The Magic of In-Cassette Splicing

Making 'Hubs with Stubs' a Thing of the Past

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Over the last 10 years, 100 million homes around the world have been passed with fiber cable that supports Fiber-To-The-Home (FTTH) networks. An important element of a FTTH build is the Fiber Distribution Hub (FDH) or cabinet, which houses optical splitters and distributes incoming feeder cables from the central switching office to outgoing distribution cables. These cable are ultimately connected to a home. The FDH is generally configured with 100-foot-long stub cables to reach a location where it can be spliced to the carrier's fiber cable. Adding any length of cable stub to an FDH cabinet adds material cost. Clearfield's Clearview Cassettes with in-cassette splicing eliminates the need for FDH cable stubs, thereby maximizing cost savings and making 'hubs with stubs' a thing of the past.

FDH stubs are generally ordered 100 feet long to allow the cables to reach a point where they can be spliced to the carrier's cable. Ideally, a splicer will perform this operation in a controlled environment inside a splice trailer, or, at minimum, a small tent that provides shelter from the weather. The 100-foot stub allows the splicing operation to take place a reasonable distance away from the hub location since there's not always enough open space around the hub for a trailer or tent. If the location is known and a splicing location is available, a carrier can cut costs by ordering shorter FDH stub cable lengths. However, savings can be maximized by eliminating the stub cable altogether. This is where in-cassette splicing used inside the FDH come into play.

Relocating the Splice

In-cassette splicing eliminates the need for a stub cable at the FDH by moving the splicing of feeder and distribution cables inside the FDH. This option has been offered by FDH suppliers in the past, but with limited success. While these "in-hub splicing" options do *reduce* the 100-foot stub length, they don't *eliminate* the cable as they still require a 10- to 20-foot service loop to allow the individual splice trays inside the FDH to be pulled out to the splice area.

Splicing within the Clearview Cassette is unique: the splicing function is not performed on a separate splice tray, but is contained on the cassette itself. The cassette can be easily removed from the cabinet and travel whatever distance is required to reach the splice trailer. The splicing operation remains the same, it's just performed on the cassette rather than on a separate tray. This eliminates the need for the 100-cable stub, splice trays, the splice closure and the vault needed to store the splice closure and cable stub slack, saving more than $1,000 per FDH cabinet deployed (Figure 1).

Figure 1

MATERIAL SAVINGS	QUANTITY	PRICE	EXTENDED PRICE
100' FEEDER CABLE – 24 FIBER	1	50	50
100' DISTRIBUTION CABLE 288 (2@144 EACH)	2	100	200
SPLICE TRAY FEEDER CABLE	1	20	20
SPLICE TRAY DISTRIBUTION CABLES	4	20	80
SPLICE CLOSURE	1	350	350
SPLICE CLOSURE TRAYS	12	5	60
VAULT*	1	400	400
TOTAL MATERIAL SAVINGS			**$1,160**

*Assumes elimination of one of two vaults. If reducing vault size instead of vault elimination, use $200 savings.

Less Labor = Lower Costs
Fewer materials to install means less labor is required to deploy the hub. Additionally, significant labor savings are achieved through the ability to splice directly within the cassette. By removing the second vault, the splice case and splice trays, the following labor steps are eliminated, resulting in one to two hours of labor savings per hub deployed (Figure 2):

- Locating and prepping the vault, and making it safe to enter and operate.
- Pumping out any water before uncoiling and organizing the internal feeder and distribution cables.
- Prepping the cables from the hub for splicing to the incoming carrier cables.
- Preparing and adjusting the splice case on the end plate to match the incoming cable counts and cable diameters.

