



अनंतिम टेस्ट गाइड

टीईसी ८५०३०:२०२५

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PROVISIONAL TEST GUIDE (Initial Draft)

TEC 85031:2025

(Supersedes No. TSTP/GR/OFC-05/02. MAR 2006)

**हाई काउंट मेटल फ्री ऑप्टिकल फाइबर केबल (रिबन टाइप)
फॉर एक्सेस नेटवर्क**

(मानक सं: टीईसी ८५०३०:२०२५)

**HIGH COUNT METAL FREE OPTICAL FIBRE CABLE
(RIBBON TYPE) FOR ACCESS NETWORK**

(Standard No. TEC 85030:2025)



ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

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इस सर्वाधिकार सुरक्षित प्रकाशन का कोई भी हिस्सा, दूरसंचार अभियांत्रिकी केंद्र, नई दिल्ली की लिखित स्वीकृति के बिना, किसी भी रूप में या किसी भी प्रकार से जैसे -इलेक्ट्रॉनिक, मैकेनिकल, फोटोकॉपी, रिकॉर्डिंग, स्कैनिंग आदि रूप में प्रेषित, संग्रहीत या पुनरुत्पादित न किया जाए ।

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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 Centers (RTECs) have been established which are located at New Delhi, Bangalore, Mumbai, and Kolkata.

ABSTRACT

This Test Guide of testing pertains to test schedule and procedure for evaluating conformance/functionality/requirements/performance of Standard for Generic Requirements of high count metal free Optical fibre Cables (Ribbon type) for access network.

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A. HISTORY SHEET

<i>S. No.</i>	<i>GR No.</i>	<i>Title</i>	<i>Remarks</i>
1.	TSTP/GR/OFC 05/01. JUL 2000	- Test Schedule and Test Procedure of High count Metal Free Optical Fibre Cable (Ribbon Type) for Access Network	First Issue
2.	TSTP/GR/OFC 05/02. MAR 2006	- Test Schedule and Test Procedure of High count Metal Free Optical Fibre Cable (Ribbon Type) for Access Network	Second Issue
3.	TEC 85031:2025	Test Guide for Standard for Generic Requirements of High count Metal Free Optical Fibre Cable (Ribbon Type) for Access Network	Third Issue

B. INTRODUCTION

This document enumerates detailed test schedule and procedure for evaluating conformance / functionality / requirements / performance of high count metal free Optical fibre Cables (Ribbon type) for access network as per Draft Standard No. TEC 85030:2025.

Draft

C. General information:

SN.	General Information	Details <i>(to be filled by testing team)</i>	
1	Name and Address of the Applicant		
2	Date of Registration		
3	Name and No. of GR/IR/Applicant's Spec. against which the approval sought		
4	Details of Equipment		
	Type of Equipment	Model No.	Serial No.
(i)			
(ii)			
5	Any other relevant Information:-		

D. Testing team: *(to be filled by testing team)*

S. N.	Name	Designation	Organization	Signature
1.				
2.				

E. List of the Test Instruments:

S.N.	Name of the test instrument	Make /Model <i>(to be filled by testing team)</i>	Validity of calibration <i>(to be filled by testing team)</i>
1			dd/mm/yyyy
2			
3			
4			
5			
6			
7			
8			

F. Equipment Configuration Offered: (to be filled by testing team)

(a) <Equipment/product name> Configuration:

S.N.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

(b) <Other equipment name> Configuration:

S. No.	Item	Details	Remarks

Relevant information like No. of cards, ports, slots, interfaces, size etc. may be filled as applicable for the product

G. Equipment/System Manuals: (to be filled by testing team)

Availability of Maintenance manuals, Installation manual, Repair manual & User Manual etc. (Y/N)

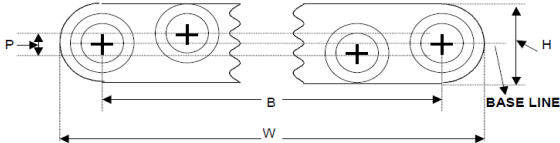
H. Clause-wise Test Type and Test No.:

Clause No.	Clause	Type of Test / Test No. etc. *
1.0	Introduction: This document describes the the Standard for Generic Requirements of high count metal free Optical fibre Cables (ribbon type) for access network. The cable is meant to be installed underground. The fibres in the cable shall be arranged in a ribbon form. A ribbon shall have 12 fibres. Multiple ribbons shall be deployed in cable to meet capacity requirements.	Manufacturer compliance shall be checked and examined.
2.0	Functional Requirements:	
2.1	The design and construction of Ribbon Optical Fibre Cable shall be inherently robust and rigid under all conditions of operation, installation, adjustment, replacement, storage and transport.	Check as per the requirement of the clause and comment. The design shall also be checked. Undertaking shall also be submitted by manufacturer.
2.2	The Ribbon optical fibre cable shall be able to work in a saline atmosphere in coastal areas and should be protected against corrosion.	Test certificate or undertaking may be obtained as per the requirement of the clause.
2.3	Life of cable shall be at least 25 years. Necessary statistical calculations shall be submitted by the manufacturer. The cable shall meet the cable aging test requirement.	The calculation shall be checked & observations are to be noted.

2.4	It shall be possible to operate and handle the Ribbon optical fibre cable with tools as per Standard No. TEC 89060:2006 (or latest release) and subsequent amendments, if any. If any special tool is required for operating and handling this optical fibre cable, the same shall be provided along with the cable.	The cable shall be checked by operating with the tools as prescribed in the Standard No. TEC 89060:2006 and observation to be noted. Undertaking shall also be submitted by the manufacturer.
2.5	The HighCount Metal Free Optical Fibre Cable (Ribbon Type) for Access Network shall be suitable and compatible with the dimensions, fixing, terminating and splicing arrangement of the splice closure supplied along with the cable & vice versa. The manufacturer shall indicate the type, make and the model no. of the splice closure to be supplied.	Check as per the requirement of the clause and comment.
2.6	The manufacturer shall indicate the maximum and average splice loss of the Individual fibres in a ribbon with the permissible variation in sizes of the optical fibre ribbon during bulk production.	Check as per the requirement of the clause.
2.7	It is mandatory that the Optical fibre cable supplied in a particular route is manufactured from a single source of optical fibres.	Test certificate or undertaking may be obtained as per the requirement of the clause
3.0	Technical Requirements of fibre: Single Mode Optical Fibre used in Ribbon fibre cable shall be as per ITU-T Rec. G 652-D or G.657 A1. The specification of optical	Check as per the requirement of the clause and comment.

	fibres are mentioned below:	
3.1	<p>Type of fibre : (Wavelength band optimized nominal 1310 nm):</p> <p>Single mode as per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any.</p>	Check as per the requirement of the clause and comment.
3.2	<p>Geometrical Characteristics of fibre :</p> <p>As per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)</p>	Record the observations
3.3	<p>Transmission Characteristics of fibre:</p> <p>As per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)</p>	Record the observations
3.4	<p>Mechanical Characteristics of fibre:</p> <p>As per Section-I of the Standard No. TEC</p>	Record the observations

