

JOB ROLE – Optical Fibre Splicer

Sector – Telecom

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Chapter 4. Tools and Equipment

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Session Objectives

The students will be able to:

- Explain Basic Hand Tools,
- Describe Tools used for splicing,
- Analyze Tools for mechanical splicing,
- Explain Cleaning tools and safety materials,

Introduction

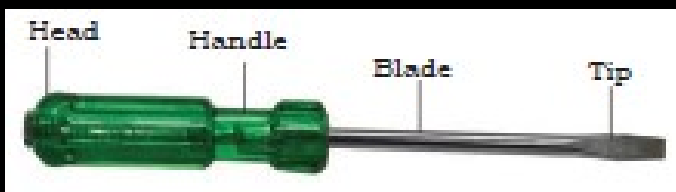
Tools and equipment play a crucial role in optical fibre installation. Various tools and equipment used for the installation of optical fibre cable in the network are optical fibre stripper, scissors, cleaver, v-groove, screwdriver kit, crimping tool kit, etc. In this chapter, we will learn about the basic tools and instruments used in optical fibre installation.

Basic Hand Tools

Basic hand tools are those used in our day to day life whenever we are dealing with any repairing, drilling, cutting, etc. These tools are discussed below.

Screwdriver: Screwdriver is a hand tool, specifically designed to insert and tighten the screws as well as to loosen and remove screws from the job. A screwdriver comprises a head or tip which is fixed to the screw head and force applied to the screwdriver to tighten it in clockwise direction and to loosen it in anticlockwise direction. A typical simple screwdriver has a handle and a shaft.

The shaft is usually made of tough steel. It is used to resist bending or twisting. Some screwdrivers have interchangeable tips that fit into a socket on the end of the shaft and are held in mechanically or magnetically. These often have a hollow handle that contains various types and sizes of tips



Basic Hand Tools

Tips to use screwdrivers

The size of the screw and the type of opening it has determines which driver to use. Following are a few tips to use a driver.

- Never use a driver to do another tool's job. It should be used for which it is designed.
- Never push a driver beyond its capacity, never put excessive pressure on the screw head.
- Never expose a driver to excessive heat, it will damage the shaft of the driver.
- Never use a driver at an angle to the screw, it is always used in a perpendicular direction of screw head.
- Never depend on a driver's handle or covered blade to insulate you from electricity.
- Discard damaged or worn drivers.

Basic Hand Tools

Scissors

Scissors are hand-operated tools. A pair of scissors consists of a pair of metal blades which are pivoted. The sharpened edges slide against each other when the handles (bows) opposite to the pivot are closed. Scissors are basically utilised for cutting purpose like paper, cardboard, metal foil, cloth, rope, and wire. the various parts of a scissor.

Precautions to be taken while handling the scissors are —

- (i) Do not touch the blade of the scissors.
- (ii) Observe tip of scissors while cutting fibre threads.

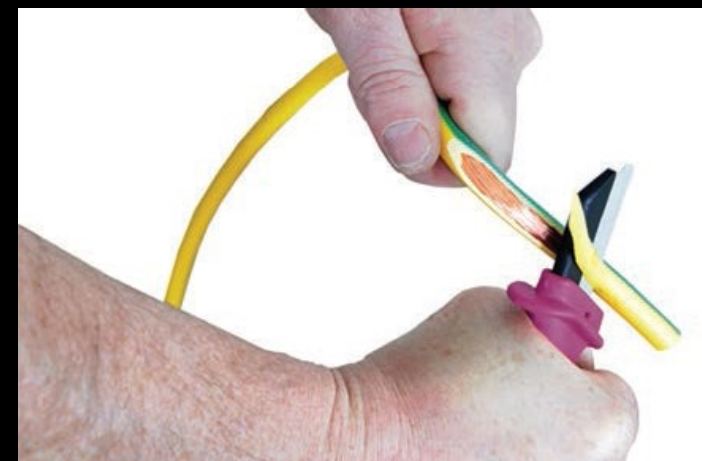


Basic Hand Tools

Cable cutting knife: It has a sharp blade with a comfortable, full-sized, handle. Its blade is made of the finest steel, tough and carefully tempered to hold its edge. The handle is textured for comfort and firm grip. A typical cable-cutting knife



Pliers: Pliers are used for gripping or twisting of wires or cables. There are different parts of the plier like handles, jaws, cutter each with a specific operation. They are used to grip, splice or cut wires, and strip insulation.



