Government of India
Ministry of Communications
Department of Telecommunications
Telecommunication Engineering Centre
K.L. Bhawan, Janpath, New Delhi-110 001.
(Transmission Division)

File No. 1-17/2025-Tx/TEC

Dated: 05.06.2025

Subject: Revision of Generic Requirements(GR) of "Micro Duct Optical Fibre Cable (GR No. *GR/OFC - 16/01. JULY 2005*)" – Inviting comments

In exercise of the powers conferred by rule 5(2) of the Telecommunications (Framework to Notify Standards, Conformity Assessment and Certification) Rules 2025, a draft Standard (Draft Standard No. TEC 85130:2025) titled *"Micro Duct Optical Fibre Cable"* in respect of revision of *GR/OFC - 16/01. JULY 2005*, is enclosed herewith **(Annexure-I)** for stakeholder consultation. It is requested to go through the aforesaid enclosed draft Standard and offer your inputs/comments. The comments may please be furnished in the template sheet enclosed herewith as **Annexure-II**.

2. The comments/inputs may be furnished through email to *dirt2-tec-dot@gov.in* , *adet-tx-tec-dot@gov.in* , *ratx.tec-dot@nic.in* at the earliest and latest within sixty days please.

Enclosures:

(i) Draft Standard (Draft Standard No. TEC 85130:2025) **(Annexure-I)**
(ii) Template/Format sheet for providing comments**(Annexure-II)**

Mudita Chandra

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To,

All Manufacturers & Stakeholders

Copy to:

1. **Sr DDG TEC**
2. **AD(IT), TEC** – with request for uploading on TEC website/Portal
3. **AD(IMP&TEP), TEC** – with request for uploading on TBT Enquiry Point

Annexure-I

वर्गीय आवश्यकताओं के लिए मानक

टीईसी ८५१३०:२०२५

(सं: जीआर/ओएफसी-१६/०१/जुलाई -२००५ को अधिक्रमित करता है)

STANDARD FOR GENERIC REQUIREMENTS

No.: TEC 85130:2025 (Initial Draft)

(Supersedes No. GR/OFC-16/01. JULY 2005)

माइक्रो डक्ट ऑप्टिकल फाइबर केबल

MICRO DUCT OPTICAL FIBRE CABLE

ISO 9001:2015

दूरसंचार अभियांत्रिकी केंद्र

खुर्शीदलाल भवन, जनपथ, नई दिल्ली–110001, भारत

TELECOMMUNICATION ENGINEERING CENTRE

KHURSHIDLAL BHAWAN, JANPATH, NEW DELHI–110001, INDIA

www.tec.gov.in

~~Transmission~~
~~Issue: JULY 2005~~

~~MICRO DUCT OPTICAL FIBRE CABLE~~

~~GENERIC REQUIREMENTS NO.–GR/OFC - 16/01. JULY 2005~~

~~TEC~~

~~TELECOMMUNICATION ENGINEERING CENTRE~~
~~KHURSHIDLAL BHAWAN, JANPATH~~
~~NEW DELHI 110001.~~

Release 2: , 2025

FOREWORD

Telecommunication Engineering Centre (TEC) functions under 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 Micro Duct Optical Fibre Cable for installation in ducts.

CONTENTS

HISTORY SHEET

Sl. No	*Standard / Document No.*	*Title*	*Remarks*
1.	GR/OFC - 16/01. JULY 2005	Micro Duct Optical Fibre Cable	First Issue
2.	Standard No. TEC 85130:2025	Standard for Generic Requirements of Micro Duct Optical Fibre Cable	Second Issue

~~Name of the Generic Requirements~~	~~No. of the Generic Requirements~~	~~Remarks~~
~~Micro Duct Optical Fibre Cable~~	~~GR/OFC-16/01. JULY 05~~	~~New GR (First issue)~~

CONTENTS

REFERENCES

Sl. No	Document No.	Title/Document Name
1.	TEC 89010:2021 GR/ORM-01/03. MAR 04	Standard for Generic Requirements of Raw Material for manufacturing of Optical Fibre Cable. Specification for Raw Material
2.	TEC 89060:2006 G/OFT-01/02. MAR 99	Standard for Generic Requirements of Specification for Tools For Installation & Operating the OFC & for Assembly of the Optical Fibre Splice Closures
3.	EIA 598-D 359-A IEC Publication 304(4)	Color Standards
4.	GR-20 –CORE July 98	Generic Requirement for Optical Fibre Cable. (Telcordia document) (Bell core)
5.	ITU-T G. 652 and G. 657	ITU-T Recommandations
6.	ISO 9001:2015 or latest issue	International Quality Management System.
7.	IEC 60811-202 , IEC 60794-1-21-E1 IEC 60794-1-21-E2, IEC 60794-1-21-E3, IEC 60794-1-21-E4, IEC 60794-1-21-E6, IEC 60794-1-21-E7,IEC 60794-1-21-E10, IEC 60794-1-21-E11, IEC 60794-1-22-F1, IEC 60794-1-22-F5, , IEC 60794-1-22-F9, IEC 60794-1-23-G7, IEC 60794-1-403, IEC 60794-1-22-F16, IEC 60794-1-219, IEC 62230	Test Methods
8.	FOTP-89	Test Methods

