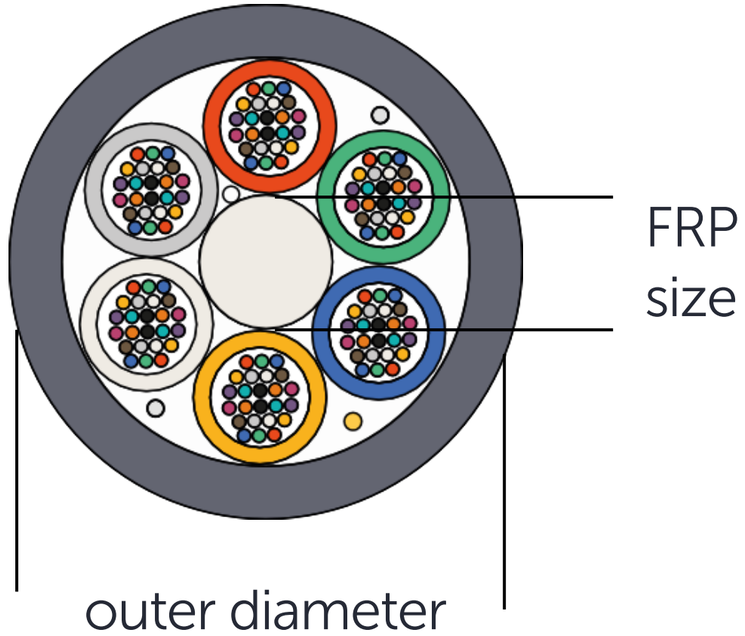


BlownIn design: .374”

Main Features of Blowing Cable

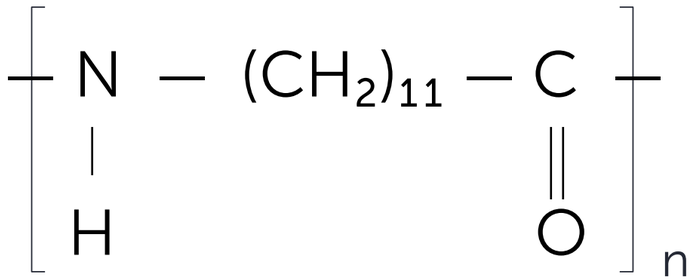
Defined stiffness to provide maximum blowing length (Use of different outer jacket material and central strength member)

Quite low mechanical characteristics because of small size

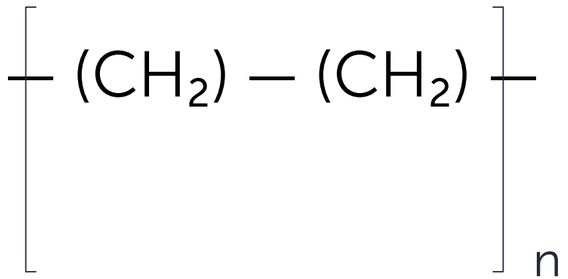


Low Friction

- Due to high jacket hardness
- It is very important to provide a minimum friction coefficient between a pipe and a cable.
- Polymer jacket should have maximum hardness but at the same time be flexible enough.
- Best materials ensuring these conditions at a favourable price are:



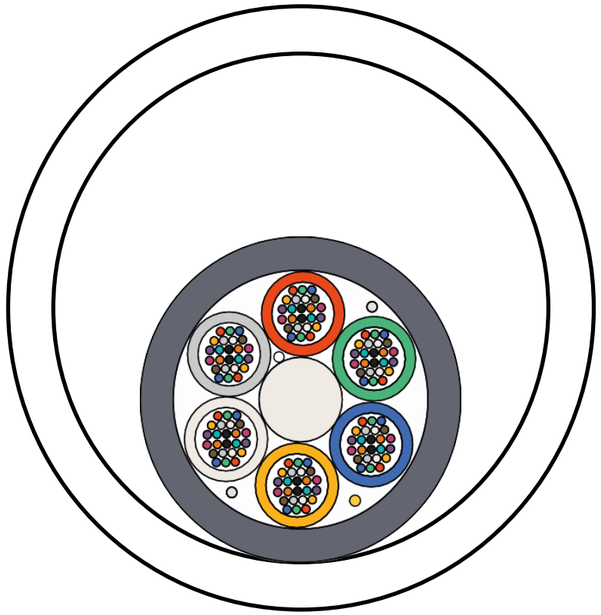
PA 12



HDPE

Diameter Limitation

- 70-80% filling of inner pipe cross section is **optimal**
- 90% filling is **maximum**
- Too low of a cross section reduces air pressure, limiting how far cable can be blown
- Too large of a cross section increases friction, which also limits blown length

