TELEKOM MALAYSIA BERHAD

CA-1C – FIBER OPTIC CABLE – INTERNAL

TM Training Centre

Training Content

Module 1- General Knowledge FTTH
✓HSBB/FTTH Structure
✓PON Component Characteristics
> ODF
> FDC
> Closure
> FDP (Overhead DP, Pedestal DP, UG DP)
> Splitter
Module 2: Cable And Infrastructure
✓Cable/Fiber
> Types of cable
> Color code

Training Content

Module 3- Internal Wiring Fiber
- ✓Drop fiber installation and termination
- ✓Internal fiber Installation

Module 4: Fiber Testing
- ✓PON OTDR
- ✓PON Power Meter
- ✓OLTS
- ✓Insertion Loss
- ✓Optical Return Loss
- ✓End to End Test

FTTH Network

Chapter 1: Introduction

- FTTH Structure
- PON Component Characteristic
- Safety Precaution

TM FTTH NETWORK

PASSIVE ELEMENT
GPON –Giga Passive Optical Network.

TM OFFICE

Drop Fiber

CUSTOMER

2:4 Splitter 1:8

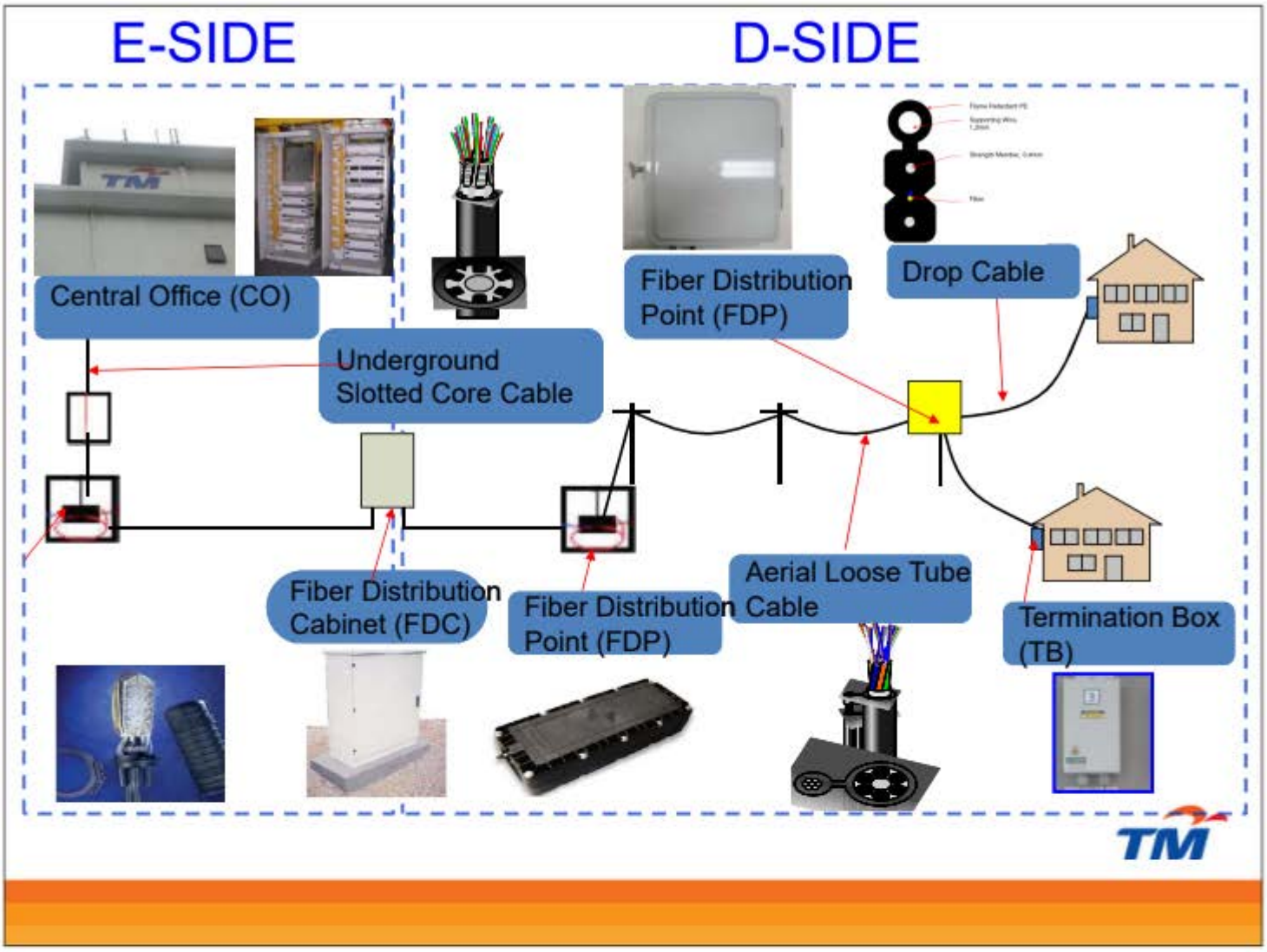
OLT ODF FDC FDP FTB FWS ONU

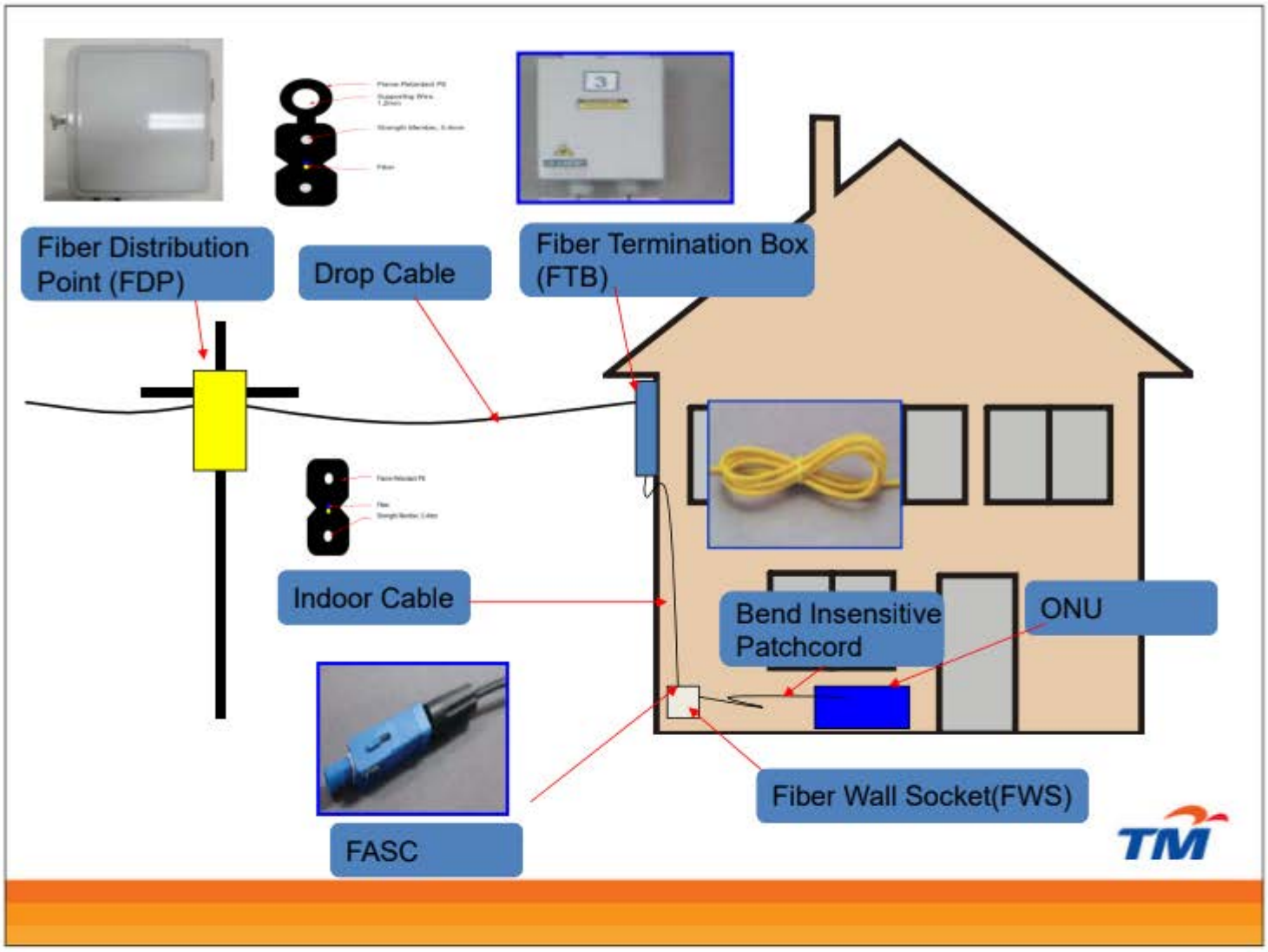
FWS

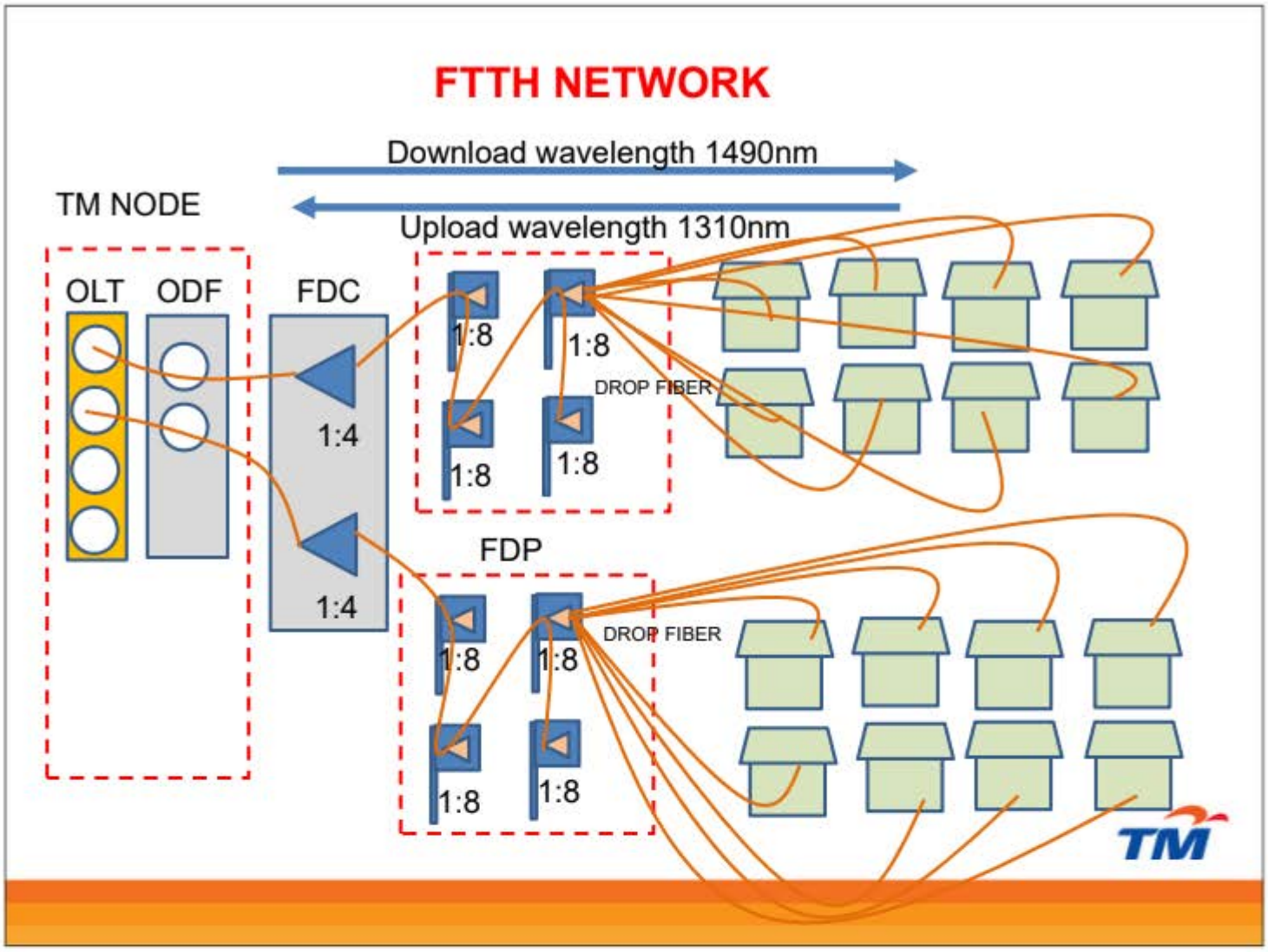
Exchange Side (E/S)

Distribution Side (D/S)

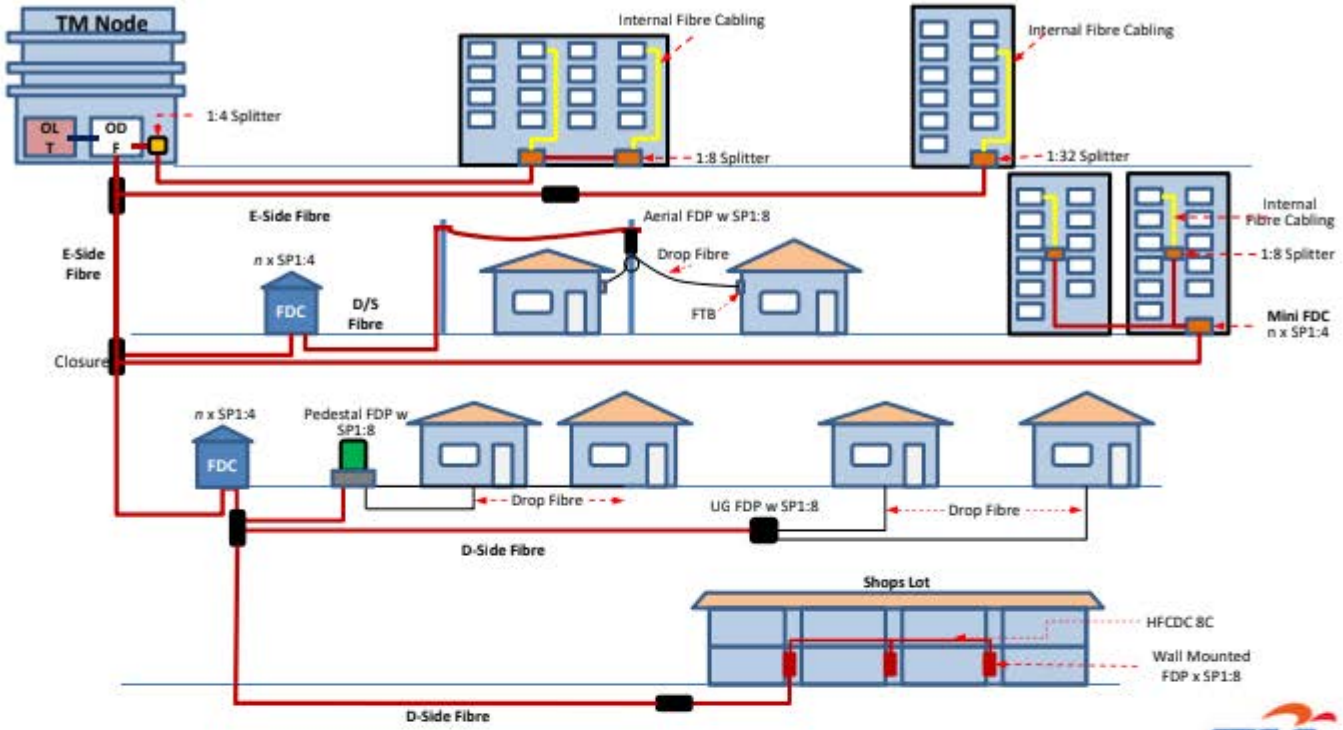
- **OLT** = Optical Line Terminal
- **ODF** = Optical Distribution Frame
- **FDC** = Fiber Distribution Cabinet
- **FDP** = Fiber Distribution Point
- **FTB** = Fiber Termination Box
- **FWS** = Fiber Wall Socket
- **ONU** = Optical Network Unit


E-SIDE
D-SIDE
Central Office (CO)
Underground Slotted Core Cable
Fiber Distribution Point (FDP)
Drop Cable
Fiber Distribution Cabinet (FDC)
Fiber Distribution Point (FDP)
Aerial Loose Tube Cable
Termination Box (TB)

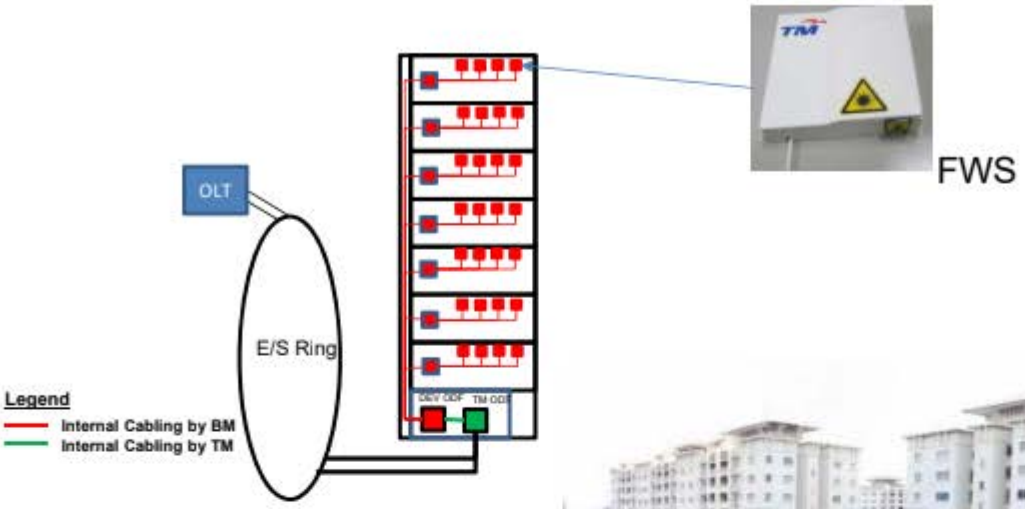

Fiber Distribution Point (FDP)
Drop Cable
Fiber Termination Box (FTB)
Indoor Cable
Bend Insensitive Patchcord
ONU
Fiber Wall Socket(FWS)
FASC


FTTH NETWORK
Download wavelength 1490nm
Upload wavelength 1310nm
TM NODE
OLT
ODF
FDC
1:4
1:4
1:8
1:8
1:8
1:8
DROP FIBER
FDP
1:8
1:8
1:8
1:8
DROP FIBER
TM

How FTTH Access Passive Network Was Designed?