9.	ASTM D-566, ASTM D-790 ASTM-1248, ASTM D-4565	Test Methods

TEC STANDARDS

1. GR/ORM-01/03. MAR 04 — Specification for Raw Material
2. G/OFT-01/02. MAR 99 — Specification for Tools For Installation & Operating the OFC & for Assembly of the Optical Fibre Splice Closures

OTHER STANDARDS (ITU-T/EIA/IEC/Bell core/ISO)

1. EIA 359-A — Color Standards
   IEC Publication 304(4) — Color Standards
2. EIA 455-104 — Test Methods
3. G. 652 D — ITU-T Recommendation
4. GR-20 -CORE July 98 — Generic Requirement for Optical Fibre Cable. (Bell core)
5. ISO 9001:2000 — International Quality Management System.

6. ~~IEC 60793 -2-50, Test Methods~~

~~IEC 60794-1-2-E1,~~

~~IEC 60794-1-2-E2,~~

~~IEC 60794-1-2-E3,~~

~~IEC 60794-1-2-E10,~~

~~IEC 60794-1-2-E11,~~

~~IEC 60794-1-2-F1,~~

~~IEC 60794-1-2-F5~~

CHAPTER - 1

PART I - TECHNICAL SPECIFICATION

1.0 Introduction :

This document describes the Standard for Ggeneric requirements of Micro Duct Optical Fibre Cable for installation in ducts. The Micro Optical Fibre Cable shall have low weight, small volume and high flexibility.

2.0 Functional Requirements :

2.1 The design and construction of Micro duct optical fibre cable shall be inherently robust and rigid under all conditions of installation, operation, adjustment, replacement, storage and transport.

2.2 The Micro duct Optical fibre cable shall be able to work in saline atmosphere in coastal areas and should be protected against corrosion.

2.3 Life of cable shall be at least 25 years. Necessary statistical calculations shall be submitted by the manufacturer., based upon life of the fibre and other component parts of the cable. The cable shall meet the cable aging test requirement.

2.4 It shall be possible to operate and handle the Micro duct optical fibre cable with tools as per Standard for GR No TEC 89060:2006 (latest release) GR No. G/OFT-01/02. MAR 99 and subsequent amendments, if any. If any special tool required for operating and handling the optical fibre cable, the same shall be provided along with the cable.

2.5 The Micro Duct optical fibre cable supplied shall be suitable and compatible to

match with the dimensions, fixing, terminating & splicing arrangement of the splice closure & vice versa.

2.6 The manufacturer shall submit an undertaking that the optical and mechanical fibre characteristics shall not change during the life time of the cable against the manufacturing defects.

2.7 It is mandatory that the Optical fibre cable supplied in a particular route is manufactured from a single source of optical fibres

3.0 Technical Requirements of Optical Fibres :

Single Mode Optical Fibre used in manufacturing optical Fibre Cables shall be as per ITU-T Rec. G. 652 D and G. 657 A1. The specifications of optical fibres are mentioned below.

3.1 Type of fibre (Wavelength band optimized nominal 1310 nm):
Single mode as per Section-I of the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any.

~~Single mode (Section I of the GR (Wavelength band optimized nominal 1310 nm) No.GR/ORM-01/03. MAR 04 and subsequent amendments, if any)~~

3.2 Geometrical Characteristics of Fibre :
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)

3.2.1 Nominal MFD

For matched clad : 8.8-9.8 µm

3.2.2 Nominal Cladding Dia. : 125 µm ± 1.0 µm

3.2.3 Cladding Non-circularity : ≤ 1%

3.2.4 Mode field concentricity error : ≤ 0.8 µm

3.2.5 Diameter over primary coated with double UV cured acrylate. (Shall be measured on un coloured fibre) : 245 µm ± 10 µm

Note: The thickness of colour coating may be over and above the values specified above, if the manufacturer adopts separate UV cured colouring process (to colour the un coloured fibres) other than the on line integrated colouring process (of secondary layer of primary coating) of the fibres, during fibre manufacturing.