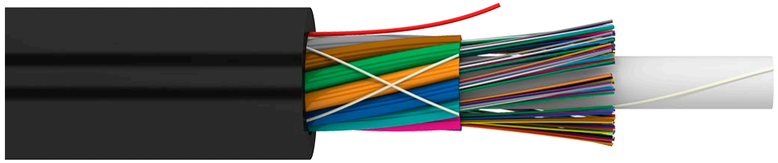


Jetted Cable Options

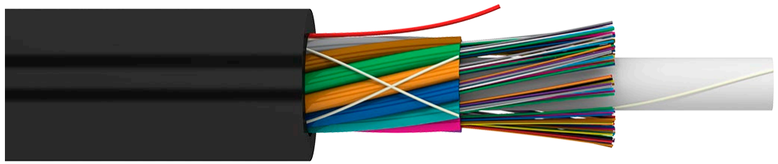
Micro Cable Design Options

Central Tube

Multi Tube 12F/Tube



Multi Tube 24F/Tube



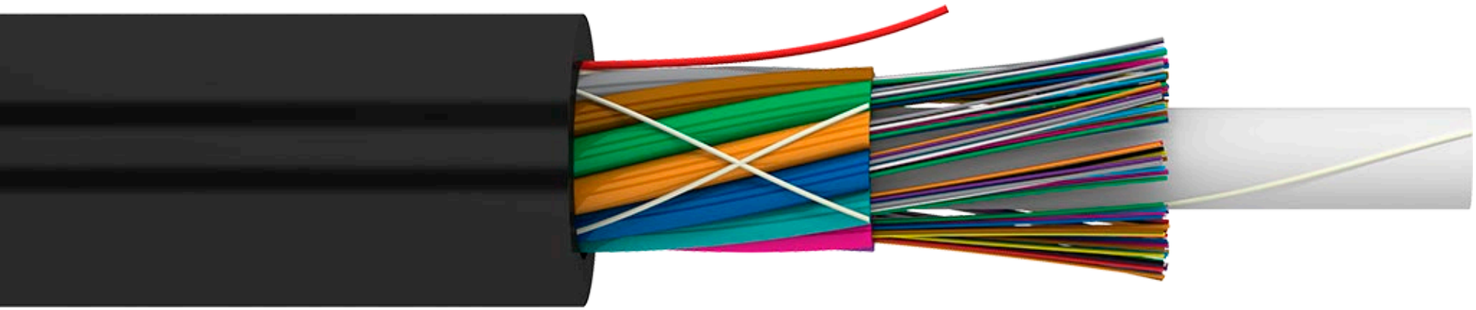
Multi Tube Design with PE

Option PE 250

–250 µm fiber

–HDPE outer jacket

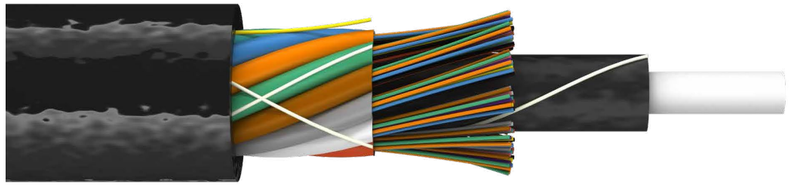
–This setup tends to be the "generic" set up in the United States