Basic Hand Tools

Parts of pliers are as follows —

The handles of pliers have a plastic coating, for added comfort while holding it. It also provides good grip to the hands. The size and length of the handles will depend on the size of the pliers. Those designed for use by electricians and linemen have insulated handles.

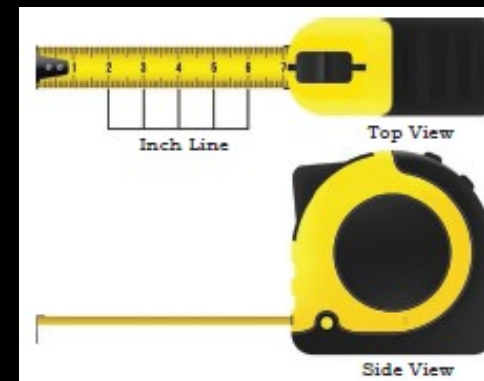
Jaws: Handles are used to open and close the jaws of pliers. They have flat edges for general gripping, which are often serrated for extra grip, although sometimes they are smooth. They usually have squared tips.

Cutter: The cutters built into the jaws of combination pliers are usually designed to cut cables and wire.

Pipe grip: The pipe grip is a rounded, cut-out in the jaws. It is primarily used for gripping rounded stock, like pipes and cables.

Pivot point: The pivot point is a kind of hinge that allows the handles and tips to open and close so the jaws can grip or cut, and then be opened again.

Measuring tape: This is used for measurement of cable during splicing. This compact and light weight tool is used for removing the outer jacket and buffer coating from fibre. This tool has automatic return spring for ease of use and speed.



Tools used for splicing

Splicing is a specialised technique of joining the broken ends of the optical fibre. The procedure of splicing requires special tools.

Optical fibre splicing machine: A typical machine for fusion splicing. It is a small, lightweight machine with an LCD screen. This screen shows the splicing operation and internal view of the operations performed in machine during splicing.

Fibre optic cleaving tool: Fibre cleaving is used to cut the fibre ends perfectly perpendicular to the axis before joining. Cleaving is different from normal cutting of cable using steel blade/ knife. This method of cutting is applied specially for fibre since it is made up of glass. Glass cutting requires fine and polished ends for cutting and it can be done using the diamond cutter.

Two types of cleaving tools are used for fibre cutting. They are —

Scribe cleaver : These types of cleavers were used in earlier days. It is used to cleave the fibre manually.

Precision cleaver : Precision cleavers are the most commonly used cleavers in the industry. They use a diamond or tungsten wheel/blade to cut the fibre. Tension is then applied to the fibre to create the cleaved-end face.