	89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)	
3.5	<p>Material Properties of fibre:</p> <p>As per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)</p>	Record the observations
3.6	<p>Environmental Characteristics of Fibre:</p> <p>As per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)</p>	Record the observations
3.7	<p>Colour Qualification and Primary coating Test:</p> <p>As per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any. All the parametric values shall be as per the Standard for GR for raw materials (Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any)</p>	Record the observations

	subsequent amendments, if any)											
3.8	Ribbon Structure:											
3.8.1	Twelve coated fibres shall be arranged in ribbon structure. The fibres in the structure shall be parallel and shall not cross over each other along the entire length of the ribbon. The dimensions of 12 fibres ribbon shall be as per the sectional specification of IEC 60794-3 / Telcordia GR-20-CORE (issue 4, July 2013) and as given below :	Check as per the requirement of the clause and record the observations.										
3.8.2	<p>Ribbon Dimensions:</p> <p>The maximum dimensions of fibre ribbon shall be as follows and the cross section geometry of the fibre ribbon shall be as shown in the following figure:</p> <table><tr><th>Number of Fibres</th><th>Ribbon Width (W)</th><th>Ribbon Height (H)</th><th>Extreme Fibres (B)</th><th>Planarity (P)</th></tr><tr><td>12</td><td>3220 μm</td><td>360 μm</td><td>2882 μm</td><td>50 μm</td></tr></table>  <p style="text-align: center;"><u>Cross section of Fibre Ribbon</u></p>	Number of Fibres	Ribbon Width (W)	Ribbon Height (H)	Extreme Fibres (B)	Planarity (P)	12	3220 μm	360 μm	2882 μm	50 μm	Check and note down the observation in Table below
Number of Fibres	Ribbon Width (W)	Ribbon Height (H)	Extreme Fibres (B)	Planarity (P)								
12	3220 μm	360 μm	2882 μm	50 μm								

S. No. of Ribbon Sample	Number of Fibres	Ribbon Width (W)	Ribbon height (H)	Extreme Fibres (B)	Planarity (P)

3.8.3	Ribbon Material: The ribbon shall be manufactured using single mode optical fibres coloured with UV cured resin and the ribbon shall be encapsulated with a further layer of UV cured acrylate. The fibres and the ribbons shall confirm to the colour requirement as per clause no. 4.4 of this GR.	Check as per the requirement of the clause and record the observations
3.8.4	Ribbon Mechanical Properties :	
3.8.4.1	Ribbon Macro-bend: Change in attenuation when wrapped on a 60 mm diameter mandrel for 100 turns at 1310 & 1550 nm : ≤ 0.05 dB	Check as per the requirement of the clause and record the observations
3.8.4.2	Ribbon Compression Resistance : Change in attenuation when subjected to a compressive load of 500 N at 1310 nm & at	Check as per the requirement of the clause and record the observations

	1550 nm : ≤ 0.05 dB	
3.8.4.3	Ribbon Torsion Resistance Change in attenuation (At 1310 nm & 1550 nm) : ≤ 0.05 dB	Check as per the requirement of the clause and record the observations .
3.9	Ribbon Optical fibre Cable Construction Specifications : The cable shall be designed to the parameters mentioned in Annexure – I. The manufacturer shall submit designed calculations and the same shall be studied and checked.	Check as per the requirement of the clause and comment.
	New Clause: Secondary Protection: The coated Ribbon fibres may be protected by loose packaging within tube, which shall be filled with thixotropic jelly. The dimensions of tube shall be as per Annexure – I.	Check as per the requirement of the clause and comment.
3.9.1	Number of fibres in the cable : 48, 96, 144, 288, 576 (Type approval for a cable shall be issued depending upon the no. of fibres in the cable).	Check as per the requirement of the clause and comment.
3.9.2	Number of fibres in a ribbon : Twelve (12) Fibres	Check as per the requirement of the clause and comment.
3.9.3	The number of ribbons per loose tube in ribbon optical fibre cable shall be as follows :	Check as per the requirement of the clause and comment.

	<table border="1"> <thead> <tr> <th>S. No</th><th>No. of Fibres</th><th>Multi loose tube type</th></tr> </thead> <tbody> <tr> <td>a.</td><td>48 fibres</td><td>Four Tube, 1 ribbon- per tube</td></tr> <tr> <td>b.</td><td>96 fibres</td><td>Five tubes, Two tubes with 1 ribbon per tube Three tubes with 2 ribbons per tube</td></tr> <tr> <td>c.</td><td>144 fibres</td><td>Six tubes, Two ribbons per tube</td></tr> <tr> <td>d.</td><td>288 fibres</td><td>Six tubes, Four ribbons per tube</td></tr> <tr> <td>e.</td><td>576 fibres</td><td>Eight tubes, Six ribbons per tube</td></tr> </tbody> </table> <p><u>TYPICAL STRUCTURAL DRAWING FOR 48F RIBBON OPTICAL FIBRE CABLE</u></p>	S. No	No. of Fibres	Multi loose tube type	a.	48 fibres	Four Tube, 1 ribbon- per tube	b.	96 fibres	Five tubes, Two tubes with 1 ribbon per tube Three tubes with 2 ribbons per tube	c.	144 fibres	Six tubes, Two ribbons per tube	d.	288 fibres	Six tubes, Four ribbons per tube	e.	576 fibres	Eight tubes, Six ribbons per tube	
S. No	No. of Fibres	Multi loose tube type																		
a.	48 fibres	Four Tube, 1 ribbon- per tube																		
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c.	144 fibres	Six tubes, Two ribbons per tube																		
d.	288 fibres	Six tubes, Four ribbons per tube																		
e.	576 fibres	Eight tubes, Six ribbons per tube																		
3.9.4	<p>Strength Member : Solid FRP non - metallic strength member shall be used in the center of the cable core. The strength member in the cable shall be for strength and flexibility of the cable and shall have anti buckling properties. The FRP shall keep the fibre strain within permissible values. The strength member(FRP) shall be as per the Standard No. TEC 89010:2021(or latest release) and the subsequent amendments, if any. The size of FRP shall be as per Annexure – I.</p>	Check as per the requirement of the clause and comment.																		
3.9.5	<p>Cable Core Assembly : The coated fibres in ribbon structure shall be protected inside loose tubes / buffer tubes which are stranded together around a central strength member</p>	Check as per the requirement of the clause and comment.																		

	using helical or reverse lay techniques and form the cable core. The buffer tubes shall maintain the fibre's mechanical & optical integrity. It shall also protect them from tensile, thermal and vibration loads. The buffer tubes shall be gel filled to block the ingress of water.	
3.9.6	Core Wrapping : The main cable core shall be wrapped by a layer/layers of Polyester foil/ tape. The nylon/polyester binder thread / tape shall be used to hold the thread / tape, if required. The nylon/polyester binder thread shall be as per Section-IX of Standard No. TEC 89010:2021(or latest release) and the subsequent amendments, if any. The core wrapping shall not leave any kink marks over the loose tube.	Check as per the requirement of the clause and comment.
3.9.7	Moisture barrier (protection): The main cable core (containing fibres & core wrapping) shall be protected by flooding compound (Jelly) having properties of non hygroscopic dielectric material.	Check as per the requirement of the clause and comment.
3.9.8	Filling and flooding compound: The filling /flooding compound used in the loose tube and in the cable shall be compatible to fibre, secondary protection of fibre, core wrapping and other component parts of the cables.. The drip point shall not be lower than +70 °C. The fibre movement shall not be constrained by stickiness and shall be removable easily for splicing. The test method to measure drop point shall be as per ASTM D 566 . The filling and the flooding jelly	Check as per the requirement of the clause and comment.

