FURUKAWA ELECTRIC

FURUKAWA ELECTRIC GROUP

Activities for sustainable optical network construction

June 2017

Ichiro KOBAYASHI

FURUKAWA ELECTRIC CO., LTD.

Corporate Profile

FURUKAWA ELECTRIC

Company name:	Furukawa Electric Co., Ltd.
President:	Keiichi Kobayshi
Founded:	1884
Established:	1896
Paid-in Capital:	¥69,395 million
Net sales:	¥843,344 million (Consolidated) (Years ended March 31, 2017)
	¥398,777 million (Non-Consolidated) (Years ended March 31, 2017)
Employees:	52,254 (Consolidated) (As of March 31, 2017)
	3,657 (Non-Consolidated) (As of March 31, 2017)

Metals 14%

Copper strips | Copper pipes | Copper sheets

Service and other 6%

Telecommunications 16%

Fiber optic cables | Photonic Devices

Energy / Industrial products 31%

Copper and Power Cables | Bands for semiconductors

Electronics / Automotrizes systems 33%

Parts for airbag control | Aluminum blanks for hard drives

Optical Fiber and Cable Factory (Global)

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Europe

Brondby

Augsburg

Voronezh

Sturbridge

Carrollton

Avon

Somerset

Norcross

Americas

Tangier
(Morocco)

FXOC

FSSM

FTOP

Chiba

Mie

SFPOC

Asia
/ Pacific

BFFO

BTC/TFOC

FFT

FOSI

FIC

FEL

FIA

Mid-East

ofs
A Furukawa Company

● Fiber Production
● Cable Production

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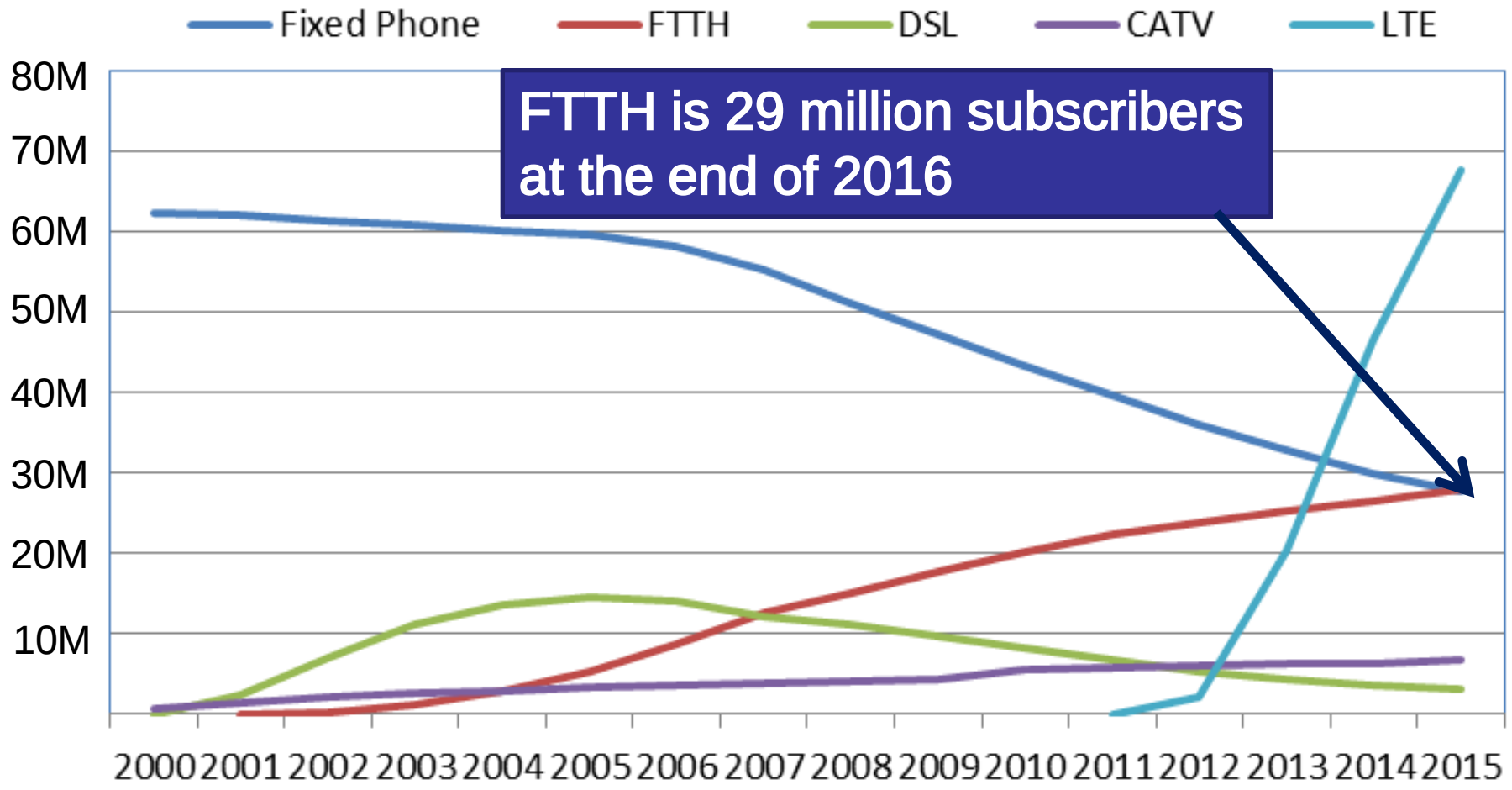
● Fiber Production
● Cable Production
● Component Production