3.3 Transmission Characteristics of Fibre:

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)

3.3.1 Attenuation :

a) Fibre attenuation before Cabling

i) At 1310 nm : ≤ 0.34 dB/km
ii) Between 1285 to 1330 nm : ≤ 0.37 dB/Km
iii) At 1550 nm : ≤ 0.21 dB/Km
iv) Between 1525 to 1625 nm : ≤ 0.24 dB/Km

b) Fibre attenuation after Cabling
i) At 1310 nm : ≤ 0.36 dB/km
ii) Between 1285 to 1330 nm : ≤ 0.39 dB/Km
iii) At 1550 nm : ≤ 0.23 dB/Km
iv) Between 1525-1625nm : ≤ 0.26 dB/Km

c) Water Peak Attenuation
Between 1360 – 1480nm : ≤ 0.34 dB/Km

Note :

1. Attenuation in the band 1380-1390nm shall be checked at every 2nm after Hydrogen aging as per IEC 60793-2-50 .
2. Sudden irregularity in attenuation shall be less than 0.1 dB
3. The spectral attenuation shall be measured on un-cabled fibre.
4. The Spectral attenuation in the 1250 nm–1625 nm band at an interval of 10nm shall be measured and the test results shall be submitted.

3.3.2 Dispersion :

a) Total Dispersion
i) In 1285-1330 nm band : ≤ 3.5 ps/nm.km
ii) In 1270-1340 nm band : ≤ 5.3 ps/nm. Km
iii) At 1550 nm. : ≤ 18.0 ps/nm. Km

Note: The dispersion in the 1250 nm–1625 nm band shall be measured at

an interval of 10nm and the test results shall be submitted.

b) Polarization mode dispersion at 1310 & 1550 nm.

i) Fibre : ≤ 0.2 ps/√ km

ii) Cabled Fibre : ≤ 0.3 ps/√ 'km

Note : Measurement on un-cabled fibre may be used to generate cabled fiber statistics and correlation established.

c) Zero Dispersion Slope : ≤ 0.092 ps/(nm ² Km)

d) Zero dispersion wave length range : 1300 -1324 nm

3.3.3 Cut off wavelength for fibres used in cables : 1320 nm Max.

Note - The above cut off wavelength is w.r.t. 2M sample length of fibre.

3.4 Mechanical Characteristics of Fibre:

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)

3.4.1 Proof test for minimum strain level : 1%

3.4.2 Stripability force to remove primary coating of the fibre. : 1.3 ≤ F ≤ 8.9 N

Note: The force required to remove 30 mm ± 3 mm of the fibre coating shall not exceed 8.9 N and shall not be less than 1.3 N.

3.4.3 Dynamic Tensile Strength

a) Un-aged : ≥ 550 KPSI (3.80 Gpa)
b) Aged : ≥ 440 KPSI (3.00 Gpa)

3.4.4 Dynamic Fatigue : ≥ 20
(Test method IEC- 60793 - 1)

3.4.5 Static Fatigue : ≥ 20
(Test method IEC- 60793 - 1)

3.4.6 Change in attenuation measured at : ≤ 0.10 dB.
1550 nm when fibre is coiled with 100 turns
on 30 +1.0 mm radius mandrel

3.4.7 Fibre Curl : ≥ 4 meters radius of curvature
(Test method as per IEC 60793-1)

3.4.8 Fibre micro bend : ≤ 0.5dB at 1550 nm
(1 turn-around 32 +0.5 mm
diameter mandrel)

3.5 Material ATERIAL Properties of FibreROPERTIES:

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)

3.5.1 Fibre Materials:

a) The substances of which the fibres are made : To be indicated by the manufacturer

b) Protective material requirement:

i) The physical and chemical properties of the material used for the fibre primary coating and for single jacket fibre. : It shall meet the requirement of fibre coating stripping force as per clause No. 3.4.2

ii) The best way of removing protective coating material. : To be indicated by the manufacturer

c) Group refractive Index of fibre : To be indicated by the manufacturer

Note: The manufacturer shall indicate the variation in group refractive index of fibre during bulk production.

3.6 Environmental Characteristic of Fibre :

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)

3.6.1 Operating Temperature

(Test Method IEC – 60793 – 1)

Temperature Dependence of Attenuation : - 60° C to +85° C

Induced Attenuation at 1550 nm at -60°C to +85° C : ≤ 0.05 dB/km

3.6.2 Temperature – Humidity Cycling

(Test method IEC- 60793 – 1)

Induced Attenuation at 1550 nm at -10°C to +85°C : ≤ 0.05 dB/km
and 95% relative humidity.

3.6.3 Water Immersion 23°C

(Test method IEC- 60793 – 1)

Induced Attenuation at 1550 nm due to
Water Immersion at 23 ± 2°C : ≤ 0.05 dB/km

3.6.4 Accelerated Aging (Temperature) 85°C

(Test method IEC- 60793 – 1)

Induced Attenuation at 1550 nm due to
Temperature Aging at 85 ± 2°C : ≤ 0.05dB/km

3.6.5 Retention of Coating Color

(Test method IEC- 60793 – 1)

Coated Fiber shall show no discernible : 30 days at 85°C with
change in color, when aged for 95% Humidity and then
relative humidity 20 days in 85°C dry
heat.

