वर्गीय अपेक्षाओं के लिए मानक

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STANDARD FOR GENERIC REQUIREMENTS

No.: TEC 87080:2025

(Supersedes No.: TEC 87080:2010)

ऑप्टिकल फाइबर केबल्स के लिए स्प्लाइस क्लोजर

Splice Closure for Optical Fibre Cables

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

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FOREWORD

Telecommunication Engineering Centre (TEC) is the technical arm of Department of Telecommunications (DOT), Government of India. Its activities include:

- Framing of TEC Standards for Generic Requirements for a Product/Equipment, Standards for Interface Requirements for a Product/Equipment, Standards for Service Requirements & Standard document of TEC for Telecom Products and Services
- Formulation of Essential Requirements (ERs) under Mandatory Testing and Certification of Telecom Equipment (MTCTE)
- Field evaluation of Telecom Products and Systems
- Designation of Conformity Assessment Bodies (CABs)/Testing facilities
- Testing & Certification of Telecom products
- Adoption of Standards
- Support to DoT on technical/technology issues

For the purpose of testing, four Regional Telecom Engineering Centres (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This document pertains to Standard for Generic requirements of a universal type of Splice Closure suitable for different types of Optical Fibre Cables used in Telecom networks.

CONTENTS

HISTORY SHEET

Sl. No	Standard/ Document No.	Title	Remarks
1.	G/OJC-02/01 MAR 99	Splice Closure for Optical Fibre Cable	Release 1
2.	GR/OJC-02/02 SEP 2003	Splice Closure for Optical Fibre Cable (Suitable for Non – Ribbon Fibre Splicing)	Release 2
3.	TEC/GR/TX/OJC-002/03/APR-2010	Splice Closure for Optical Fibre Cables (Suitable for Non-Ribbon Fibre Splicing)	Release 3
4.	TEC 87080:2010	Splice Closure for Optical Fibre Cables (Suitable for Non-Ribbon Fibre Splicing)	Document number and document name changed as per Revised Numbering Scheme of TEC for conversion of existing TEC document to Standard vide document No. 4-47/2019-RC/TEC dated 07.09.2020.
5.	TEC 87080:2025	Standard for Generic Requirements of Splice Closure for Optical Fibre Cables	Release 4

REFERENCES

S. No.	*Document No.*	*Title/Document Name*
1.	TEC 89020:2011	Standard for Generic Requirements for Splice Protection Sleeves for Optical Fibre (Type-I & Type-II)
2.	TEC 89030:2011	Standard for Generic Requirements for Splice Protection Sleeves for Ribbon Optical Fibre
3.	TEC 89060:2006	Standard for Generic Requirements for Tools for installation and operating the Optical Fibre Cable and for assembly of the Optical Fibre Splice Closures
4.	QM 333 (or TEC 14016:2010) (Latest Issue)	Standard for Environmental Testing of Telecommunication Equipment
5.	ITU-T G.652, G.655, G.656 & G.657	ITU-T Recommendations
6.	ASTM G 154	UV Resistance
7.	ASTM-D-792	Specific gravity
8.	ASTM-D-638	Tensile Strength (ABS Material) and Elongation
9.	ASTM-D-57-59	Water Absorption
10.	ASTM-D-785A	Rock well hardness
11.	Telcordia GR-771-CORE Issue 2, July 2008	Generic Requirements for Fibre Optic splice Closure (Telcordia document)
12.	ISO 9001:2015 {Latest issue}	International Quality Management System

CHAPTER - 1

1.0 Introduction:

This document describes the Standard for generic requirements of a universal type of Splice Closure suitable for different types of Optical Fibre Cables (Ribbon or Non-Ribbon) used in Telecom networks. Optical Fibre splice closure is used in the outside plant network and houses the spliced optical fibre cables and its fibres in secured conditions. It shall be possible to use it for both Armoured & Metal Free type of Optical Fibre Cables and also compatible for different types of installation practices of cable installations viz. duct, aerial & directly buried. It provides mechanical protection and environmental sealing (by mechanical sealing method only) to the spliced cables and fibres etc. It is also possible to branch out the cable from the splice closure as and when required without damaging the existing cables. A typical representative diagram/drawing of Splice closure is illustrated in Figure 1 below, and may be referred for information only.

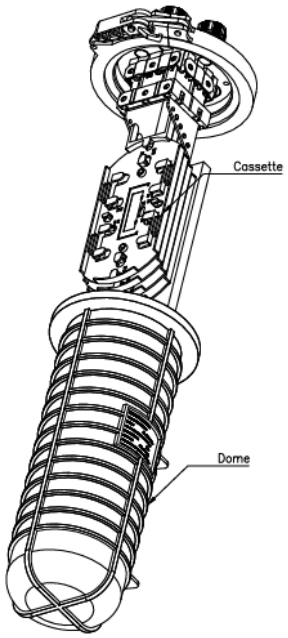

Figure 1: Typical drawing of Splice Closure

2.0 Functional Requirements:

2.1 The splice closures shall enable:

a) Direct junctions (Straight joints)/Butt splice applications.
b) Branching junctions (Branch Joints)/Lateral splice applications.
c) Mid sheath/Ring Cut splice applications.