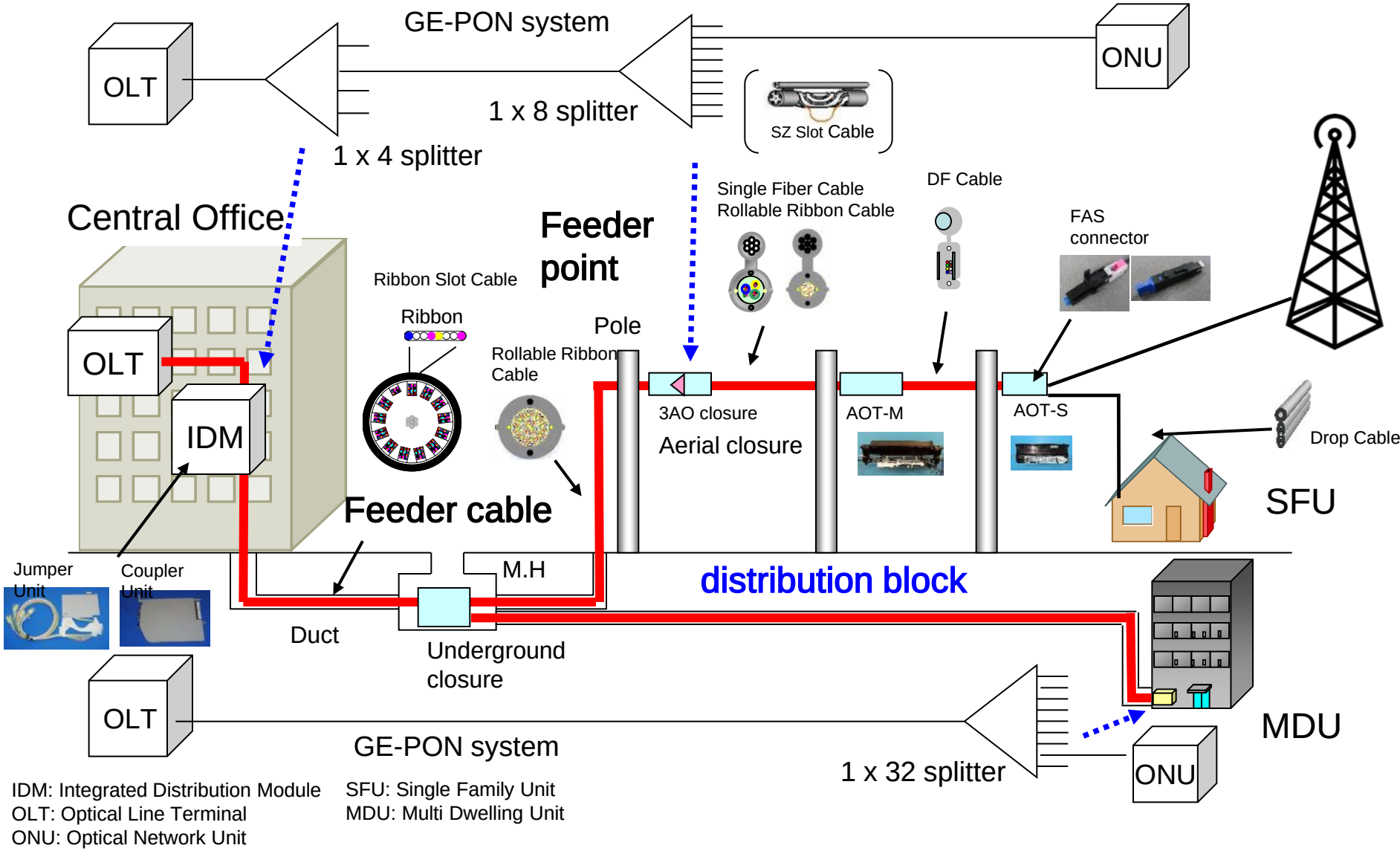
Broad band subscribers in Japan

Population of Japan : 127M

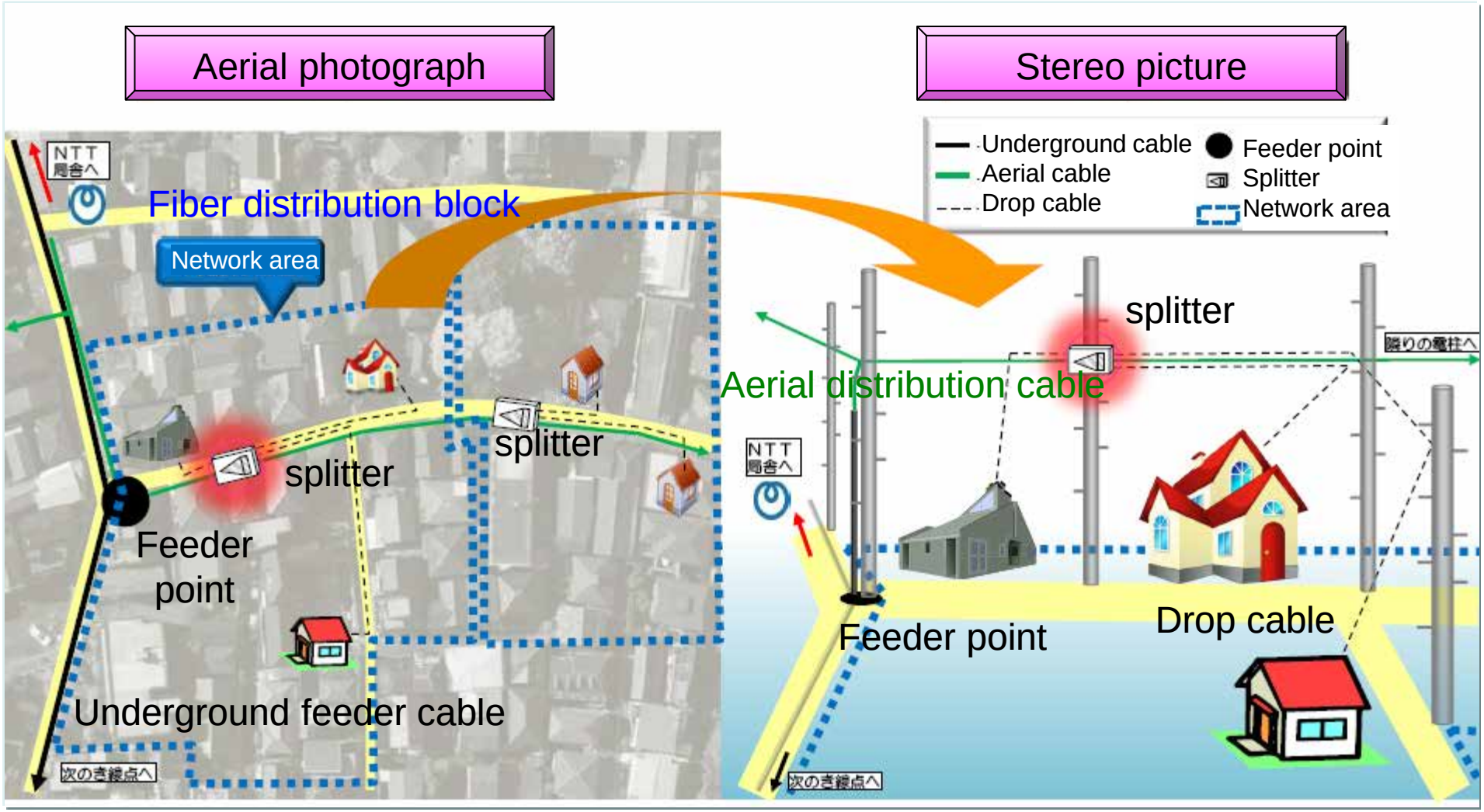


(source: MIC Japan)

Typical Optical Access Network Configuration



Optical Access network in JAPAN



(quoted from：MIC Japan)

Optical Access network in JAPAN

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Sustainable optical network ?

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Which is stable? reliable?

Optical Access network in JAPAN

Optical Access network in X

What is different? Cable network design

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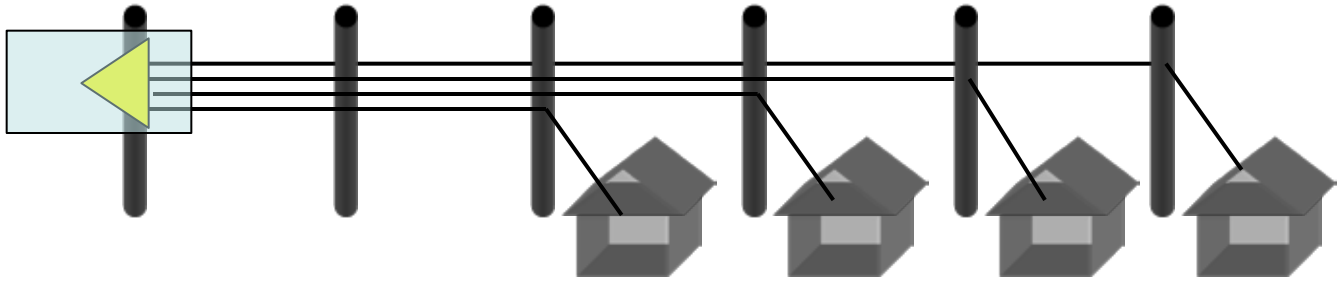
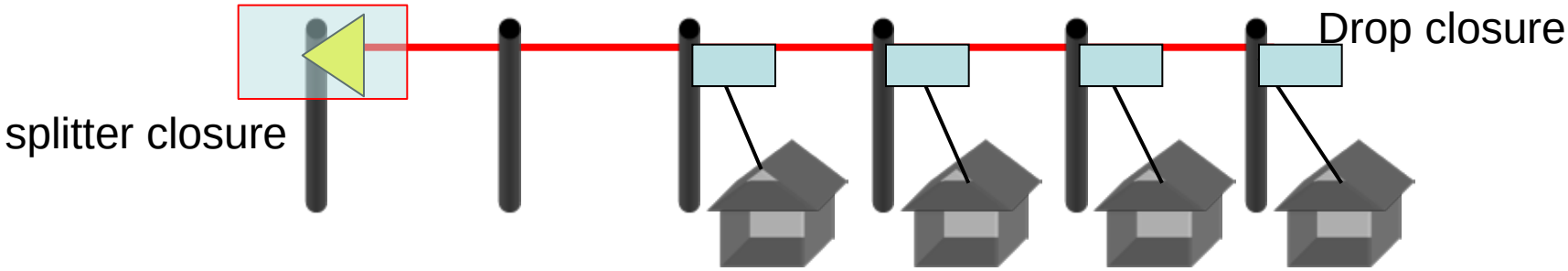
Conventional network design:

small fiber count cable installation frequently



Sustainable network design:

High fiber count cable and cable branching



Cable network design is important for sustainable network !

