

Best Practices for Installing Fiber in Buildings

Operators have several choices in installing fiber to an apartment or office unit. The right answer depends on building construction and other considerations.

By Shaun Trezise / PPC Broadband

The advantages of fiber optic cable over copper wire for some applications are well understood. Fiber can transfer more data in less time over longer distances than copper. It does not degrade like copper, requires little maintenance and loses only a fraction of its signal strength over 325 feet.

Consumer demand for faster internet speeds is fueled by video and music streaming services and over-the-top bundles. This has caused operators to rethink their strategies when it comes to fiber.

For network operators that want to install fiber in apartment buildings and multistory offices, there are typically three phases to a fiber installation in a multiple dwelling unit (MDU) or commercial building. First, the fiber has to be taken from the curb into the building. Then it needs to be routed from the basement to each floor in the building. In the final phase – which is similar to the last drop in installations of fiber

to single-family premises – the cable has to be brought into individual apartments. Different techniques can be applied at any stage in the process.

FIBER TO THE PREMISES

The first phase of an in-building fiber installation typically involves bringing fiber cable from the curb to an outside distribution box. In most cases, the fiber is then brought inside the building. However, in some parts of the world – such as the Middle East – it is common practice for operators to install single fiber cables from the outside distribution box directly to individual apartments in point-to-point (P2P) cable runs through ducts and on the exterior walls of the building. The fiber is first connected to the distribution box. It is then inserted into an outdoor microduct, which is used to carry the fiber up the outside of the building into an individual apartment.

For apartment blocks with four to six apartments, or small commercial buildings with a few offices, this kind of P2P cable run system can be cost-effective. However, scaling this method for medium- and high-density complexes is challenging and often not cost-effective. In these scenarios, the preferable method of installing fiber requires a staged approach throughout the building.

One downside of this approach is that it can require considerable up-front expenditure. Depending upon the architecture, indoor optical

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PROS AND CONS OF DIFFERENT FIBER INSTALLATION METHODS

	New Duct		Existing Duct		Populated		None		Max Installation Distances
	Time	Cost	Time	Cost	Time	Cost	Time	Cost	
Pushed (hand)	☹☹	\$	☹☹	\$	☹☹	\$			25-100m
	no tools, no skills		no tools, no skills		no tools, no skills, distance < 25m				
Pulled	☹☹	\$	☹☹	\$	☹☹☹	\$\$			25-500m
	no tools, no skills, pull-cord can be specified		no tools, no skills, but pull-cord may not be present		some tools, no skills, rod/fish tape pre-install				
Pushed (machine)	☹	\$\$\$	☹	\$\$\$					50-300m
	Machine required, can be air assisted		Machine required, can be air assisted						
Blown	☹☹☹	\$\$\$\$	☹☹☹	\$\$\$\$					<1km
	specialized tools and skills required		specialized tools and skills required						
Drop							☹☹☹	\$\$	<1km
							basic tools and skills required		

distribution boxes or distribution frames need to be purchased and installed. In most cases, floor-level or buddy boxes have to be bought and positioned on separate floors. It is not uncommon for operators to spend many thousands of dollars on equipment for an apartment building before signing up a single subscriber. However, in most cases, this method proves to be more economical than a P2P approach over the medium to long term.

TAKING THE CABLE INSIDE

To get fiber into a premises, a cable has to be routed from the point of presence (the outside distribution box, in this instance) into the building through the wall and plugged into a further distribution box or distribution frame in the basement or a communications (comms) room.

There are a number of benefits to having a fiber distribution point inside a building. First, the network life cycle is longer because network elements are better protected. Fiber terminals and other passive equipment are no longer at risk of being damaged by harsh weather, negligence or vandalism.

Second, it speeds up the whole process of installation. Network operators commonly route fiber cable from the basement of an apartment or office building up to floor boxes on each landing. This allows operators to break out fiber quickly and cost-effectively when a resident demands it.

Whether the network architecture is PON, point to point, or some other configuration, once the fibers have been brought to the distribution frame (or, for small MDUs, the distribution box), they need to be connectorized. Operators increasingly use pre-terminated cable in multiple-dwelling installations to remove weak spots, limit the requirement for highly trained engineers and reduce installation times.

FIBER TO THE FLOOR

A crucial step every installer negotiates during fiber cable installation in an apartment building or a multistory office building is to decide on the most appropriate way of getting the fiber cable from the basement to each floor.

In new-build apartments and commercial buildings, this process can often be fairly straightforward –

especially if the architect has designed the building with fiber in mind and included a microduct.