2.2 The closures must be suitable for the same installation conditions as those used for the installation of different types of optical fibre cables.

2.3 The closures should be suitable for all types of cable structures for splicing the optical fibre cables adopting different construction practices. It shall be designed for use with all types of cables in all environmental condition of installation. The closure must be equipped & supplied with accessories for the installation of all types of Ribbon or Non-Ribbon Optical cables having outer diameter from 8 to 18 mm, accommodating up to 96 fibres.

2.4 The splice closure shall hold mechanically all constituent parts of the cables (sheath, central part, peripheral reinforcements, etc.).

2.5 The splice closures shall be suitable for splicing of optical fibre cables with single mode fibres as per ITU Rec. G.652, G.655, G.656 and G.657 for transmission at wavelengths of 1310, 1550 and 1625 nm.

2.6 The splice closures shall contain fibre organizer system where the extra length of fibres and splices are stored in systematic & secured manner. The method or device for safely routing and securing buffer tube and bare fibre shall be provided.

2.7 The splice closures shall allow an easy opening & re-closing without any degradation in the performance of splice closure and access to the inner junctions shall be possible without damaging the existing cables. The closure must be designed such that no installed cable is disturbed or require re-sealing of the existing cables during installation of additional cables.

2.8 It shall be possible to carry out the installation without inflicting any damage to the existing fibres or the fibre splices.

2.9 The increase in attenuation for each of the fibre splices in the installed splice closure as a result of operational strain shall not exceed 0.05 dB, measured at 1310 nm & 1550 nm.

2.10 The installed splice closure shall satisfy the following mechanical requirements:
The splice closure shall be resistant to mechanical stress, vibration, and impact that may result from normal operation and handling, or from any external sources. The cable terminations shall withstand tensile stress, pressure, bending, and twisting that may result from normal operation and handling, without any leaks arising or other damage being caused to the installed splice closure. The splice closure shall comply all the tests listed in clause No. 4.0

2.11 The minimum-bending diameter of the fibres outside the splice trays in the splice closure shall be at least 100 mm.

2.12 It shall be possible to open and close the splice closure repeatedly with the tools as per Standard No. TEC 89060:2006 (or latest release) and subsequent amendments issued, if any, by replacing the sealing arrangement, only if required. Any special tool if required for the installation & operation of optical fibre splice closure, the same shall be provided along with the Splice closure and kitted in each box so as the installer need not to carry on his person any

additional tool etc.

2.13 The materials used for manufacturing the components/ parts of the splice closure shall be compatible with those used for manufacturing the cables in all respect and shall not effect the performance of the optical fibre cables and fibres. The material used shall be resistant to solvents, chemicals, stress cracking, creep and other materials to which they might get exposed in normal applications.

2.14 All the fasteners used in the assembly of a closure shall be captivated to prevent any accidental loss during installation & maintenance activities.

2.15 The closure assembled with section of cable containing damaged sheath shall show no evidence of water intrusion into the closure after it is subjected to water immersion test.

2.16 The life of the closure shall be at least 25 years and shall match the life of the cable for which it is proposed to be used.

3.0 Technical Requirements:

3.1 General Description:

a) The splice closure shall have a base and domed shaped body. The dome shall be fixed on the base. The dome shaped body shall cover the entire junction while the base shall enable the entries of the optical fibre cables.

b) The base and dome shall be made of thermoplastic/High Density Polyethylene/polypropylene/ un-reinforced PC/ PBT alloy material and shall have the characteristics to meet the performance requirements as in Annexure - I. The material used shall have minimum hardness of Rockwell

R87 or equivalent. The material shall be termite proof (The standard test on the material for termite proof-ness shall be conducted). The base and dome shall be impact resistant. The body shall be smooth with no burrs or sharp edges. Ribs on the body of Splice closure shall be provided.

c) The splice closure shall be kitted with a full set of parts and materials and any associated tools or apparatus to fully prepare and seal the closure up to the maximum amount of cables and trays unless otherwise specified. All materials and required tools directly related to the installation of the closure shall be kitted along with the closure for each closure.

3.2 Dimensions:

The dimensions of the splice closure i.e. of the main body (base & dome), excluding cable entry ports shall be as below:

a) Length : 400 mm (Minimum)
b) Internal Diameter : 220 mm (Maximum)

3.3 Cable entry and its Sealing arrangements:

3.3.1 The Splice closure design should allow for jointing together at least two pairs of cables. The base shall have a minimum 4 single cable entry ports and one port for express (looped) cable entry. The arrangement shall be provided for terminating looped or express cable by making a suitable necessary provision. All ports shall be sealed, and entry ports (sealed) shall be opened as per the requirement. The opening of any port shall not cause any interference to any existing cable. No heat shrink of any type shall be allowed on the cable for sealing. The sealing material shall be termite proof. No consumable items shall be required for sealing. The sealing components must be reusable and shall

have unlimited shelf life. The sealing arrangements shall be specified along with opening and closing arrangements by the manufacturer and the same shall be tested.