3.7 Colour Qualification and primary coating Test :

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)

~~3.7.1 MEK RUB Test (Methyle Ethyl Ketone Test)~~

~~To be tested by using soaked (Solvent) tissue paper for ten strokes unidirectional on 10 cm length of fibre. No colour traces to be observed on the tissue paper.~~

~~3.7.2 Fourier Transform Infrared Spectroscopy (FTIR)Test~~

~~To be tested to check the curing level of primary coating on the glass. The curing level shall be better than 90%.~~

3.8 Micro Optical Fibre Cable Construction Specifications for 6F, 12F and 24F:

The cable shall be designed to the parameters mentioned in ~~a~~Annexure – I. The manufacturer shall submit designed calculations and the same shall be studied and checked.

3.8.1 Secondary Protection :

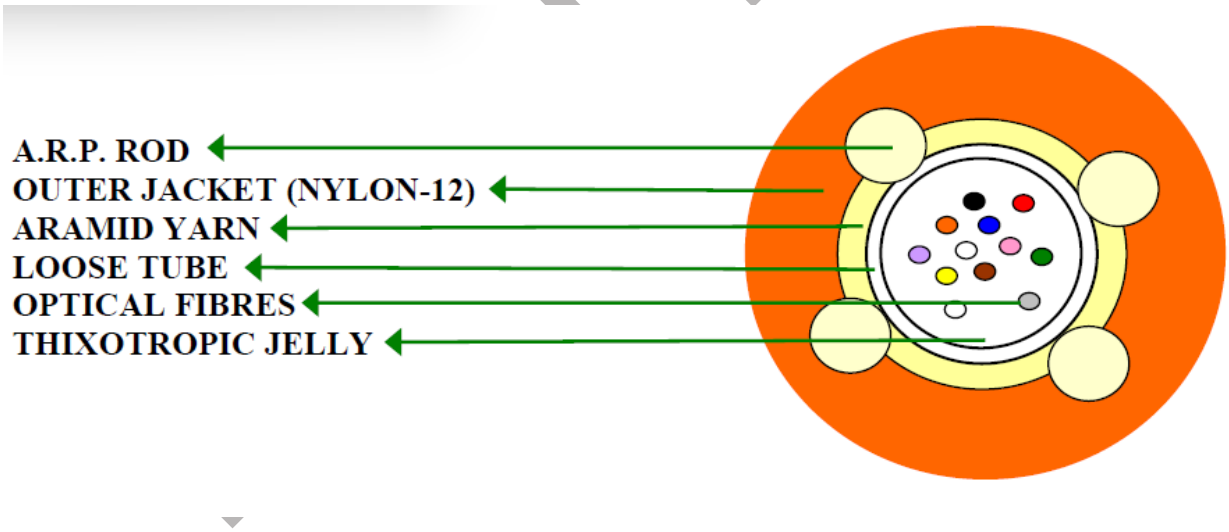
The ~~primary~~ coated fibres may be protected by loose packaging within a tube, which shall be filled with thixotropic jelly. The tube dimensions shall be as per Annexure – I.

3.8.2 Number of fibres : 6,12 and 24

(Type approval for a cable shall be issued depending upon the no. of fibres in the cable)

3.8.3 Strength Member : The strength member in the cable shall provide the strength and flexibility to the cable and shall have anti buckling properties. The four nos. Solid Aramid reinforced plastic rod (ARP rod) of 0.5 mm shall be used over the loose tube diagonally to each other. The specification of ARP rod shall be as per Section XVI of Standard No. TEC 89010:2021(or latest release) and the subsequent amendments, if any.~~The specification of ARP rod shall be as per Annexure –III.~~

MICRO CABLE FROM 6 TO 24 FIBRES:



3.8.4 Filling compound : The filling compound used in the loose tube shall be compatible to fibre and secondary protection of fibre ~~etc~~ of the cable. The drip point shall not be lower than +70 ~~degree~~ °C. The fibre movement shall not be constrained by stickiness and shall be easily removable for splicing. Reference

test method to measure drop point shall be as per ASTM D 566. The filling jelly compound shall be as per the Standard No. TEC 89010:2021(or latest release) ~~GR no. GR/ORM-01/03. MAR 04~~ and subsequent amendments, if any.

3.8.5 **Reinforcement :** The Micro optical fibre cable shall be reinforced with Aramid Yarn in the periphery over loose tube. The Aramid Yarn shall be uniformly and equally distributed on the entire periphery (circumference) of the loose tube. The quantity of the Aramid Yarn used per kilometer length of the cable shall be as per Annexure – I.~~with its D-Tex value shall be as per the requirement mentioned.~~

3.8.6 **Outer Jacket :** A circular jacket of minimum 0.50 mm thick of nylon-12 material orange in colour, free from pin holes, scratches and other defects etc shall be provided over and above the Aramid reinforcement. The nylon jacket shall have smooth finish.

3.8.7 **Cable diameter :**

~~The manufacturer shall define the cable diameter.~~ The finished cable diameter shall be as per Annexure-I.