FTTH to High Rise Building - Greenfield



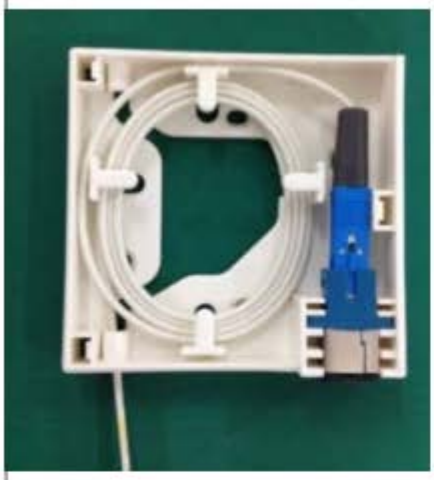
Aerial & Wall Mounted DP

Underground DP

Drop cable sealing and secure accessory

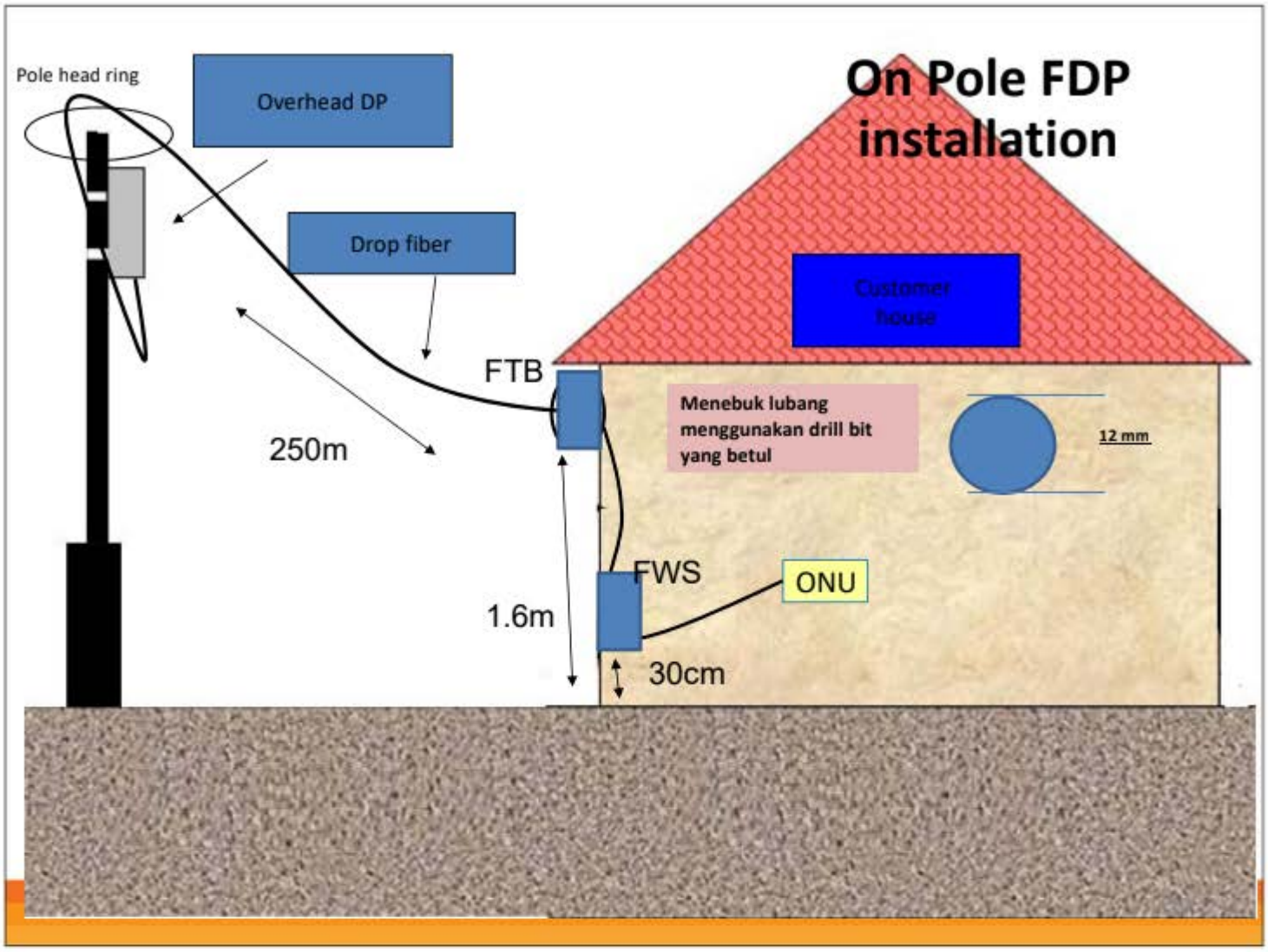
PEDESTAL DP

FWS (Fiber Wall Socket)



Features

- Ability to allow cables to enter from rear, bottom or of the unit.
- Proper routing, bend radius protection and strain relief of incoming cable
- Built-in auto shuttered SC adaptor as customer's required
- Drop cable terminated with field assembly or fusion splice with pigtail
- SC or duplex LC connector available
- Material is ABS/PC and Flame retardant


On Pole FDP installation
Pole head ring
Overhead DP
Drop fiber
Customer house
FTB
Menebuk lubang menggunakan drill bit yang betul
12 mm
250m
FWS
ONU
1.6m
30cm

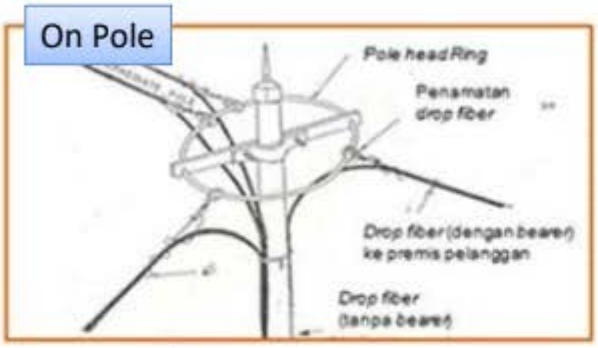
PRE-CONNECTORIZED DROP FIBRE

SWING ISSUE: STATISTIC ON POLE & UNDERGROUND INSTALLATION

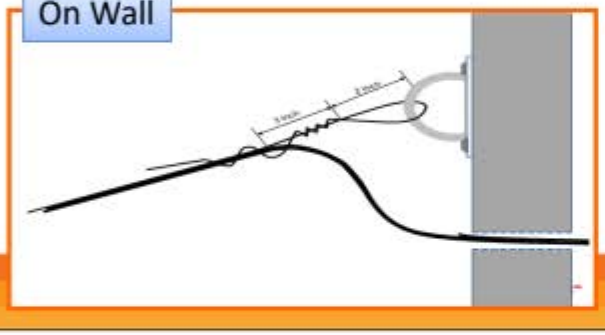
As described in the Work Instruction for On Pole drop fiber installation, good cable bearer installation shall minimize swinging impact to the connector.

Cable Bearer Installation Procedure For Drop Fiber

On Pole

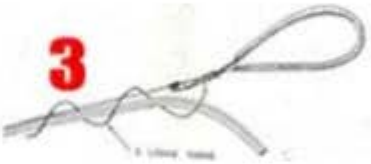


On Wall

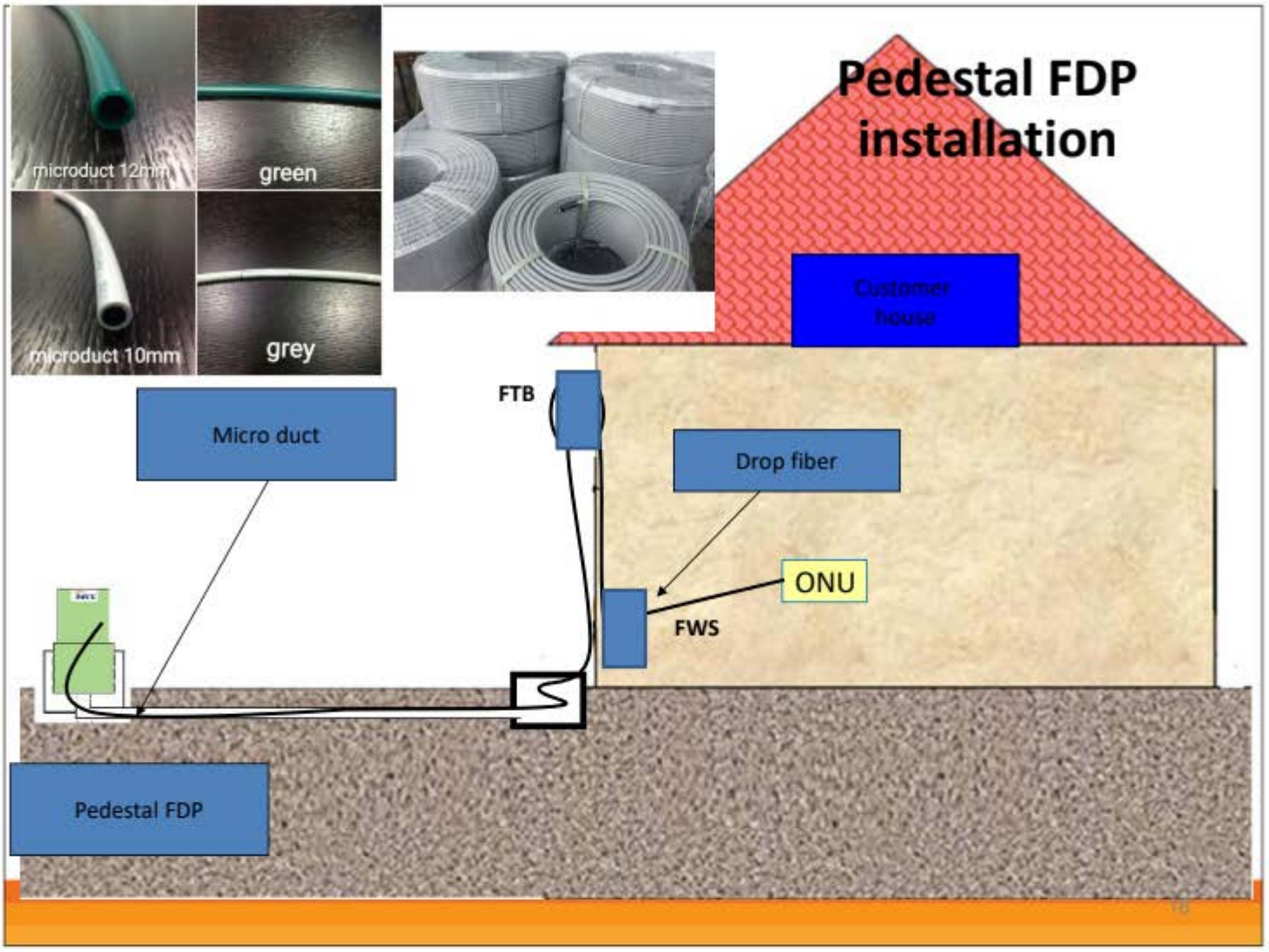


1. Penamatan *drop fiber* pada *pole head ring* dan pintal sebanyak 3 kali

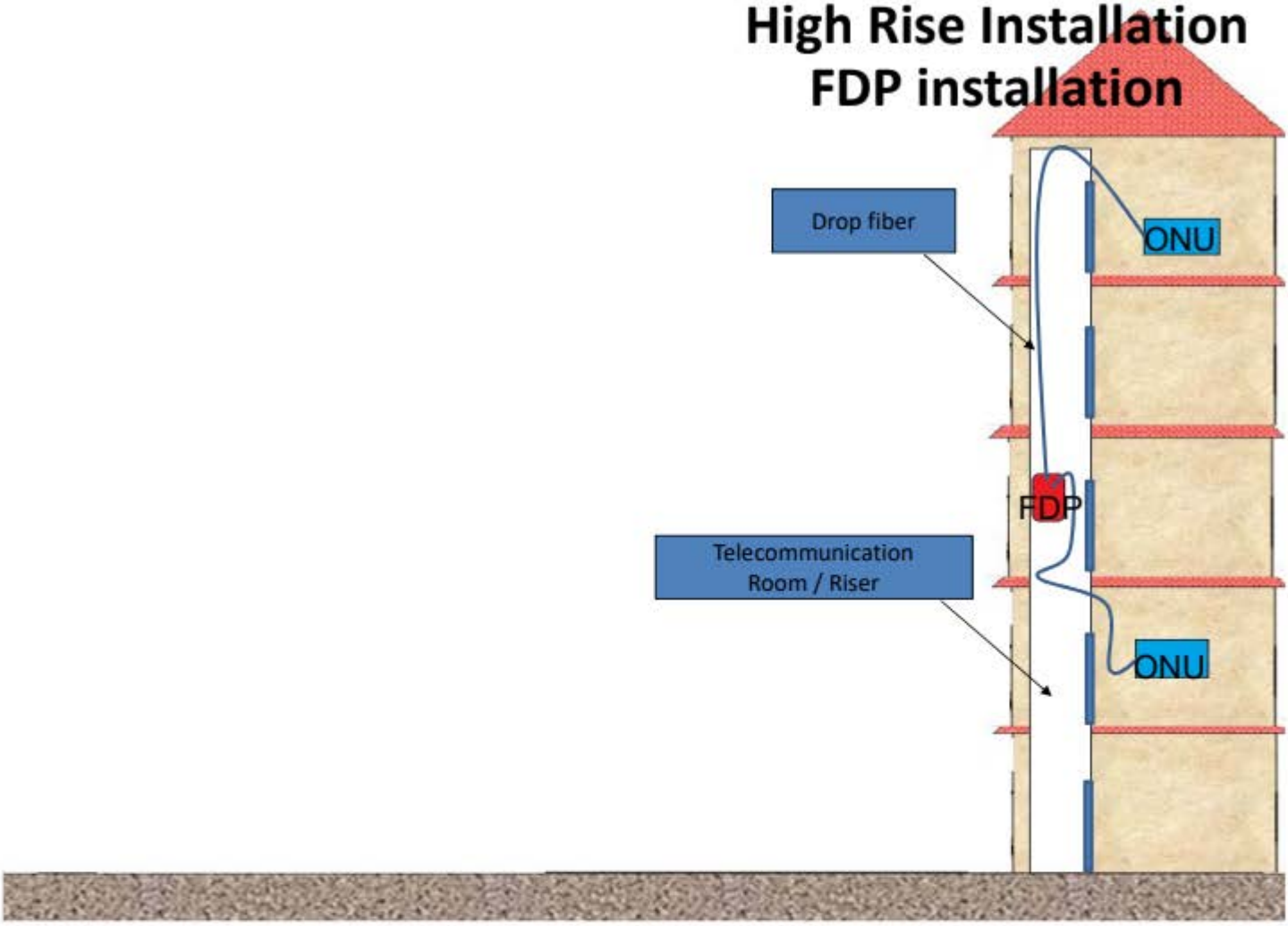
2. Pintalan seterus sebanyak 3 kali dilakukan di hujung berdekatan dengan *pole head ring*



3. Seterusnya, sekurang-kurang 2 pintalan dilakukan pada *drop fiber*.


microduct 12mm
green
microduct 10mm
grey
Pedestal FDP installation
Customer house
FTB
Micro duct
Drop fiber
ONU
FWS
Pedestal FDP