Figure 2

LABOR SAVINGS	QUANTITY	TIME	EXTENDED TIME MIN.	EXTENDED TIME MAX.
LOCATE SPLICE VAULT & SET UP SAFETY CONES	1	10-30 min.	10	30
OPEN HOLE AND PUMP OUT WATER & VENT	1	10-30 min.	10	30
UNCOIL & ORGANIZE CABLES OUTSIDE VAULT	1	10-30 min.	10	30
OPEN AND PREP CABLES	1	20-30 min.	20	30
PREP SPLICE CASE END PLATE	1	10-30 min.	10	20
TOTAL LABOR SAVINGS			**60 min.**	**2 hrs. 20 min.**
AT $100/HR., LABOR SAVINGS			**$100**	**$233**

Cassettes with in-cassette splicing reduce pre-engineering time, the amount and number of SKUs needed, and improve turn up time for the customer.

Pre-Engineering and SKU Inventory Made Simple
Configuring hubs with stub cables can be complicated. There are many cable configuration options that need to be determined before an FDH cabinet with stub cables can be engineered, ordered and built. For the feeder stub cable, typical fiber counts are 12, 24 or 48 fibers. For the distribution stub cables, fibers counts of 72, 96, 144, 216 and 288 fibers are common. The FDH stub cable fiber counts should match the fiber counts in the carrier's network, which contributes to a large number of combinations in ordering variables.

To further complicate the ordering process, stub cable construction must be identified; is the fiber inside the stub cable loose tube, stranded construction or made with 12 fiber ribbons? Also, it must be specified if the cable is dielectric or is constructed with an armored sheath used for cable locating purposes and rodent resistance. Some carriers prefer to have dry OSP cables rather than gel filled and prefer to have stub cables that are made from specific glass manufacturers. Some applications require longer lengths of stub cables to reach a safe splicing location or access point. Lengths of 200 feet, 300 feet or even longer have been required.

Considering all these configuration options, more than 500 combinations need to be identified before engineering can be completed, a new ordering SKU-assigned and loaded, and an order placed for an FDH cabinet with stubs. The capability for in-cassette splicing from Clearfield greatly reduces this work and makes lead time a non-issue. One cassette with in-cassette splicing satisfies the requirements of all these configuration variables and is scalable in groups of 12 fibers (Figure 3).

Figure 3

CONFIGURATION SKU SAVINGS	NUMBER OF OPTIONS
FEEDER CABLE COUNTS 12/24/48	3
DISTRIBUTION CABLE COUNTS 72/96/144/216/288/MIXES	6
CABLE CONSTRUCTION DIELECTRIC/ARMORED/GEL/DRY	4
LENGTH OPTIONS 50/200/300/500	4
LOADING HALF LOADED/FULLY LOADED	2
SKU'S ELIMINATED	576
AT $100/YEAR TO MAINTAIN A SKU	**$5,760**

This reduction or elimination of pre-engineering is a key concept for Clearfield—we call it Labor Lite. Labor Lite technologies simplify fiber deployment by using flexible products that match multiple application environments. In the FDH example, cassettes with in-cassette splicing greatly reduce the pre-engineering required compared to shipping 100-foot stubs because the same scalable 12-fiber cassette can be used regardless of the fiber count of the feeder or distribution cables entering the cabinet, or the type of cables (dielectric, armored, gel filled or dry). Using common parts makes the engineering go faster, improves delivery and reduces the number of ordering SKUs, all elements of a Labor Lite solution. Lowering the number of active SKUs translates into lower annual labor costs for maintenance.

But why stop at the FDH cabinet? The benefit of in-cassette splicing —capital cost savings, installation labor savings, reduced engineering and lower maintenance costs—can extend to Inside Plant applications as well, including fiber distribution frames, fiber panels and wall boxes that are commonly ordered with fiber tails. The Clearview Cassette is a single building block solution that can be deployed throughout a service provider's network.

Cassettes with in-cassette splicing use Labor Lite technologies to greatly reduce pre-engineering costs by being scalable and flexible regardless of fiber count and cable construction. Delivery, inventory position and part number maintenance costs are improved because the same scalable 12-fiber cassette is deployed in multiple application environments, including inside and outside plant environments.