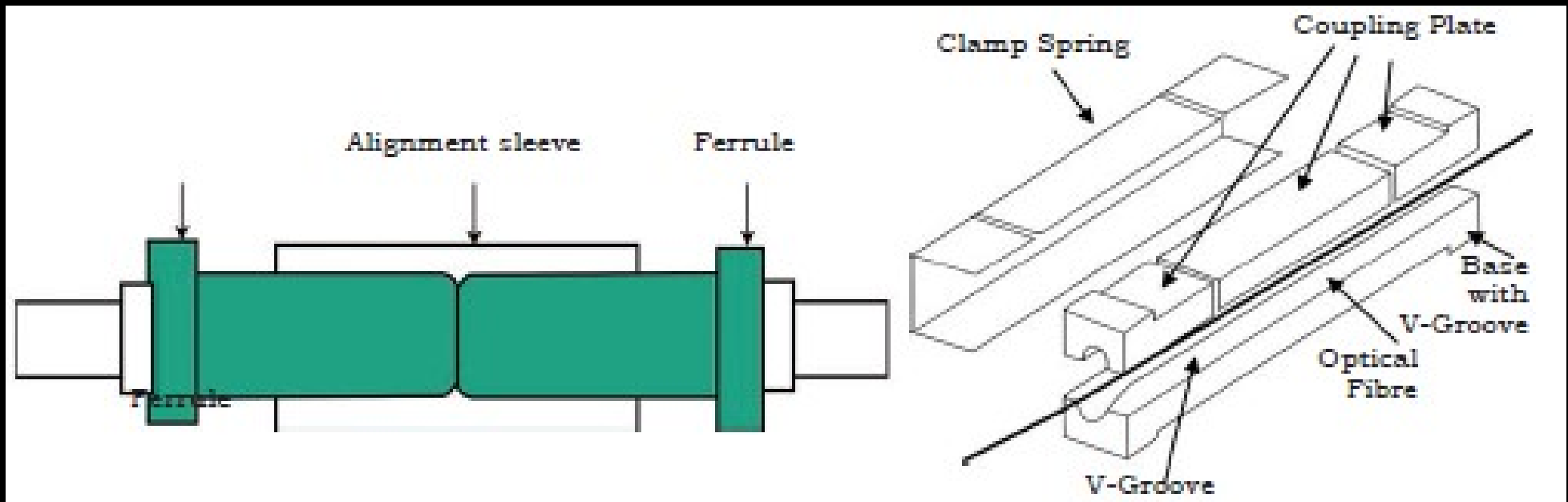


Tools for mechanical splicing

Basic tools used for the mechanical splicing are as below.

Mechanical splice connector

The basic mechanical splice connector and its structural description. Mechanical splicing creates temporary joints and can be disconnected. This type of splicing is less accurate than fusion splicing.

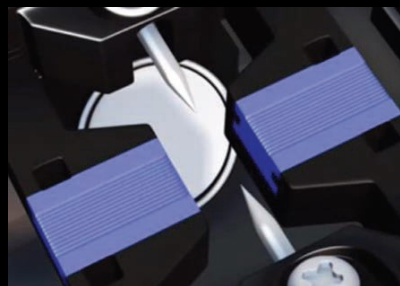


Tools for mechanical splicing

Ferrule: A ferrule is a component in optical fibre used for protecting and aligning the stripped fibre end. Material for a ferrule is selected keeping in mind a variety of factors such as durability of the material, cost, connector mating frequency, surface finish over time and the material's ability to retain end-face geometry.

V-groove: V-groove is the most commonly used alignment mechanism for mechanical fibre splices. Precision holes or V-groove is drilled or moulded through the centre of each ferrule allowed for fibre insertion and alignment.

Precise fibre alignment depends on the accuracy of the central hole of each ferrule. The fibre alignment is done by using splicing machine having V-groove.



Tools for mechanical splicing

Matching gel: It is a gel which is used to match the refractive index of a material. The index-matching material is a substance, usually a liquid, cement (adhesive), or gel, which has an index of refraction that closely approximates that of fibre-optic.



Clamp spring: After the fibre is properly aligned and joined/spliced by gel, the clamp is pressed above it protecting the jointed portion. It is used as a locking mechanism to hold the spliced fibre.

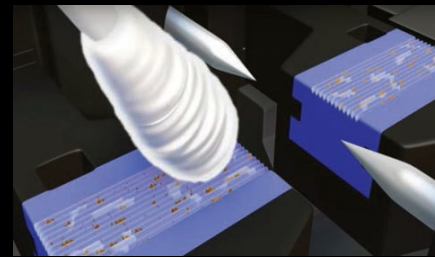


Cleaning tools and safety materials

Cleaning swab: Today's splicing equipment is fast, efficient and requires minimal maintenance due to advances in splicing technology. However, environmental contamination, such as dust, dirt and fibre coating debris, as well as, the silica deposits generated during the fusion process eventually find their way to the optical elements and V-grooves. This contamination offsets the fibre and degrades its performance. The cleaning swabs are high absorbency swabs and remove dust and other contaminants.

Applications

- For fusion splice mirror cleaning
- Dust removal from precision surfaces



Tissue paper :

It is a lightweight paper used for cleaning the fibre after stripping it. It is made by recycling paper pulp. It comes in bundle or packet and white in colour. It is very cheap and is used to clean the jelly which is above the core and cladding. Dry tissue paper is taken with few drops of isopropyl alcohol above it and then it is used to clean the fibre.

Cleaning tools and safety materials

Alcohol: This fast-acting cleaner can be used with dry fibre wipes or tissues to remove jelly above the fibre core, or dust from optical fibre prior to termination and fibre optic splicing or to clean the end of the fibre. A fast evaporating alcohol based chemical named as isopropyl is used with the tissue paper to clean the bare fibre.

Gloves: Gloves are used for safety during splicing.



Summary

In this session, you have learnt about Tools and Equipment used in Fibre Optic cable.

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