High Rise Installation
FDP installation




8


DP
TKT - 6
101 - 120
A-2
MRI
C 134 M
DP 0015

Interconnection of BTU and CPE for FTTH UNIFI

Content – Triple Play

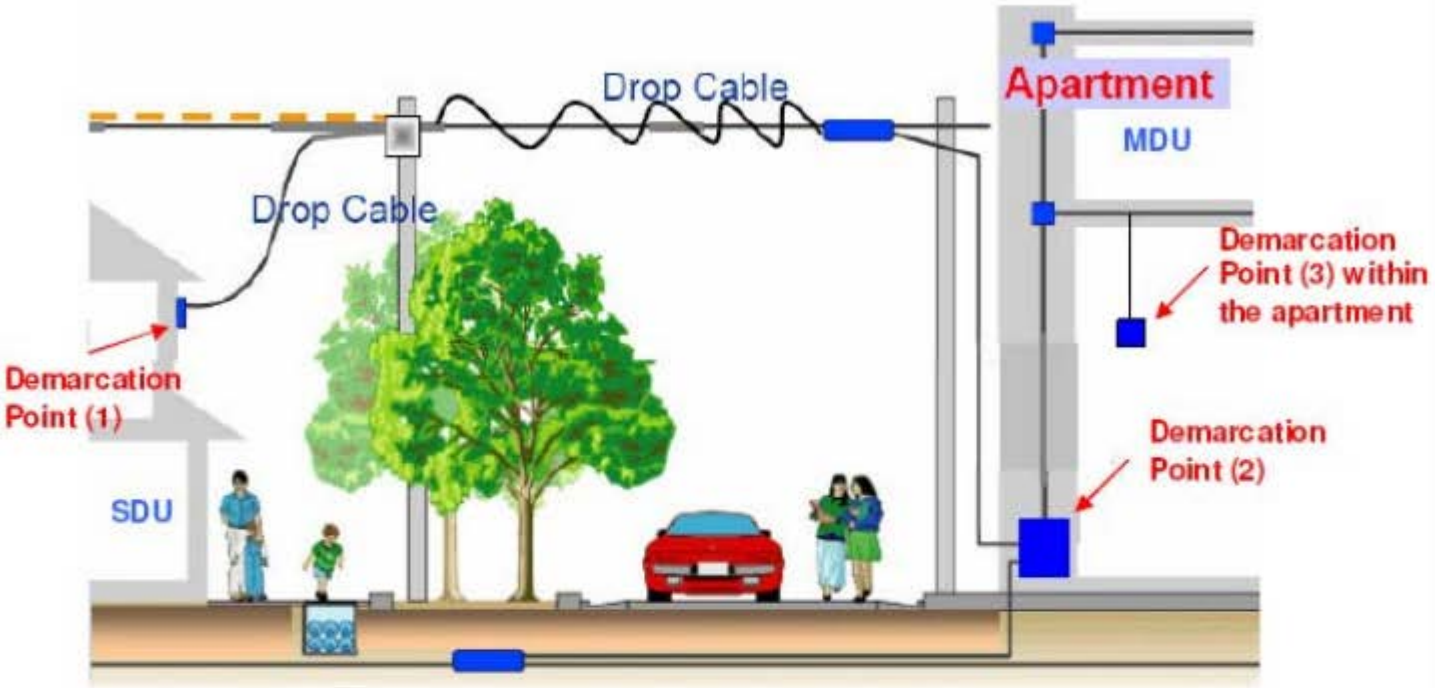
- ***Triple play – Voice, Video and Data***

- ***Voice –*** VoIP (Voice over IP) is used instead of conventional PSTN system. VoIP lowers telephony cost

- ***Video –*** IPTV over PON offers broadcast TV and also Video on Demand at SDTV and also HDTV quality

- ***Data –*** High Speed Broadband at 100Mbps and 1Gbps are currently available.

Demarcation points



Passive Elements

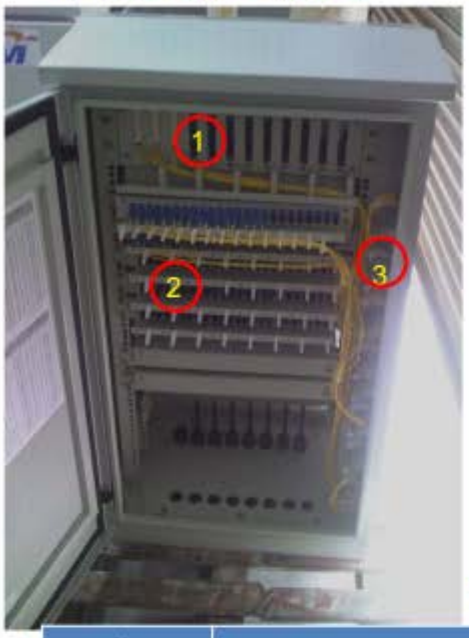
OPTICAL DISTRIBUTION FRAME

Fiber Dustribution Panel

Cable Management

FDC

FRONT SIDE



REAR SIDE

No	Description
1	Splitter Compartment
2	Patch Panel
3	Cable Management
4	Splicing Tray
5	Outdoor Cable Entry (E-side and D-side)

OPTICAL POWER SPLITTER

No	Description
1	Splitter Input
2	Splitter Module
3	Splitter Output
4	SC Connector

Type of Connectors

E2000

SC

FC

LC

PRODUCTS	PRODUCT DETAILS
ADAPTERS & ATTENUATORS	SC/UPC & E2000/APC ADAPTERS & ATTENUATORS

- Adapter : to connect between two connectors
- Used at ODF, FDC, FDP, TB and Fiber Socket
- Types of adapter :

E2000 Adapter

SC Adapter

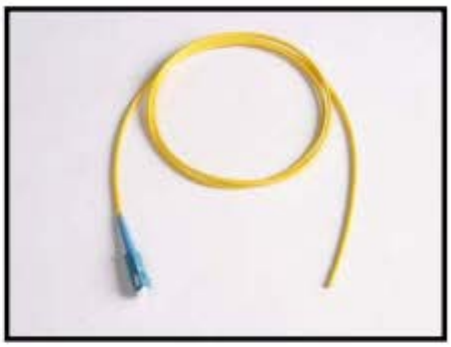
FC Adapter

LC Adapter

Pigtail

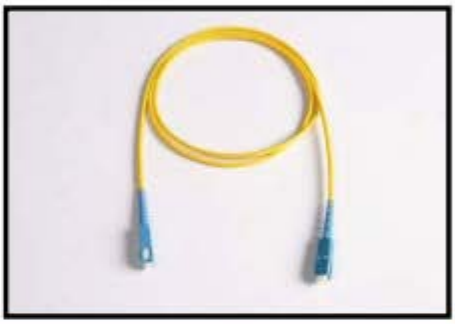
- Used at :-

  ODF - spliced with E-side cable and then patched at adapter for interconnection between OLT and E-side cable



Patchcord

- Used at ODF for interconnection between OLT and ODF
- Conform to the ITU-T Rec G.652D standard



CLOSURE

SPLICING TRAY

DOME

CABLE INLET/OUTLET

CLAMP

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SAFETY GEAR AND PRECAUTION

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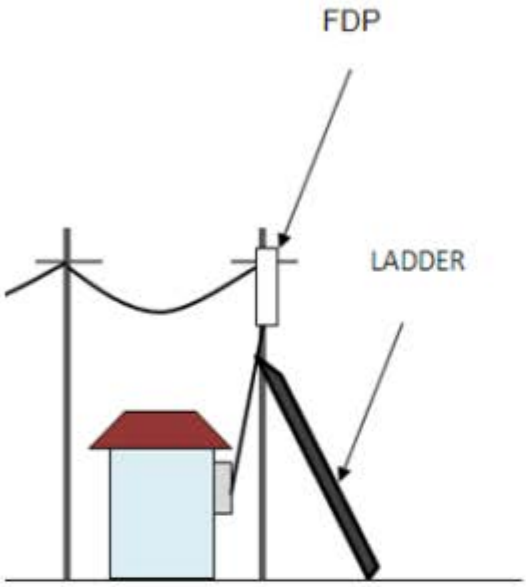
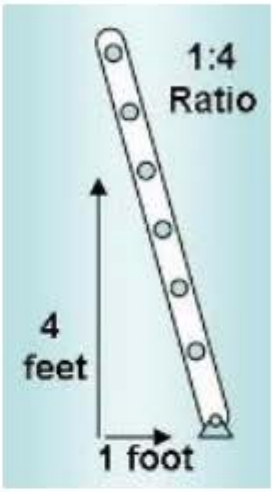
LADDER SAFETY

Set the ladder angle



Set the ladder angle



Letakkan tangga satu perempat daripada ketinggian tiang

Full body harness for overhead work

Alatan keselamatan yang perlu digunakan ketika memanjat tiang DP

Manhole Safety

Authorized Gas Tester (AGT) means:
a person who appointed by employer to carry out atmosphere test and had attended a training course on safe working in confined space for Authorized Gas Tester and Entry Supervisor and passed the test or examination of Authorized Gas Tester

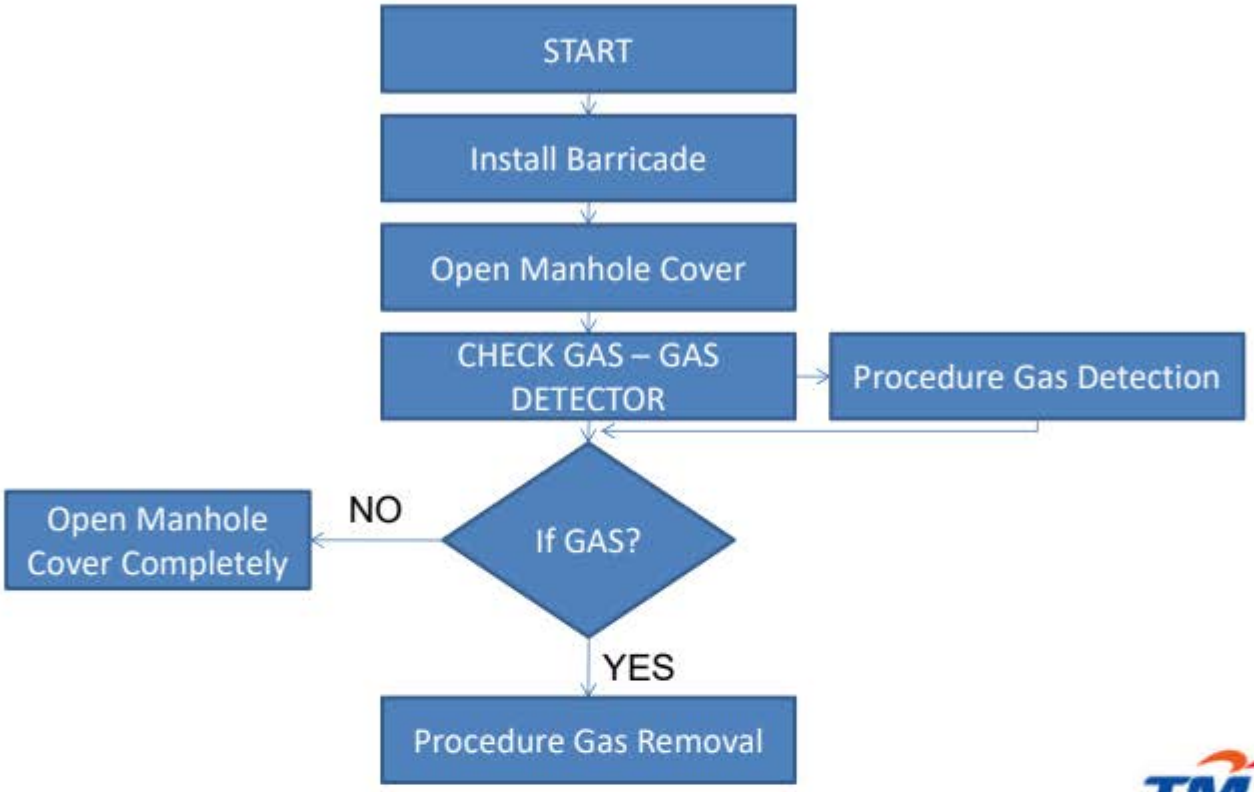
Authorised Entrant & Standby Person for Confined Space (AESP)

Authorised Gas Tester and Entry Supervisor for Confined Spaces (AGTES)

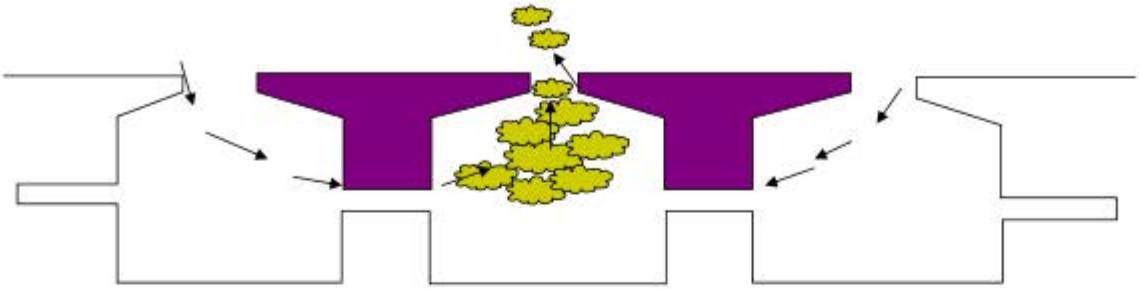
Hazardous Gasses

Hazardous Gas	Type of Gas
Explosive / Flammable	Petrol-Methane
Gas that cause suffocation	a) Carbon monoxide b) Carbon dioxide
Poisonous	Hydrogen sulfide

MANHOLE


START
Install Barricade
Open Manhole Cover
CHECK GAS – GAS DETECTOR
Procedure Gas Detection
If GAS?
NO
Open Manhole Cover Completely
YES
Procedure Gas Removal

GAS REMOVAL PROCEDURE



a) Use Blower / Exhaust fan
b) Open nearby manhole cover

Drilling Operation

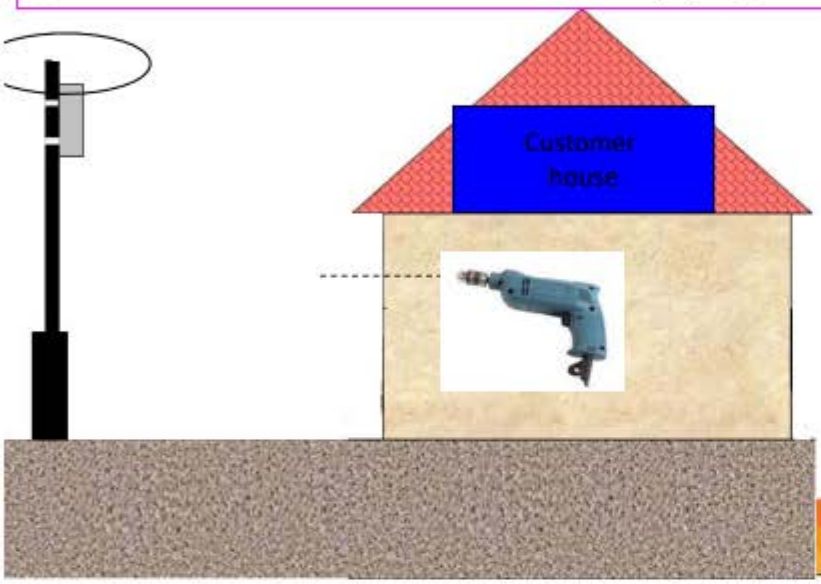
Drilling must be inside the house to the outside house

To make sure less breaking to the wall inside the house while drilling operation.

Plaster filling must be applied after drilling operation

To rebuild the surface of wall that broken because of drilling.

Use the metal detector to detect metal piping inside the wall



Peralatan keselamatan yang diperlukan oleh 'Installer" sebelum melakukan kerja-kerja penggerudian ialah: **Goggle, sarung tangan, topi keledar keselamatan & penutup telinga**

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TOOLS AND TEST GEARS FOR FTTH

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Power Meter

This product is GPON power meter for testing FTTx optical network. It allows for the testing of passive optical networks (PONs) at the three main wavelengths (1310, 1490 and 1550 nm) used in fiber-to-the-home (FTTH) and fiber-to-the-premises (FTTP).