3.8.8 **Cable weight :**

~~The manufacturer shall define the cable weight.~~ The nominal cable weight shall be as per Annexure-I.

3.9 **Micro Optical Fibre Cable Construction Specifications for 48F and 72F :**

3.9.1 **Secondary Protection** :

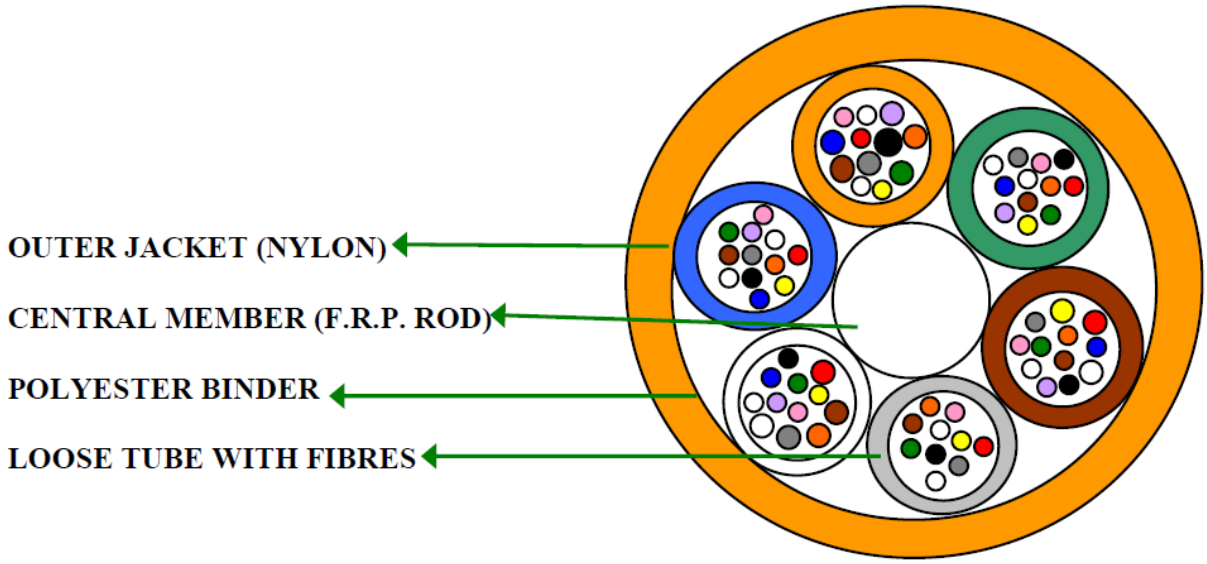
The ~~primary~~ coated fibres may be protected by loose packaging within ~~a~~ tube,

which shall be filled with thixotropic jelly-. The dimensions of tube shall be as per Annexure - I

3.9.2 **Number of fibres** : 48 or 72

(Type approval for a cable shall be issued depending upon the no. of fibres in the cable)

MICRO CABLE FROM 48 TO 72 FIBRES



3.9.3 **Strength Member :** Solid FRP non-metallic strength member ~~(FRP)~~ shall be provided in the center of the cable core. The strength member ~~(as per Annexure-II)~~ in the cable shall be for strength and flexibility to 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 – II.

3.9.4 Filling compound : The filling compound used in the loose tube shall be compatible to fibre and secondary protection of fibre etc of the cable. The drip point shall not be lower than +70° degree C. The fibre movement shall not be constrained by stickiness and shall be easily removable for splicing. Reference test method to measure drop point shall be as per ASTM D 566. The filling jelly compound shall be as per the Standard No. TEC 89010:2021(or latest release) and subsequent amendments, if any.

3.9.5 Cable Core Assembly: The coated primary fibres in loose tubes, stranded together around a central strength member (using helical or reverse lay techniques), shall form the cable core. The polyester/Nylon binder thread shall be used to hold the cable core assembly.

3.9.6 Outer Jacket : A jacket of minimum 0.5 mm thick of nylon -12 material, orange in colour, free from pin holes, scratches and other defects etc., shall be provided over the cable core assembly.

3.9.7 Cable Diameter :

The manufacturer shall define the cable diameter. The finished cable diameter shall be as per Annexure-II.

3.9.8 Cable Weight :

The manufacturer shall define the cable weight. The nominal cable weight shall be as per Annexure-II.

3.10 Mechanical Characteristics and Tests on Micro Optical Fibre Cable :

3.10.1 Tensile Strength Test:

Objective : To test the tensile strength of Micro optical fibre cables in order to examine the behavior of the attenuation as a function of the load on a cable which may occur during installation.

Test Method : IEC 60794-1-21-E1.

Test Specs. : The cable shall have sufficient strength to withstand a load of value T(N) = 9.81 x 1.3 W (where W-mass of 1 Km of cable in Kg) or 300 Newtons which whichever is higher. The load shall be sustained for 10 minutes and the strain on the fibre shall be monitored. and the same shall not exceed above 0.25%.