Key Success Factors for sustainable optical network

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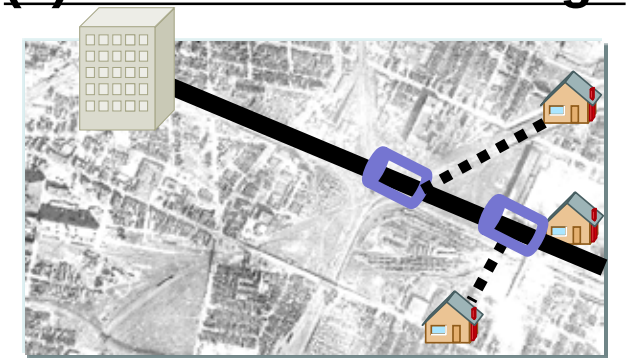
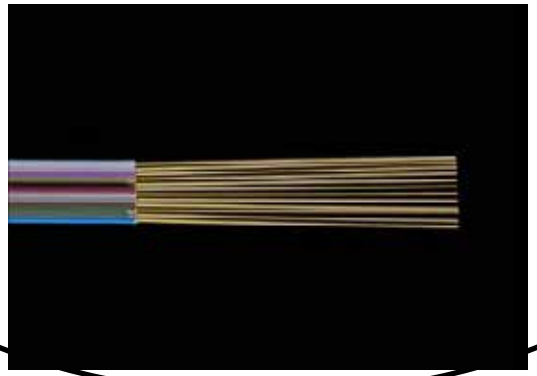
(1) cable network design



(2) Optical fiber ribbon



(3) training

What is optical fiber?

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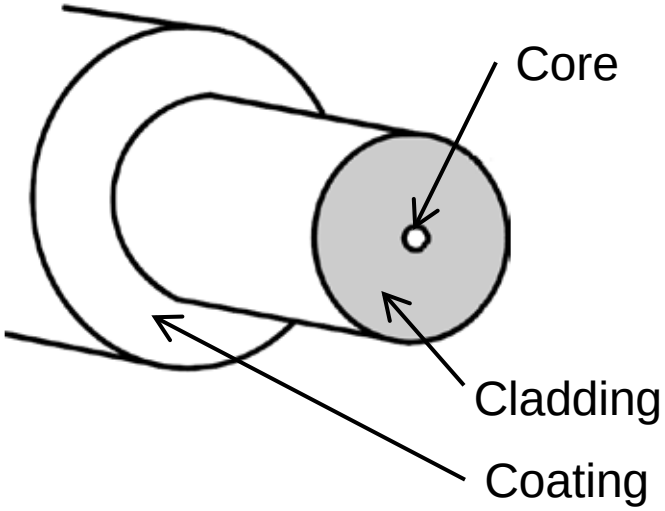
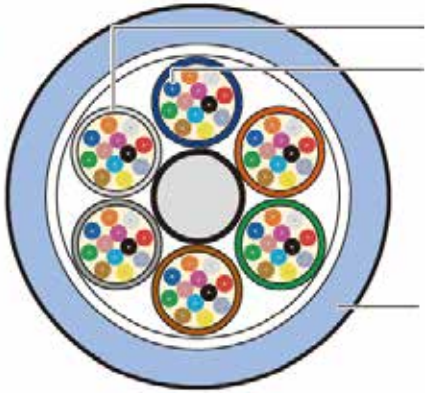
Optical fiber

	Diameter	Material
Core	0.01 [mm]	Silica (glass)
Cladding	0.125 [mm]	Silica (glass)
Coating	0.250 [mm]	UV resin



Optical fiber cable

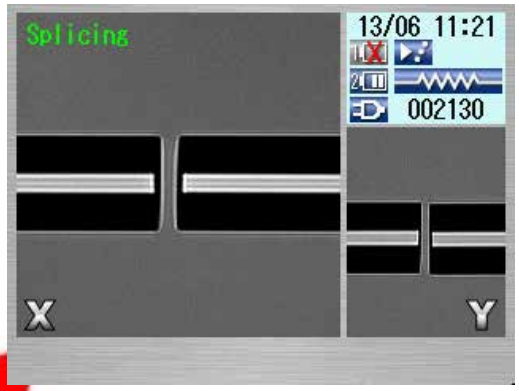


Optical fiber joint

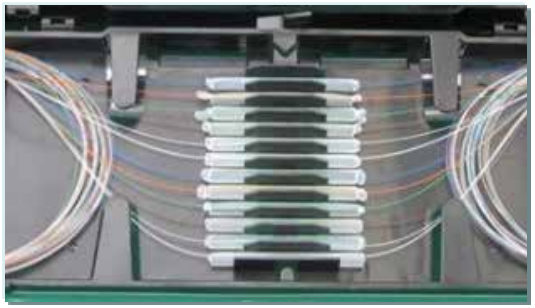
Optical fiber joint is necessary for optical fiber network construction

- Splicing process of each fiber (one by one) required.

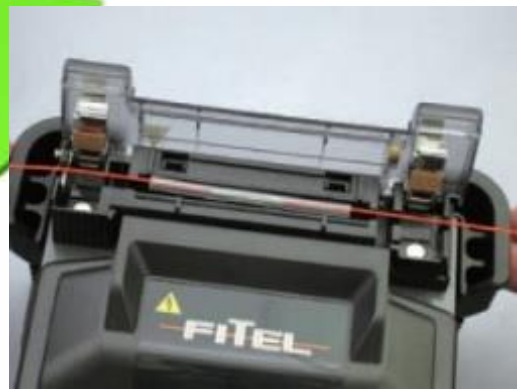
Preparation



Fusion Splice



storage



Protection

Optical cable joint for network construction

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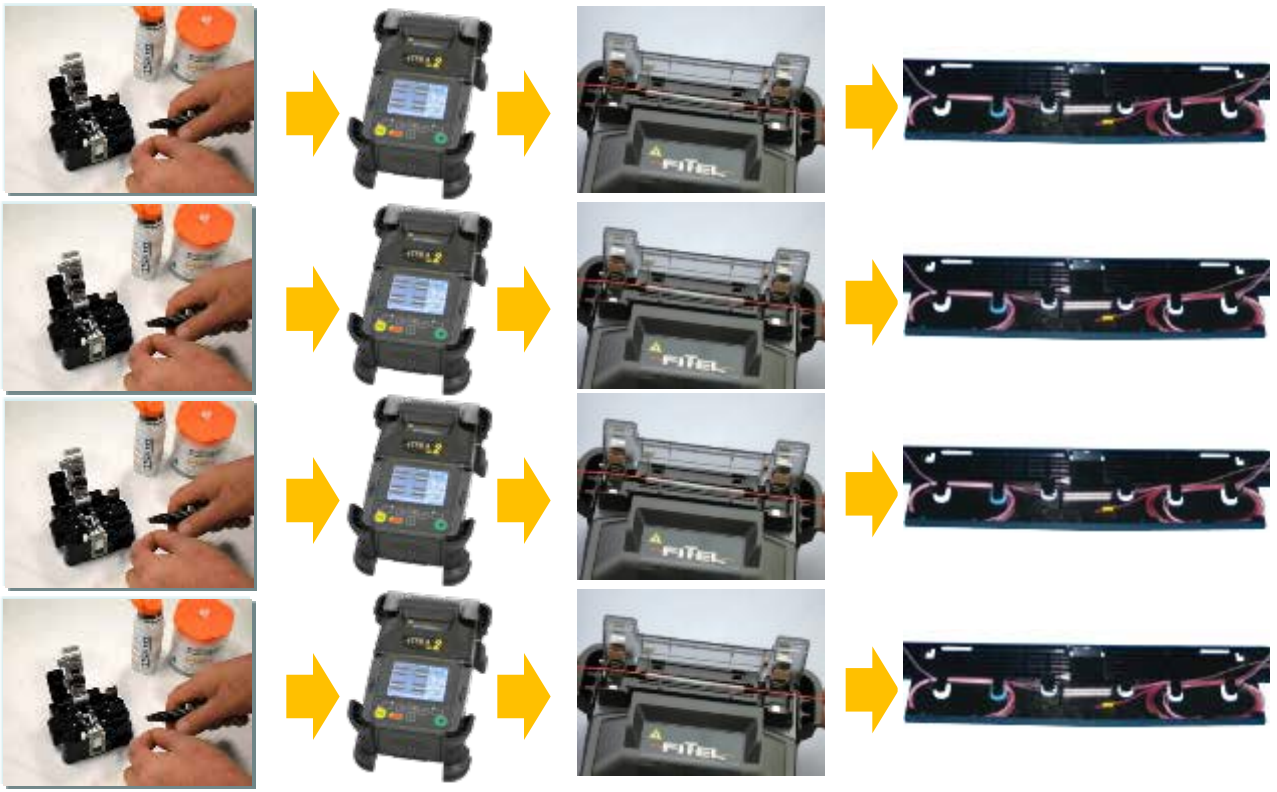
Fiber Pick Up