Visual Fault Locator

1mW 5KM Visual Fault Locator Fiber Optic Cable Tester Meter

10mW 10-12KM Visual Fault Locator Fiber Optic Laser Cable Tester

TOOLS FOR SPLICING

Cleaver

99% Isopropyl Alcohol

Fiber Optic Disposal Unit

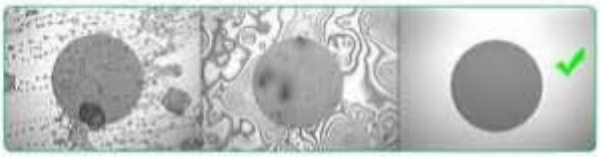
Fiber Stripper

lint free tissues

Cable Sheath Stripper

Fiber Cleaning Kits

99% fiber alcohol wipes



Before → After

One Click Cleaner

lint-free tissues

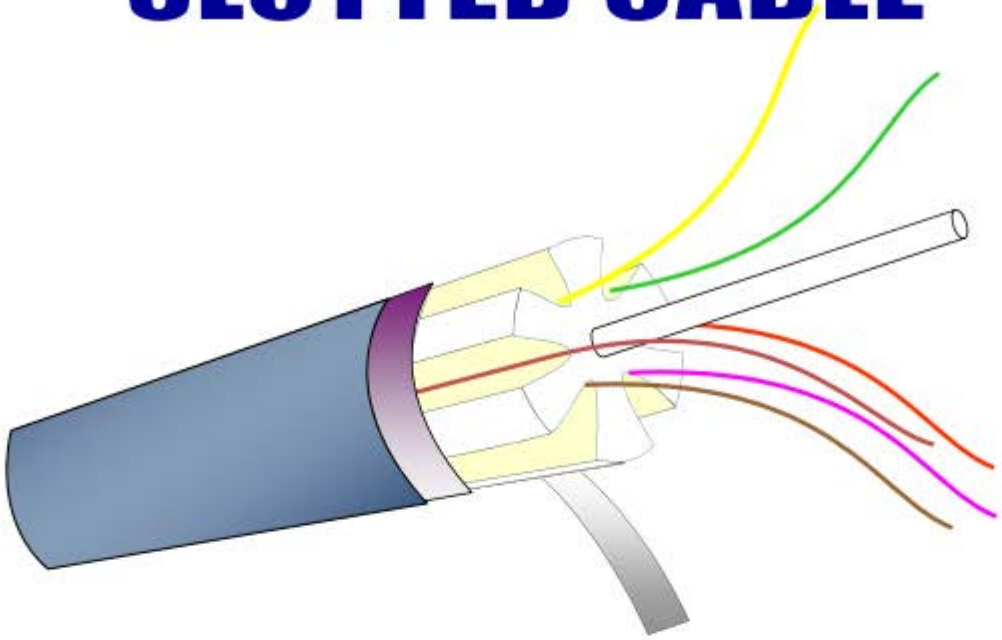
99% Isopropyl Alcohol

lint-free swab

Fiber Cassette Cleaner

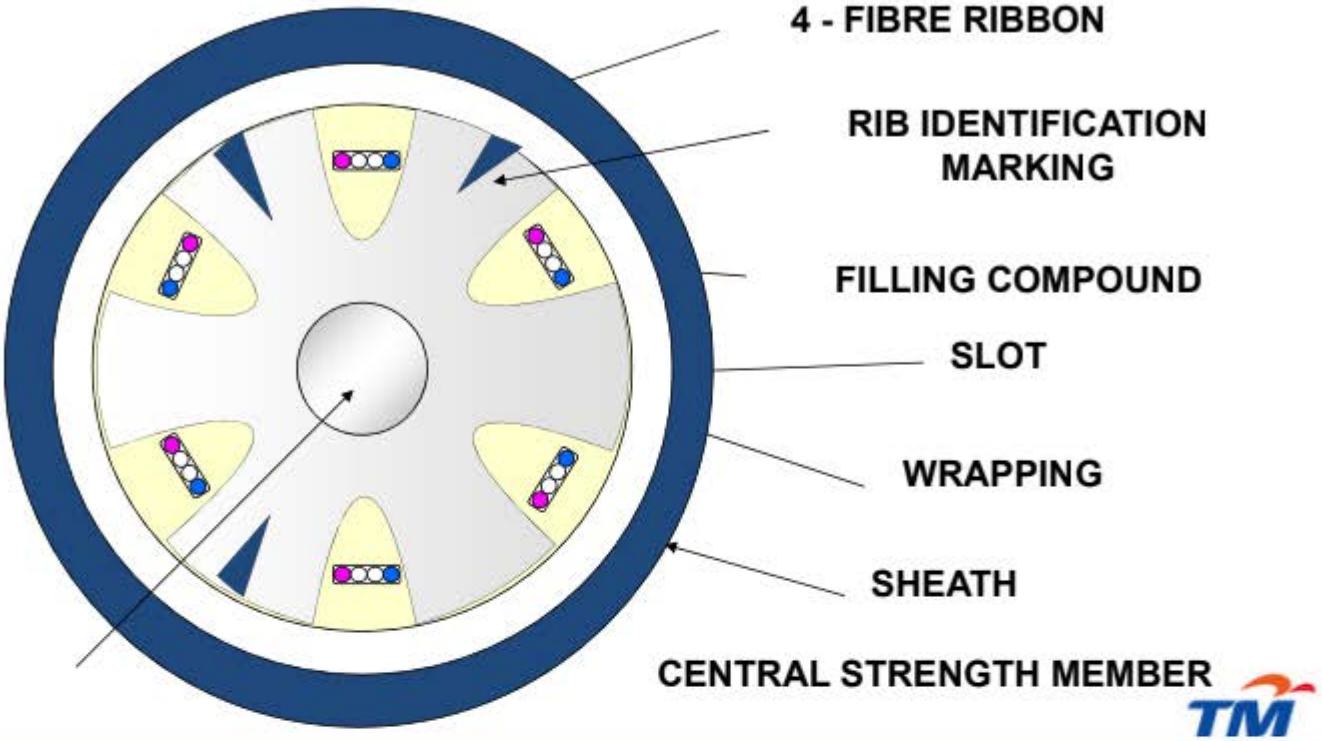
Cable and Infrastructure

SLOTTED CABLE



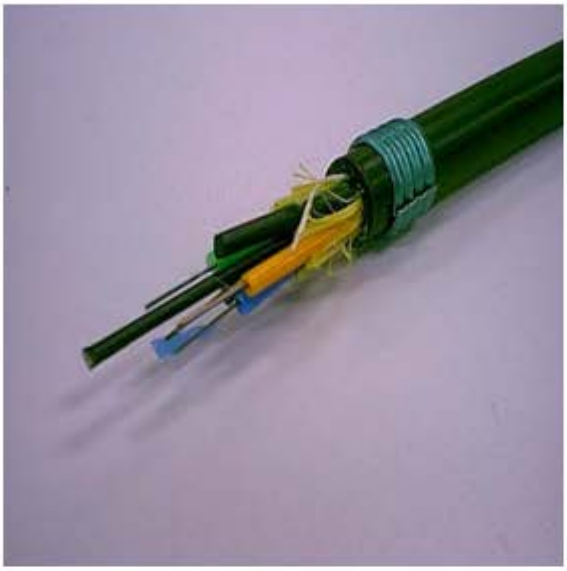
CONSTRUCTION OF SLOTTED CORE OPTICAL FIBER CABLE

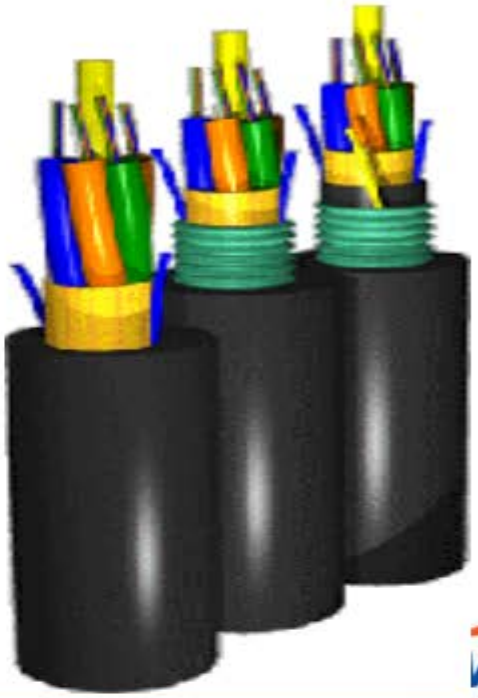
CROSS-SECTION OF COMPLETED CABLE 24 FIBER RIBBON



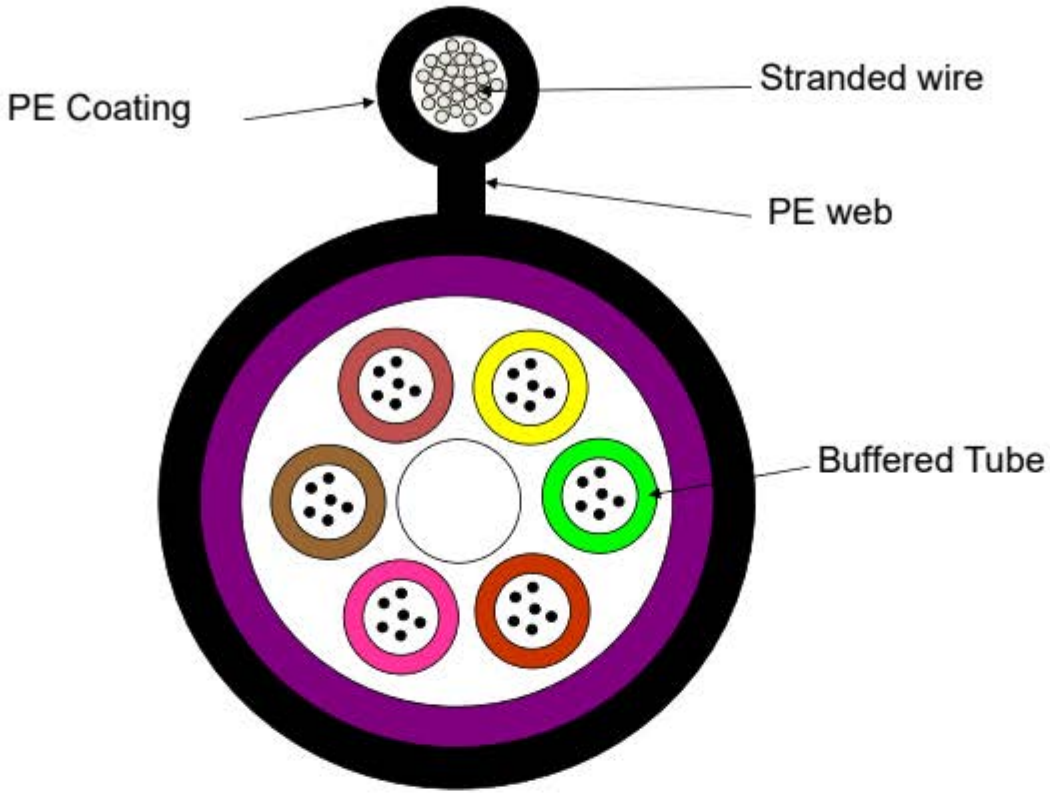
Basic Cable Design

- **Loose-tube fiber cable**



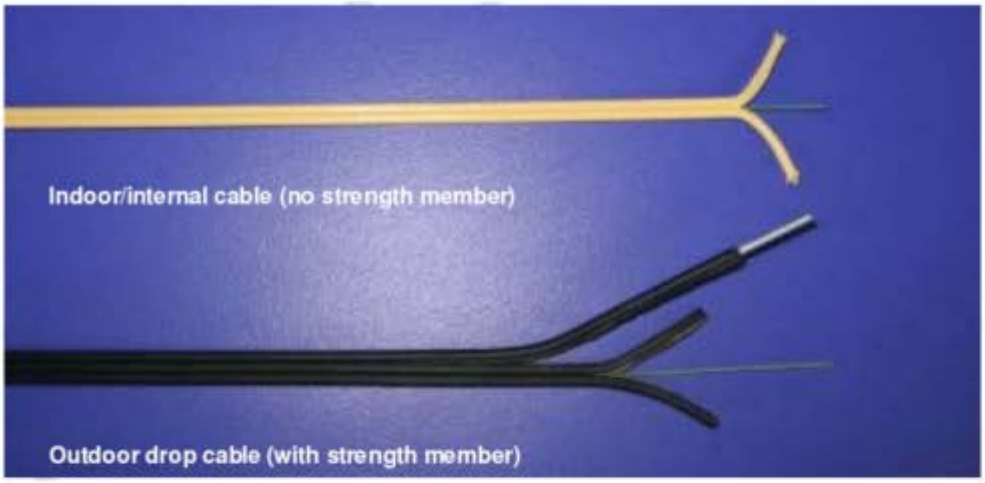


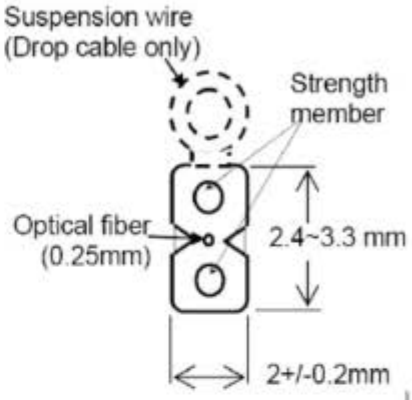
CONSTRUCTION OF LOOSE BUFFERED TUBE OPTICAL FIBER CABLE



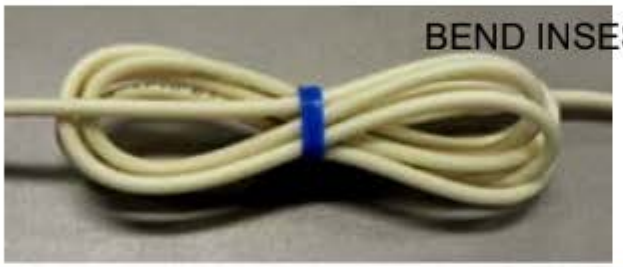
36 core

Drop & Indoor Cables

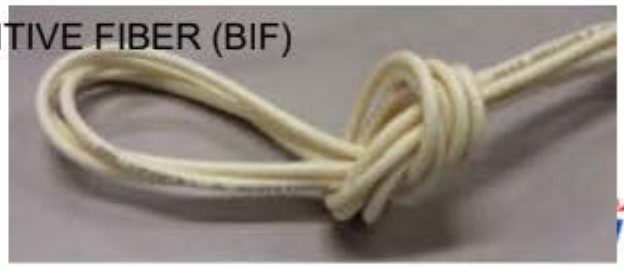




BEND INSESITIVE FIBER (BIF)



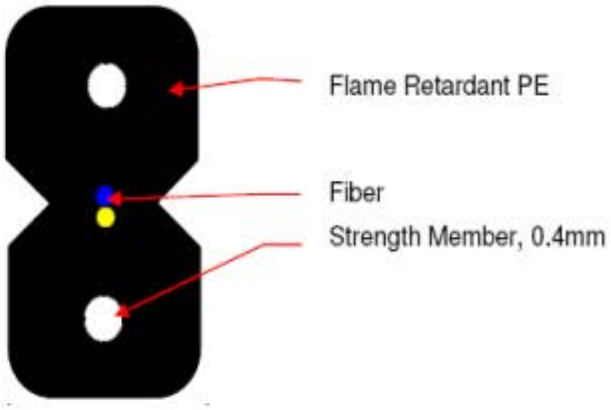
▲「PureFlex-slim」を束ねた状態



▲「PureFlex-slim」を縛った状態

Indoor Cable Series

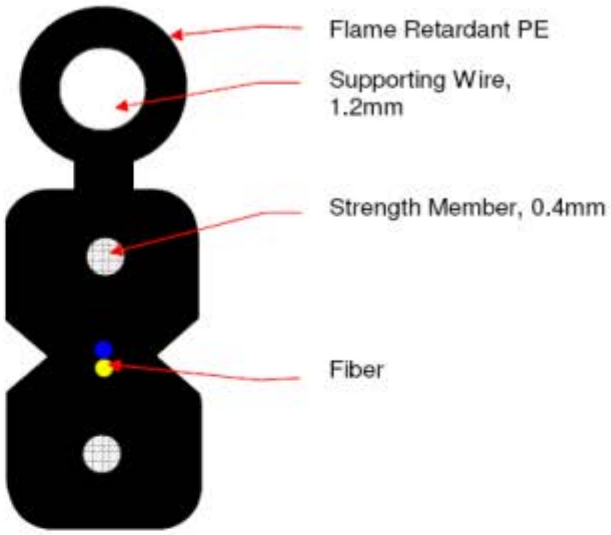
- For indoor installation
- Used for connection between Termination Box and Fiber Socket
- One or two fiber; ITU-T Rec G657 (Bend Insensitive Fiber)
- Halogen Free Flame Retardant sheath
- Estimated Fiber Loss : 0.4 dB/km



X-Sectional for Indoor Cable

Drop Cable Series

- For outdoor installation
- Used for connection between Fiber Distribution Point and Termination Box
- One or two fiber; ITU-T Rec G657 (Bend Insensitive Fiber)
- Halogen Free Flame Retardant sheath
- Estimated Fiber Loss : 0.4 dB/km



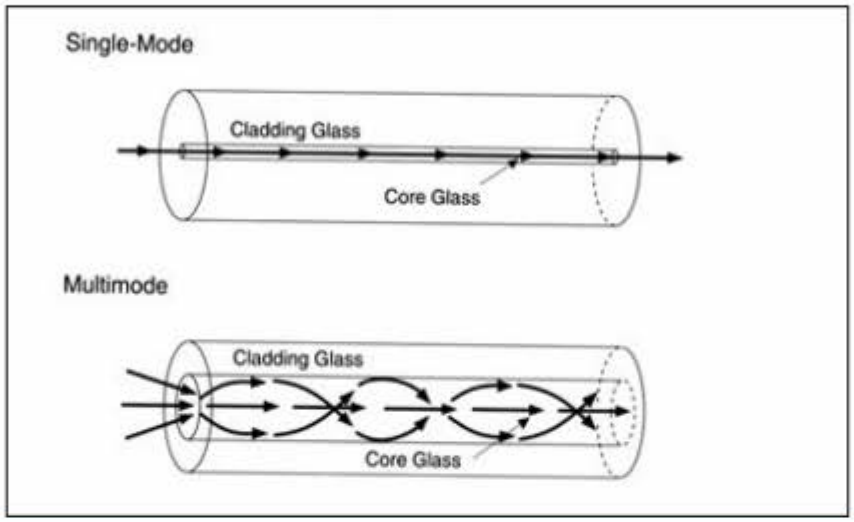
X-Sectional for Drop Cable

Patch cord

	G.652D	G.657A	G.657B
Bending radius	30mm	15mm	7.5mm
Used at:	OLT-ODF	FDP-FTB	FWS-ONU
		FTB-FWS	

Types of Fiber Optic

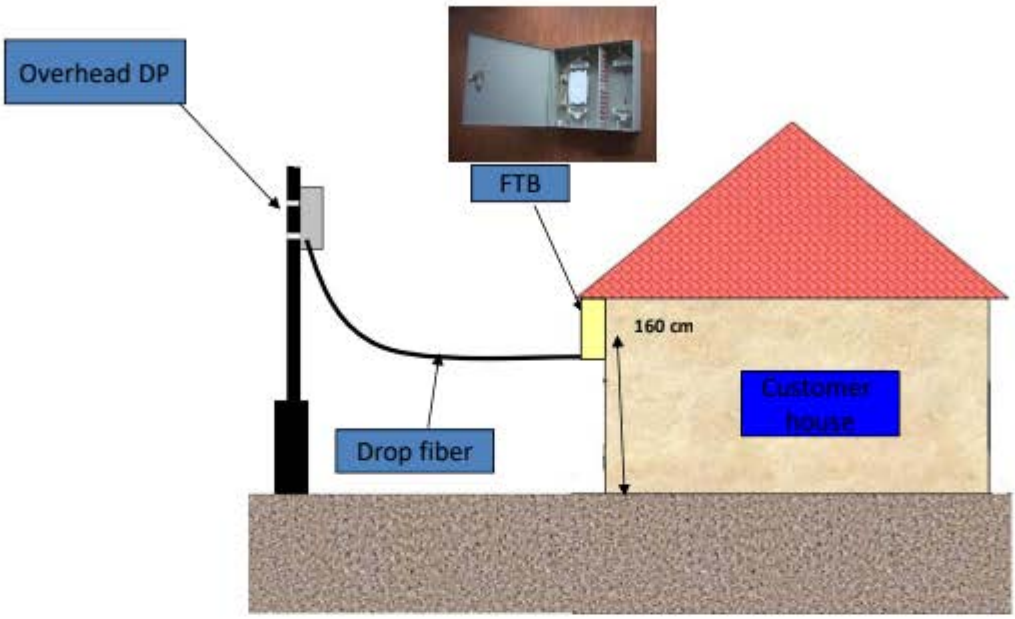
Single-mode fiber gives you a higher transmission rate and up to 50 times more distance than multimode, but it also costs more. Single-mode fiber has a much smaller core than multimode.



