

# OPTICAL CABLE SPLICING PROCEDURE AND REQUIREMENTS

 <b>UNSERE GRÜNE GLASFASER</b>	<b>OPTICAL CABLE SPLICING PROCEDURE AND REQUIREMENTS</b>	TECHNICAL NORMATIVE	JANUARY 2024 2 <sup>nd</sup> Edition
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## OPTICAL CABLE SPLICING PROCEDURE AND REQUIREMENTS

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## 1. INTRODUCTION

This document aims to give a general view with the construction instructions that must be considered to make optical cable splicing.

### 1.1 REVISIONS

This document derogates the related parts of the “Construction Instruction for fiber deployment” document.

EDITION	DATE	REVISED SECTIONS	CHANGES	OBSERVATIONS
1 <sup>st</sup>	MAY 2023		The original chapter is modified to include new alternatives of splices installed inside manholes (and not directly buried).	This document is based on the extraction of the chapter “Optical cable splicing procedure” from the document “Construction Instruction for fiber deployment”
2 <sup>nd</sup>	JANUARY 2024	All	New codification of the document	The document is codified with the document code: TEF-NORM-00013. The logo of UGG is updated in the page header. References to other documents are included.
		2. Criteria for the optical cable splicing realization	Included considerations for Distributed Splitting Architecture	
		7. Pressure test for the optical closure	Reduced the pressure from 0,5 bar to 0,4 bar	

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## 2. CRITERIA FOR THE OPTICAL CABLE SPLICING REALIZATION

If it is possible, all the sections of the network must be deployed without optical splices. That means, that is not expected to have splices in the following sections of the network:

- **Local backbone.** The optical cables only must be spliced in the ends of the local backbone network.
  - Active Point of Presence (Active POP) and Passive POP in the Centralized Splitting Architecture
  - Headend POP and Feeder Point (FP) in the Distributed Splitting Architecture.
- **Feeder network.** The optical cables only must be spliced in the ends of the feeder network.
  - POP and the DP (Distribution Point) in the Centralized Splitting Architecture
  - FP and Urban Distribution Point (UDP) in the Distributed Splitting Architecture.
- **Distribution Network.** The optical fiber units only must be spliced in the ends of the distribution network.
  - DP and Optical Termination Box (OTB) in the Centralized Splitting Architecture
  - UDP and OTB in the Distributed Splitting Architecture.

It is assumed that splices could be needed for the backhaul network.

The best blowing technique and scheme must be chosen to have sections of at least 6 km without splicing. These techniques are described in the normative “TEF-NORM-00002 - Blowing procedure for cables and fiber units”.

**NOTE:** the cable will be supply in reels of 6 km. Under request, superior lengths could be supplied, but not as a standard. For these cases, it is important to have the means to manages with bigger cable reels.

Only in the situations in which the distance of the path is longer than the length of the optical cable available it is allowed to make splices in the field.

There are two possibilities of installation of splice closures in the UGG network: closures installed directly buried into the ground and closures installed inside manholes.

**NOTE:** At the beginning of the deployment, it was defined the directly buried installation. Currently, for new deployments all the closures must be installed inside manholes.

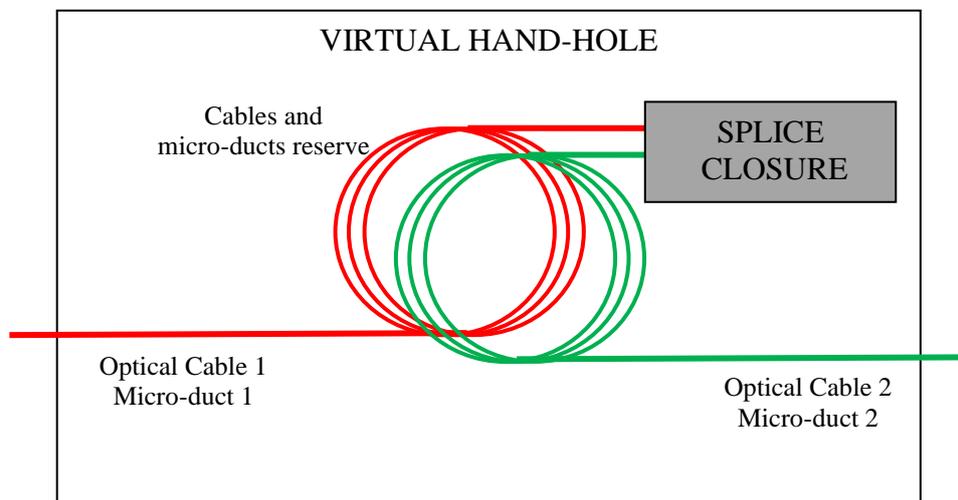
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### 3. SPLICE CLOSURES INSTALLED DIRECTLY BURIED

**NOTE:** The installation of the splice closure directly buried is currently not allowed but they can be found in the field since it was allowed in the past. Currently, splice closures must be installed inside manholes.

In this case, the splice closure, and the reserve of micro-ducts and cables involved, will be installed directly buried into the ground.

