HOW DO I MAKE MY BUILDING FIBER-READY?

Q: HOW DO I MAKE MY BUILDING FIBER-READY?

A: Guidelines from the Fiber Broadband Association to Facilitate Fiber Deployment in a Residential Building
BASIC GUIDELINES
What Does “Fiber to the Unit” Mean?

- At least one fiber to each living unit: More fibers may enable future services or multiple carriers to service the building. The FBA recommends an “overprovisioning factor” of 1.5x the total number of fibers in the riser to living units to accommodate future requirements.

- Use single-mode fiber only due for its compatibility with service providers’ networks and available bandwidth. Additional recommendations for fiber type will be given later in the document.

- In this document, “Greenfield” guidelines are for new buildings built or total renovations. “Brownfield” guidelines are for buildings that are already built with an existing non-fiber telecom infrastructure in place.

- When in doubt, contact the potential service provider for guidance. Questions for the service provider are listed in blue font.

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

The Components of an FTTH Network
The overall network consists of pathways, cables, fiber hardware, and powered electronics. Electronics are typically only powered at the subscriber end, but sometimes a network “Optical Line Terminal” or “Switch” is installed in the building.

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<thead>
<tr>
<th>Diagram Number</th>
<th>Network Element</th>
<th>Description</th>
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<tbody>
<tr>
<td>1A or 1B</td>
<td>“Telecom closet” or Fiber Distribution Hub (FDH)</td>
<td>The starting point in the network. Fibers in the building come back to this point. May be placed indoors or outdoors. May be dedicated to one or more buildings. May include optical splitters.</td>
</tr>
<tr>
<td>2</td>
<td>Riser cable(s)</td>
<td>Also known as the distribution cable. Serves as the backbone of the network. Can be one or more cables, but the minimum total fiber count should be enough for each unit in the building.</td>
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<tr>
<td>3</td>
<td>Fiber Distribution Terminal (FDT)</td>
<td>Serves as a transition point between the Riser and Drop cables. Often placed on every floor or every other floor. Some networks do not include terminals.</td>
</tr>
<tr>
<td>4</td>
<td>Drop</td>
<td>The cable that runs from the FDT to the living unit. In some networks, the riser and drop cables are the same cable, running up the riser and down the hall.</td>
</tr>
<tr>
<td>5</td>
<td>In-unit Network</td>
<td>Cabling components in each living unit. These will be described in more detail later in the document.</td>
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</table>
Who Does What?
Building owners have a choice regarding the scope of their involvement in network preparation. In context of an entire building, fiber is a very small part.
Typically, the building owner fulfills one of two roles:
• Path creation only
• Building out the passive fiber network
There are advantages and disadvantages to the roles. However, describing these are beyond the scope of this document.

BUILDING PREPARATION
Spaces Needed: Cable Entrance Into the Building
• Aerial access requires building attachment capability and entrance hole into the building.
• Underground access requires a conduit (2” or larger preferred) from outside to inside, preferably to the telecom closet
• Sharp bends in the duct should be minimized. Duct must meet minimum bend radius/ diameter requirements. The majority of outdoor-rated fiber optic cables have a minimum bend diameter of 20x the cable OD.
• Discuss conduit diameter, materials, and minimum bend radius with potential service providers

Spaces Needed: “Telecom Closet” or FDH (Fiber Distribution Hub) Location
• Fiber connections and equipment are typically located in a dedicated electrical or telecom closet, often on a lower floor in the building with access to riser spaces
• Equipment can be either mounted or on the wall in an electronics rack (typically 19” wide).
• A backboard roughly, 4’W x 8’H x 3/4” D in accordance with National Electric Code (NEC) or other codes, can be helpful to facilitate installations on walls. Equipment will extend roughly 30” when installed on the backboard.
• Power and HVAC services will be helpful if the service provider plans to install active electronics in the closet
• Discuss space, HVAC, and power requirements with potential service providers
Pathways can be indoors or outdoors
Pathways are typically designated as “riser” and/or “drop”
Pathways need to be large enough to accommodate the fiber counts needed to reach the residents
There are different pathway scenarios for different building designs

**Spaces Needed: “Terminal” or Patch Panel Locations**
- Fiber distribution terminals (FDT) or patch panels can be used to connect riser cables to drop cables
- These are typically housed in a closet with access to the riser or in the stairwell
- They can be on every floor, every other floor, or some other arrangement depending on the design of the building and network
- 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 at minimum 4’ from ground level can be helpful. 1’ spacing around the FDT for access.
- Discuss the proposed network architecture with your service provider to determine if space for terminals will be needed.