Internal Wiring Fiber

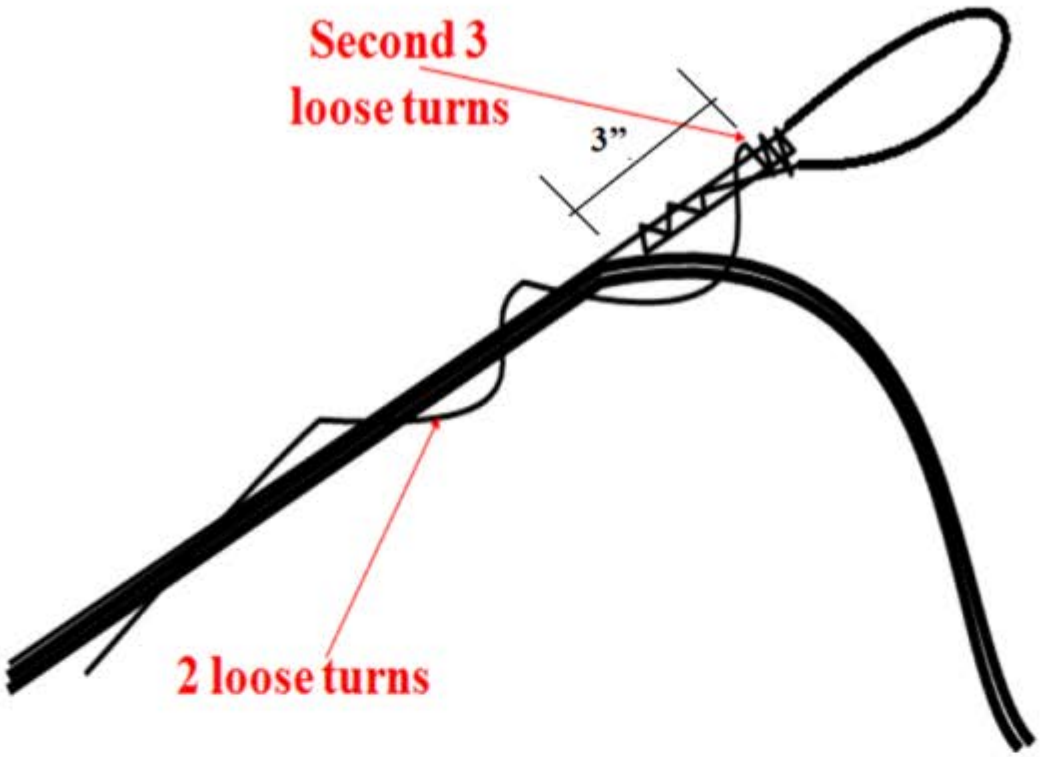
MAIN PROCESS	ACTION DETAILS
1.0 COMMUNICATION WITH CUSTOMER	1.1 CALL CUSTOMER TO CONFIRM APPOINTMENT FOR INSTALLATION.
2.0 SITE SURVEY ASSESSMENT	2.1 INFORM CUSTOMER TO PERFORM INSTALLATION. 2.2 PERFORM CUSTOMER PREMISE SURVEY. SITE PREPARATION.
3.0 EXTERNAL AND INTERNAL INSTALLATION / OPERATION	3.1 FA-SC CONNECTOR INSTALLATION. 3.2 DROP FIBER PULLING AND FTB INSTALLATION. 3.3 DRILLING OPERATION. 3.4 INTERNAL WIRING INSTALLATION 3.5 FIBER WALL SOCKET INSTALLATION
4.0 ONU INSTALLATION AND OPERATION	4.1 INSTALL ONU INSIDE CUSTOMER HOUSE. 4.2 INSTALL RG AND SET TOP BOX INSIDE CUSTOMER HOUSE.
5.0 RG AND SET TOP BOX INSTALLATION AND CONFIGURATION	5.1 MAKE CONNECTTION FROM RG AND SET TOP BOX.
6.0 TESTING, DEMONSTRATION AND ACCEPTANCE BY CUSTOMER	6.1 TESTING 6.2 DEMONSTRATION ON SERVICES. 6.3 CUSTOMER WILL BE EVALUATE THE TESTING AND DEMO.
7.0 SITE CLEANLINESS	7.1 CLEAN CUSTOMER PREMISE AFTER INSTALLATION.

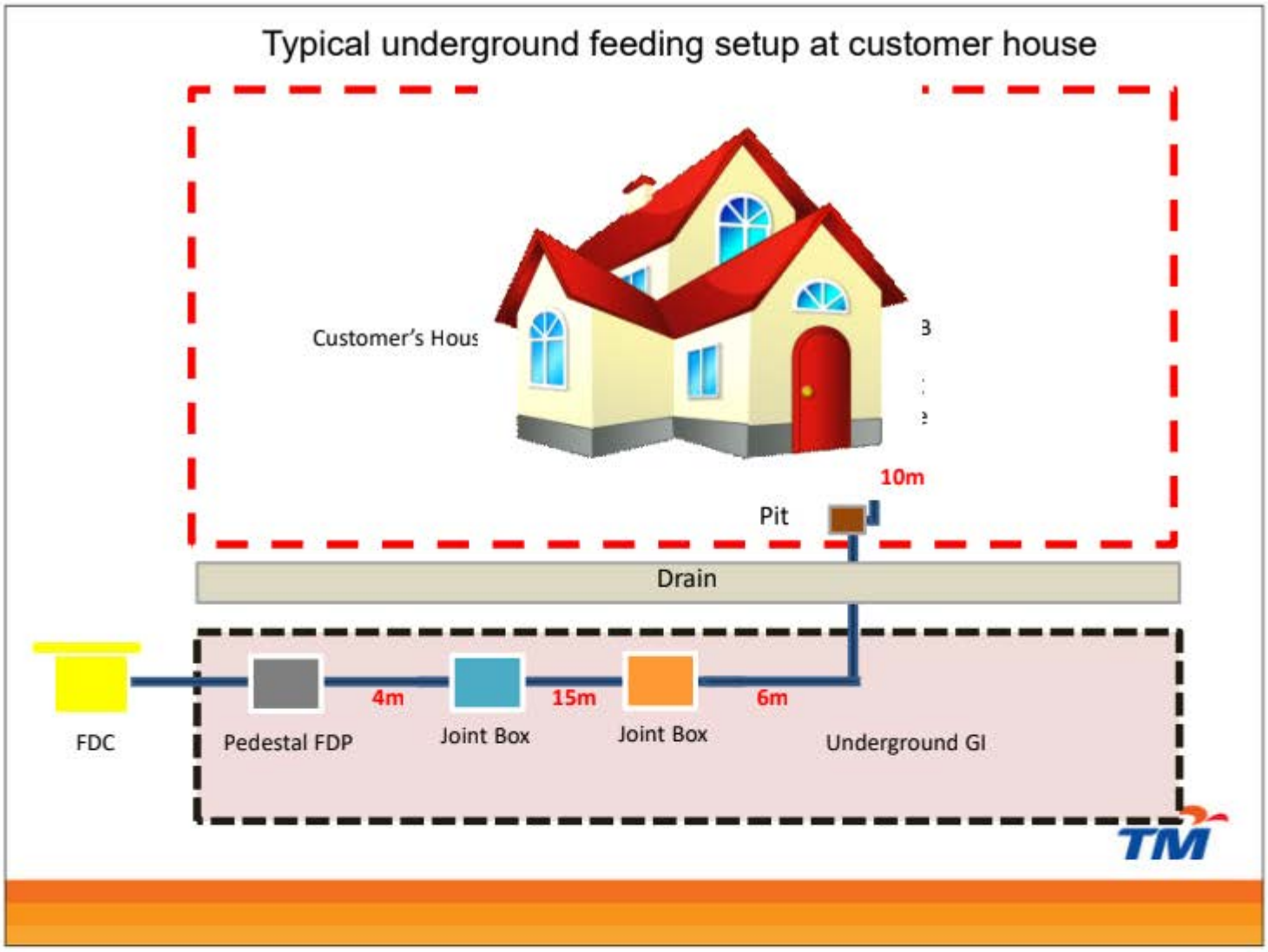
FTTH Overhead Installation…



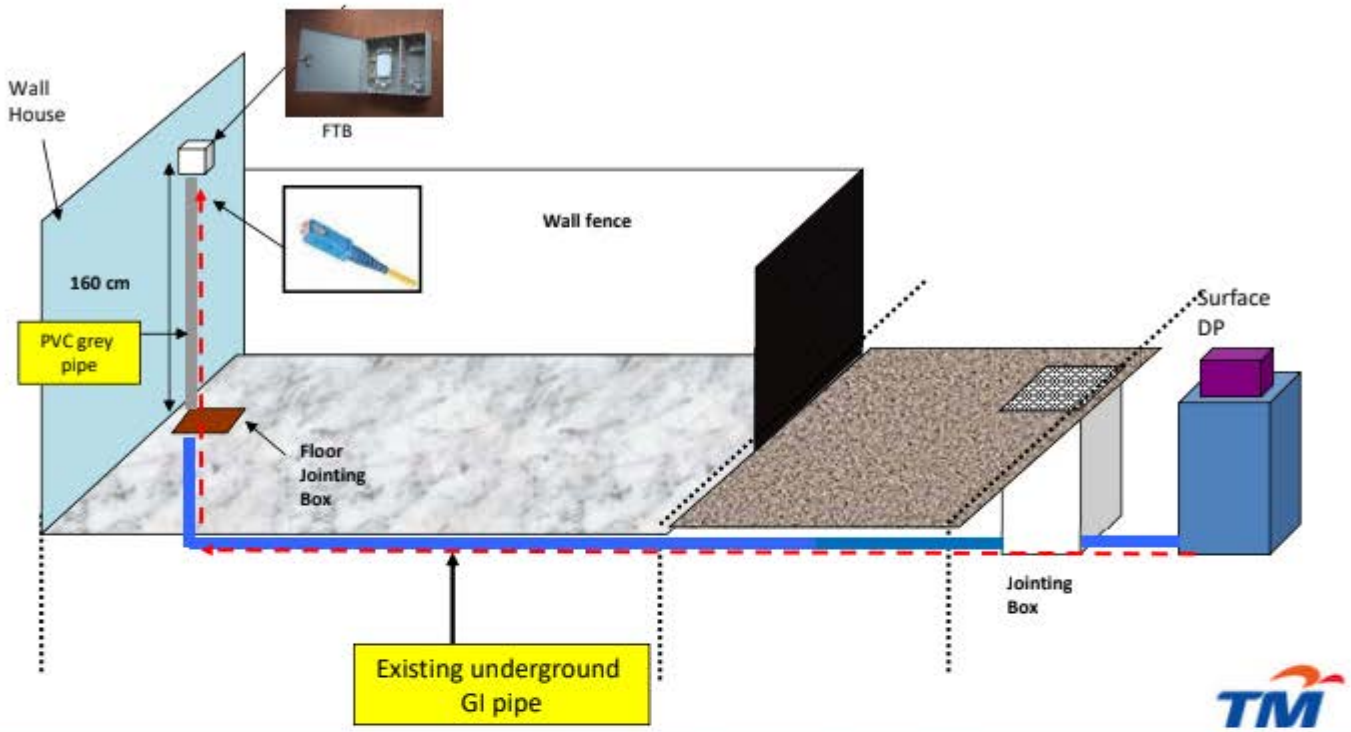
Note : FTB will be drilled onto surface wall.

Termination IB wire at ring pole and D-hook



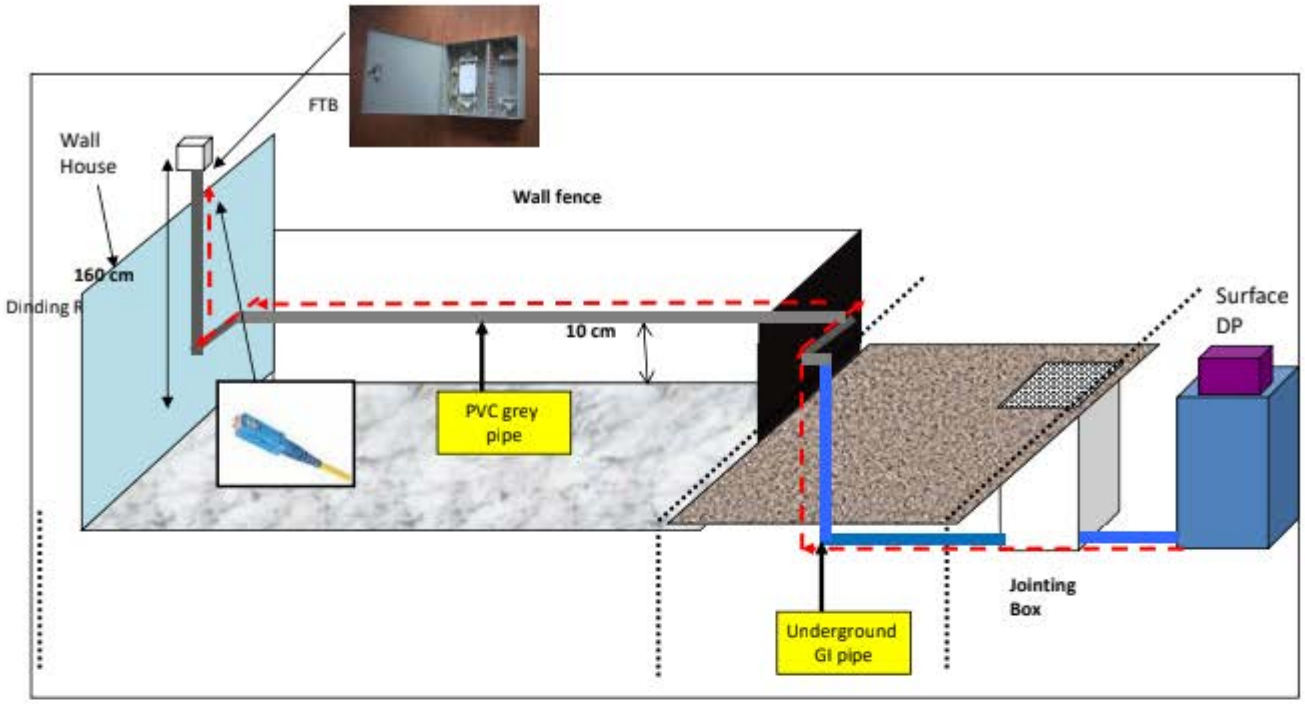

Typical underground feeding setup at customer house
Customer's Hous
10m
Pit
Drain
FDC
Pedestal FDP
4m
Joint Box
15m
Joint Box
6m
Underground GI

FTTH Underground Installation (Using Existing Piping)



Note : 1) FTB will be drilled onto surface wall.

FTTH Underground Installation (Using New Piping)



Note : 1) PVC pipe will fixed on the surface of the wall fence using stainless still clips (drilled to the wall)

2) FTB will be drilled onto surface wall.