	compound shall be as per the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any.	
3.9.9	<p>Sheath : A non-metallic moisture barrier sheath may be applied over and above the cable core. The core shall be covered with tough weather resistant High Density Polyethylene (HDPE) sheath, black in colour (UV Stabilized). Thickness of the sheath shall be uniform and shall not be less than 1.8 mm including the strength members if used in the sheath. The sheath shall be circular, smooth, free from pin holes, joints, mended pieces and other defects. The reference test method to measure thickness shall be as per IEC 60811-202.</p> <p>Note: HDPE material, black in colour, from the finished cable shall be subjected to following tests (on sample basis) and shall confirm to the requirement of the material as per as per Section III of Standard No. TEC 89010:2021(or latest release) and the subsequent amendments, if any.</p> <ul style="list-style-type: none"> a) Density. b) Melt Flow Index. c) Carbon Black Content. d) Carbon Black Dispersion. e) ESCR. f) Moisture Content g) Tensile Strength and Elongation at break 	Check as per the requirement of the clause and comment.

	h) Oxidative Induction time i) Absorption Coefficient j) Brittleness Temperature	
3.9.10	Outer Jacket : A circular sheath/Jacket of not less than 0.65 mm thick of Polamide-12/Nylon-12 material orange in colour, free from pin holes, scratches and other defects etc. shall be provided over and above the HDPE sheath. The nylon Jacket shall have smooth finish.	Check as per the requirement of the clause and comment.
3.9.11	Cable diameter : The finished cable diameter shall be as per Annexure-I.	Check as per the requirement of the clause and comment.
	New Clause: Cable Weight : The nominal cable weight shall be as per Annexure -I	Check as per the requirement of the clause and comment.
3.9.12	RIP Cord : a) Two suitable rip cords shall be provided in the cable which shall be used to open the HDPE sheath of the cable. The rip cords shall be placed diametrically opposite to each other. It shall be capable of consistently slitting the sheath without breaking for a length of 1 meter at the installation temperature. The rip cords (3 ply & twisted) shall be properly waxed to avoid wicking action and shall not work as a water carrier.	Check as per the requirement of the clause and comment.

	<p>b) The rip cord used in the cable shall be readily distinguishable from any other components utilized in the cable construction.</p>	
3.10	Mechanical Characteristics and Tests on Optical Fibre Cable:	
3.10.1	<p>Tensile Strength Test :</p> <p>Objective : This measuring method applies to optical fibre cables which are tested at a particular tensile strength in order to examine the behavior of the attenuation as a function of the load on a cable which may occur during installation.</p> <p>Method : IEC 60794-1-21-E1.</p> <p>Test Specs.: The cable shall have sufficient strength to withstand a load of value $T(N) = 9.81 \times 2.5 W$ Newtons or 10000 N which ever is lower (where W-mass of 1Km of cable in Kg). The load shall be sustained for 10 minutes and the strain on the fibre and the attenuation shall be monitored.</p> <p>Requirement : The load shall not produce a strain exceeding 0.25 % in the fibre and shall not cause any permanent physical and optical damage to any component of the cable. The attenuation shall be noted before strain and after the release of strain. The</p>	<p>Check and note down the observation in Table below</p>

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.2	<p>Abrasion Test :</p> <p>Objective : To test the abrasion resistance of the sheath and the marking printed on the surface of the cable.</p> <p>Method : IEC-60794-1-21-E2</p> <p>Test Specs.: The cable surface shall be abraded with needle (wt. 150 gm) having diameter of 1 mm with 500 grams weight (Total weight more than equal to 650 gms.).</p> <p>No. of cycles : 100</p> <p>Duration : One minute (Nominal)</p> <p>Requirement : There shall be no perforation and loss of legibility of the marking on the sheath.</p>	Check and note down the observation in Table below

Test Results:

Length Code	Load Applied	No. of cycles	Duration	Observation / Remarks
	650 gms	100 cycles	01 Minute	

Clause No.	Clause	Type of Test / Test No. etc. *
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3.10.3	<p>Crush Test (Compressive Test) :</p> <p>Objective : The purpose of this test is to determine the ability of an optical fibre cable to withstand crushing.</p> <p>Method : IEC 60794-1-21-E3.</p> <p>Test Specs.: The fibres and component parts of the cable shall not suffer permanent damage when subjected to a compressive load of 2000 Newtons applied, between the plates of dimension 100 mm x 100 mm. The load shall be applied for 60 seconds. The attenuation shall be noted before and after the completion of the test.</p> <p>Requirement : The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelength.</p>	Check and note down the observation in Table below
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.4	<p>Impact Test:</p> <p>Objective : The purpose of this test is to determine the ability of an optical fibre cable to withstand impact.</p> <p>Method : IEC 60794-1-21-E4.</p> <p>Test Specs : The cable shall have sufficient strength to withstand an impact caused by a mass weight of 50 Newtons, when falls freely from a height of 0.5 meters. The radius R of the surface causing impact shall be 300 mm. Ten such impacts shall be applied on the cable at different places typically spaced not less than 500mm apart. The attenuation shall be noted before and after the completion of the test.</p> <p>Requirement: The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm</p>	Check and note down the observation in Table below

	<p>Method : IEC 60794-1-21-E6</p> <p>Test Specs. : The cable sample shall be of sufficient length (5 m minimum) to permit radiant power measurements as required by this test. Longer lengths may be used, if required.</p> <p>Parameters:</p> <p>Weight : 5 Kg or as per FOTP-104 whichever is higher</p> <p>Minimum distance from Pulley centre to holding device : 216 mm</p> <p>Minimum distance from Wt. to Pulley centre : 457 mm</p> <p>Pulley Diameter : 20 D(D cable diameter)</p> <p>Angle of Turning : 90°</p> <p>No. of cycles : 30</p> <p>Time Required for 30 cycles : 1 minute to 2 minute</p> <p>Length of Cable sample : 5m (minimum)</p> <p>Requirement : During the test no fibre shall break and the attenuation shall be noted before and after the completion of the test. The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelengths.</p>	
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.6	<p>Torsion Test:</p> <p>Object : The purpose of this test is to determine the ability of an optical fibre cable to withstand torsion.</p> <p>Method : IEC 60794-1-21-E7.</p> <p>Test Specs. : The length of the specimen under test shall be 2 meters and the load shall be 100 N. The sample shall be mounted in the test apparatus with cable</p>	Check and note down the observation in Table below

	<p>clamped in the fixed clamp, sufficiently tight, to prevent the movement of cable sheath during the test. One end of the cable shall be fixed to the rotating clamp, which shall be rotated in a clockwise direction for one turn. The sample shall then be returned to the starting position and then rotated in an anti-clockwise direction for one turn and returned to the starting position. This complete movement constitutes one cycle. The cable shall withstand ten such complete cycles. The attenuation shall be noted before and after the completion of the test.</p> <p>Requirement: The cable shall be examined physically for any cracks, tearing on the outer sheath and for the damage to other component parts of the cable. The twist mark shall not be taken as damage. The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelengths.</p>	
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.7	<p>Kink Test:</p> <p>Objective : The purpose of this test is to verify whether kinking of an optical fibre cable results in breakage of any fibre, when a loop is formed of dimension small enough to induce a kink on the sheath.</p> <p>Method : IEC 60794-1-21-E10.</p> <p>Test Specs. : The sample length shall be 10 times the minimum bending radius of the cable. The sample is held in both hands, a loop is made of a bigger diameter and by stretching both the ends of the cable in opposite direction, the loop is made to the minimum bend radius, so that no kink shall form. After the cable comes in normal</p>	<p>Check and note down the observation in Table below</p>