Requirements: The load shall not produce a strain exceeding 0.25% in the fiber 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 change in attenuation of each fiber after the test shall be ≤ 0.05dB, both for 1310nm & 1550 nm wavelengths.

3.10.2 Abrasion Test :

Objective : To test the abrasion resistance of the jacket and marking printed on the surface of the Micro cable.

Test Method : IEC-60794-1-21- E2 or by any other international test method

Test Specs : The cable surface shall be abraded with needle (wt. 150 gm) having diameter of 1mm with 500 grams weight (Total weight more than equal 650 gms.)

No. of cycles : 100 ~~50~~

Duration : One minute (Nominal)

Requirement : There shall be no perforation and loss of legibility of the marking on the jacket.

3.10.3 Crush Test (Compressive test):

Objective: The purpose of this test is to determine the ability of the Micro optical ~~fiber~~ fibre cable to withstand crushing.

Test Method : IEC-60794-1-21-E3

Test Specs : The fibers and component part of the cable shall not suffer permanent damage when subjected to a compressive load of 1000 N applied, between the plates of dimension 100 X 100 mm. The load shall be applied for 60 seconds. The attenuation shall be noted before/after the completion of the test.

Requirement :The change in attenuation of the fibre after the test shall be ≤ 0.05dB, both for 1310nm and 1550nm wavelengths.

3.10.4 Repeated Bending Test :

Objective : The purpose of the test is to determine the ability of Micro optical

~~fiber~~ fibre cable to withstand repeated bending.

Test Method : IEC 60794-1-21-E6 ~~EIA-455-104~~

Test Specs. : The cable sample shall be of sufficient length (5 m minimum) to permit radiant power measurements as required by this test. Longer length of the may be used, if required.

Parameters :

a)	Weight	: 52 Kg or as per FOTP-104,whichever is higher.
b)	Minimum distance from Pulley centre to holding device	: 216 mm
c)	Minimum distance from Wt. to Pulley centre	: 457 mm
d)	Pulley Diameter ~~(D - cable diameter)~~	: 20 D (D - cable diameter)
e)	Angle of Turning	: 90°
f)	No. of cycles	: 30
g)	Time Required for 30 cycles	: 1 minute to 2 minutes
h)	Length of Cable sample	: 5m (minimum)

Requirement : During the test no ~~fiber~~ 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 less ≤ 0.05 dB, both for 1310 and 1550nm wavelengths.

3.10.5 Kink Test :

Objective : The purpose of this test is to verify whether kinking of Micro optical fibre cable results in breakage of any fibre, when a loop is formed of dimension small enough to induce a kink on the jacket.

Method : IEC 60794-1-21-E10.

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 condition, the attenuation reading is taken.

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.

3.10.6 Cable Bend Test :

Objective : The purpose of this test is to determine the ability of Micro 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.

Method : IEC 60794-1-21-E11 (Procedure-I).

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.

Requirement : The change in attenuation of the fibre after the test shall be ≤0.05 dB, both for 1310 nm and 1550 nm wavelengths. The jacket shall not show any cracks visible to the naked eye, when examined whilst still wrapped on the mandrel.

3.10.7 Temperature Cycling (Type Test) :

Objective : To determine the stability behaviour of the attenuation of Micro cable subjected to temperature changes, which may occur during storage, transportation and usage.

Method : IEC 60794-1-22-F1. (To be tested on standard cable length of drum i.e. 2 Km ± 5%)

Test Specs. : The permissible temperature range for storage and operation will be 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 :

TA2 temp. : - 20°C.
TA1 temp. : - 10°C.
TB1 temp. : + 60°C.
TB2 temp. : + 70°C.

The test shall be conducted for 2 cycles at the above temperatures.

Requirement: The change in attenuation of the fibre under test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelengths for the entire range of temperature.

3.10.8 Cable aging (Type Test) :

Objective : To check the cable material change dimensionally as the cable ages.

Method : IEC 60794-1-22-F9

Test Specs : At the completion of temperature cycle test, the test cable shall be exposed to 85 ± 2°C ~~degree C~~ for 168 hours. The attenuation measurement at 1310 & 1550 nm wave-length to be made after stabilization of the test cable at ambient temperature for 24 hours.

Requirement : The change in attenuation of the fibre after the test shall be ≤ 0.05 dB, both for 1310 nm and 1550 nm wavelengths.

Note : The attenuation changes are to be calculated with respect to the baseline attenuation values measured at room temperature before temperature cycling.

3.10.9 Water Penetration Test (Type Test) :

Objective : The aim of this test is to ensure that installed Micro optical fibre

cable will not allow water passage ~~in the cable~~ along its length.

Method : IEC 60794-1-22-F5 ~~(Fig. B) 1992.~~

Test Specs. : A circumferential portion of the loose tube shall face the water head. The water tight sleeve shall be applied over the loose tube. 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 loose tube for a period of 7 days, at ambient temperature.