Site Preparation

Preparation of site is important to eliminate safety hazards or operational risks during the installation process.

Make sure environment is safe to start work.

For outdoor installation, installation team must use a proper ladder for aerial work. Ladder is leaned to the pole at angle of 30° ensuring a flat surface at ground level.

Equipment that will be used must be in good condition and safe.

Installation team must use the safety belt or harness is clamped properly to the pole to ensure stability.

Harness is used for safety of the installation team while on the ladder at pole.

TM

Site Preparation cont'd

In order to have a flat surface to do aerial work, install a flat surface platform to the pole.

Open the fiber DP box using the proper key.

FDP must be locked properly to ensure that insect or dust will be not entered the FDP.

Site Preparation cont'd

Determine port to be used at FDP and its associated drop fiber entry hole at the bottom of the FDP.

Each port must be label and the entry hole must be closed using end cap after used.

Test the FDP port for acceptable attenuation measurement using Power meter. Attenuation level must be less than 25dB.

Attenuation must be less than 25dB to get better services.

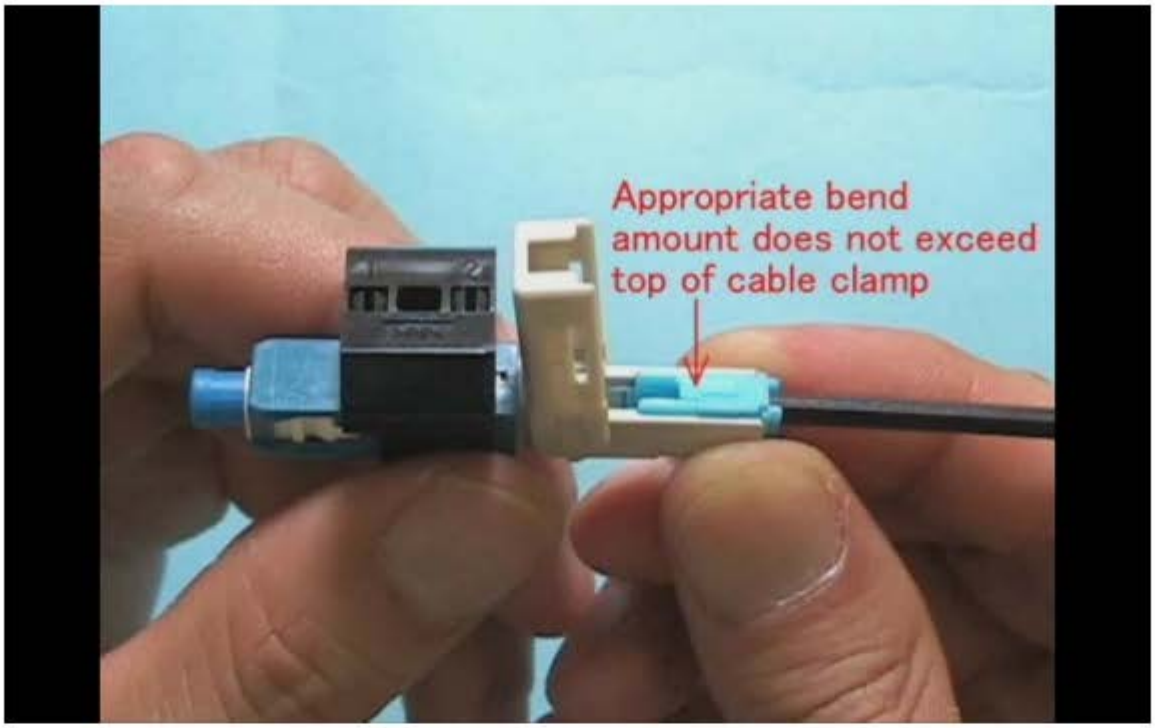
Customer Premise Assessment

Survey to determine the route of external and internal wiring.
Some of the items to be determined are:-

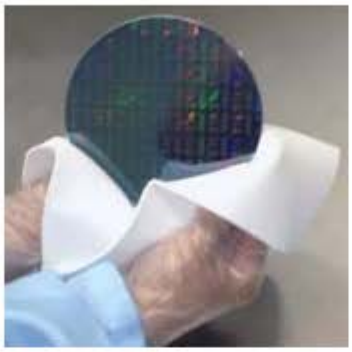
- Cable entry to customer premise
- Location of FTB
- Location of internal fiber route (to be estimated at 10m, inform customer that any additional meter shall be chargeable).
- Location of fiber wall socket (the furthest distance for bend insensitive fiber from wall socket to ONU is 5 meter).
- Location of ONU & CPEs (RG, STB, DECT Phone). Location of ONU& CPEs must be near the TV set.
- At least 4 AC power supply for ONU & set top box.

TM

FA-SC Connector Installation



Places uses FASC connector:
FDP
FTB
FWS



Tools used for Construct FASC:

- **Fiber Cleaver**
- **Stripper**
- **Lint-Free gauze**
- **Cutter**

Drop fiber pulling and FTB installation

Pull drop fiber with the FA-SC connector attached from FDP to the premise.

Clean the connector ferrule before attaching to FWS.

Attach one end of the drop fiber with the FA-SC connector to the FDP port to be used for the particular customer. Attach the other end of the drop fiber to the FTB port.

Installation of FTB will differ according to type of customer premise. Customer premise are define as:
SDU – Single storey & double storey terraced, semi detached bungalow house and shop lot.
MDU – Condominiums, apartments and high rise buildings.

Drilling Operation

Drilling must be inside the house to the outside house

To make sure less breaking to the wall inside the house while drilling operation.

Plaster filling must be applied after drilling operation

To rebuild the surface of wall that broken because of drilling.

Use the metal detector to detect metal piping inside the wall

Drilling Operation cont'd

Observe the water tap location to determine the path of water pipe in order to avoid drilling the path of the water pipe

This action strictly must do to prevent from leakage from the water pipe in the wall.

The determined the condition of the wall to be drilled (cement or plaster) to ensure that the drilling has a good grip

This is to ensure that FTB will hold.

Detailed information for the drilling works are as attached in Appendix C.

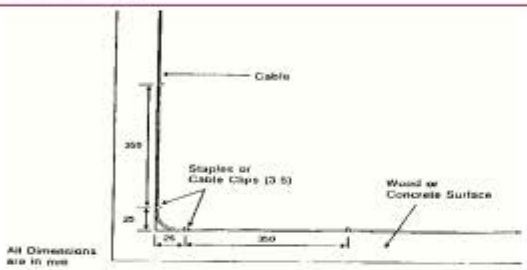
Internal Wiring Installation

Exposed surface cabling

Exposed surface cabling should be installed along the wall surface edges by means of staples or cable clips. Staples should be used for attaching bend insensitive indoor fiber cables or patch cords onto wood or partitions. Cable clips should be used for securing cables onto concrete or plaster surface.

Be careful while placing the staples at wall surface. This is to ensure it does not damage the wall.

To prevent the wire from sagging, staples or cable clips (35mm) should be spaced evenly at 350mm. The staples or clips should be spaced about 25mm away from the corners.



Internal Wiring Installation

Installation of cables using PVC casing and batten

PVC casings/battens should be installed either horizontally or vertically. Casings are installed along wall edges nearest to the floor wherever possible to ensure an organized and neat internal wiring route.

PVC casing/batten shorter than 300mm should be fixed with at least two nails.

Be careful while placed the nails at PVC batten.

Cables should be secured onto the batten by using saddles fixed with brass nails at 250mm distance

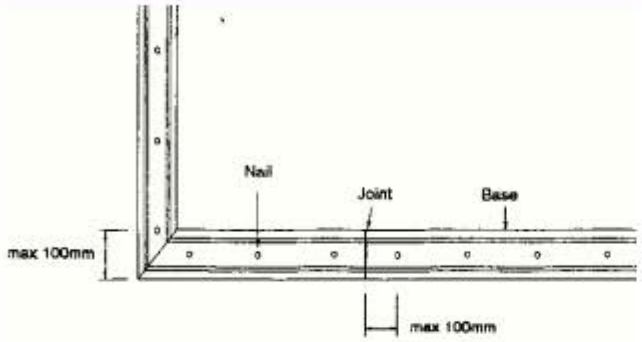
The cable should be protecting by using saddles.

Internal Wiring Installation

Installation of cables using PVC casing and batten cont'd

The nail at the end of the casing should not be more than 100mm from the end.

Nails are placed at each 100mm at the batten.



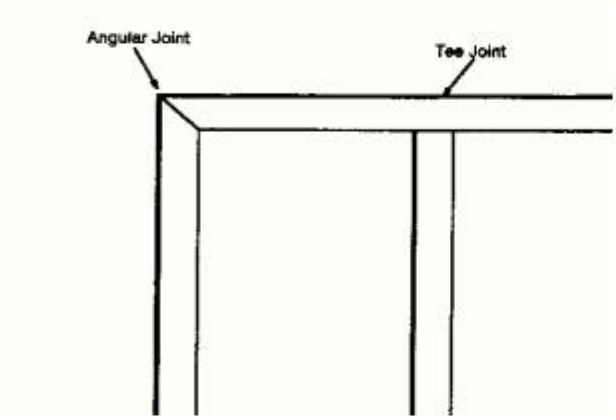
Where batten is installed through an opening in the beam, the batten should have no joint in the opening and its length should be such that there is 100mm length of batten at each end of the opening.

Internal Wiring Installation

Installation of cables using PVC casing and batten cont'd

All angular joints should be cut and formed to conceal the cables fully on the batten or in the PVC casing.

Make sure the PVC batten placed correctly and tight when it is installed.

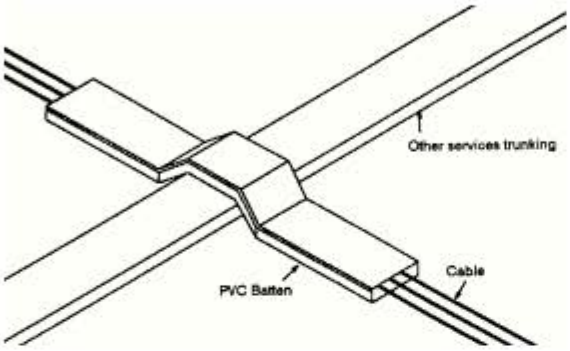


Internal Wiring Installation

Installation of cables using PVC casing and batten cont'd

Where batten and other services' casing, conduit, trunking, duct etc intersect, a crossover should be constructed to bridge the batten.

Make sure the PVC batten is cut correctly in shape as figure to place on the other trunking.



Fiber wall socket Installation

Fix the fiber wall socket to the wall ensuring a height of at least 30cm from the floor. This is to avoid environmental risks that may arise if it is installed lower.

Fiber wall socket will be put at 30cm above the floor so it will protect fiber wall socket from collecting dust.

Fix the fiber wall socket using proper screw to ensure stability of installation. Avoid using stickers such as double sided tapes.

Make sure screw at fiber wall socket is tight.

Clean the connector ferrule before attaching to FWS.

Connect the bend insensitive patch cord/internal fiber cable to the fiber wall socket.

Use visual inspection probe to confirm the cleanliness of the ferrule.

Fiber wall socket Installation cont'd

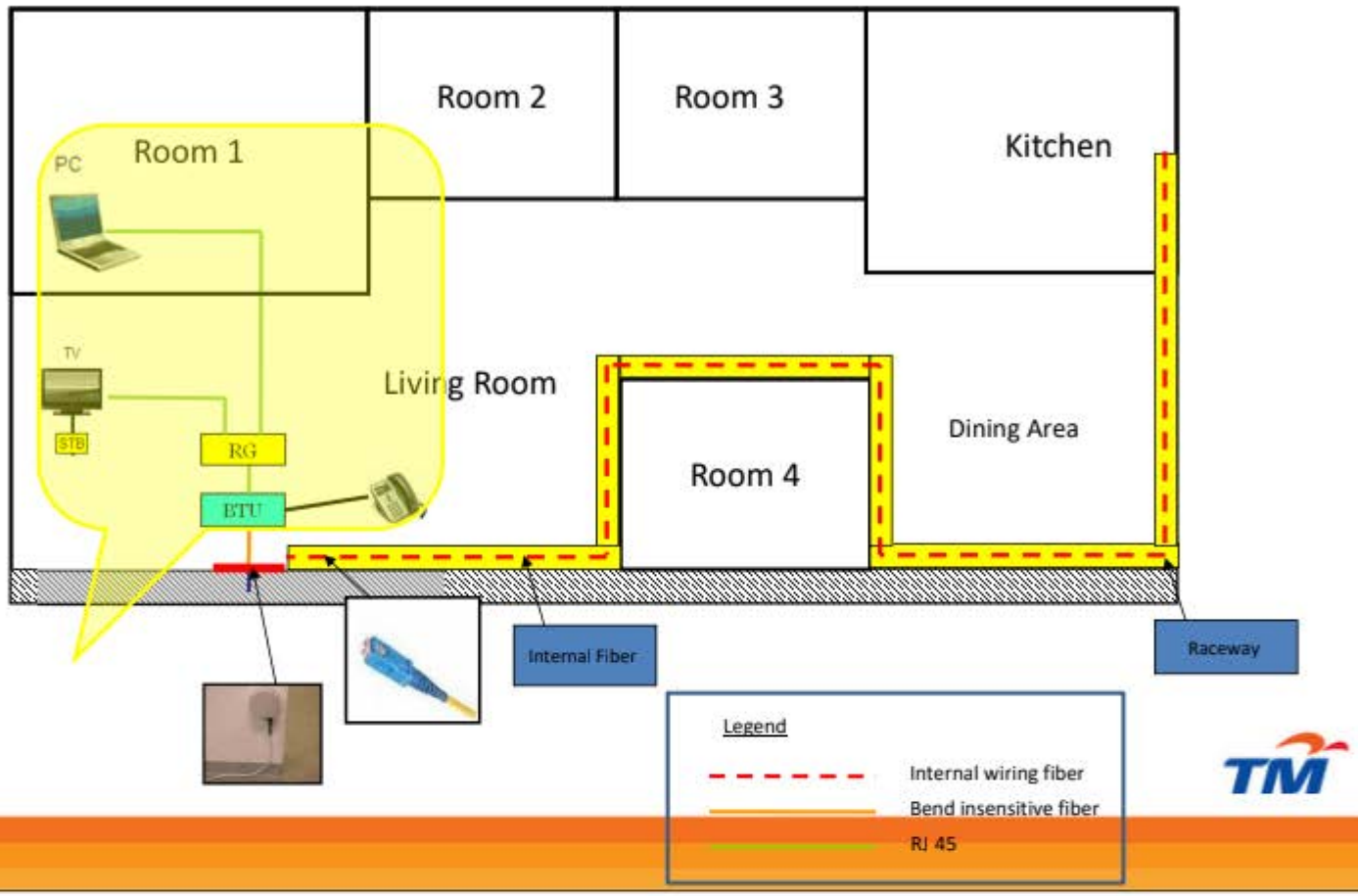
Using a PON power meter, test the total link loss received at the fiber wall socket. Absolute power measurement should be more than -25dBm. If the value is less than -25dBm, clean the connector using alcohol and lint-free cloth.

Clean the connector with connector cleaner after and before the test.

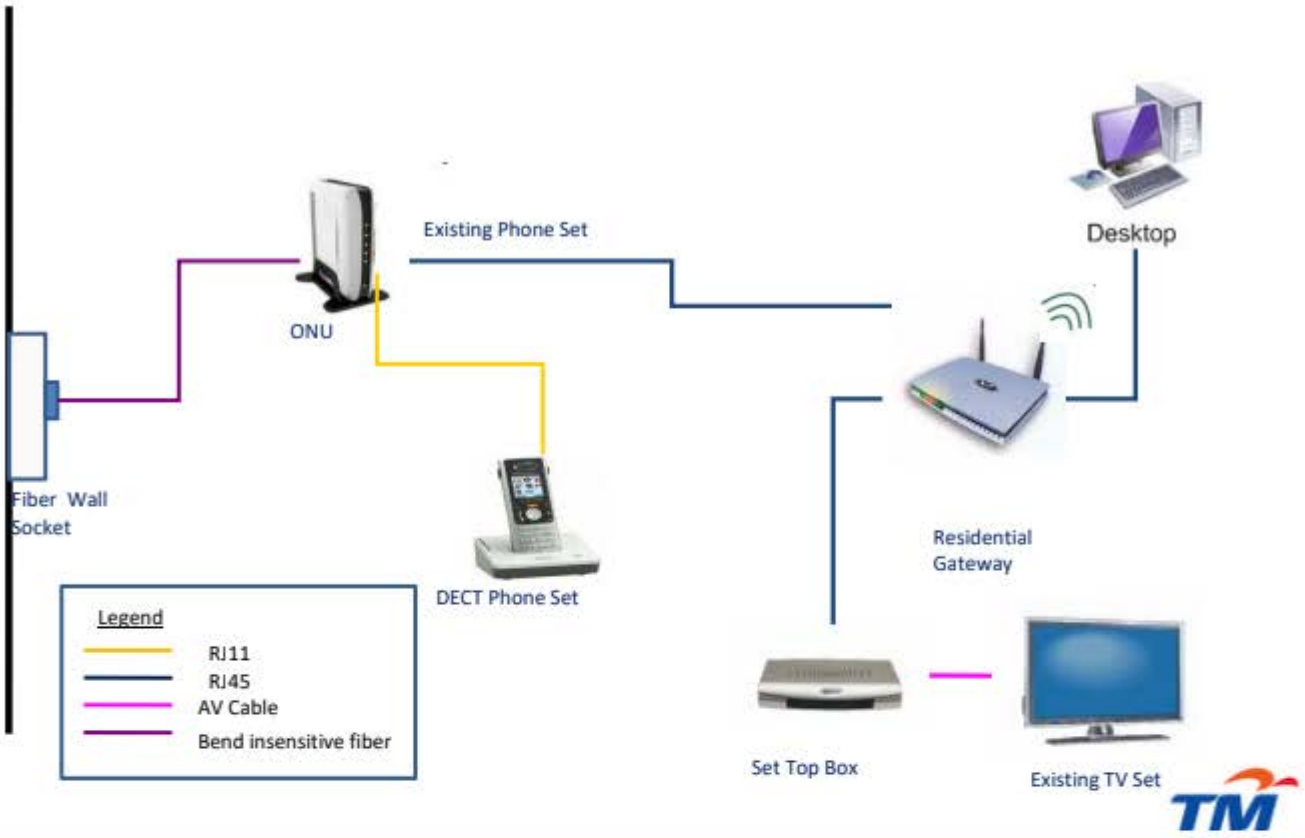
Repeat measurement of absolute power level. If the measurement is more than -25 dBm, test the loss measurement at every connection (FTB & FWS) to ensure it is within specification.