	<p>condition,attenuation reading is taken.</p> <p>Requirement : The kink should disappear after the cable comes in normal condition. The change in attenuation of the fibre after test shall be ≤ 0.05 dB, both for 1310 nm & 1550 nm wavelengths.</p>	
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.8	Cable Bend Test:	Check and note down the

	<p>Objective : The purpose of this test is to determine the ability of an optical fibre cable to withstand repeated flexing. The procedure is designed to measure optical transmittance changes and requires an assessment of any damage occurring to other cable components.</p> <p>Method : IEC 60794-1-21-E11 (Procedure-I).</p> <p>Test Specs. : The fibre and the component parts of the cable shall not suffer permanent damage when the cable is repeatedly wrapped and unwrapped 4 complete turns of 10 complete cycles around a mandrel of 20 D, where D is the diameter of the cable. The attenuation shall be noted before and after the completion of the test.</p> <p>Requirement : The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelengths. Sheath shall not show any cracks visible to the naked eye, when examined whilst still wrapped on the mandrel.</p>	observation in Table below
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Test Results:

Colour of		Initial Reading	Final Reading	Change in Attenuation (dB)	Observation / Remarks
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Loose tube	Colour of Fibre	1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.9	<p>Test of Figure of 8 (Eight) on the cable (Type Test):</p> <p>Objective : Check of easiness in formation of figure of 8 of the cable during installation in the field.</p> <p>Test Method : 1000 meter (approximate) of the cable shall be uncoiled from the cable reel and shall be arranged in figure of 8 (eight). The diameter of each loop of the figure of 8 shall be maximum 2 meters.</p>	Check and note down the observation in Table below as well as cable diameter change/kink introduced if any

	<p>Requirement : It shall be possible to make figure of 8 of minimum 1000 meter length of the cable uncoiled from the cable reel, without any difficulty. No visible damage shall occur.</p>	
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Test Results:

Length Code No.	Observation	Remarks

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.10	<p>Temperature Cycling (Type Test) :</p> <p>Objective : To determine the stability behavior of the attenuation of a cable subjected to temperature changes, which may occur during storage, transportation and usage.</p> <p>Method : IEC 60794-1-22-F1 (To be tested on Standard cable length of drum i.e. 2 Km \pm 5 %).</p> <p>Test Specs. : The permissible temperature range for storage and operation will be</p>	Check and note down the observation in Table below

	<p>from -20°C to +70°C. The rate of change of temperature during the test shall be 1°C per minute approx. The cable shall be subjected to temperature cycling for 12 Hrs. at each temperature as given below :</p> <p>TA2 temp. : - 20°C. TA1 temp. : - 10°C. TB1 temp. : + 60°C. TB2 temp. : + 70°C.</p> <p>The test shall be conducted for 2 cycles at the above temperatures.</p> <p>Requirement : The change in attenuation of the fibre under test shall be ≤ 0.05 dB, for 1310 nm and 1550 nm wavelengths for the entire range of temperature.</p>	
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Test Results:

- A) Cable length code:
Temperature: Ambient

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

B) Cable length code:

Temperature: - 20 °C

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

C) Cable length code:

Temperature : - 10 °C

Colour of		Initial Reading	Final Reading	Change in Attenuation (dB)	Observation / Remarks
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Loose tube	Colour of Fibre	1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

D) Cable length code:

Temperature : + 60 °C

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

E) Cable length code:

Temperature : + 70 °C

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

F) Cable length code:

Temperature : Ambient

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.11	<p>Cable Aging test (Type Test):</p> <p>Objective : To check the cable material change dimensionally as the cable ages.</p> <p>Method : IEC 60794-1-22-F9</p> <p>Test Specs. : At the completion of temperature cycle test, the test cable shall be exposed to 85 ± 2 °C for 168 hours. The attenuation measurement at 1310 nm & 1550 nm wavelength to be made after stabilization of the test cable at ambient temperature for 24 hours.</p>	Check and note down the observation in Table below

	<p>Requirement : The increase in attenuation allowed is ≤ 0.05 dB at 1310 nm and 1550 nm .</p> <p>Note : The attenuation changes are to be calculated with respect to the base line attenuation values measured at room temperature before temperature cycling.</p>	
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading		Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
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3.10.12	<p>Water Penetration Test (Type Test):</p> <p>Objective : The aim of this test is to ensure that installed Optical Fibre cable will not allow the water passage along its length.</p> <p>Method : IEC 60794-1-22-F5</p> <p>Test Specs.: A circumferential portion of the cable end (with HDPE sheath, after removing the nylon jacket) shall face the water head. The water tight sleeve shall be applied over the cable. The cable shall be supported horizontally and two meter water head, containing sufficient quantity of water soluble fluorescent dye for the detection of seepage, shall be applied on the HDPE sheath for a period of seven days, at ambient temperature. No other colored dye is permitted.</p> <p>Requirement : No dye shall be detected when the end of the 3 m length cable sample is examined with ultraviolet light detector.</p>	Check and note down the observation in Table below
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Test Results:

Length code No.	End	Date	Time In	Date	Time Out	Observation / Remarks
Sample no 1	Top					
	Bottom					

Sample no 2	Top					
	Bottom					

Clause No.	Clause	Type of Test / Test No. etc. *			
3.10.13	<p>Cable Jacket Yield Strength And Ultimate Elongation :</p> <p>Objective : To check the yield strength and elongation of polyethylene (HDPE) cable sheath.</p> <p>Test Method : FOTP-89 or ASTM D1248 Type III Class.</p> <p>Test Condition :</p> <p>1) Sample shall be taken from a completed cable (The nylon to be removed for this test). The aged sample shall be conditioned at $100 \pm 2^{\circ}\text{C}$ for 120 hours before testing.</p> <p>2) The cross-head speed shall be 50 mm per minute.</p> <p>Requirement:</p> <table border="1"> <tr> <td>Jacket Material</td><td>Minimum Yield Strength</td><td>Minimum Elongation (%)</td></tr> </table>	Jacket Material	Minimum Yield Strength	Minimum Elongation (%)	Check and note down the observation in Table below
Jacket Material	Minimum Yield Strength	Minimum Elongation (%)			

			(MPa)	(psi)		
		HDPE un- aged	16.5	2400	400	
		HDPE aged	12.4	1800	375	

Test Results:

