Making a Building Fiber-Ready

Following these guidelines will help building owners provide spaces, pathways and cables that service providers can use to deliver fiber optic services.

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The case for fiber in the building is clear. Fiber is the most future-proof communications medium available. It attracts residents, and it's less expensive, easier to install and less intrusive than copper and coax cables.

The question in many building owners' minds is, "How do I make my building fiber ready?" This article is a condensed version of the white paper of that name published by the Fiber Broadband Association (FBA). For more information, please reference the full paper at the FBA's website (https://toolkit.fiberbroadband.org/d/do/2639).

WHAT IS FIBER TO THE UNIT?

If at least one fiber passes or enters each living unit, a building has fiber to the unit. More than one fiber per unit may enable future services or multiple carriers to service the building. To accommodate future requirements, the FBA recommends that the number of fibers in the riser be 1.5 times the number of living units.

The fiber type is critical. Single-mode fiber is recommended for in-building fiber networks, and because buildings contain many corners and bends, bend-insensitive, single-mode fibers are recommended. For risers, fibers meeting or exceeding International Telecommunication Union (ITU) Recommendation G.657.A2 are recommended. For drops down hallways and inside units, fibers meeting ITU Recommendation G.657.B3 are recommended.

WHO DOES WHAT?

Building owners have a choice regarding the scope of their involvement in network preparation. Compared with the construction of an entire building, fiber installation is a very small and inexpensive part.

Typically, a building owner fulfills one of two roles:

- Creating pathways for fiber
- Building out the passive fiber network.

If a building owner chooses to put in the network, close communication with the service provider is important to make sure the service provider will be able to use the network. For example, connector types must match, conduit sizes must be large enough, and power and cooling requirements for any active components must be met.

COMPONENTS OF AN FTTU NETWORK

A typical architecture of a fiber-to-the-unit MDU network is as follows:

1A/1B The telecom closet or fiber distribution hub (FDH) is the starting point in the network. Fibers in the building come back to this point. It may be placed indoors or outdoors. It may be dedicated to one or more buildings and may include optical splitters.

2 Riser cable, also known as distribution cable, serves as the network backbone. There can be one or more cables, but the minimum total fiber count should be enough for each unit in the building.

3 A fiber distribution terminal (FDT) serves as a transition point between the riser and

drop cables. FDTs are placed on every floor or every other floor. However, some networks do not include these terminals.

4 Drop cable runs from an FDT to a living unit. In some networks, the riser and drop cables are the same cable, running up the riser and down the hall.

5 In-unit network cabling consists of the fiber components in each living unit.

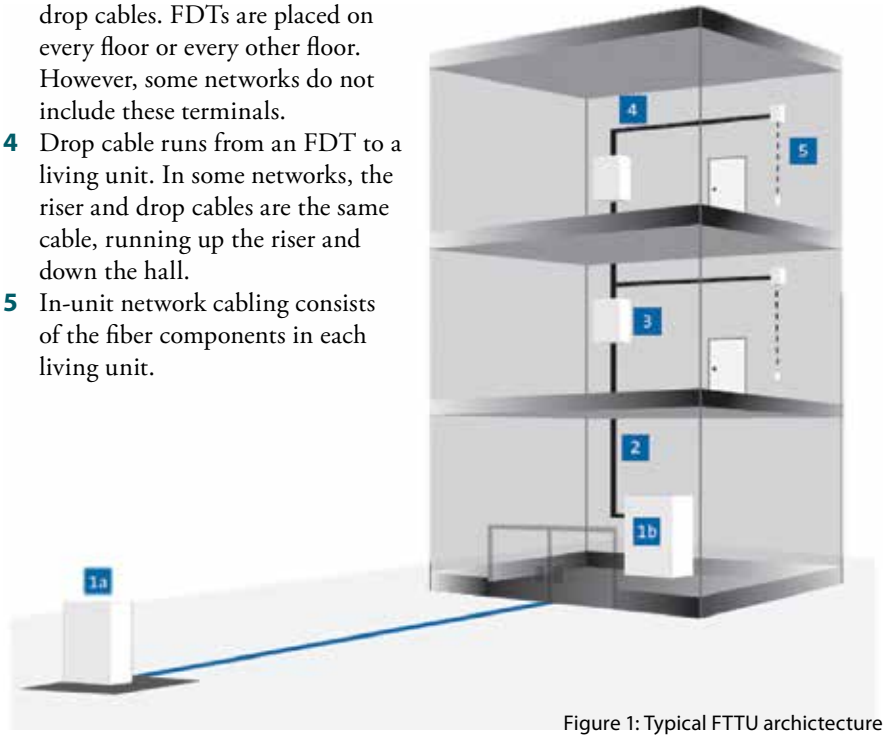

Figure 1: Typical FTTU archictecture

All conduits and cables must meet appropriate flame and smoke ratings. The National Electrical Code (NEC) is a main source of information regarding requirements, although local codes may also apply.