	Preparation	Fusion Splice	Protection	storage
24 fiber cable	× 24	× 24	× 24	× 24
288 fiber cable	× 288	× 288	× 288	× 288

efficient fiber joint technology is demanded

Optical Fiber Ribbon

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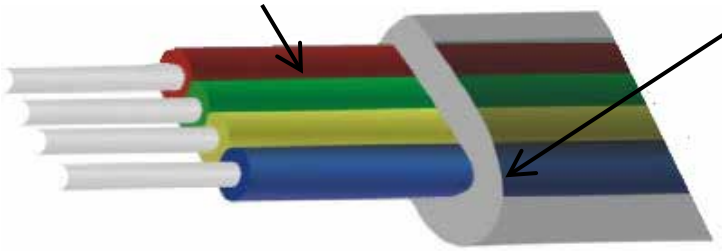
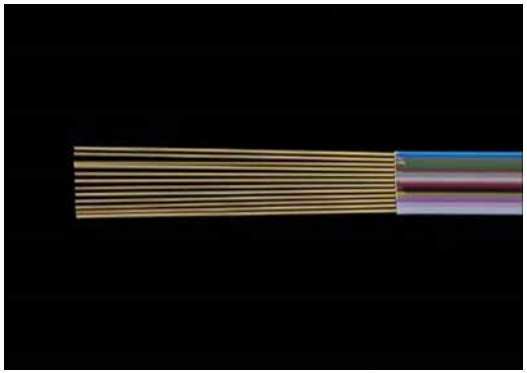
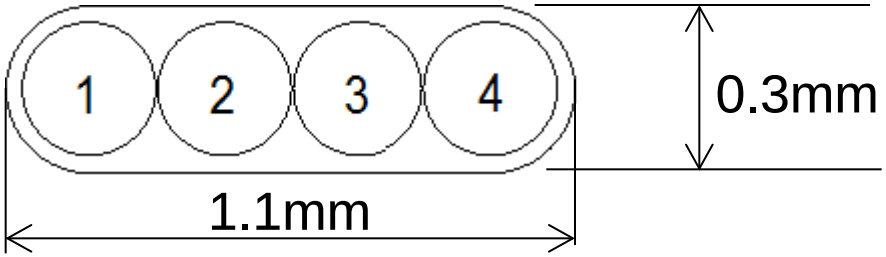
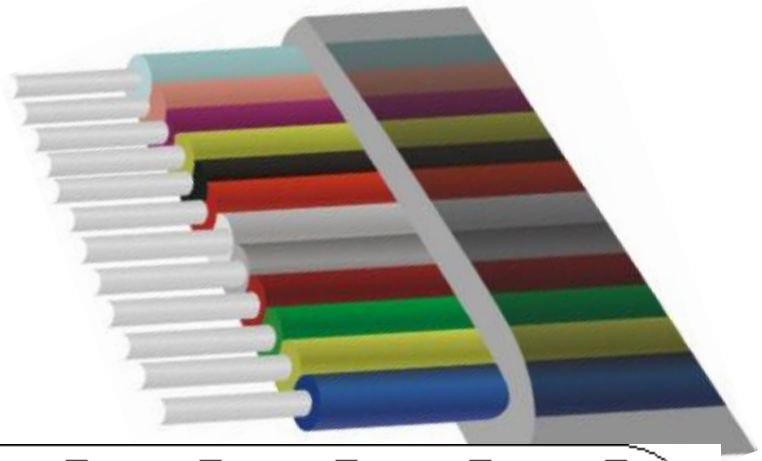
Optical Fiber

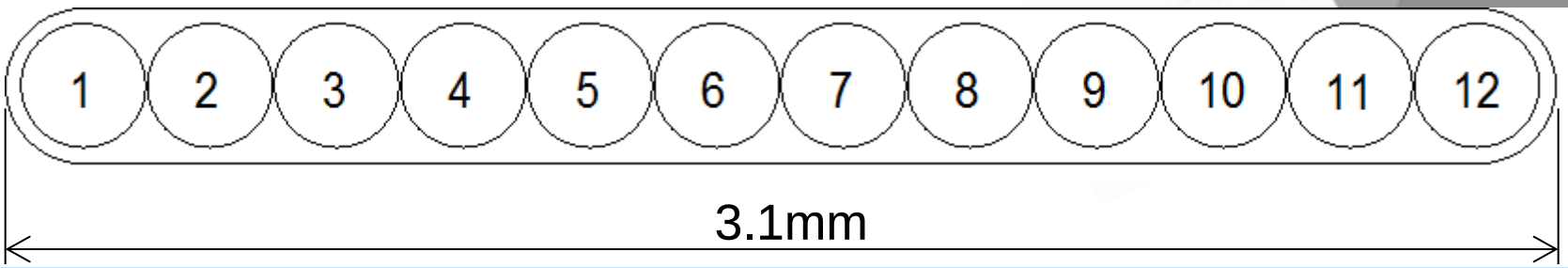
UV resin











Advantage of fiber ribbon: Mass Fusion Splice

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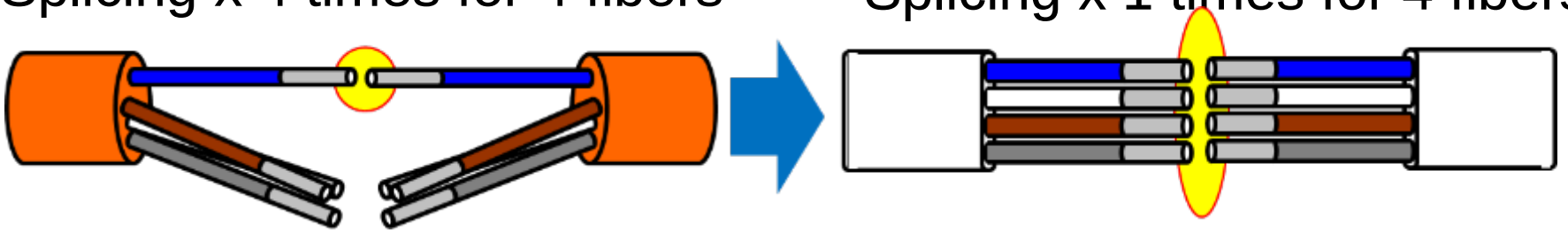
4 Optical fibers can be spliced at once by mass fusion splice