S. No.	Sheath Material	Minimum Yield Strength	
		(16.5 Mpa)	(2400 psi)
Sample No.1	HDPE Unaged		
Sample No.2	HDPE Unaged		

S. No.	Sheath Material	Minimum Yield Strength	
		(12.4 Mpa)	(1800 psi)
Sample No.1	HDPE aged		
Sample No.2	HDPE aged		

S. No.	Sheath Material	Elongation 400 %
Sample No.1	HDPE Unaged	
Sample No.2	HDPE Unaged	

S. No.	Sheath Material	Elongation 375 %
Sample No.1	HDPE aged	
Sample No.2	HDPE aged	

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.14	<p>Ribbon Dimension Measurements test:</p> <p>Objective : To check the fibres in ribbon structure, fibre cross over and fibre identity to ensure the transmission performance and the mechanical service life of the fibre in the ribbon structure.</p> <p>Test method : IEC 60794-1-23-G2</p> <p>Requirement: It shall meet the dimensional requirements given in clause no. 3.8.2 of this GR. The fibres in the entire length of the ribbon shall not cross over at any point.</p>	Check as per the requirement of the clause and comment.
3.10.15	<p>Ribbon Resistance to Twist (Robustness) test (Type Test):</p> <p>Objective: To check the robustness of the fibre ribbons to withstand the twist in installed conditions and to check the structural integrity of the ribbon over the deployed length for mid-span entry, maintenance purposes, consideration in</p>	Check as per the requirement of the clause and comment

	<p>rearrangements and housekeeping.</p> <p>Test method: Telcordia GR-20-CORE (issue 4, July 2013) / FOTP-141</p> <p>Requirement: The un-aged and aged (at $85 \pm 2^{\circ}\text{C}$ with uncontrolled humidity for a period of 30 days) completed ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test when observed under 5X magnification.</p>	
3.10.16	<p>Ribbon Residual Twist (Flatness) test (Type Test) :</p> <p>Objective : To check the dimensional integrity of the ribbon without twisting to allow rearrangements and to limit the potential attenuation increases due to a macro-bending caused by twisting of the fibre ribbon.</p> <p>Test Method : Telcordia GR-20-CORE (issue 4, July 2013) / FOTP-131 / IEC 60794-1-308</p> <p>Requirement : The aged (at $85^{\circ} \pm 2^{\circ}\text{C}$ with uncontrolled humidity for a period of 30 days) ribbon residual twist (if any) shall have a pitch : $\geq 450\text{ mm}$ (or maximum 8 deg/cm residual twist).</p>	Check as per the requirement of the clause and comment
3.10.17	<p>Ribbon Separation Test:</p> <p>Objective:</p>	Check as per the requirement of the clause

	<p>(a) To check the separation of individual fibres, separation of sub-unit of fibres and mid span separation from a fibre ribbon.</p> <p>(b) To check the retention of sufficient colorant for identification for any 2.5 cm length of fibre after separation for individual and sub-unit of fibres.</p> <p>Test Method: IEC 60794-1-305</p> <p>Test to be conducted for :</p> <p>a) Separation of any single fibre or a multi-fibre subgroup by a tool or by hand from a ribbon for a length of 1 meter. Mid span separation from a 2 meter sample, separated close to middle for at least 0.5 meter (both single fibre and the multi fibre sub – units) for un-aged ribbon.</p> <p>Requirement: The un-aged ribbon of minimum length of a 0.3 meter (1.0 foot) of an individual fibre and a sub group of six fibres shall be separated from the ribbon without breaking the fibres or damaging the fibre coating. The force required to perform separation shall not exceed 4.4 N. The area at the separation shall not show any damage to the fibre coating when examined under 5X magnification.</p>	and comment
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	<p>b) Retention of the Colour and Fibre Identification after separation.</p> <p>Requirement:</p> <p>Individual fibre colour identification shall be maintained after the separation test. It shall retain sufficient colorant that any 2.5 cm length is readily identifiable.</p> <p>c) Removal of Ribbon matrix material to access individual fibres.</p> <p>Requirement:</p> <p>No damage shall occur either to fibre coating or the fibres. The coating shall not sustain any swelling self-stripping, cracking or splitting when examined under 5X magnification.</p> <p>Note: The manufacturer shall recommend the procedure for the removal of ribbon matrix.</p>	
3.10.18	<p>Ribbon Strippability Test (Type Test):</p> <p>Objective: Check of removal of the matrix material and the fibres protective coating mechanically with commercial stripping tools from un-aged and aged ribbons.</p> <p>Test Method : IEC 60794-1-310-G10B</p> <p>Pre Conditioning:</p>	<p>Check as per the requirement of the clause and comment</p>

	<p>a. Aged samples: The humidity of aged ribbons shall be soaked at $85 \pm 2^{\circ}\text{C}$ and a non-condensing humidity of $85 \pm 5\%$ for a period of 30 days.</p> <p>b. Water aged samples: The water aged ribbons shall be soaked in de-ionized or distilled water at a temperature of $23 \pm 5^{\circ}\text{C}$ for a period of 14 days.</p> <p>The fibre ribbon strip-ability testing shall be conducted at standard atmospheric conditions. The un-aged, humidity – aged, and water aged ribbons shall be tested within eight hours after aging.</p> <p>Requirement: There shall be no fibre breakage, and any coating residue shall be removable with a single isopropyl alcohol wipe when at least 25 mm of the matrix material and the fibre Protective coating is mechanically removed with commercial stripping tools from un-aged and aged ribbons.</p>	
3.10.19	<p>Ribbon Bend Test</p> <p>Objective: To check the bend performance of a ribbon.</p> <p>Test Method: IEC 60794-1-301</p> <p>Method: One hundred turns of ribbon are</p>	Check as per the requirement of the clause and comment

	<p>wound around a 60 mm diameter ribbon and the loss increase at 1310 nm & 1550 nm shall be measured.</p> <p>Requirement: The change in attenuation of the fibre shall be ≤ 0.05 dB, for 1310 nm and 1550 nm wavelengths.</p>	
3.10.20	<p>Torsion Resistance of the ribbon (Type test):</p> <p>Objective: To check the torsion resistance of the ribbon.</p> <p>Test Method : IEC 60794-1-31, IEC 60794-1-306</p> <p>Method : One-meter length of ribbon is twisted to through five revolutions of 360° and measurement is taken.</p> <p>Requirement: The change in attenuation of the fibre shall be ≤ 0.05 dB, for 1310 nm and 1550 nm wavelengths.</p>	Check as per the requirement of the clause and comment
3.10.21	<p>Crush Resistance of Ribbon (Type Test):</p> <p>Objective: To check the crush resistance of the ribbon.</p> <p>Method: A 50 mm² sample is subjected to a load of 500 N and the attenuation measurement taken for both 1310 nm & 1550 nm wavelengths.</p>	Check as per the requirement of the clause and comment

	<p>Requirement: The change in attenuation of the fibre shall be ≤ 0.05 dB, for 1310 nm and 1550 nm wavelengths.</p>	
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Clause No.	Clause	Type of Test / Test No. etc. *
3.10.22	<p>Check of the quality of the loose tube (containing optical fibre ribbon) (Type Test):</p> <p>a. Embrittlement Test of Loose Tube:</p> <p>This test method is based on bending by compression and reflects embrittlement much better than the other tensile tests. This test is independent of wall thickness of the loose tube.</p> <p>Sample: The minimum length of the test sample depends on the outside diameter of the loose tube and should be 85 mm for tubes up to 2.5 mm outside dia. The length of the bigger tubes should be calculated by using the following equation:</p> $L_o > 100 \times \sqrt{\frac{D^2 + d^2}{4}}$ <p>L_o = Length of tube under test. D = Outside dia of loose tube. d = Inside dia of loose tube.</p>	Check and note down the observation in Table below