Note: Inclusion of the specific sealing arrangement for cable entry with screws or nut and bolts may be decided by the purchaser.

3.3.2 It shall be possible to terminate all cables having outer diameter from 8 mm to 18 mm and the arrangement shall be provided for terminating looped or express cable by making a suitable necessary provision. Alternatively, it shall be possible to install a mid accessed cable without routing a cable tubes through a window or other closure end plate hole.

3.3.3 All cable entry ports shall be independent to each other. All access and port sealing shall be accomplished by mechanical methods. No heat shrink of any type shall be allowed. In the event of growth or any other type of activity by the installer, it shall be able to access the cables and the existing trays with spliced fibres and separate the trays and the cable without disturbing any active fibre.

3.4 Strength member & Cable termination:

3.4.1 It shall be possible to fix the strength member(s) and the optical fibre cable firmly to the splice closure so that the strength member will not shift laterally or move inside the closure. Separate arrangements shall be made to fix strength member (FRP) and cable. FRP fixing arrangement should be such that it doesn't lead to bending of the fibre tubes.

3.4.2 The closure shall have metallic and/or non-metallic internal structure in order to support and hold the cables and strength members etc. The metallic components shall be of either stainless steel or galvanized steel or electric grade aluminum or

tinned copper or Brass. The metals used shall be corrosion resistant. The metallic component shall have low resistivity to withstand the current surge. The internal structure when tested shall meet the requirement of clause no. 4.16 of this GR, without causing any damage to other parts of the closure and shall also meet other performance requirement of the closure. Material of central member shall be defined.

3.4.3 The metallic parts for making connection shall be made of either Brass or stainless steel or tinned copper or galvanized steel or aluminum and shall be corrosion proof.

3.4.4 For fixing cassettes, clamps should be continuous extension of metallic portion used for fixing the cable. The metallic strip should be of stainless steel grade 304 as per ASTM A 240 running throughout the length of dome up to the end.

3.4.5 The mechanical structure for FRP and cable fixing has to be through proper metallic plate.

3.5 Sealing arrangement:

3.5.1 Sealing arrangement of base and dome:

a) The splice closure's base and dome shall be sealed by Mechanical sealing method using circular clamp.

b) The manufacturer shall indicate clearly the method of mechanical sealing. The 'O' ring (circular in cross section) required for sealing shall be made of Neoprene/Silicon/EPDM rubber. The clamps for sealing the base to dome shall be made of corrosion proof material (for example: Stainless steel or Thermoplastic). The clamp shall be circular in shape. A proper clamping system shall be provided which shall include the facility of lock. The sealing

material shall be termite proof.

c) The clamp of the closure shall be equipped with a locking device to prevent un-authorized entry.

3.5.2 Cable sealing system:

The closure shall provide cable sealing system that uses a mechanical type seal and that does not allow for any kind of heat shrinkable substance (cl. no. 3.3 of this document).

3.6 Fibre Organiser:

3.6.1 Fibre organizer shall be capable of handling and organizing the fibres from different design of the cables. Fibre organizer shall be non-metallic made of ABS/ABS blended material and shall confirm to the requirements mentioned in the Annexure - II.

3.6.2 A system of cassettes or trays shall be provided on which the junctions and the extra length of fibres after splicing will be placed (fibre organization). At both ends of the cassettes, an arc type guide should be provided to hold the fibre having a diameter not less than 100 mm. Proper arrows should be provided on the cassettes for guiding the fibres.

3.6.3 The Fibre Organizers (cassettes) system shall be built in such a way as to offer the facilities of its movement about a hinge similar to turning a page in a book and it shall offer easy access to each tray such that working with fibres and splices in any one of tray shall not disturb the fibres on the other trays. This shall ensure to splice all fibres of the cables in predetermined order. Closure in which organizer trays are to be removed to provide access to fibres on other trays shall not be acceptable. For hinged type cassettes tray assembly central pin shall be

provided.

3.6.4 Size of the Cassette (Splice tray):

Length	:	250 mm (minimum)
Width	:	100mm (minimum)
Thickness	:	1.5 mm (minimum)
Depth	:	5 mm

3.6.5 It shall provide storage space of slack fibres (800 mm minimum length) from either sides of the cables for realignment and rejoining.

3.6.6 Splice trays shall be non-metallic made of ABS/ABS blended material and shall be designed such that it shall not harm the fibres from sharp edges etc. All the trays shall have a suitable cover of ABS material.

3.6.7 The minimum bending diameter allowed for the fibre coils inside the splice trays shall be at least 85 mm. During the installation & storage the buffer tubes shall not be subjected to a bend radius smaller than 40 mm.

3.6.8 Arrangement to hold either 12 number of spliced protection sleeves per splice tray for loose fibres OR 6 number of spliced protection sleeves per splice tray for ribboned fibre, shall be provided. Splice protection sleeves used for loose fibre & ribboned fibre, shall meet the requirements of the Standard No. TEC 89020:2011(or latest release) and Standard No. TEC 89030:2011(or latest release), respectively.

