JOB ROLE – Optical Fibre Splicer

Sector – Telecom

(Qualification Pack Code: TEL/Q6400)

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Chapter 6. Optical Fibre Testing

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Session Objectives

The students will be able to:

- Explain Soldering the broken wire at home,
- Describe Factors affecting OFC,
- Analyze Types of splicing,
- Explain Testing of splicing,
- Describe Factors that are considered to have good splicing,

Introduction

Optical fibre cable (OFC), two fibre cables are joined together by a method, known as splicing. Hence, splicing is the method in which broken fibre ends are joined permanently. Splicing is nothing but a sort of noble name of “soldering”. The sophisticated term of splicing is used with fibre optics since these cables carry light signal and not the electrical signal. The OFC consists of a core through which the light propagates. Hence, joining the OFC cables requires proper core-to-core alignment so that light can pass through it without any leakage.

ldering the broken wire at home

ibre cables are widely applied in today's communication network. They re buried under the street or under the sea. Fibre cables are quite ndispensable for information transmission and data providing.

ince optical fibre cable is made up of glass it requires repairing if roken or damaged. The repairing done to join the damaged cable is not ame as the repairing or soldering done on the electrical wires at home. t requires specialised technique to join the damaged optical cable ecause the cable of optical fibre is composed of glass. This technique of oining the fibre optics cable is called splicing. Splicing is a costly method f repairing the fibre. It requires expensive machines and technicians to epair.

ctors affecting OFC

here are various factors that lead to the damage of fibre optics able.

n the telecommunications industry, we focus a lot on how to uild our fibre optic outside plants quickly and efficiently while roviding a highly functional network. What happens to that uried fibre after the heavy equipment and construction crew eave? Several factors can destroy buried fibre optic cable and nterrupt network traffic, triggering significant repair costs and ost revenue. The various factors affecting OFC are —

- Water
- Rodents
- Lightning or Incidental Voltage
- Construction
- Ice Crush

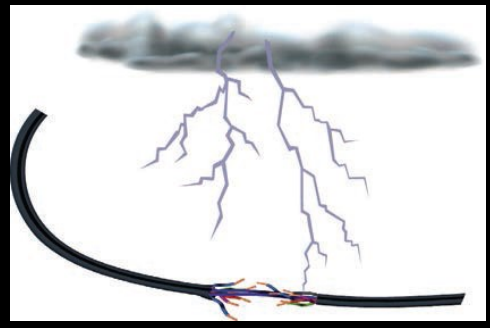
ctors affecting OFC

Vater: Water is very harmful for fibre optic trands. Modern-day fibres benefit from advanced oatings that protect them from water, except in he splice enclosures where the tips of the fibre trands are stripped off their coatings so the plices can be fused without contaminants. Today, ost water damage happens in splice enclosures hat have failed to keep water away from the fibre.

odents: Since they have a life-long drive to gnaw, odents are often responsible for extensive damage to bre optic cable. Even metal armoured cable can get ut in two by these furry creatures.

ctors affecting OFC

ightning or incidental voltage: When lightning trikes the ground, it searches for the best conductor vailable, even if it is underground. If that happens to e the armour or trace-wire of your fibre cable, then amage to the cable sheath and even the fibre itself is ery likely.



onstruction: Construction can be the biggest cause f damage to buried cable. Backhoes, post hole augers nd even hand shovels can all bring network traffic to halt by severing your fibre optic cable.

ce crush: In colder climates, water that enters a plice enclosure can freeze, crushing the fibre strands nd leaving you with a costly network outage. When ce crush occurs, an emergency network repair is eeded to avoid additional damage and downtime.

pes of splicing

plicing can be divided into the following two types —

- Fusion splicing
- Mechanical splicing

plicing can be performed in two ways either mechanically or lectrically. If splicing is done mechanically it is called mechanical plicing. But if splicing is done electrically it is called fusion splicing.

usion splicing is done by heating the ends of the fibre using electric arc. t is useful to join the fibre ends permanently together. It has lower ttenuation loss of 0.1dB/km. In mechanical splicing, the joint is emporary and has loss between 0.2 to 0.72dB/Km, which is more than usion splicing.

sting of splicing

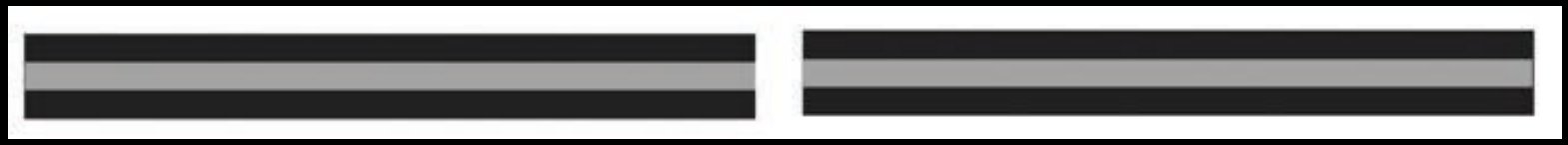
Mechanisms of light loss at optical fibre joint When joining optical fibres, the pposed cores must be properly aligned. Optical fibre connector/splice loss ccurs mostly due to the following —

oor concentricity: Poor concentricity of joined optical fibres causes a onnector/splice loss. In case of general-purpose single-mode fibres, the value of onnector/splice loss is calculated roughly as the square of the amount of isalignment multiplied by 0.2. For example, if the light source wavelength is 310 nm, misalignment by 1 µm results in approximately 0.2 dB of loss.

xial run-out: A connector/splice loss occurs due to an axial run-out between he light axes of optical fibres to be joined. For example, it is necessary to avoid n increased angle at fibre cut end when using an optical fibre cleaver before usion splicing, since such an angle can result in splicing of optical fibres with un-out.

sting of splicing

ap: An end gap between optical fibres causes a connector/ splice ss. For example, if optical fibre end faces are not correctly butt-ined in mechanical splicing then it results in a splice loss.



eflection: An end gap between optical fibres results in 0.6 dB of eturn loss at the maximum due to the change in refractive index rom the optical fibre to the air. Cleaning optical fibre ends is mportant for optical connectors. In addition, the optical connector nds should be cleaned because loss can also occur due to presence f dirt between.

ctors that are considered to have good splicing

. Fibre ends must be cut perpendicular to the length of the fibre. Some
leaving devices are there which produce quite clean and ready-to-use
bre cuts.

. Just after the end preparation, splicing must be done to avoid dust
ccumulation on the cleaved ends which will cause loss of a part of light
nergy at the splicing point.

. Jackets of the fibre are to be cut lengthwise without scoring the fibre,
o get the bare fibre.

. If jackets are cut longitudinally, it will allow them to be pulled back
nd forth, to expose the buffered fibre.

. A chemical or a special stripping must be used to remove the buffer. If
chemical is used for the removal of buffer, it should be removed quickly
therwise it may damage the fibre.

ctors that are considered to have good splicing

. Follow the splicing instructions provided by the manufacturer of the plicing equipment and fibre.

. Splicing is visually inspected. During the process of splicing, optical bres can cause white or black lines in the spliced region which is not onsidered as faults.

. Method of fusion splicing provides a high-quality of permanent joint ith very less loss of light (in the range of 0.00 dB to 0.02 dB for single- ode fibres).

actors that are considered for bad splicing

uring the splicing process, some errors might occur which are not acceptable. his requires the splicing process to be repeated. Sometimes black spots or nes are created in the fibre and can be improved by repeating the whole rocess of splicing. For large core offsets, bubbles, or bulging-splice, method of plicing is repeated again.

Summary

In this session, you have learnt about splicing and its factors.

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