Splicing x 4 times for 4 fibers

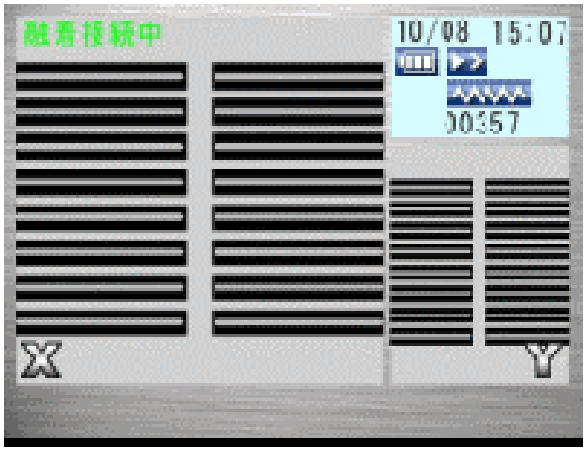
Splicing x 1 times for 4 fibers



Conventional cable

Optical fiber ribbon

Mass Fusion Splicer



Benefit of Mass Fusion Splice: reduction of splice

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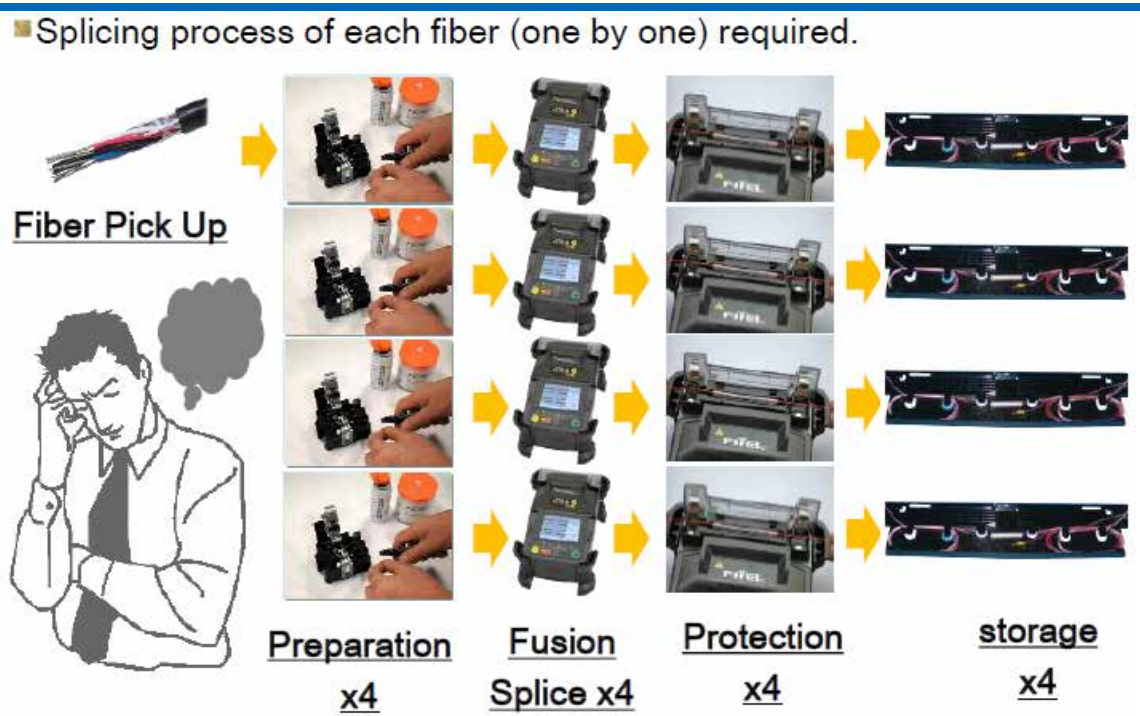
skill and time



Benefit of Mass Fusion Splice: saving of splice space

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Reduction of splice number makes splice tray storage simple.

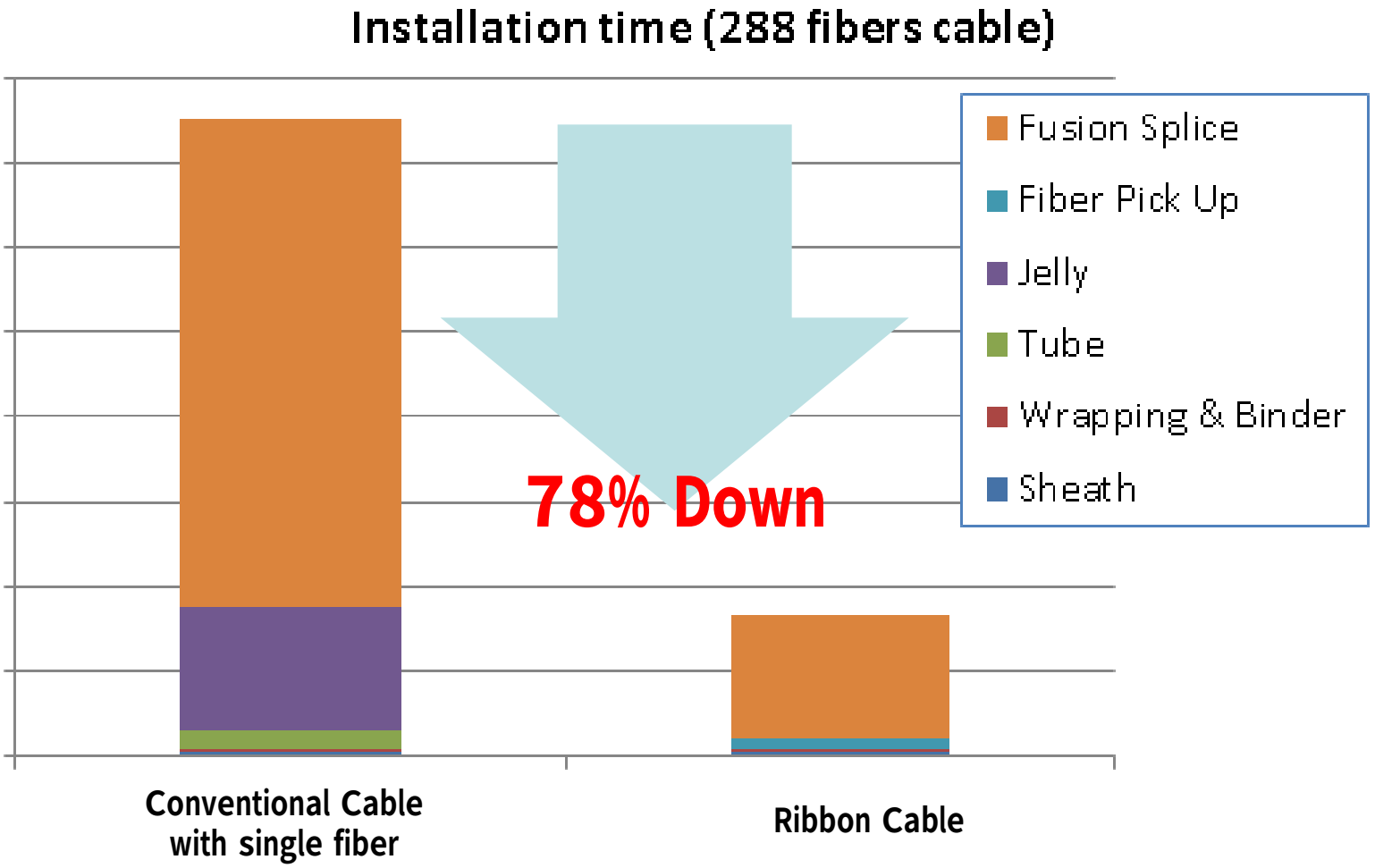
Simple storage state is more reliable and sustainable

- 24F Single fiber cable: 24 splicing x single fiber

- 24F Ribbon fiber Cable: 6 splicing x 4-ribbon fiber

Benefit of Mass Fusion Splice: reduction of construction time

Mass fusion splicing can reduce construction time and cost.



*Installation time depends on worker's skill and other conditions.