3.6.9 Slots of the splice tray shall be able to fix the splice protection sleeves in such a way that they will not shift or move inside the splice tray or come into conflict with the fibre coils once fixed in a slot of the tray. The slots shall not cause any stress

or strain neither on splice protection sleeve nor on the optical fibres.

3.6.10 The fastening arrangement for entry of the fibres into the splice tray shall be suited to secondary coated fibres, and primary coated fibres in tubes without there being any risk of bending loss or damage to the fibres or the secondary tubes.

3.6.11 It shall be possible to fix a minimum of 4 secondary tubes at the entry ports of each tray. No PVC or any other type of adhesive tape is permitted to hold fibre and loose tube inside the tray.

3.6.12 It shall be possible to lead fibres from one tray to another tray inside the splice closure to allow flexibility for branch joints and in the splicing of different cable constructions to each other. Whenever a lateral cable is installed to feed either a building or secondary run cascading multiple buildings or to feed a secondary ring, a separate tray may be installed to splice the lateral fibres to the backbone fibres. No jumping of fibres between trays shall be allowed. If in the event the backbone closure or primary ring closure sees multiple re-entries and continued active splicing, then it shall be an option to run a lateral cable to a second closure in the same vault and to use this closure for all service changes.

3.6.13 It shall be possible to take any individual fibre out of the splice tray for repair during normal operation without damaging the remaining fibres.

3.6.14 Splice trays shall be fixed inside the splice closure in such a way that this shall not loosen once fixed or shift or move in any way, due to vibration and or movement of the closure.

3.6.15 Each tray should have the capacity to store either 12 number of loose fibres OR 6 number of ribbons (with number of fibres per ribbon being 6 or 8 or 12).

3.6.16 The quantity of splice trays in the splice closure shall be supplied as per the number of fibres in a particular cable.

3.7 Transport tubes:

3.7.1 Transport tubes shall be provided to guide the fibres from terminations point of the cable to storage basket of the closure and or to the entry port of the cassette. The transport tube shall be made of polyolefin / silicon and shall be non-kinking type. The material of the transport tube shall not affect the primary coated fibres. It shall not be necessary to make a transition from loose tube buffers to the splice trays with transition tubing.

3.7.2 Diameter of transport tube shall match the dimension of the funnel and able to accommodate 12 number of loose fibres OR 6 number of ribbons (with number of fibres per ribbon being 6 or 8 or 12). Alternatively, the splitter shall be able to accommodate all ranges in size of central core tube type cables.

3.7.3 A suitable storage basket/slack tray shall be provided to store extra length of loose tube buffers etc. Depth of storage basket/slack tray shall be defined to accommodate around 12 m of loose tube, and shall be tested.

3.7.4 A tray wedge shall be provided in each shelf for ease to enable working on the lower tray.

4.0 TESTS:

4.1 Visual Test:

The splice closure shall be examined physically for the workmanship and the design technology employed. It shall be checked minutely for any flaws defects, cracks visible to naked eye.

4.2 Drop and Topple Test:

Objective: To determine the ability of splice closure to withstand the impacts when closure is inadvertently dropped or toppled during installation, repair work or rough handing in its use.

a) **Drop Test:**

Height : 2 meters

No. of drops : 10

Procedure: Drop the closure from a height of 2 meters onto a 12 mm thick steel plate bolted on the concrete floor.

Requirement: The closure shall not exhibit any mechanical damage such as cracks or fractures in the closure housing and damage to components within the closure.

b) **Topple Test:**

Keep the closure in the standing position. Allow it fall freely from 45 degree to all the four directions.

Requirement: The closure shall not exhibit any mechanical damage such as cracks or fractures in the closure housing and damage to components within the closure.

4.3 Gas (AIR) Tightness Test:

Objective: To determine the effectiveness of sealing arrangement of splice closure.

Test Parameters:

Internal pressure	:	1.5 Kg/sq. cm.
Temperature	:	Ambient
Test time	:	24 hours.
Gas	:	Dry Air

Requirement: The fall in pressure in a period of 24 hours shall be within ≤0.05Kg/sqcm at the end of test and there shall be not be any visible flaw or defect after the test.

4.4 Water ingress Test:

Objective: To determine the water tightness of the splice closure when subjected to immersion in water as per Telcordia's GR-771.

Test Parameters:

Water head	:	6.00 meters
Duration of immersion	:	7 days.
Temperature	:	Ambient

Requirement: There shall not be presence of any water vapor inside the splice closure.

4.5 Variation in attenuation (Residual Loss) Test:

Objective: To check the effect of the use of fibre organizer and other arrangement on the transmission characteristics of optical fibres in assembled condition.

Test parameters:

a) Wavelength of operation : 1310 nm & 1550 nm

b) The Fibres attenuation of the spliced fibre shall be measured for the following conditions:
   i) Leaving the fibre un-looped,
   ii) After the arrangement on the tray and stabilization time of one hour.

c) The change in attenuation: $\leq$ 0.05 dB.

Requirement: The change in attenuation shall not increase by more than 0.05 dB when measured at 1310 nm & 1550 nm. The test shall be conducted on at least 50% of the fibres in a cable.