	<p>Procedure : Both the ends of a buffer tube test sample may be mounted in a tool, which is clamped in jaws of a tensile machine which exerts a constant rate of movement. The movable jaw may move at a rate of 50 mm per minute toward the fixed jaw. Under load, the tube will bend so that it is subjected to tensile and compressive stresses. The fixture for holding the tube should be designed in a manner that the tube might bend in all directions without further loading.</p> <p>Requirement: The tube should not get embrittled. No kink should appear on the tube up to the safe bend diameter of tube (15 D), where D is the outside diameter of the loose tube. There should also not be any physical damage or mark on the tube surface.</p> <p>b. Kink Resistance Test on the Loose Tube</p> <p>Objective: To safeguard the delicate optical fibers, the quality of the loose tube material should be such that no kink or damage to the tube occur while it is being handled during installation and in splicing operations.</p> <p>Method: IEC 60794-1-23-G7</p>	
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	<p>Procedure: To check the kink resistance of the loose tube, a longer length of the loose tube is taken (with fiber and gel), a loop is made and loop is reduced to the minimum bend radius of loose tube i.e. 15 D (where D is the outside diameter of the loose tube). This test is to be repeated 4 times on the same sample length of the loose tube.</p> <p>Requirement: No damage or kink should appear on the surface of the tube.</p>	
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Test Results a:

Length Code No.	Observation	Remarks

Test Results b:

Length Code No.	Observation	Remarks

Clause No.	Clause	Type of Test / Test No. etc. *

3.10.23	<p>Drainage Test for Loose Tube and Drip test on the cable (Type Test):</p> <p>a. Drainage Test for loose Tube</p> <p>Sample Size: 30 cm tube length.</p> <p>Test procedure:</p> <ol style="list-style-type: none"> 1. Cut the tube length to 40 cm. 2. Fill the tube with the tube filling gel ensuring that there are no air bubbles and the tube is completely full. 3. Place the filled tube in a horizontal position on a clean worktop and cut 5 cm from either end so that the finished length of the sample is 30 cm. 4. Leave the filled tube in a horizontal position at an ambient temperature for 24 hrs. 5. The sample tube is then suspended vertically in an environment heat oven over a weighed beaker. It is left in the oven at a temperature of 70° C for a period of 24 Hrs. 6. At the end of the 24 hrs. period the beaker is checked and weighed to see if there is any gel in the beaker. <p>Requirement:</p> <ol style="list-style-type: none"> 1. If there is no gel or oil in the beaker the tube has PASSED the drainage test. 	<p>Check and note down the observation in Table below</p>
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	<p>2. If there is gel or oil in the beaker the tube has FAILED the drainage test.</p> <p>b. New Clause: Drip test on the cable</p> <p>Objective: The purpose of this test is to determine the ability of jelly in the Optical Fibre cable to withstand a temperature of 70°C.</p> <p>Method: IEC 60794-1-22-F16</p> <p>Test Specs: Take a sample of 30 cm length of the cable with one end sealed by end cap. Remove outer black sheath, binder tapes for 5 cm from open end of the sample. Then the sample is kept vertically with open end downwards in the oven for 24 hours at 70°C with a paper under the sample.</p> <p>Requirement: Examine the paper placed below the cable inside the oven for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.</p>	
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Test Results a:

Length Code No.	Observation	Remarks

Test Results b:

Length Code No.	Observation	Remarks

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.24	<p>Check of easy removal of sheath:</p> <p>Objective: Check of the easy removal of sheath of the optical fibre cable by using normal sheath removal tool.</p> <p>Procedure: To check easy removal, the sheath shall be cut in circular way and the about 300 mm length of the sheath should be removed in one operation. It should be observed during sheath removal process that no undue extra force is applied and no component part of the cable is damaged. One should be able to remove the sheath easily.</p> <p>Note : - Easy removal of both the outer jacket and the inner sheath shall be checked separately.</p>	Check and note down the observation in Table below

Test Results:

Length Code No.	Observation	Remarks

Clause No.	Clause	Type of Test / Test No. etc. *
3.10.25	<p>Check of the effect of aggressive media on the cable (Type Test):</p> <p>Procedure: To check the effect of aggressive media, solution of PH4 and PH10 shall be made. The two test samples of the finished cable, each of 600 mm in length, are taken and the ends of the samples are sealed. These test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc on the sheath and other markings of the cables. (Test method no. ISO175).</p> <p>Requirement : The sample should not show any effect of these solution on the sheath and other marking of the cable.</p>	Check and note down the observation in Table below

Test Results:

Length Code No.	Observation	Remarks

New Clause

Clause No.	Clause	Type of Test / Test No. etc. *
	<p>Flexural Rigidity Test on the optical fibre cable (Type Test):</p> <p>Objective: To check the Flexural Rigidity of the optical fibre cable.</p> <p>Method: To be tested as per ASTM D –790</p> <p>Test Specs: The fibre and the component parts of the cable shall not suffer permanent damage in the cable subjected to Flexural Rigidity Test as per the above method. The attenuation shall be noted after and before the completion of the test.</p> <p>Requirement: The change in attenuation of the fibre after the test shall be ≤ 0.05 dB at both 1310 nm and 1550 nm wavelengths. The sheath shall not show any cracks visible to the naked eye.</p>	Check and note down the observation in Table below

Test Results:

[illegible]

New Clause

Clause No.	Clause	Type of Test / Test No. etc. *
	<p>Static Bend test (Type Test)</p> <p>Objective: To check the cable under Static bend.</p> <p>Method: As per the clause no 4.8 of the GR alternatively as per ASTM D 790.</p> <p>Test Specs: The cable shall be subjected to static bend test. The optical fibre cable shall be bend on a mandrel having a</p>	Check and note down the observation in Table below

	<p>Diameter of 10 D (D is diameter of the cable).</p> <p>Requirement: The change in attenuation of the fibre after the test shall be ≤ 0.05 dB for both 1310 nm and 1550 nm wavelengths. Sheath shall not show any cracks visible to the naked eye when examined whilst still wrapped on the mandrel.</p>	
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Test Results:

Colour of Loose tube	Colour of Fibre	Initial Reading			Final Reading		Change in Attenuation (dB)		Observation / Remarks
		1310 nm	1550 nm	1625 nm	1310 nm	1550 nm	1310 nm	1550 nm	

Clause No.	Clause	Type of Test / Test No. etc. *
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4.0	Engineering Requirements:	
4.1	Cable Marking:	
4.1.1	A long lasting suitable marking shall be applied in order to identify this cable from other cables. The cable marking shall be imprinted (indented). The marking on the cable shall be indelible of durable quality and at regular intervals of one meter length. The accuracy of the sequential marking must be within -0.25% to +0.5% of the actual measured length. The sequential length markings must not rub off during normal installation and in life time of optical fibre cable. The total length of the cable supplied shall not be in negative tolerance.	The method of imprinting (Indenting) and its quality must be checked as per the requirement of the GR and also the accuracy of the sequential marking shall be checked by standard measuring scale at three different places. It shall meet the requirement of the clause.
4.1.2	The marking shall be in black colour over the orange colour nylon jacket and shall be done by hot foil indentation method. It must clearly contrast with the surface. The colour used must withstand the environmental influences experienced in the field.	The contrast colour shall be checked & noted and the method of imprinting (Indenting) must be checked as per the requirement of the clause
4.1.3	The type of legend marking on O.F. cable shall be as follows: a) Company Legend b) Legend containing telephone mark & international acceptable Laser symbol c) Type of Fibre– G.652 D / G.657 A1 d) Number of Fibres e) Type of cable	This shall be checked as per the requirement of the clause and the observation to be noted.