**IMPORTANT:** In the splices point between cables, a reserve of 5-6 meters of each cable and microduct involved must be done. This reserve is important to make easy the installation of the microducts and cables and for maintenance purposes. If it is needed, to make the reserve loop of the cable and the microduct, it is possible to make ducts joints adding the extra micro-duct meters needed for this.



**Figure 1. Optical Splice Point buried**

The point in which the fiber splice is made, must be registered in the inventory system with GPS coordinates with precision of centimetres (tolerance: 2 cm max). Also, a picture of the installation should be registered in the inventory system of UGG.

Considering the weakness of the cables used in the deployment (mini cables for blowing applications) it is compulsory to protect them with microducts until the entrance of the splice closure (that means that the microducts must be finished inside the closure). The goal of this procedure is to protect the cable from problems related to impacts, crushing, and (although not definitively) from attacks by animals like rodents.

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### 3.1 MICRODUCT AND OPTICAL CABLE TERMINATION IN THE CLOSURE

The microduct must enter directly to the closure. The ducts that can go inside the closure can have a diameter from 14 to 16 mm maximum (external diameter).

The entrance of the closure must fix properly the microduct to the closure and must seal against the duct diameter correctly, using the correct seal kit entrance.



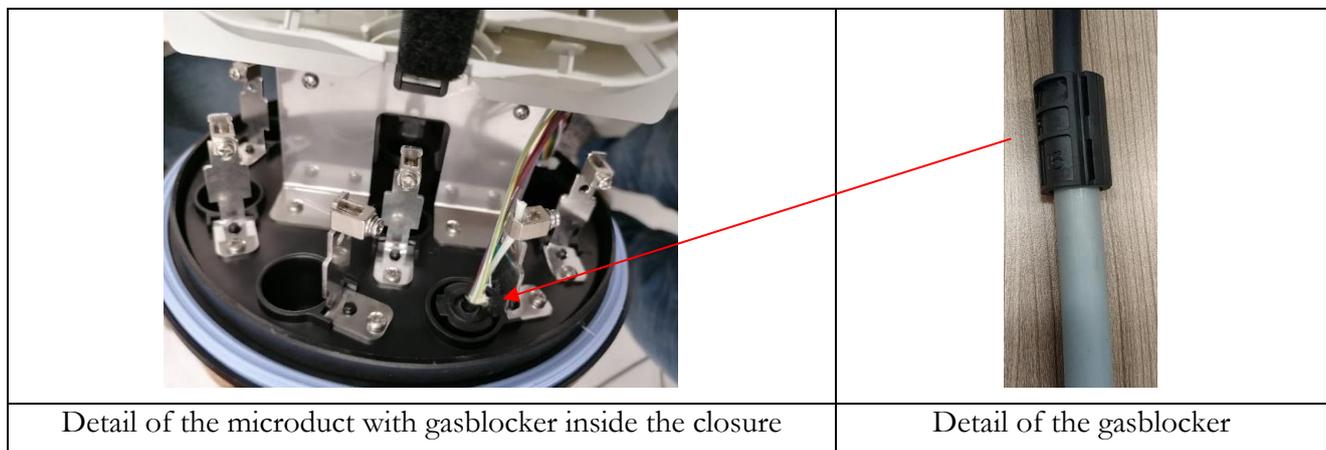
Detail of a seal kit entrance



Detail of the entrance being sealed

**Figure 2. Cable and duct entry of the closure**

Internally in the closure, it is necessary to install an adequate gasblocker to seal the duct against the cable. This gasblocker will prevent from water or gas entrance through the microduct to the closure, in case of damage of the microduct pipeline. Also, this gasblocker will lightly fix the cable and the microduct.



**Figure 3. Microduct and cable installation inside the closure.**

This gasblocker must be supplied in the endowment of the closure due to the specific dimensions necessary that make the use of standard gasblockers unfeasible.

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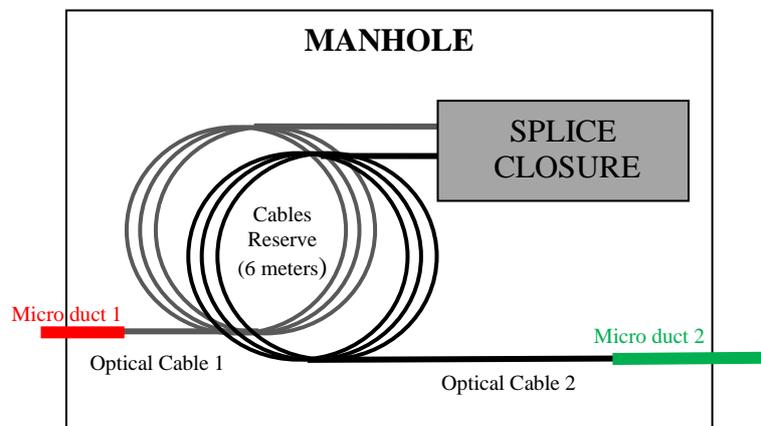
#### 4. SPLICE CLOSURES INSTALLED INSIDE MANHOLES

In this case, the splice closure, and the reserve of cables involved, will be installed inside a manhole following the recommendations and instructions of the specific document “TEF-INST-00003 - Installations in manholes”.