4.6 Clamping:

a) Cable Clamping:

Objective: The cable-clamping test means to determine the effect of installing

the closure, if any and on the optical transmission characteristics of the fibres and splices.

Test conditions:

1. Place two fibre optic cables inside the closure. Very loosely secure the cables to permit splicing. Sheath retention clamps and environmental seals shall not be used at this time.
2. Splice fibers of the cables.
3. Measure and record the initial value for the optical attenuation of the 50% fibers of the cable.
4. Assemble the closure using all associated cable clamping and sealing hardware according to the manufacturer's instructions. Rigid and non-rigid strength members shall also be terminated per the manufacturer's instructions. Care should be taken to minimize movement of the splices.
5. Repeat the optical measurements on the same 50% fibre of the cable.

Requirement: The change in attenuation shall not be more than 0.05 dB measured at 1310 nm & 1550 nm.

b) **Cable Axial Tension (Sheath Retention) Test**:

Objective: To check the cable and sheath holding mechanism for the axial tension if applied to the assembled Splice Closure.

Test parameters:

Tension applied longitudinally on cables.	: 50 Kg
Test Time	: 30 minutes
Internal pressure	: 1.5 Kg/sq. cm.

Temperature	:	Ambient
Change in pressure allowed	:	≤ 0.05kg/sq cm.

The load shall be applied individually to each cable

Requirement:

1. The holding mechanism shall not cause any damage to the cable or the clamping hardware.
2. There shall be no visible flaws or defects after the test.

4.7 Torsion Test:

Objective: To check the effect of torque on the cables of the splice closure.

Test Parameters:

Torque	:	10 x D [Nm], where D is the external diameter of the cable in mm (Max. 50 Nm)
Internal pressure	:	0.5 Kg/sq. cm.
Distance from the entry port	:	250 mm
Rotation	:	90° max.
Temperature	:	Ambient
Number of cycles	:	5
Holding Time	:	5 minutes at each rotation
Change in pressure allowed	:	≤ 0.05kg/sq cm.

The extending cables shall be clamped rigidly at specified distance. Only one cable shall be clamped at a time but the test shall be repeated with each extending cable. The closure shall be axially rotated through 90° and retained for five minutes. It shall be rotated to normal position and then towards to the

opposite direction.

Requirement:

1. There shall not be any flaws, defects, cracks visible to naked eye.
2. There shall not be any fall in pressure more than the prescribed limit.

4.8 Flexure Test:

Objective: To test the Flexure strength of the splice closure.

Test Parameters:

1. Internal pressure	:	0.5 Kg/sq. cm.
2. Force	:	Max 500N and 30 degree bending force application 10XD from the end of cable seal sleeve. (D is the dia. of cable in mm).
3. No. of cycle	:	5
4. Holding time	:	5 minutes
5. Change in pressure allowed	:	$\leq$ 0.05kg/sq cm.

Requirement: The sample shall be checked for gas tightness. There shall not be any fall in the air pressure more than the prescribed limit and there shall not be any physical damage to the cable or the closure.

4.9 Impact Test:

Objective: To determine the ability of splice closure to with stand impacts likely to occur during installation.

Test Parameters:

Internal Pressure	:	0.5 Kg/sq. cm.
Striking Force	:	5 Kg
Dropping height	:	500 mm
Radius of spherical weight	:	50 mm
Location and Number of impacts:		3 Impacts along the length of closure each, at 3 different points located at 120° along the circumference (Total 9 impacts) At least 3 impacts on the mould line.
Change in pressure allowed	:	≤ 0.05kg/sq cm.

Requirement: The sample shall be checked for any cracks, permanent deformation or fractures and gas tightness. There shall not be any fall in the air pressure more than the prescribed limit.

4.10 Static Load Test:

Objective: To determine the mechanical strength capability of splice closure under the action of static load.

Test Parameters:

Internal Pressure	:	0.5 Kg/sq. cm.
Static Load	:	250 kg
Duration for keeping load	:	24 hours
Change in pressure allowed	:	≤ 0.05kg/sq cm.

Requirement: The sample shall be checked for any cracks, permanent deformation or fractures and gas tightness test after completion of test. There

shall not be any fall in the air pressure more than the prescribed limit.

4.11 Thermal Aging:

Objective: Sealing components (gasket, grommets. O-ring, seals etc.) used in a closure shall not permit the entry of water into the closure after thermal aging at 90 ^{0} C + 1^{0} C for 720 hours.

Procedure: Place two sets of components (gasket, grommets. O-ring, seals etc.) in an air oven perpendicular to air flow. Age the components at 90^{0}C for 720 hours (30 days). Allow the components to stabilize at room temperature for min 24 hrs.

Requirement: There shall not be any visible deterioration or deformation or melting or cracking of the samples. This test should be conducted on the sealed closure followed by the Gas tightness test.

Note: The aged components shall be used on the closure subject to remaining environmental Test

4.12 Environmental cycle:

Objective: To determine the working capability of splice closure for climatic conditions.