Requirement : No dye shall be detected when the end of the 3m length. ~~is~~ cable sample is examined with ultraviolet light detector.

3.10.10 Test of Figure of 8 (Eight) on the cable (Type Test) :

Objective : Check of easiness in formation of figure of 8 of the cable during installation in the field.

Test Method : 1000 meter of the cable shall be uncoiled from the cable reel and shall be arranged in figure of 8 (eight) shape. The diameter of each loop of the figure of 8 shall be maximum 2 meters.

Requirement : It shall be possible to make figure of 8 of minimum 1000 meters of the cable uncoiled from the cable reel, without any difficulty. No visible damage shall occur.

3.10.11 Check of quality of the loose tube (containing optical fibre) (Type Test) :

a. **Embrittlement Test method** :

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.

Sample : The minimum length of the test sample depends on the outside diameter of the loose tube and should be 85 mm for tubes upto 2.5 mm outside dia. The length of the bigger tubes should be calculated by using the following equation :

$$Lo > 100 \times \sqrt{\frac{(D^2 + d^2)}{4}}$$

Where Lo = Length of tube under test.

D = Outside dia of loose tube.

d = Inside dia of loose tube.

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 towards 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.

Requirement: The tube should not get embrittled. No kink should appear on the tube up to the safe bend dia 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.

b. **Kink Resistance Test method**

Objective : To safeguard the delicate optical fibres, 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.

Method: IEC 60794-1-23-G7

Procedure : To check the kink resistance of the loose tube, a longer length of the loose tube is taken (with fibre 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 out side dia of the loose tube). This test is to be repeated 4 times on the same sample length of the loose tube.

Requirement : No damage or kink should appear on the surface of the tube.

3.10.12 **Drainage Test for loose Tube and Drip test on the cable (Type Test) :**

a) Drainage Test for loose Tube

Sample Size : 30 cm tube length.

Test procedure :

i. Cut the tube length to 40 cm.
ii. Fill the tube with the tube filling gel ensuring that there are no air bubbles and the tube is completely full.
iii. 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.
iv. Leave the filled tube in a horizontal position at an ambient temperature for 24 hrs
v. 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.
vi. At the end of the 24 Hrs period the beaker is checked and weighed to see if there is any gel in the beaker.

Requirement :

i. If there is no gel or oil in the beaker the tube has PASSED the drainage test.
ii. If there is gel or oil in the beaker the tube has FAILED the drainage test.

b) New Clause: **Drip test on the cable**

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.

Method: IEC 60794-1-22-F16

Test Specs.: Take a sample of 30 cm length of the cable with one end sealed by end cap. Remove outer jacket, binder's for 5 cm from open end of the sample.

Clean the jelly. 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.

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.

3.10.13 Check of easy removal of Jacket:

Objective : Check of the easy removal of jacket of the Micro optical fibre cable by using normal jacket removal tool.

Procedure : To check easy removal, the jacket shall be cut in circular way and the about 300 mm length of the jacket should be removed in one operation. It should be observed during jacket 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 jacket easily.

3.10.14 Check of Effect of aggressive media on the cable surface (Acidic and alkaline behavior) (Type Test) :

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 jacket and other markings of the

cables. (Test method no. ISO175).

Requirement : The sample should not show any effect of these solution on the jacket and other marking of the cable.

New Clause: Impact Test :

Objective: The purpose if this test is to determine the ability of an optical fiber cable to withstand the impact.

Test Method : IEC 60794 -1- 21-E4

Test Specs : The cable shall have sufficient strength to withstand an impact caused by a mass weight of 25 Newton, when falls freely from a height of 0.5 meters. The radius `R' of the surface causing impact shall be 300 mm.**10** such impacts shall be applied at the at different places typically spaced not less than 500mm apart. The attenuation shall be noted before and after the completion of the test.

Requirement : The change in attenuation of the fibre after the test shall be < 0.05 dB, both for 1310nm and 1550nm wavelengths.

New Clause: Torsion Test :

Object : The purpose of this test is to determine the ability of an optical fibre cable to withstand torsion.

Method : IEC 60794-1-21-E7.

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 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 clock wise direction for one turn. The sample shall then be returned to the starting position and then rotated in an anti-clock wise 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.

Requirement : The cable shall be examined physically for any cracks, tearing on the outer sheath and for the damage to other component ports 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 wave lengths.

New Clause: Flexural Rigidity Test on the optical fibre cable (Type Test) :

Objective : To check the Flexural Rigidity of the optical fibre cable .

Method : To be tested as per ASTM D –790

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.

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.

New Clause: Static Bend test (Type Test) :

Objective : To check the cable under Static bend

Test Method : As per the clause no 3.10.6 of the GR alternatively as per ASTM D 790.