Multi Tube with PA Jacketing

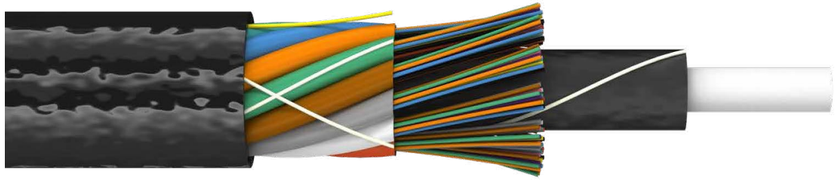
Option PA 250

— 250 µm fiber
— PA outer jacket



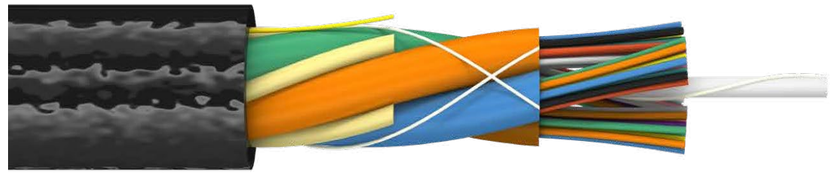
Option PA 200

— 200 µm fiber
— PA outer jacket



Option PA 200 Reduced

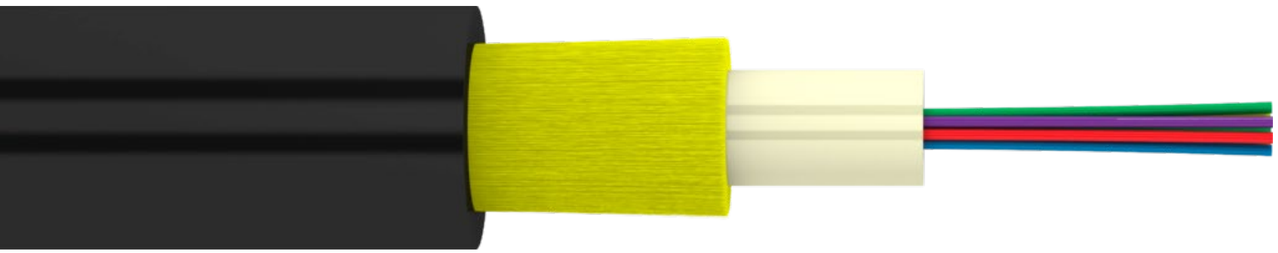
— 200 µm fiber
— PA outer jacket
— Decreased design (up to 48 OF)



-PA jacketing is the standard jacketing used in air blown cable applications in most of the rest of the world (will explain why in later slides)

Central Tube Design

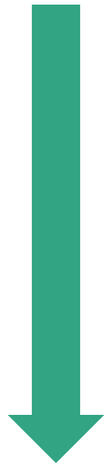
- Central loose tube design
- Up to 24 OF
- Typically Used for drop cables



Design differences

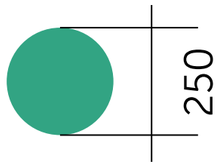
Let’s Compare

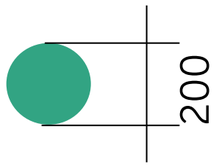
	in	mm
250 µm fiber and HDPE outer jacket	0.220 – 0.441	5.6 – 11.2
250 µm fiber and PA outer jacket	0.201 – 0.421	5.1 – 10.7
200 µm fiber and PA outer jacket	0.177 – 0.366	4.5 – 9.3
200 µm fiber, PA outer jacket Decreased design (up to 48 OF)	0.142	3.6
Central loose tube design (up to 24 OF)	0.094 – 0.139	2.4 – 3.4

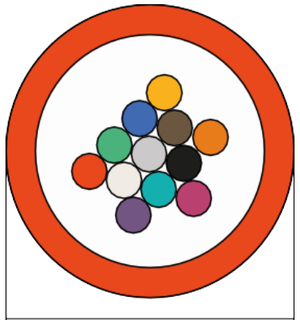


288 OF Design

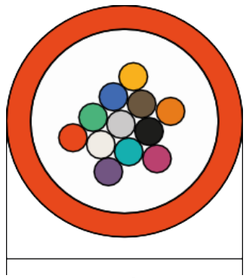
Decreasing fiber diameter → Decreasing loose tube diameter → Decreasing cable diameter



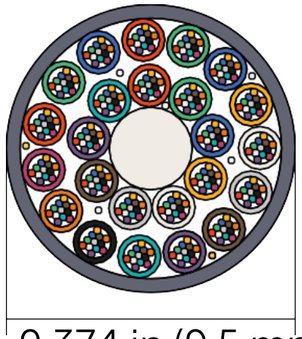




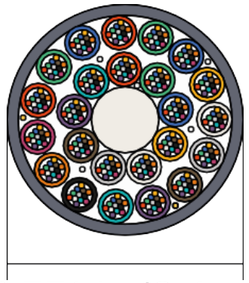
0.055 in (1.4 mm)