Test Parameters:

Lowest temperature	: -20 ^{0} C
Highest temperature	: 60^{0} C
Dwell Time	: 4 hrs

Transition time : 2 hrs

Cycle duration : 10 and 1/2 hrs.

Number of cycles : 20

Closed system pressure : 0.5 kg/sq. cm.

Change in pressure allowed : $\leq$ 0.05kg/sq cm.

Humidity to be kept at 95% at 60 ^{0} C and uncontrolled % humidity for all other temperature during the cycle.

Requirement:

1. The sample shall be checked for any cracks, permanent deformation or fractures and gas tightness.
2. There shall not be any fall in the air pressure more than the prescribed limit and the change in attenuation shall not be more than 0.05 dB measured at 1310 nm & 1550 nm.

4.13 Salt spray (Mist) Test (Corrosion Test):

Objective: To determine the suitability of the splice closure and all metallic components in salt laden atmosphere

Test Parameters:

Salt mist test as per TEC document SD: QM-333 (or TEC 14016:2010) {latest issue}.

Requirement: It shall meet the requirements of salt mist test and there shall not be any damage or any evidence of corrosion to the closure.

4.14 Vibration Test:

Objective: To check the effect of vibration on splice closure and its accessories.

Test parameters:

3 Planes : (X-axis, Y-axis, Z-axis)
Sweep : (10-300) Hz ± 2% at 1octave ± 10% per minute
a) sine sweep (10-28) ± 1 Hz 0.1" (2.5 mm) double amplitude
b) sine sweep (28-300) Hz ± 2% max. 4 g acceleration
Time : 2 hours each axis
Internal pressure : 0.5 kg/sq cm.
Change in pressure allowed : ≤ 0.05kg/sq cm.

Requirement: The sample shall be checked for any cracks, permanent deformation or fractures and gas tightness. There shall not be any fall in the air pressure more than the prescribed limit.

4.15 Aggressive Media Test:

a. Resistance to aggressive media test

Test conditions:

The samples shall be checked under internal pressure of 0.5 kg/sq cm. in the solutions as stated below at ambient temperature:
Change in pressure allowed: ≤ 0.05kg/sq cm.

Solution	Test Time
pH 2	5 days
pH 12	5 days
Kerosene	5 days

Petroleum jelly	5 days
Fuel Oil	5 days

Requirement: The sample shall be checked for the receptivity of splice closure in the given media. There shall not be any fall in the air pressure more than the prescribed limit

b. Resistance to stress cracking test

Test conditions:

The samples shall be checked under internal pressure of 0.5 kg/sq cm. in the solutions as stated below:

Test temperature	: 50 ± 2° C
Test medium	: 10% Igepal
Internal pressure	: 0.5 kg/sq cm.
Test time	: 7 days
Change in pressure allowed	: ≤ 0.05kg/sq cm.

Requirement: The sample shall be checked for the receptivity of splice closure in the given media. There shall not be any fall in the air pressure more than the prescribed limit.

4.16 Current Surge Test (Applicable for Armoured Optical fibre cable)

Objective: This test is intended to check that externally grounded closures can safely conduct an accidental current surge on the cable through a controlled metal path to ground.

Test Parameters:

The internal current carrying components shall with stand a current surge of 1000 Amps for 5 seconds in case of Armoured optical fibre cable.

Requirement: No damage to any component part of the splice closure.

4.17 UV test:

Objective: To determine the effect of ultraviolet exposure if any on the Tensile and elongation properties of the non - metallic materials.

Test Method:

ASTM G-154 (latest issue) or as per Telcordia's GR-771-CORE Issue 2, July 2008
Duration: 2000 hours.

Test procedure:

1. Prepare four-test sample of the non metallic material. Keep two samples inside the chamber and expose them to ultraviolet radiation. Continue the test for 2000 hours.
2. Check and compare the properties of the tensile and elongation of the two samples subject to radiation with the other 2 samples kept outside at ambient.

Requirement:

1. There should not be any crack or damage to the sample.
2. The parameters of tensile and elongation shall not be reduced more than 20%

from the two samples at ambient.

Note: A test certificate from Govt. of India recognized or accredited laboratory/ institute may be acceptable.

4.18 Galvanized Test:

Objective: To check galvanized coating and the quality of galvanizing on metallic components of splice closure

Test Method: IS: 2633-1972 for uniformity

Requirement: The metallic components shall meet the requirement of the specifications.

5.0 Consumable Spares: As per Annexure -III

6.0 Engineering Requirements:

6.1 The splice closure shall be manufactured as per the latest state of art technology.

6.2 The splice closure shall be compact and composite in construction. The mechanical design and construction of the splice closure shall be inherently robust and rigid under all conditions of installation, operation, replacement, storage and transportation etc. The manufacturer shall define the weight of the closure. It shall be made up of heat resistance material.