	f) Year of manufacture g) Sequential length marking h) User's Identification i) Cable ID	
4.2	Cable Ends:	
4.2.1	<p>Both cable ends (the beginning end and end of the cable reel) shall be sealed and readily accessible. Minimum 5 meter of the cable of the beginning end of the reel shall be accessible for testing. Both ends of the cable shall be kept inside the drums and shall be located so as to be easily accessible for the test. The drum (conforming to GR No. G/CBD-01/02. NOV 94 or latest release and subsequent amendments issued, if any) should be marked to identify the direction of rotation of the drum. Both ends of cable shall be provided with cable pulling (grip) stocking and the anti twist device (free head hook). The diameter of the cable shall also be marked on the cable drum. The wooden drum shall be properly treated against termites and other insects during transportation and storage. The manufacturer shall submit the methodology used for the same.</p>	The requirement of the clause shall be checked in detail and the observation to be noted.
4.2.2	<p>An anti twist device (Free head hook) shall be provided, attached to the both the ends of the cable pulling arrangement. The arrangement of the pulling eye and its coupling system along with the anti twist system shall withstand the prescribed tensile load applicable to the cable.</p>	The tensile strength requirement shall be checked with pulling eye and its coupling system along with the anti-twist device shall be checked and noted.
4.3	The nominal drum length:	
4.3.1	Length of OF Cable in each drum shall be 2 Km / 4Km	Check as per the

	/ 8Km and shall be supplied as per the order. The variation in length of optical fibre cable in each drum shall be $\pm 5\%$ to $\pm 10\%$, as decided by the purchaser. Purchaser may at their discretion procure shorter length cable drum as per their requirement.	requirement of the clause and comment
4.3.2	The fibres in cable length shall not have any joint.	This shall be examined for each fibre and observations to be noted. A certificate /undertaking may be obtained for the bulk production.
4.3.3	The drum shall be marked with arrows to indicate the direction of rotation.	Check as per the requirement of the clause.
4.3.4	<p>Packing list supplied with each drum shall have at least the following information:</p> <ul style="list-style-type: none"> a) Drum No. b) Type of cables c) Physical Cable length d) No. of fibres e) Length of each fibre as measured by OTDR f) The Cable factor - ratio of fibre/cable length g) Attenuation per Km. of each fibre at 1310 & 1550 nm h) Users / Consignee's Name i) Manufacturers Name, Month, Year and Batch No. j) Group refractive index of fibre. k) Purchase Order No. l) Cable ID 	The packing list shall be checked as per the requirement and observation to be noted.

4.4	Colour coding Ribbon identification in O.F. Cables:																							
4.4.1	The colorant applied to individual fibres shall be readily identifiable throughout the lifetime of the cable and shall match and conform to the Munsell Colour Standards (EIA-598D) and also IEC Publication 304 (4).	Check as per the requirement of the clause and comment.																						
4.4.2	<p>Colour Coding Scheme :</p> <p>When the loose tubes are placed in circular format, the marking to indicate the loose tube no. "1" shall be in blue colour followed by loose tube no.2 of orange and so on for other tubes as per the colour scheme given below at Table-1 and complete the circular format by placing the dummy /fillers at the end.</p> <p>Table -1 : Colour Coding scheme of Loose tube</p> <table><tr><th>Loose tube No./Sequence</th><th>Loose tube identification</th></tr><tr><td>1</td><td>Blue</td></tr><tr><td>2</td><td>Orange</td></tr><tr><td>3</td><td>Green</td></tr><tr><td>4</td><td>Brown</td></tr><tr><td>5</td><td>Slate</td></tr><tr><td>6</td><td>White</td></tr><tr><td>7</td><td>Red</td></tr><tr><td>8</td><td>Black</td></tr><tr><td>9</td><td>Yellow</td></tr><tr><td>10</td><td>Violet</td></tr></table>	Loose tube No./Sequence	Loose tube identification	1	Blue	2	Orange	3	Green	4	Brown	5	Slate	6	White	7	Red	8	Black	9	Yellow	10	Violet	The colour coding identification method shall be checked & observation to be noted as per the requirement of the clause.
Loose tube No./Sequence	Loose tube identification																							
1	Blue																							
2	Orange																							
3	Green																							
4	Brown																							
5	Slate																							
6	White																							
7	Red																							
8	Black																							
9	Yellow																							
10	Violet																							

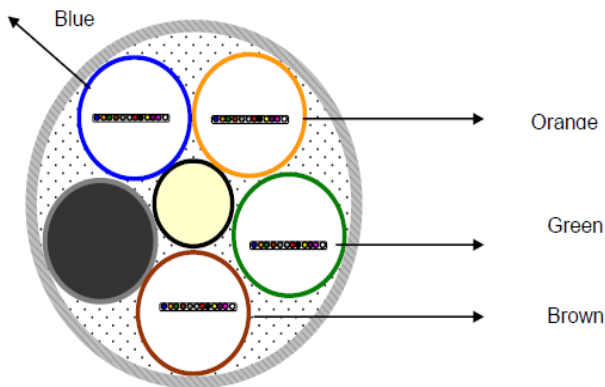
11	Rose/Pink
12	Aqua

Depending upon the number of fibres in a Ribbon (which depends on the cable capacity), the fibres within each Ribbon are serially chosen starting from blue colour as per the colour scheme given below at Table-2.

Table -2 : Colour Coding scheme of the Optical Fibre within Ribbon

Fiber No./Sequence within Ribbon	Fiber identification
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow
10	Violet
11	Rose/Pink
12	Natural

4.4.3	Identification of Ribbon:				Check as per the requirement of the clause and comment
	No. of fibre in a Cable	No. of Tubes	No. of Ribbon per Tube	Fiber Per Ribbon	Marking on Ribbon
	48Fibres	Four	One	6	1 RIBBON 1
	96 Fibres	Five	2 tubes with 1 ribbon per tube 3 tubes with 2 ribbon per tube	6	1 RIBBON 1 1 RIBBON 1 2 RIBBON 2
	144 Fibres	Six	Two	6	1 RIBBON 1 1RIBBON 2
	288 Fibres	Six	Four	6	1RIBBON 1 2 RIBBON 2 3 RIBBON 3 4 RIBBON 4
	576 Fibres	Eight	Six	6	1 RIBBON 1 2 RIBBON 2 3 RIBBON 3 4 RIBBON 4 5 RIBBON 5 6 RIBBON 6