Roll-able Ribbon Technology

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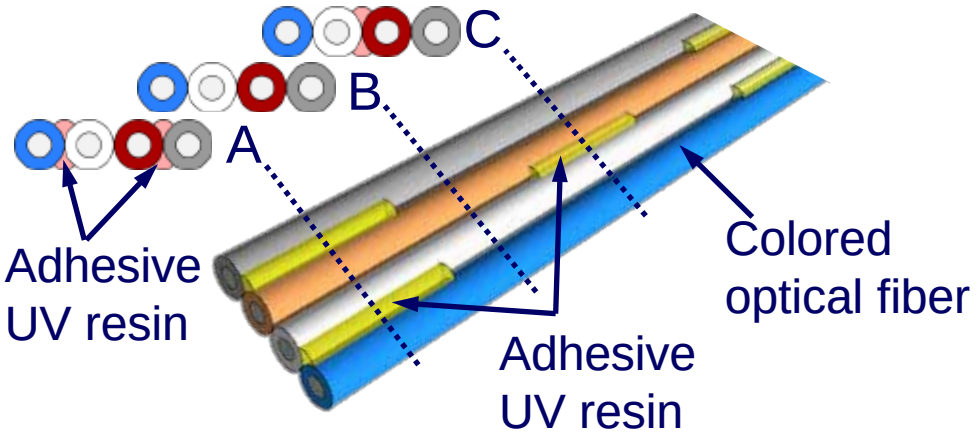
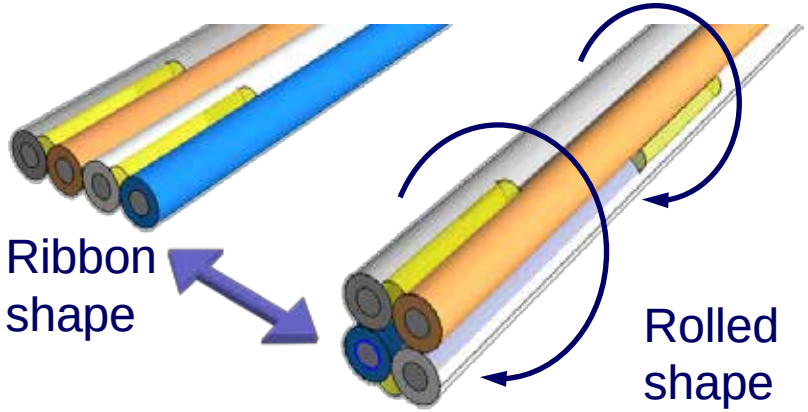
- Structure

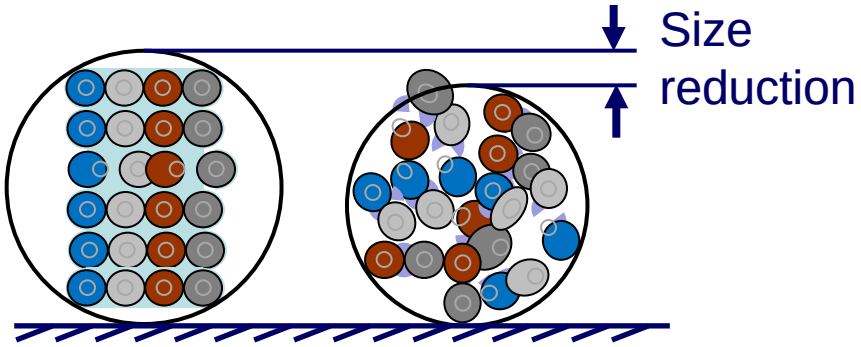


Ø Easy to split

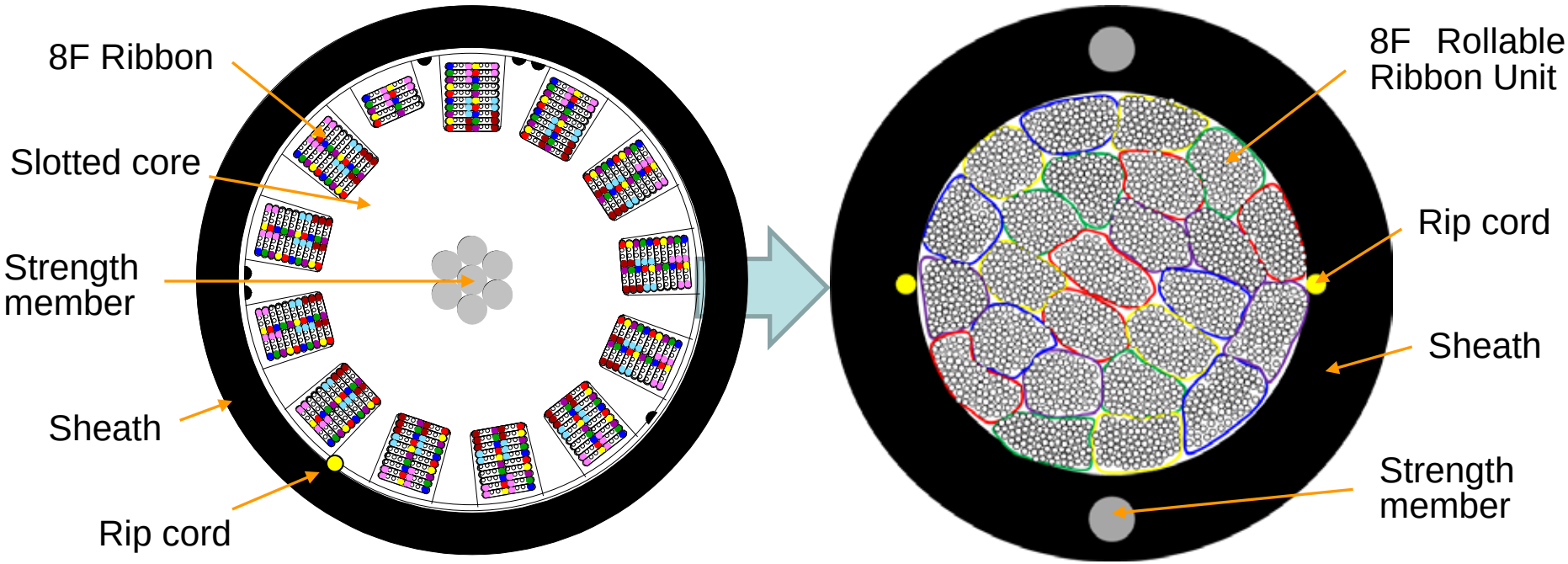
- Flexible handling



Ø Smaller diameter



Advantages of Roll-able ribbon: 2000f !



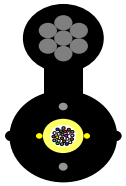
1000F Conventional Ribbon Slotted Core Cable
φ23.0mm, 0.45kg/m

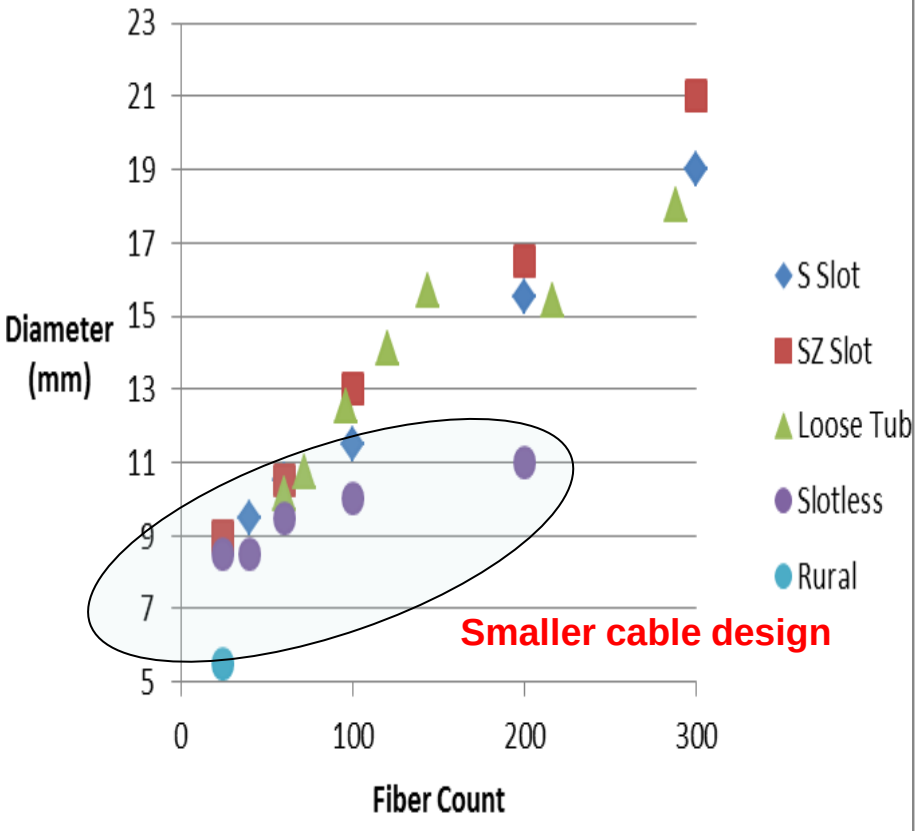
2000F Rollable Ribbon Central Core Cable
φ23.0mm, 0.40kg/m