6.3 The design of the closure must ensure:

a) The splice closure shall be possible to be sealed hermetically and shall be able to prevent the intrusion of liquid and vapor into the closure interior. The

neoprene/Silicon/EPDM_rubber O-ring/gasket (circular in cross section) along with a circular clamp is to be used.

b) Mechanical and Optical protection of the splice.

c) Environmental protection of the splice.

d) It shall be possible to pressurise the closure after installation to check the integrity of the environmental seal. The splice closure must be equipped with an integrated pressure valve. The valve shall be such mounted as to avoid any leakage or entry of moisture etc.

e) The integrity of the connections and cable seals, fibres and buffers during mounting, functioning and dismounting.

f) The possibility of the repeated, reopening and re-closing of the dome and base for access to fibre organizer shall be made available without removing or modifying the entire structure but only by replacing the sealing reusable component, if required.

g) The addition of new cables shall be possible without replacing the complete closure, when a growth scenario is encountered. The closure shall allow the installation of a mid-sheath cable in addition to the 1st installation of either a butt or mid sheath splice. The addition of a new cable must be accomplished without the use of any special tool, if required and must not require the replacement or addition of any other closure parts.

h) It shall be able to work in saline atmosphere in coastal areas and should be protected against corrosion.

6.4 Marking on body of the splice closures:

The following information by marking on the body of the splice closure shall be provided by way of engraving or laser printing method

a) Manufacturer's name & date / year of production.

b) Type of Joint closure - (for example i.e. ARMJC)

c) Number of splice (organizer) cassettes
d) Number of Splices per cassette.
e) Batch number
f) Serial Number
g) Model No.
h) Capacity i.e. No. of cables and fibres
i) TEC GR No.

7.0 Quality Requirements:

7.1 The Splice Closure shall be manufactured in accordance with the International Quality Standards ISO 9001-2015 for which the manufacturer shall be duly accredited. A quality plan describing the quality assurance system, being followed by the manufacturer, should be submitted. The splice closure shall meet all primary components as applicable in the field in a real life scenario under GR-771-CORE Issue-2, July 2008 Telcordia's document.

8.0 Environmental requirements:

8.1 The splice closure shall meet the environmental requirements as per document QM-333 (or TEC 14016:2010) (Latest issue) specification for environmental testing. The applicable tests shall be for environment category "C" including drop & topple, vibration and corrosion tests, unless otherwise specified separately.

8.2 The splice closure shall meet Telcordia's GR-771 requirement for environment applications including section on sealing.

9.0 Safety Requirements:

The materials used for manufacturing the components parts of the closure should

not be noxious for the installation and maintenance personnel and shall not cause any environmental pollution. It shall be dermatologically safe. The closure installation shall not require the use of any noxious contact cements or liquid adhesives.

CHAPTER – 2

10.0 Documentation:

The technical literature in English language along with detailed drawings of all the assemblies and parts shall be provided. All the aspects of Installation, Operation and Maintenance including illustration of external and internal parts shall be covered in the manual. The soft copy as well as hard copy of the manuals shall also be provided. The manuals shall include the following:

a) Installation, Operation and Maintenance details of closure.
b) Safety measures to be observed in handling the closure.
c) Precautions for operation and maintenance.
d) Illustration of internal and external parts.
e) List of the parts including their source and ordering information for all the replaceable parts.
f) Detailed method for re-opening and re-closing of the splice closure.
g) Each splice closure shall be supplied along with small booklet giving the installation method etc. in brief to help the installer in field by way of illustrations.
h) Packaging list of all items included in the shipping container.
i) A flow chart for the installation of the closure (giving the diagrams and details of parts etc.) shall be provided along with the each closure.

11.0 Shipping Container and Packaging Arrangement:

a) All the materials and component parts specified by the manufacturer for installation shall be shipped in a single container. Packaging of parts in the carton shall be such that the parts become available in the order in which they are needed.

b) The shipping container and the packaging equipment shall be reusable, recyclable or biodegradable.
c) The packaged parts shall be clearly labeled with part number & names consistent with those given in the instructions.
d) If consumable material with a limited shelf life is packaged with the closure assembly, the expiration date shall be clearly marked.
e) The packaging shall be adequate to ensure that no damage will occur to the splice closure or materials under normal handling, shipping and storage in reasonably dry unheated quarters.

12.0 Guidelines for Purchaser

12.1 The size of the cassette (or splice tray) to be used inside the splice closure is mentioned in Clause No. 3.6.4 of this GR. The purchaser may procure a higher size splice tray as per their requirement, provided the given splice closure meets the requirements as specified in this GR.

12.2 Following clauses shall be applicable for Splice closure for Armoured Optical fibre cable:

i. The bond clamp shall remain firmly attached to the cable shield of an Armoured cable when the clamp to sheath joint is subjected to a tensile load of 9 kg. There shall be no evidence of the clamps loosening or damage to the clamp or to the cable that would reduce its current carrying capacity as required by AC surge current test (clause no. 4.16) after the removal of the load. The closure must be designed to allow independent and common bonding.

ii. Arrangement shall be made inside the closure to ensure metallic continuity with the metallic parts of the cables.

iii. The point of connection on the splice closure for earthing shall be waterproof and airtight to avoid ingress of moisture into the closure.

iv. A grounding device and mounting accessories shall be provided for grounding the splice closure if required by the user, and in such cases:

a. It shall be possible to make metallic connection on the body of the closure for proper grounding arrangement of the closure.
b. All the fixture like lugs (thimble) suitable to accommodate earth wire of 6 SWG, washers, bolt & nuts etc. shall be provided.