	<p>Note :</p> <p>1. In case of 96 Fibre cable, Loose tube No. 1 & 2 shall have 1 ribbon per tube and Loose tube No. 3, 4 & 5 shall have 2 ribbons per tube.</p> <p>2. The individual number marking shall be at regular interval of every 300 mm on natural color ribbon and shall be legible. The printing on the ribbon shall also be of durable quality and shall be compatible with coating of the ribbon and Thixotropic Jelly (filled in the loose tube of the cable).</p> <p><u>Color coding of Loose tubes for 4 Ribbons (48 fibres) (Refer Table-1)</u></p>  <p>(Loose Tube Colour: Blue, Orange, Green and Brown)</p>	
5.0	Quality Requirements:	
5.1	The cable shall be manufactured in accordance with the international quality standards ISO 9001-2015 or latest issue for which the manufacturer should be duly accredited. The Quality Manual shall be submitted by the manufacturer.	Check as per the requirement of the clause and verify the validity of the ISO certificate.
5.2	Raw Material:	

5.2.1	The cable shall use the raw materials approved against the Standard No. TEC 89010:2021(or latest release) and the subsequent amendments issued, if any. The list and details of the Raw Materials used, the make and grade of the raw material and valid certificate of source approval issued by CACT or any Conformity Assessment Body(CAB) recognized by TEC, shall be submitted by the manufacturer.	Check as per the requirement of the clause and comment
5.2.2	Any other material used, shall be clearly indicated by the manufacturer. The detailed technical specifications of such raw materials used shall be furnished by the manufacturer at the time of evaluation/testing.	The details of the materials shall be taken and checked
5.2.3	The raw materials used from multiple sources is permitted. The source / sources of raw materials (Type and grade) from where these have been procured shall be submitted by the manufacturer.	The details shall be obtained from the manufacturer and checked.
5.2.4	The manufacturer can change the raw material from one approved source to other approved source with the approval of QA, wing of purchaser . The change of source/grade of SM Optical Fibre / Ribbon and / or design shall call for fresh type approval/certification. The clauses 9.2 and 9.3 of this Standard for GR shall facilitate the clause 5.2.4 of this Standard for GR, in order to simplify the certification process and to avoid repetitive testing.	This shall be checked as per the requirement of the clause
5.2.5	The HDPE, Black in colour, used for sheath shall be UV stabilized. Note: A test certificate from CACT or from any Conformity Assessment Body(CAB) recognized by TEC may be acceptable for the UV stability of the HDPE sheath material. Source Approval Certificate (SAC) issued by CACT against Standard No. TEC	The certificate to be obtained as per the requirement of the clause.

	89010:2021(or latest release) for the HDPE raw material used, indicating UV stabilized grade, may also be acceptable in this respect.	
5.2.6	<p>The material used in optical fibre cable must not evolve hydrogen that will affect the characteristics of optical fibres.</p> <p>Note: A test certificate from a recognized laboratory or institute may be acceptable.</p>	Certificate/Undertaking may be obtained as per the requirement of the clause.
5.3	<p>Cable Material Compatibility:</p> <p>Optical fibre, buffers/core tubes, and other core components shall meet the requirements of the compatibility with buffer/core tube filling material(s) and/or water-blocking materials that are in direct contact with identified components within the cable structure as per clause no. 6.3.3 of Telecordia document GR-20-CORE issue 4, July 2013 or as per IEC 60794-1-219.</p> <p>Note : The tests may be conducted in house (if facility exist) or may be conducted at CACT or any other recognized laboratory. The test certificate may be accepted and the tests may not be repeated subsequently, in next type approvals, if the raw material used is of same make and grade.</p>	Check as per the requirement of the clause and comment. Certificate may be obtained.
6.0	Safety Requirements:	
6.1	The material used in the manufacturing of the optical fibre cables shall be non-toxic and dermatologically safe in its life time and shall not be hazardous to health. The manufacturer shall submit MSDS (Material safety Data	<p>The details may be obtained & checked.</p> <p>Certificate / Undertaking</p>

	<p>Sheet) for all the material used in manufacturing of OF Cable to substantiate the statement.</p> <p>Note: Latest issue of the Standards mentioned in the GR, may be referred.</p>	may be obtained.
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CHAPTER- 2

Clause No.	Clause	Type of Test / Test No. etc. *
7.0	Documentation:	
7.1	Complete technical literature in English with detailed cable construction diagram of various sub-components with dimensions, weight & test data and other details of the cable shall be provided.	Details submitted by the manufacturer shall be checked as per the requirement of the clause.
7.2	All aspects of installation, operation, maintenance and fibre splicing shall also be covered in the handbook. The pictorial diagrams of the accessories (with model no. and manufacturer name) supplied along with the cable as package shall be also be submitted. A hard as well as soft copy of the manuals shall be provided.	Details submitted by the manufacturer shall be checked as per the requirement of the clause.
8.0	New clause Information for the Procurer of product/ User:	
8.1	It is suggested that the Optical fibre cable used/deployed in a particular route is manufactured from a single source of optical fibres.	
8.2	User shall check for compatibility issues that may arise because of different fibre types and MFD mismatch.	Compatibility issues may be quantified by bidirectional splice loss and MFD mismatch between the fibres if any.
9.0	New Clause Procedure for Issue of Approval Certificate	
9.1	The approval certificate against this Standard for GR shall be issued	

	subsequent to successful testing against the clauses of this Standard.
9.2	Single Mode Optical Fibre used in manufacturing optical fibre cables shall be as per ITU-T Rec. G.652 D or G.657 A1. The manufacturer having a valid approval certificate against this Standard for GR for cable of specific fibre count and specific fibre type, may also seek approval certificate for cable having same fibre count but different fibre type, provided the manufacturer gets testing done for all corresponding and concerned parameters. This will be applicable when there is change only in the fibre type while all other cable design parameters and fibre count remain the same.
9.3	The manufacturer having valid approval certificate against this Standard for GR for cable with higher fibre count and specific fibre type, may seek approval certificate for cable with lower fibre count without conducting actual tests, provided that all cable design parameters including the fibre type being same.
9.4	The clauses 9.2 and 9.3 shall be read in conjunction with the clause 5.2.4.

Note: Manufacturer shall provide at least two cable drums (of 2 Kms each approx.) for testing with regard to issue of approval certificate.

**Physical Check/Declaration/Documentation/ Report from Accredited test lab/
Functional verification / Information / Test No.*

I. SUMMARY OF TEST RESULTS

TEC Standard No. _____

TEC Test Guide No. _____

Equipment name & Model No. _____

<i>Clause No.</i>	<i>Compliance</i> <i>(Complied /Not Complied / Submitted/Not Submitted / Not Applicable)</i>	<i>Remarks / Test Report Annexure No.</i>

[Add as per requirement]

Date:

Place:

Signature & Name of TEC testing Officer /

** Signature of Applicant / Authorized Signatory*

** Section J as given above is also to be submitted by the Applicant/ Authorised signatory as part of in-house test results along with Form-A. The Authorised signatory shall be the same as the one for Form 'A'.*

Template for submitting comments/inputs on draft Test Guide titled “*High count Metal Free Optical Fibre Cable (Ribbon Type) for Access Network*”

(Draft Test Guide No. TEC 85031:2025)

Name of Manufacturer/Stakeholder:

Organization:

Contact details:

Clause No.	Clause	Comments	Other Remarks, if any

Note: The comments/inputs on the draft Test Guide (Draft Test Guide No. TEC 85031:2025) may be provided in the above format vide email to **dirt2-tec-dot@gov.in** , **adet-tx-tec-dot@gov.in** and **ratx.tec-dot@nic.in**