The reading should be 0.5dB or less at every termination.

Layout In Customer Premise For Landed



Installation Of BTU And CPE



Workspace Cleanliness

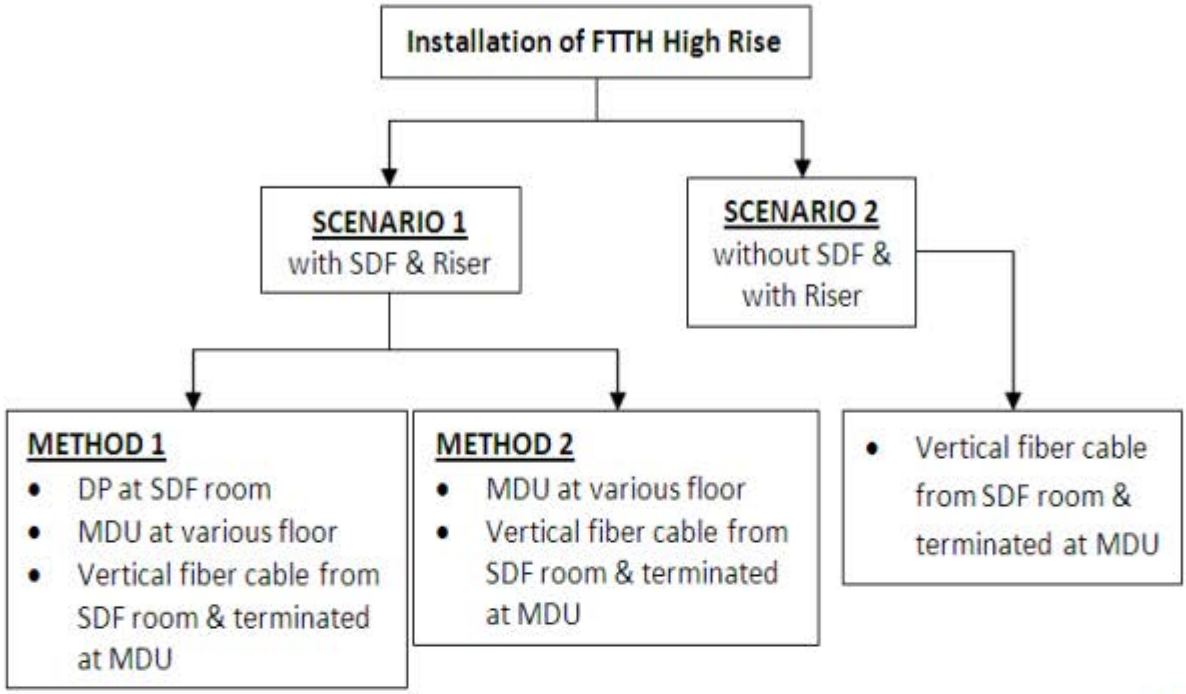
Ensure all the packaging materials (including the instruction manuals) are properly put away and handed over to customer.

Ensure all the tools and test gears are stored back in the toolbox.

Ensure that the workspace inside and outside customer premise is clean. It is recommended to use a vacuum cleaner to clean the working area.

Internal Wiring Fiber
High Rise

DESIGN OF FTTH NETWORK IN HIGH RISE RESIDENTIAL BUILDING



RESIDENTIAL BUILDING WITH SDF ROOM & CABLE RISER (SCENARIO 1)

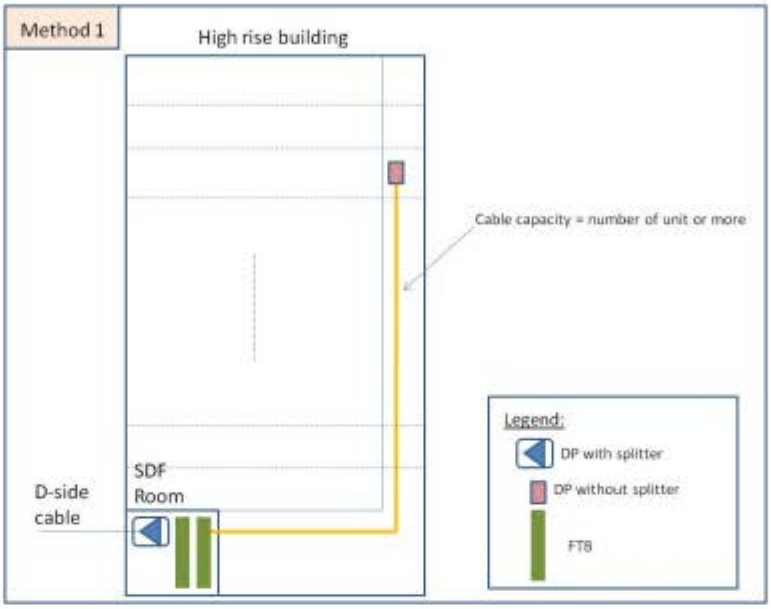


Figure 1: FTTH network at residential building with SDF and riser. (Method 1)

RESIDENTIAL BUILDING WITH SDF ROOM & CABLE RISER (SCENARIO 1)

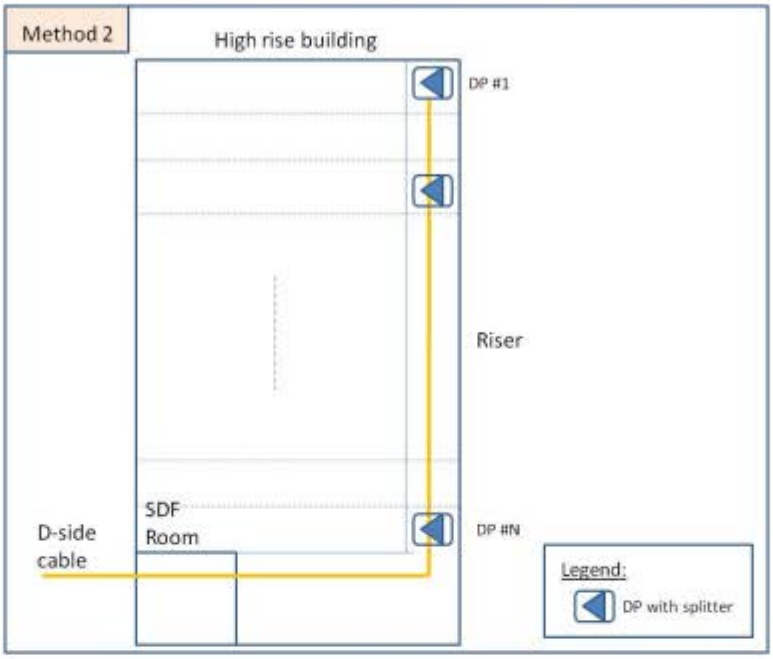


Figure 2: FTTH network at residential building with SDF and riser. (Method 2)

RESIDENTIAL BUILDING WITHOUT SDF ROOM & CABLE RISER (SCENARIO 2)

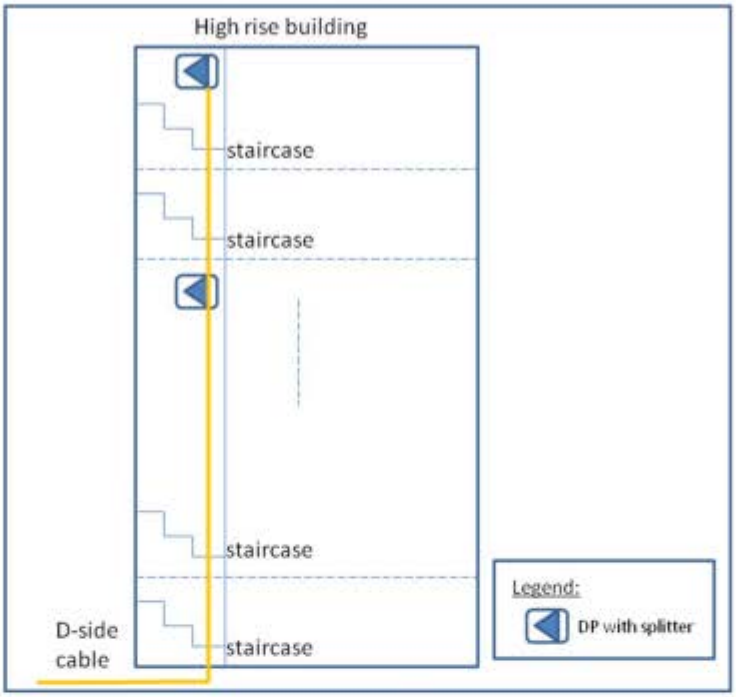


Figure 3: FTTH network at residential building without SDF and with riser.

Example of FTTH Installation

FTTH

1 Determining location of CPE

- Location of CPE (including BTU, RG, STB) must be suitable i.e. near the television.

FTTH

2 • **Determining location of CPE**

Best Location

FTTH

3 Quality of drilling works

- Installer must be skilled in performing drilling works to avoid damage to customer's wall.

FTTH

4 **Blocked existing underground cable duct**

- For certain customer premise with underground DP and cable duct, there are cases where the ducts are blocked. For blocked duct that cannot be recovered/rectified, new cable route need to be done. This would sometime involve hacking of concrete walls or floor tiling,

Example of Underground Installation for FTTH

Testing on Existing underground GI pipe. Ok but new piping required to place FTB.

Briefing to customer on external plan (to place FTB)

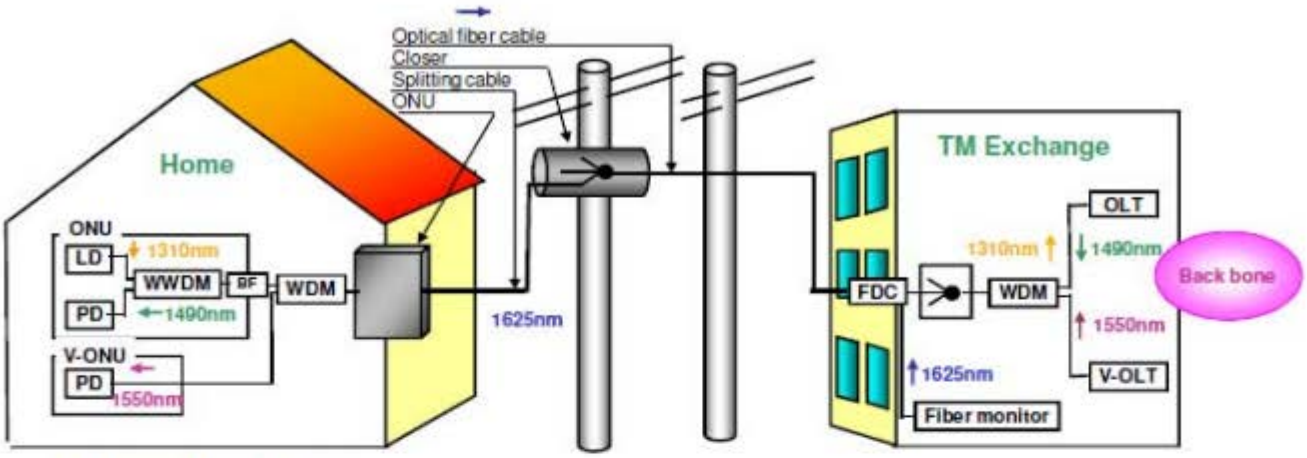
Example of Underground Installation for FTTH using Microduct

Example of Overhead Installation for FTTH

Example of inside house Installation for FTTH

FTTH Testing

FTTH NETWOTK ARCHITECTURE



OLT : Optical Line Terminal

V-OLT : Video-Optical Line Terminal

WDM :Wavelength Division Multiplexing

FDC : Fiber Distribution Cabinet

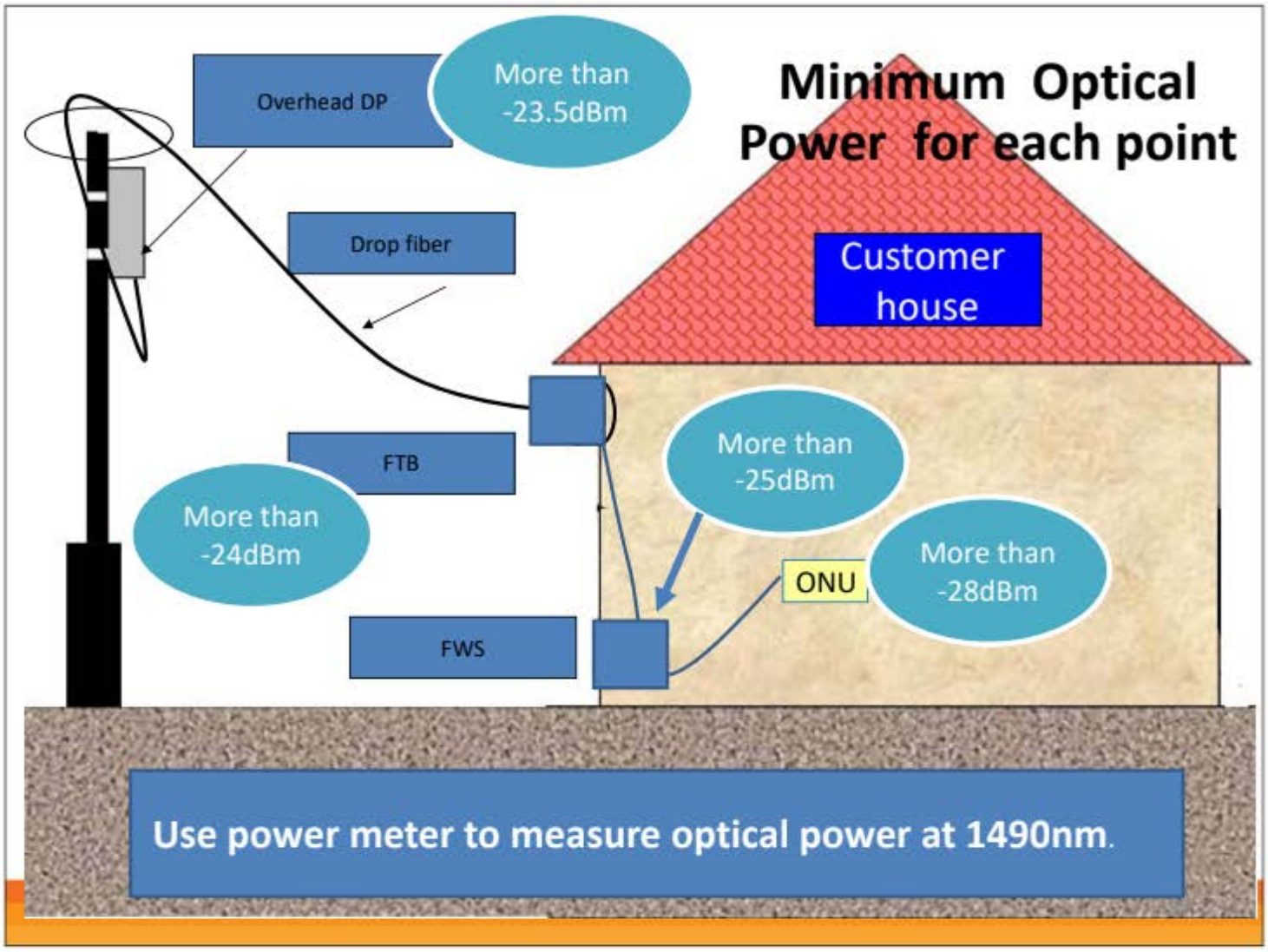
WWDM : Wide Wavelength Division Multiplexing

V-ONU : Video Optical Network Unit

BF (Band pass Filter)

1310nm: Data(Up load)
1490nm: Data (Down load)
1550nm: Video(Down load)
1625nm: Surveillance

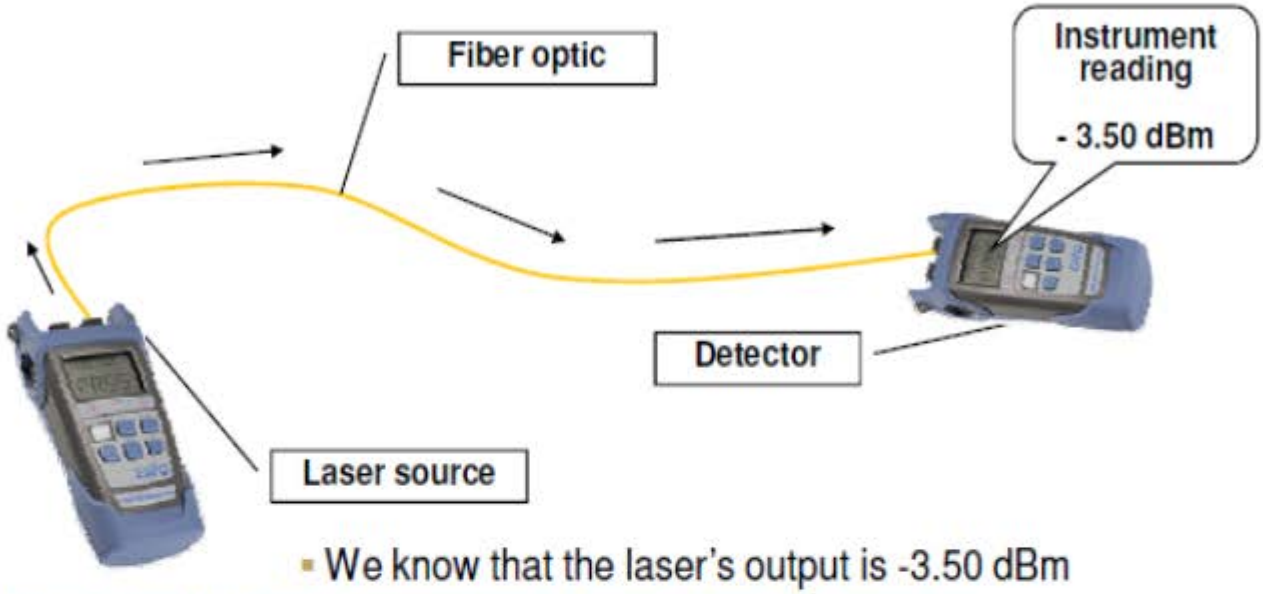
Check Power Level On Pole DP


Minimum Optical Power for each point
Overhead DP
More than -23.5dBm
Drop fiber
Customer house
FTB
More than -24dBm
More than -25dBm
ONU
More than -28dBm
FWS
Use power meter to measure optical power at 1490nm.