Note: The earthing of the splice closure may be carried out, only in case of armoured optical fibre cables, if required by the user or purchaser

13.0 Procedure for issue of Approval Certificate

13.1 The approval certificate against this Standard for GR shall be issued after successful testing against the clauses of this Standard.

13.2 There may be variations in the fibre holding arrangement within the cassette (splice tray) of the Splice closure depending on the application of the splice closure whether for Ribbon or Non-Ribbon optical fibre cables. The manufacturer seeking approval certificate against this Standard for GR for Splice closure shall explicitly mention the different types of the cassettes (splice trays) with their corresponding application (i.e. whether for accommodating loose fibres or ribboned fibre), that intend to be put inside the given splice closure.

13.3 The different types of cassette(or splice tray) designed for accommodating either loose fibres or ribboned fibre may be covered under a single approval certificate issued against this Standard for GR for Splice closure, provided they meet the requirements as specified in this GR and testing being done for each type of

cassette(or splice tray).

13.4 The approval certificate issued against this Standard for GR for Splice closure should clearly mention the types of cassettes (splice trays) used inside the given splice closure and whether these cassettes (splice trays) types are for accommodating loose fibres or ribboned fibres.

ANNEXURE - I

The material of thermoplastic/High density polyethylene/polypropylene characteristics and the performance requirements:

a) Tensile strength : > 17 N/mm^2

b) Elongation at breaking : > 350 %
(velocity 25 mm/min, + 25 ± 2° C)

c) Resistance to chemical agents : No traces of grazing or cracking.
(The sample shall be soaked in filling jelly, iso paraffinic solvent derived from petroleum for 30 days)

d) It shall be U V stabilized. : (Tested as per ASTMG53 for 1000 Hours)

e) Thermal ageing : 168 hours at +100 ± 2° C
i) Tensile strength : >15 N/mm^2
ii) Elongation at breaking : > 300 %

f) It shall not be affected by the soil at any PH, or by the micro-organisms and insects or termite and rodents

Note: Test certificate with results from recognized laboratory is acceptable if the manufacturer does not have the test facility.

ANNEXURE - II

The material for fibre organizer:

The optical fibre organiser shall be made of ABS/ABS Blend material having following characteristics:

For ABS materials:

a)	Specific gravity	1.01-1.21	ASTM-D-792
b)	Tensile strength	≥0.002kg/sqmm	ASTM-D-638
c)	Elongation	< 50%	ASTM-D-638
d)	Water absorption	0.4%	ASTM-D-57-59
e)	Rock well hardness	R81-R111	ASTM-D-785A

Note: A certificate with results from recognized laboratory is acceptable if the manufacturer does not have the test facility.

ANNEXURE – III

CONSUMABLE SPARES

S. No	Item	Qty.
1	Protection Sleeves (Standard No. TEC 89020:2011 or Standard No. 89030:2011) (For example for the straight joint of 12 fibre cable, 15 nos. of protection sleeves shall be supplied)	As per the fibre count in the cable + 25 % extra quantity
2.	Cable Tie	12 nos. per tray of required length
3.	Tissue / Lens paper 3"x 4"	For 6F & 12F - 20 nos. For 24F-30 nos. For 48F-60 nos. For 96F-100 nos.
4.	Isopropyl (Lab Grade)	For 6F / 12F/ 24F -50ml For 48F/ 96F- 100 ml.
5.	PVC adhesive tape (5m length of 10mm width)	1No (IS no. and Shelf life may be specified)
6.	Velcro tape (to hold the cassettes assembly if required)	As per the requirement
7.	Sealing arrangement	1 complete set
8.	Cable & fibre identification rings (As per the cable and the fibre counts)	2 sets
9.	Transport Tube	As per the requirement
10.	Any other item required for the installation and assembly	As per the requirement
11.	Gasket or O-rings for mechanical sealing	1 (One O-ring to be supplied)
12.	Silica gel	2 packets each of 50grams for each closure supplied. This shall be so packed that it can be tied

		with the internal mechanical structure of the closure inside the closure.
13.	Fibre guiding pin	1 No.

ABBREVIATIONS

ASTM	- American Society for Testing and Materials
ABS	- Acrylonitrile Butadiene Styrene
BIS	- Bureau of Indian Standards
HDPE	- High Density Polyethylene
IEC	- International Electro -Technical Commission
IS	- Indian Standards
ISO	- International Organization for Standardization
Mpa	- Mega Pascal
OF	- Optical Fibre
QA	- Quality Assurance
QM	- Quality Manual
RH	- Relative Humidity
TEC	- Telecommunication Engineering Centre
GR	- Generic Requirements
ITU-T	- International Telecommunication Union – Telecommunication
Kg	- Kilo gram
Sq cm	- Square Centimeter
hrs.	- Hours
C	- Centigrade
UV	- Ultra Violet