**BUILDING PREPARATION**
*Pathways Needed: Pathways Are Very Important!*
- Pathways can be indoors or outdoors
- Pathways are typically designated as “riser” and/or “drop”
- Pathways need to be large enough to accommodate the fiber counts needed to reach the residents
- There are different pathway scenarios for different building designs

**Sample Pathway Scenarios**
- **Homerun single fiber drop cables directly from the FDH to the unit** (typically small buildings only)
- **Multifiber cables running up the riser and down the hallway** (typically one per floor)
- **Multifiber cables running up the riser and connecting to drop cables at the floor**
- **One multifiber cable per floor running up the risers and connecting to the drop cables at the floor**

**PATHWAY DEVELOPMENT: GREENFIELD**
*Interior Pathways for New Buildings*
- During building construction, placement of conduits and/or microducts (with pull strings) in the riser and to each unit can be helpful to facilitate installations
- Pull strings are used to pull the fiber optic cables into place
- Discuss conduit diameters and sweeps, materials and path with the service provider
- Typical conduit sizes for risers are 1” or 2”
- Typical conduit size for drops is 1/2”, but can also be much smaller if properly planned
PATHWAY DEVELOPMENT: BROWNFIELD

**Interior Pathways for Existing Buildings**

- If possible, placement of conduits and/or microducts is helpful
- However, since conduit placement is not possible with many existing buildings, alternative methods of making pathways include the following:
  - Placing cables above drop ceilings
  - Wall surface mounting small cables
  - Placing cables behind moldings
- Discuss potential available pathways and deployment methods with the service provider

PATHWAY DEVELOPMENT

**Exterior Pathways**

- In some cases, buildings do not have available pathways indoors
- In those cases, cables can be run outside of the building:
  - Under gutters
  - Along soffit lines
  - Under moldings
- Clips and other fastening methods can be used to fasten cables to buildings
- Cables can sometimes be available in different colors to match exteriors

FIBER AND CABLES

**In the Building**

- “Single-mode” fiber is recommended for in-building fiber networks
- Since buildings contain many corners and bends, bend-insensitive single-mode fibers are recommended
- For risers, fibers meeting International Telecommunications Union (ITU) Recommendation G.657.A2 (or better) are recommended
- For drops, fibers meeting ITU Recommendation G.657.B3 are recommended
- Cables come in different structures and fiber counts with different advantages and disadvantages to various cable types
- Most fiber optic cables are typically <1”, although some cables with hundreds of fibers may be larger
- If the building owner is to purchase cables, discuss the proposed network architecture and fiber and cable types with your service provider to confirm cable and fiber types, fiber counts and connection plan

**IMPORTANT GENERAL NOTE:** All conduits and cables must meet appropriate flame and smoke ratings. The National Electric Code (NEC) is a main source of information regarding codes, although local codes may also apply.
FIBER AND CABLES
In the Unit

- Fiber in the unit is installed and typically terminates in an “Optical Network Terminal” (ONT). The ONT is typically located near AC power.
- Other devices from the service provider may include:
  - Battery backup unit
  - Router and/or switch
  - Set-top boxes
- ONTs are often either desk or wall-mounted
- Discuss the proposed electronic equipment with your service provider to determine installation locations in the unit.

Drops to the Living Unit

- Fiber is installed to the final location of the ONT.
- Since residents are very sensitive to the visual footprint of cables, fiber products used in the unit are typically more aesthetically pleasing
- Smaller cables are often used for this section of the installation
- Fibers meeting ITU G.657.B3 are recommended for this application due to the many bends (see above picture)
- Fibers are often installed near the ceiling to reduce incidental contact
- Methods of installation include:
  - Stapling
  - Surface-mounting
  - Track-mounting
DEFINITIONS AND ACRONYMS
FROM “2016 FTTx GLOSSARY”

The Light Brigade, Copyright 2016, or adapted for buildings as appropriate

Brownfield: A type of FTTx network installation that makes upgrades or additions to existing legacy copper or coaxial installations.

Drop Pathway/Cable: The fiber cable that connects the subscriber from the riser.

FDH (Fiber Distribution Hub): A type of cabinet that houses optical splitters in passive optical systems between feeder, distribution, and drop segments. They provide an easy fiber management location for connecting subscribers to the service providers.

FDT (Fiber Distribution Terminal): A device to make a transition to drop fibers to the customer’s interface.

Greenfield: Network deployment in an area under development. Since everything is being built for the first time, network construction can be done with few obstructions and installation can be accomplished parallel to other utilities.

HomeRun: A network architecture where the optical splitter (if used) is housed at the building entrance.

OLT (Optical Line Terminal): The PON controller card or unit that converts incoming traffic into laser pulses and sends them down the fiber, and signals the ONTs when to send upstream traffic.

ONT (Optical Network Terminal): A media converter or gateway at a home or business that converts signals from light to electric signals and contains ports to distribute signals either wirelessly or on existing home wiring.

Riser Pathway/Cable: Cable and/or pathway installed in vertical runs and penetrating more than one floor or cables installed in vertical runs in a shaft. Rated by the NEC/CEC for resisting flame spread and smoke generation.

Single-mode: The most common fiber type used in fiber to the home or living unit installations. A step-index waveguide in which only one mode will propagate above the cutoff wavelength.
# STANDARDS REFERENCE GUIDE

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