MEASUREMENT UNITS

dBm

- The dBm is use to measure the output power of a light source



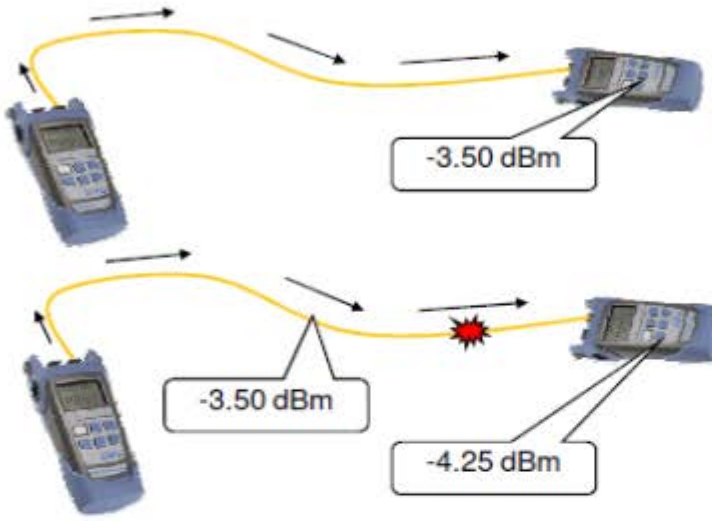
- We know that the laser's output is -3.50 dBm

dBm is refer to level of transmitting power, receiving power or instantaneous power in between

MEASUREMENT UNITS

dB (relative power)

- dB is the difference between 2 power measurements
- Take the -3.50 dBm laser shown previously



Laser output = -3.50 dBm

This is an event on the fiber and the detector reads -4.25 dBm

To calculate this difference:

(-3.50 dBm) – (-4.25 dBm) = 0.75 dB

We have lost 0.75 dB

So the insertion loss is **-0.75 dB**

MEASUREMENT UNITS

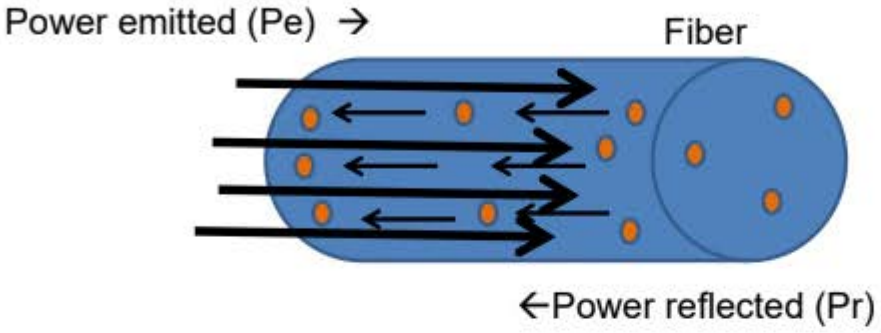
Optical Return Loss (ORL) (dB)

- Comes from the amount of energy lost within components and fiber due to back reflections
- We use the term « ORL » when speaking of the amount of energy returned by a section or an entire link
- Expressed as a positive value

Type of Splitter FDC & FDP	ORL UP	ORL DWN
2:8 & 1:8	50dB	32dB
2:4 & 1:8	47dB	32dB

What is Optical Return Loss (ORL)

$$ORL = 10Log\frac{P_e}{P_r} \qquad (\geq 0)$$



- The ORL can be measured using OTDR or OLTS

What is effect of high ORL value (low dB value)

- Increasing transmitting noise and reduce Optical Noise-to-Signal Ration (OSNR)
- Increase light source interference
- Reduce the quality of video signal

How to reduce the ORL value (higher dB value)

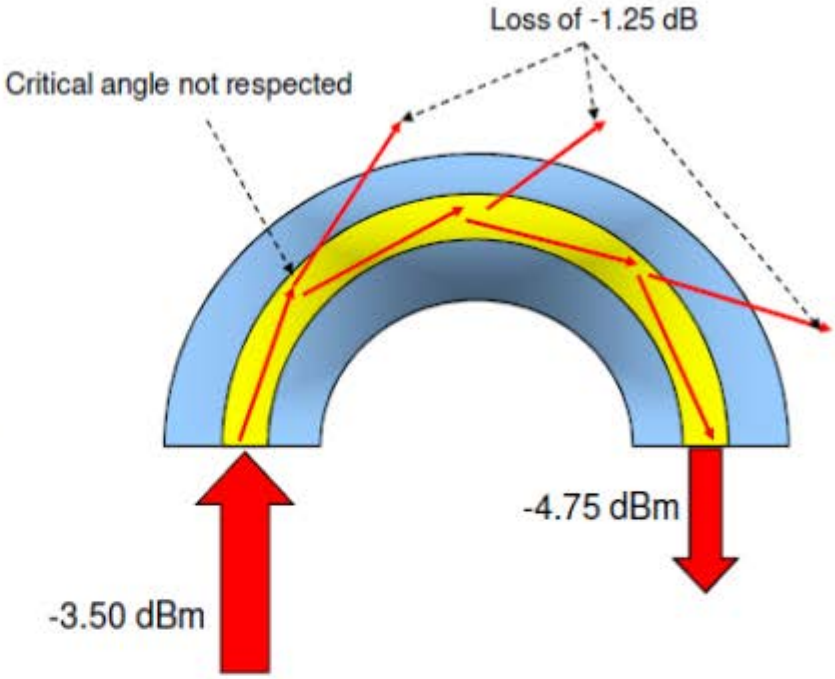
- Use low reflection connector (UPC, APC)
- Use optical isolator near the laser to reduce back reflection level

What is the allowable value for FTTH network ?

- ORL must be more than 50dB

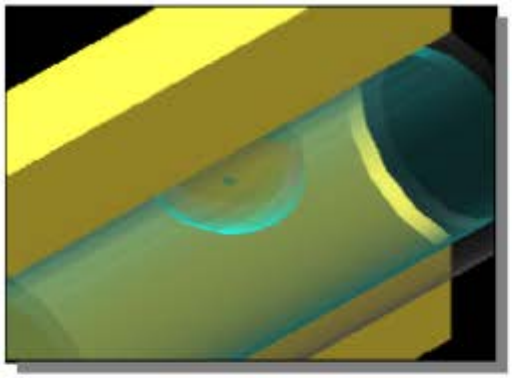
MACROBENDING

The minimal radius of curvature for singlemode is 3 cm

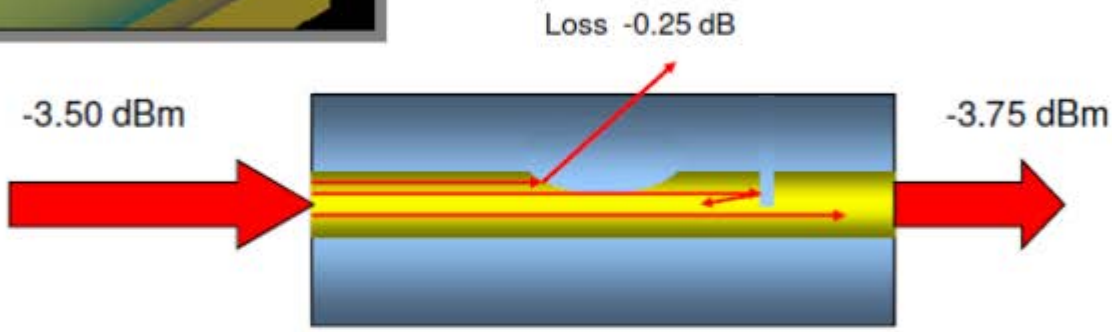


MICROBENDING

Microbendings



- Microbendings are created during fabrication or due excessive bending
- They create very minimal loss but can deteriorate the signal with time



CONNECTORS

- !!! Warning !!!
- Angle Polished Connectors cannot be connected with Flat Polished Connectors!

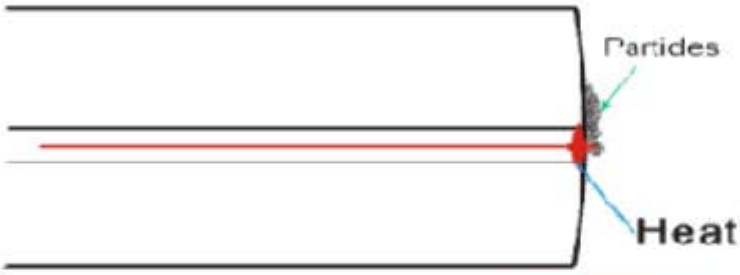
Clening Dirties

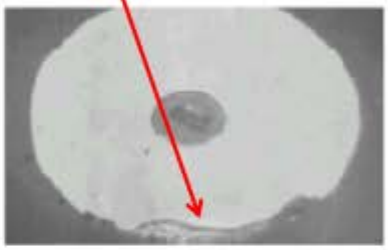
Dirty connector gets poor transmission quality:

- cause Higher Insertion Loss
- cause Higher Return Loss
- cause Higher Bit Error Rate

High return power may burn off the connector, transmitter

Can be seen using Fiber Probe





From NTT, 2006

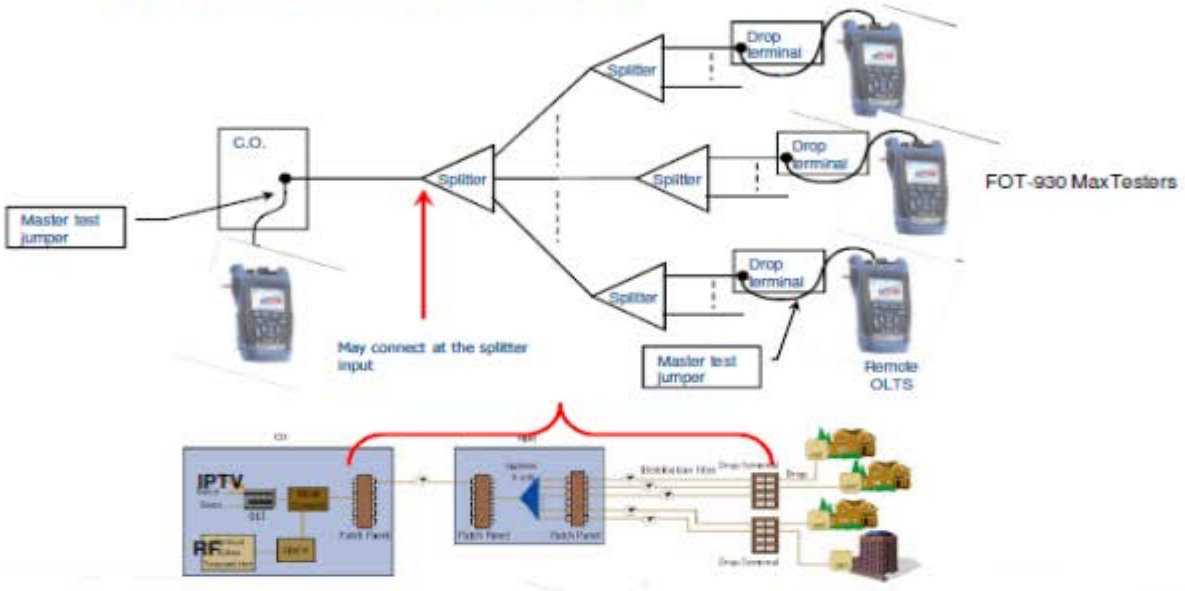
Fiber Probe →

TESTING PARAMETERS

OLTS for Link Budget Certification

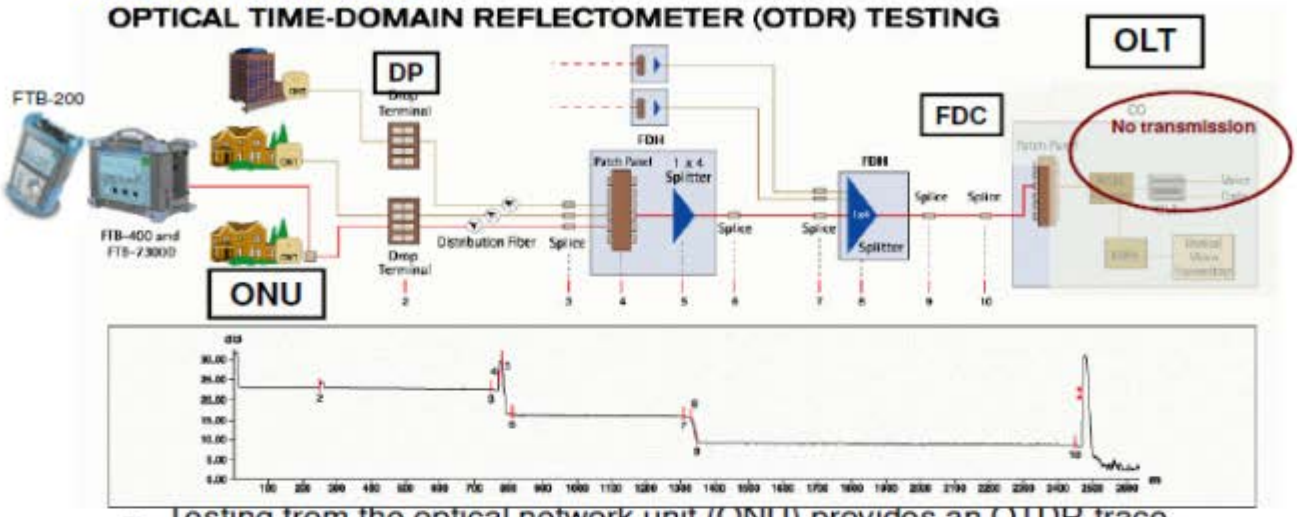
1) **Insertion Loss (IL)** - Splice, Splitter, Connector, Cable, & Macrobending
2) **Optical Return Loss (ORL)**

- Using FOT-930: works in pair.



TESTING PARAMETERS

Fiber loss, Splice loss, adapter loss, splitter loss, Fiber length, total ORL



- Testing from the optical network unit (ONU) provides an OTDR trace that is easier to interpret.
- Testing from the optical line terminal (OLT) will present an OTDR trace with up to 32 or 64 branches combined after the splitter.

OTDR

The sensitivity and the signal to noise ratio (SNR) of the receiver are improved greatly by averaging the returned signal.

The averaging depends mainly on:

- —The pulse width used
- —The length of the fiber
- —The OTDR measurement range
- —The processing speed

OTDR

Main OTDR specifications

—The Dynamic Range
—The Measurement Range
—The Attenuation Dead Zone
—The Event Dead Zone
—Minimum spacing between points (spatial resolution)

Visual Fault Locator (VFL)

Fiber Checker
Visual Fault Locator

To locate fiber beak

Powered by TM

EVERYONE CONNECTS

Thank you!

We Will Broaden Your Future