SPACES

Spaces are needed in a building to house various pieces of equipment and connection points.

- Cable entrance into the building and telecom closet or FDH location
  - For the building entrance, aerial access requires building attachment capability and an entrance hole into the building. Underground access requires a conduit (2 inches or larger preferred) from outside to inside, preferably to the telecom closet. Sharp bends in the duct should be minimized. The duct must meet minimum bend radius/diameter requirements. The majority of outdoor-rated fiber optic cables have a minimum bend diameter of 20 times the cable outside diameter.
  - Fiber connections and equipment are typically located in a dedicated electrical or telecom closet, often on a low floor in the building with access to riser spaces.
  - Equipment can be mounted either on the wall or in an electronics rack (typically 19 inches wide).
  - A backboard roughly 4'W x 8'H x 3/4"D, in accordance with NEC or other codes, can be helpful to facilitate installations on walls. Equipment will extend roughly 30 inches when installed on the backboard.
  - Power and HVAC services will be helpful if the service provider plans to install active electronics in the closet.
- Terminal or patch panel locations
  - FDTs or patch panels used to connect riser cables to drop cables are typically housed in closets that have access to the riser or in the stairwell. They can be on every floor, on every other floor or in some other arrangement, depending on the design of the building and network. Some networks don't have them.
  - Terminals on a floor are most often wall-mounted. A backboard, roughly 2'W x 2'H x 3/4"D, in accordance with NEC or local code, can be helpful.

Figure 2: A typical FDH

Figure 3: A fiber distribution terminal

PATHWAYS

Pathways for fiber placement are critical. The fiber pathways needed to new buildings versus already occupied buildings can be quite different from one another. Pathways can be either indoors or outdoors, are typically designated as "riser" or "drop," and must be large enough to accommodate the cables needed to reach living units. There can be different pathway scenarios for different building designs.

Figure 4: Conduits installed for fiber distribution

For new buildings, the easiest approach is to place conduits or microducts with pull strings in the riser and to each unit during building construction. The pull strings can then pull cables into place as needed. Typical conduit sizes are 1 inch or 2 inches for risers and ½ inch for drops, but these should be confirmed with the

Figure 5: In an existing building, cable can be installed above a drop ceiling, beneath molding, on a wall surface or on the building exterior.

service provider to make sure they are properly sized.

In already occupied buildings, conduit placement is not often possible without extensive renovation, but there are many alternative ways of making pathways, including placing cables above drop ceilings or moldings, mounting small cables on wall surfaces, or running cables up the outsides of buildings into individual units. Fiber optic cables can be very small, and in many cases, the visual impact can be small.

Cables come in different structures and fiber counts. Most fiber optic cables are typically less than 1 inch in diameter, although some cables with hundreds of fibers may be larger. If the building owner is to purchase cables, be sure to discuss the proposed network architecture and fiber and cable types with the service provider to confirm cable and fiber types, fiber counts and the connection plan.

FIBER IN THE UNIT

Fiber in the unit is connected to the fiber in the hallway (or outside). It is then installed in the unit and typically terminates in an optical network terminal (ONT), which converts the optical signal to an electrical signal. The ONT is typically located near AC power. Other devices supplied by the service provider may include a battery backup unit, a router and/or switch, and TV set-top boxes. ONTs are often either desk- or wall-mounted.

As residents are sensitive to the visual footprint of cables, fiber products used in the unit are typically more aesthetically pleasing than those used in risers or closets. Smaller cables and cords are often used. Fibers meeting ITU G.657.B3 are recommended for this application because of the many bends. Fibers are often installed near the ceiling to reduce incidental contact. Methods of installation include stapling, surface-mounting or track-mounting on walls. It's best to discuss the in-unit components with the service provider in advance and to coordinate the installation path with the resident so everyone is satisfied with the installation.

> Property owners can choose from a variety of products and techniques to make their buildings ready for fiber services.

SUMMARY

The Fiber Broadband Association believes that every building and living unit should ultimately have fiber. Millions of apartments and condominium units have already been wired with fiber, and service providers and manufacturers have developed products and techniques to easily and cost-effectively wire the vast majority of buildings. ❖

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Figure 6: ONTs may be wall-mounted or desk-mounted.

Figure 7: Inside the customer premises, fiber may be stapled to the wall, mounted on the wall surface or track-mounted.