For the network operator, the key step is deciding on the best method of getting the cable to each floor, whether that's by blowing, pushing or pulling the fiber cable from the basement to each floor.

Blowing fiber. Though blown fiber is a tried and tested method, it's not necessarily optimal for in-building deployments. Heavy, gasoline-powered compressors are not always suited to basement applications. In addition, some developers may simply not allow compressed air, which might carry dirt and water, to be blown into their buildings. The key advantage of blowing, though, is distance. Because blown fiber has an installation distance of up to 3,000 feet, in some high-rise scenarios it may be the only realistic choice.

Pullable fiber cable. One of the biggest advantages of pullable cable is cost. This method requires minimal extra equipment and has a proven track record in most regions. However, it can be a labor-intensive process



A technician buries TuffDuct microduct for a Miniflex fiber installation at a college housing complex in Florida.

unless a pull cord is already in place. Some installers prefer a cable-rodging approach, but with that comes the risk of overstressing the cable. Excessive tensile load during pulling has the potential to damage the fiber, as do any obstacles along the cable's path. This method has a maximum installation distance of only about 1,500 feet.

Pushable cable. Inexpensive pushing equipment enables cables to be pushed up to 984 feet. If cable is pushed in conjunction with pre-termination, the pushing process is quick and efficient. Hand-pushing cable is not as quick, and the cable can be pushed only up to 325 feet. In addition, older buildings may

have congested or ill-planned conduits that make pushing cable difficult.

Troubleshooting. In older buildings in particular, only PVC electrical conduits may be in place, or conduits may be pre-populated with other types of existing infrastructure. Though a well-designed microduct path might allow up to 325 feet of cable to be pushed and/or pulled through it, a congested or poorly planned conduit might accept only as little as 50 feet of cable inside.

Sometimes there are no obvious means of getting the fiber to the floor at all. What options do network operators have in these situations?

When no pre-existing infrastructure is in place to transport cable, operators should use whatever spaces are available in the building. There may be an elevator shaft through which the cable can be dropped from the floors above, or it may be possible to tack or glue the cable to walls, ceilings or plenum spaces. A slightly more aesthetic approach is to use cable trunking or some other method to conceal the cable.

FIBER TO THE APARTMENT OR OFFICE

Several viable options work for the last leg of an in-building fiber installation project – namely, direct fixing, pulling and pushing.

In select cases, blowing may be an option if there is a duct leading from the floor into each apartment. However, very few apartment or office buildings have this kind of infrastructure in place, and it may not be an acceptable installation method for reasons mentioned previously.

It is also possible to use a pull-back method to connect each room. This involves deploying a multifiber feeder cable from the comms room in the basement up to each floor and then along the corridor or hallway, passing each room.

Although the pull-back approach is space efficient and can negate the need for floor boxes, a skilled technician is still needed to handle the bare fiber, which is manually pulled out of the cable and threaded into the dwelling space via a lead-in access box. Once installed, the fiber requires field termination.

For pulling, the ideal scenario is to source microducts with pulling rope or cord installed. In this case, the cable is simply tied to the pull cord or secured inside a pulling sock before being pulled through the microduct. Installers often prefer pulling because it's quick and reliable, with comparable distances to blown fiber and none of the mess.

With pushing, the selected cable should be flexible enough to push around corners yet stiff enough not

to buckle in long routes where high levels of friction are generated. In many respects, pushing is much simpler – there is only one step in the process. In addition, pushing the cable into a microduct or conduit applies zero tensile load to the cable, reducing instances of damaged cable or strained fiber.

THE FINAL CONNECTION

The final step of the process involves connecting the fiber to the media converting equipment in the apartment.

Typically, the fiber was pushed, pulled or fixed as far as a wall box terminal in the apartment or office entrance. If the fiber was pre-terminated (for example, with an SC/APC connector), it then simply connects to the service provider's equipment (media gateway) directly or via a short fiber patch lead. If the fiber is bare, however, the splice

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technician must first furnish the fiber with (typically) an SC or LC format connector. From there, the gateway translates the data into a range of different signals for copper and wireless communications used in and around the home or office.

The global market for FTTP is far from mature. Fiber is an integral part of new builds around the world, providing residents and companies with high-speed access to services, from video on demand to IPTV. In-building fiber installations don't need to be painful

experiences. If managed properly, they can be carried out quickly and cost-effectively with minimum disruption to the customer. Most important, they can deliver what an operator values most – a genuine return on investment. ❖

Shaun Trezise is a product manager at PPC Broadband, a manufacturer and developer of connectivity solutions for the broadband service provider market. Contact him at shaun.trezise@ppc-online.com.

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