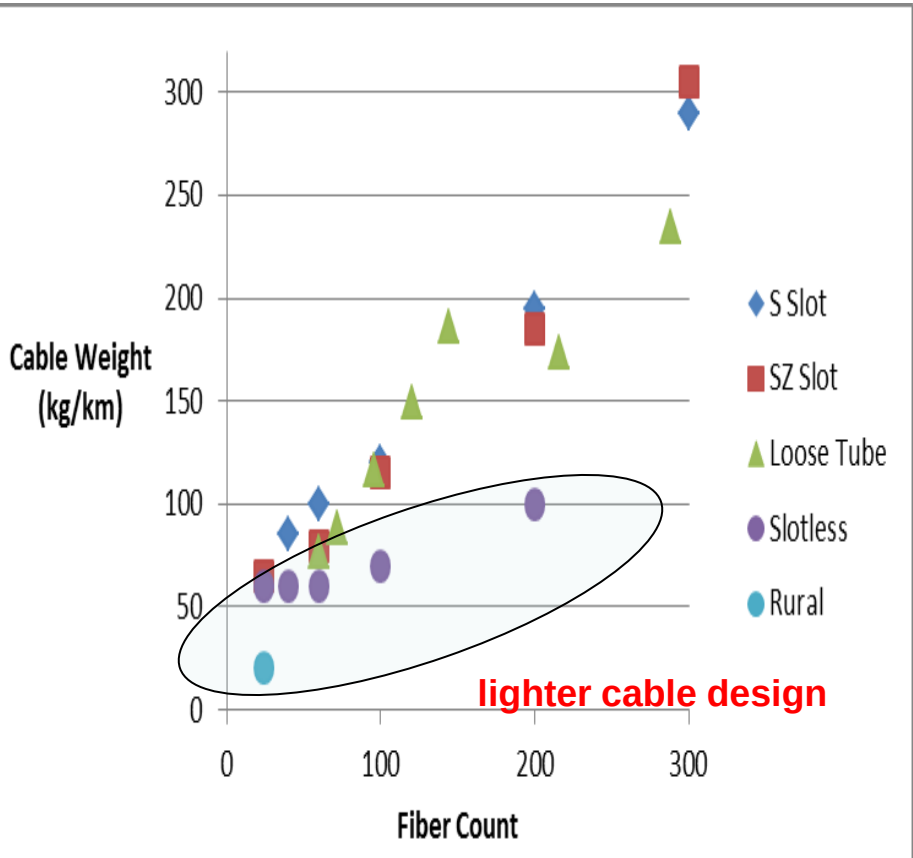
- Same diameter, but twice fiber counts
- Ultra high density cable that can be spliced as same as conventional one
- Max. 6000 fibers can be installed one duct (f 75mm)

Advantages of Roll-able ribbon: compact size







Roll-able ribbon can realize smallest and lightest cable

Standardization activities of roll-able ribbon

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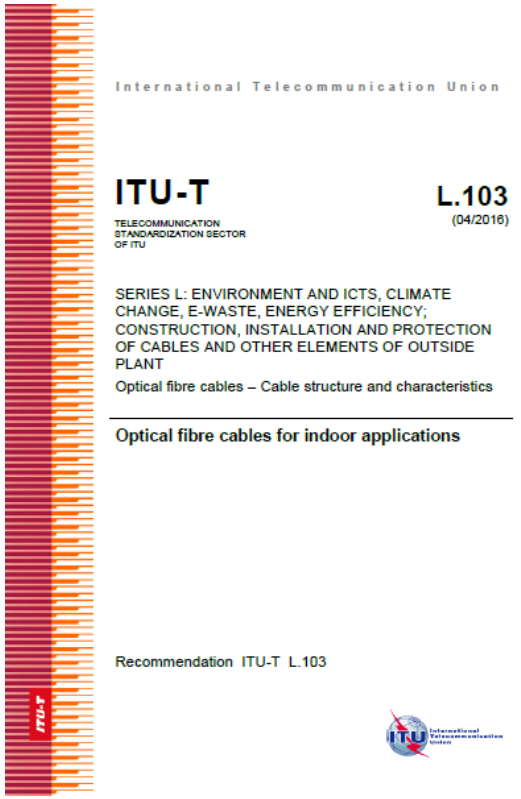
- Rollable ribbon

  Rollable Ribbon are recommended in ITU-T Rec. L.100-103 and will be specified at IEC standard in 2017.



International Telecommunication Union

ITU-T L.103

TELECOMMUNICATION STANDARDIZATION SECTOR OF ITU

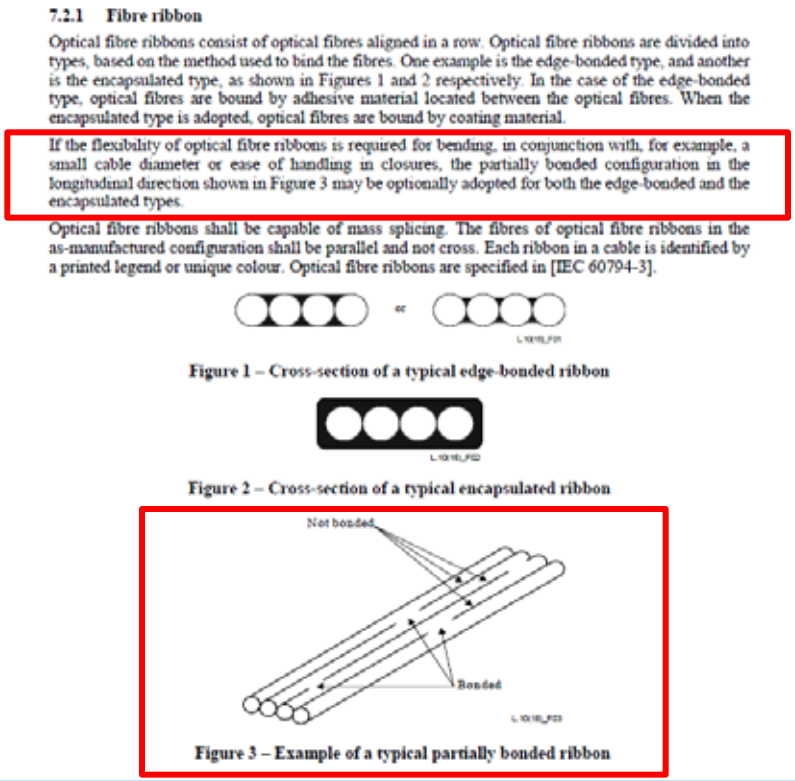
(04/2016)

SERIES L: ENVIRONMENT AND ICTS, CLIMATE CHANGE, E-WASTE, ENERGY EFFICIENCY; CONSTRUCTION, INSTALLATION AND PROTECTION OF CABLES AND OTHER ELEMENTS OF OUTSIDE PLANT

Optical fibre cables – Cable structure and characteristics

Optical fibre cables for indoor applications

Recommendation ITU-T L.103



7.2.1 Fibre ribbon

Optical fibre ribbons consist of optical fibres aligned in a row. Optical fibre ribbons are divided into types, based on the method used to bind the fibres. One example is the edge-bonded type, and another is the encapsulated type, as shown in Figures 1 and 2 respectively. In the case of the edge-bonded type, optical fibres are bound by adhesive material located between the optical fibres. When the encapsulated type is adopted, optical fibres are bound by coating material.