The closure must be installed on one wall of the manhole.

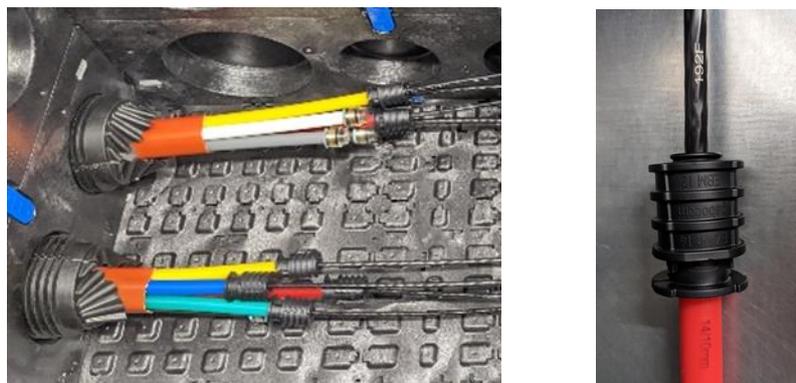
For each cable involved in the splicing, at least 6 meters of reserve length will be kept inside the manhole for maintenance purposes.

In this case, the cables will enter directly to the closure (without the protection of the microduct).



**Figure 4. Scheme of an Optical Splice Point in a manhole**

A suitable gasblocker must be installed to seal the duct against the cable. The gasblocker will prevent from water or gas entrance through the microduct.



**Figure 5. Gasblocker installed in a manhole**

#### 4.1 OPTICAL CABLE TERMINATION IN THE CLOSURE

The optical cable will enter directly to the closure. The optical cables that can go inside the closure can have a diameter from 5 to 10 mm maximum (external diameter).

The entrance of the closure must fix properly the cable to the closure and it must seal against the cable diameter correctly, using the correct seal kit entrance.



Detail of a seal kit entrance



Detail of the entrance being sealed

**Figure 6. Cable entry of a splice closure**

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## 5. OPTICAL FIBER SPLICING

The optical cable must be prepared, also retiring the sheath of the cable, releasing the loose tubes and the central reinforced element of the cable. The central reinforcing element must be fixed to the supports included in the closure for this purpose.

After the preparation of the cables and the closure the splice job could start.

The loose tubes must be cut at the correct distance according to the instructions of the manufacturer of the closure, fix them into the fiber management system of the closure and guide the fibers to the splice trays of the box.

The fibers must be stored in the splice trays in order. The upper tray will be considered the first position. **Note:** If the closure has 2 sides of splice trays, on side will have the first half of splice trays numeration, and the other side the second half of splice trays numeration.

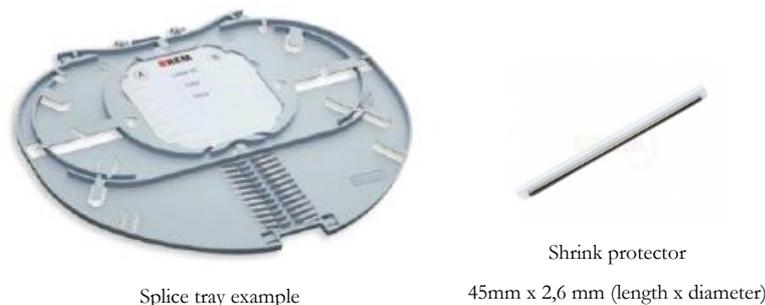


**Figure 7. Detail of the fiber management system of the closure**

The optical fibers must be guided to the splice trays in order and putting a maximum of 12 fibers per tray.

A minimum distance of 1.5 meters of each fiber must be stored in each tray to make the fusion comfortably and store it correctly after the fusion splice is made.

The splice trays allow to store up to 12 splice protectors (shrink type). The splice protector that must be used is a shrink protector type with 45 mm length and 2.6 mm of diameter once contracted.



**Figure 8. Example of the splice tray and the shrink protector**

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## 6. OPTICAL SPLICE REQUIREMENTS

The splices shall comply with the following requirements:

- Attenuation (1,550 nm):  $\leq 0.1$  dB
- Return loss:  $> 65$  dB
- A splice protection (shrinkable type) must be installed to protect the fibre optic splice.  
ANT protectors are not allowed.

**IMPORTANT:** Only fusion splices are allowed. Mechanical splices are not permitted.

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## 7. PRESSURE TEST FOR THE OPTICAL CLOSURE

After the installation cables and once finished the splicing works, it is necessary to test the tightness of the optical closure, to avoid network malfunctions in the future. For that, a pressure test must be done using the valve that includes the optical closure in the base or cover.

The pressure test must be done, introducing air into the closure reaching up to 0,4 bars without no leaks, and observing that the manometer keeps the same pressure value during at least 5 minutes.