0.047 in (1.2 mm)



0.374 in (9.5 mm)



0.331 in (8.4 mm)

Comparison of 250 and 200 µm OF

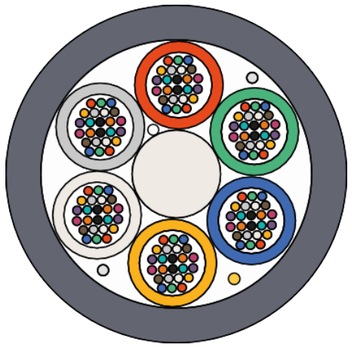
OF	250 µm OF	200 µm OF
Price	**lower**	higher
Standard diameter of 12 OF loose tube, in (mm)	0.055 (1.4)	**0.047 (1.2)**
Application	Simple tasks, when there is no strict diameter limit	Strict diameter limit, cable with 250 um OF doesn't fit

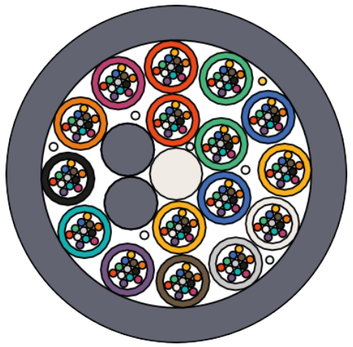
What is the difference between HDPE and PA?

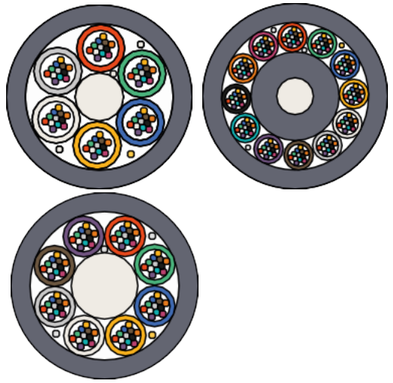
	HDPE	PA
Price	**lower** ✓	higher
Density	lower	higher
Hardness and strength	lower	**higher** ✓
Standard thickness, in (mm)	0.024 (0.6)	**0.016 (0.4)** ✓
Maximum rated design tension	same	same
Application	Simple tasks, when there is no strict diameter limit	Strict diameter limit, cable with HDPE jacket doesn't fit
Friction	More friction which will limit distance cable can be blown	Less friction which results in more distance in a single pass

What design is more cost-effective: 12OF/tube or 24OF/tube?

It depends on the total number of fibers.
For blown cables, option with 24OF per tube has less weight, smaller diameter and lower price can typically be seen in fiber counts 144 and higher
In other cases 12 OF/tube is more cost-effective and has smaller diameter.







144 (6x24) OF and 192 (8x24) OF and higher
This rule is relevant to blowing cables only

All other number of fibers – N×12

BlownIn Cables vs “sky spaghetti”

Problem

The ‘sky spaghetti’ is a mix of low voltage coaxial wires for cable TV, fiber optic internet cables, telephone lines, power cables, etc. All these wires make up overwhelmed aerial sceneries and cause eye fatigue of the citizens.
Risk of poles becoming overloaded can collapse one day. There's also the omnipresent danger of a pole being rammed by a vehicle or toppled by a falling tree branch causing telecommunication and utility breakdown.

Solution

BlownIn cables minimize the visual pollution of the human-made landscape
Air-blown cables deployment ensures rapid installation and provides users with flexible, secure, and cost-effective FTTH systems, at the same time preserving the visual image of urban and rural areas.

BlownIn Cables vs “sky spaghetti”

How To Earn PDH Credits

- You will receive a follow up email with these details:
  - Link to 10 question quiz
    - Must pass quiz with 70% or higher to receive credits
  - Participation will be submitted within 1 business day
  - Recording of presentation will be uploaded on our Learning Hub

- Please respond to follow-up email if you need a copy of presentation

- If you do not receive an email or have questions, please reach out to marketing@incabamerica.com

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Thank you! Questions?

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