If the flexibility of optical fibre ribbons is required for bending, in conjunction with, for example, a small cable diameter or ease of handling in closures, the partially bonded configuration in the longitudinal direction shown in Figure 3 may be optionally adopted for both the edge-bonded and the encapsulated types.

Optical fibre ribbons shall be capable of mass splicing. The fibres of optical fibre ribbons in the as-manufactured configuration shall be parallel and not cross. Each ribbon in a cable is identified by a printed legend or unique colour. Optical fibre ribbons are specified in [IEC 60794-3].

or

Figure 1 – Cross-section of a typical edge-bonded ribbon

Figure 2 – Cross-section of a typical encapsulated ribbon

Figure 3 – Example of a typical partially bonded ribbon

Our Training experience (Global)

Colombia

Ecuador

Peru

Chile

Myanmar

Indonesia

Japan

Class room lecture

Practice training in Classroom

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Cable branching at Aerial closure

Field trial in a university

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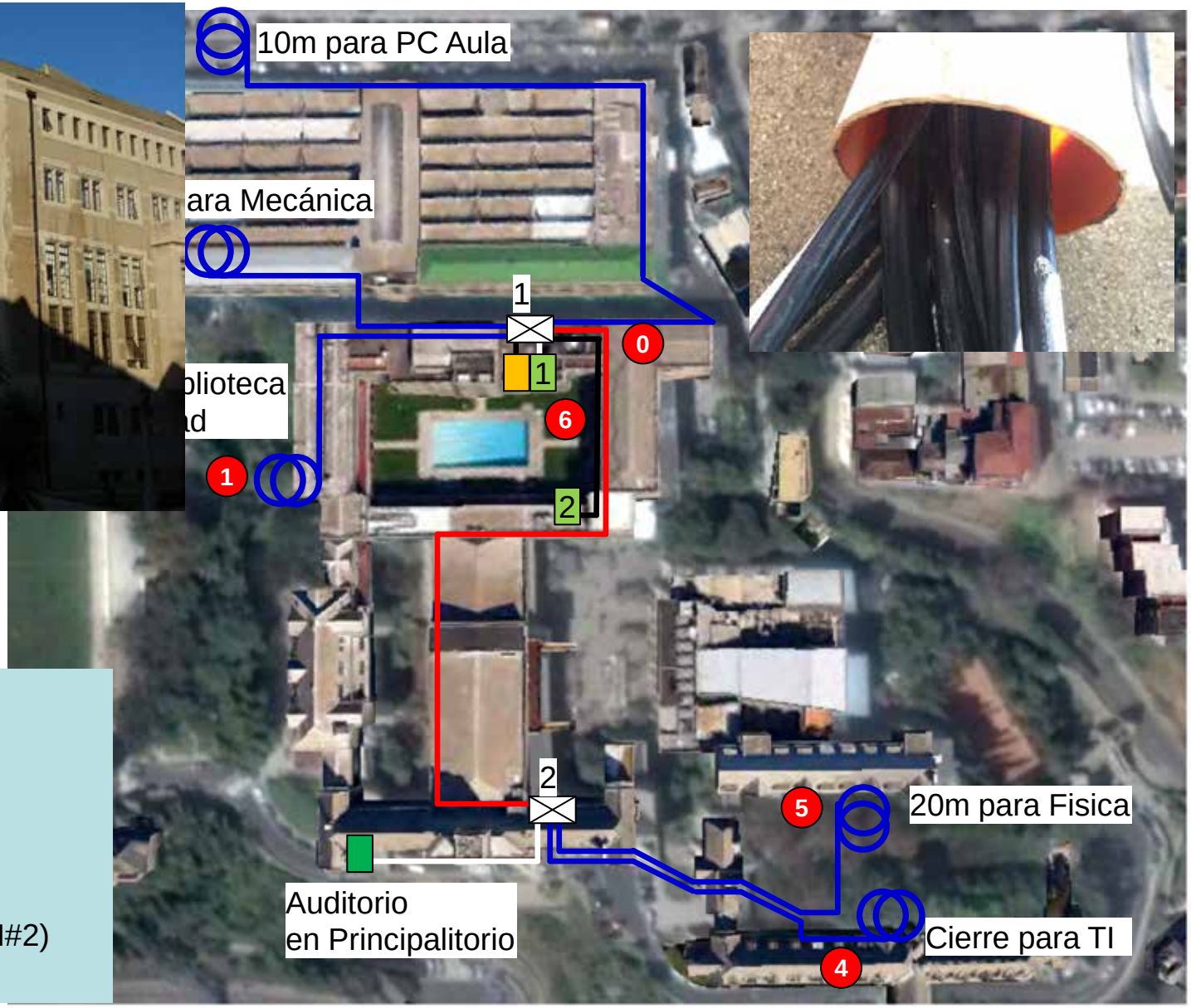
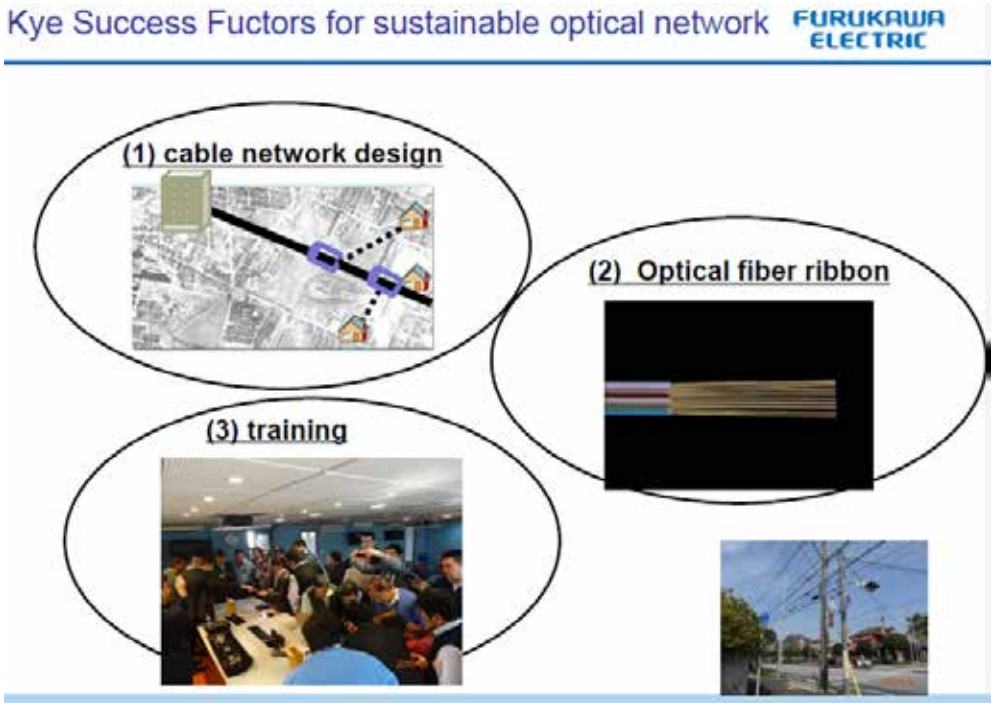


- 100F cable
- 12F cable
- 8F low friction cable
- 1F low friction cable
- Joint Box (J#1 y J#2)
- Sala de Servidores
- Sala Modelo (M#1 y M#2)
- Auditorio Principal

Summary

- **High quality products and well trained operations can reduce the operation cost. These items are necessary for establishment of sustainable infrastructure.**
- **We introduced our activities that help other countries to build reliable optical fiber networks rapidly by using Japanese technology.**

We welcome your offer !



Thank you !

Ichiro.kobayashi@furukawaelectric.com

Bound to Innovate