Test Specs : The cable shall be subjected to static bend test. The optical fibre cable shall be bend on a mandrel having a Diameter of 10 D (D is diameter of the cable).

Requirement : The change in attenuation of the fibre after the test shall be ≤ 0.05 dB for both 1310 nm and 1550 nm wavelengths. The jacket shall not show any cracks visible to the naked eye when examined whilst still wrapped on the mandrel.

~~PART II – GENERAL REQUIREMENTS~~

4.0 Engineering Requirements :

4.1 Cable Marking :

4.1.1 Marking on Micro optical fibre cable shall be of durable quality. It shall be marked at one meter intervals in black colour inkjet printing over the orange colour jacket. The accuracy of the sequential marking must be within -0.25% to +0.5% of the actual measured length. The markings on the cable must not rub off during

normal installation.

4.1.2 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 cable i.e. Micro Cable
d) Type of Fibre
e) Number of Fibres
f) Year of manufacture
g) Sequential length marking
h) Purchaser's Identification
i) Cable ID

New Clause: **Cable Ends:** 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 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 and subsequent amendments, 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 wooden drums shall be properly treated against termites and other insects during transportation and storage. The manufacturer shall submit the methodology used for the same.

New Clause: 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.

4.2 The nominal drum length:

4.2.1 Length of Micro optical fibre cable in each drum shall be 2 Km /4 Km/ 8Km/ 10Km. and shall be supplied as per the order. ± 10%. The variation in length of Micro optical fibre cable in each drum shall be ± 5% to ±10%, as decided by the purchaser. Purchaser may at their discretion procure shorter length cable drum as per their requirement.

4.2.2 The fibres in cable length shall not have any joint.

4.2.3 The drum shall be marked with arrows to indicate the direction of rotation.

4.2.4 Packing list supplied with each drum shall have at least the following information:

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) User's / Consignee's Name
i) Manufacturer's Name, Month, Year and Batch No.
j) Group refractive index of fibres
k) Name of the route
l) Diameter of cable

4.3 Colour coding in O.F. Cables & Unit Identification :

4.3.1 The colorant applied to individual fibres shall be readily identifiable throughout the lifetime of the cable and shall match and conform to the MUNSELL Color

Standards (For EIA Standard EIA-598-D 359-A) and also IEC Publication 304 (4).

4.3.2 Colour code to be adapted for individual fibres :

1. Blue	5. Slate/Grey	9. Yellow
2. Orange	6. White	10. Violet
3. Green	7. Red	11. Rose/Pink
4. Brown	8. Black	12. Natural/Aqua

4.3.3 Unit / Bundle Identification:

Each unit/bundle has to be identified by colour of the binder with colours indicated as follows :

Blue, Orange, Green, Brown, Slate/Grey, White, Red, Black, Yellow, Violet, Rose / Pink, Natural/Aqua.

4.3.4 Colour Coding Scheme :

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.

Table -1 : Colour Coding scheme of Loose tube

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

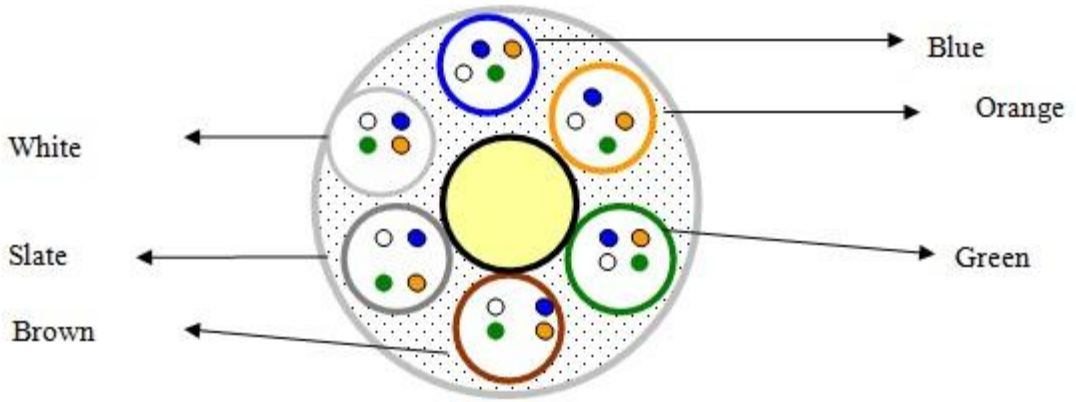
Depending upon the number of fibres in a loose tube (which depends on the cable capacity), the fibres within each loose tube are serially chosen starting from blue colour as per the colour scheme given below at Table-2.~~from the column no. II of the table~~. Last ~~One of the~~ fibre~~s~~ in a tube shall be of natural color, while the rest of fibres are colored.

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

Fibre No./Sequence within loose tube	Fibre identification
1	Blue
2	Orange
3	Green
4	Brown
5	Slate
6	White
7	Red
8	Black
9	Yellow

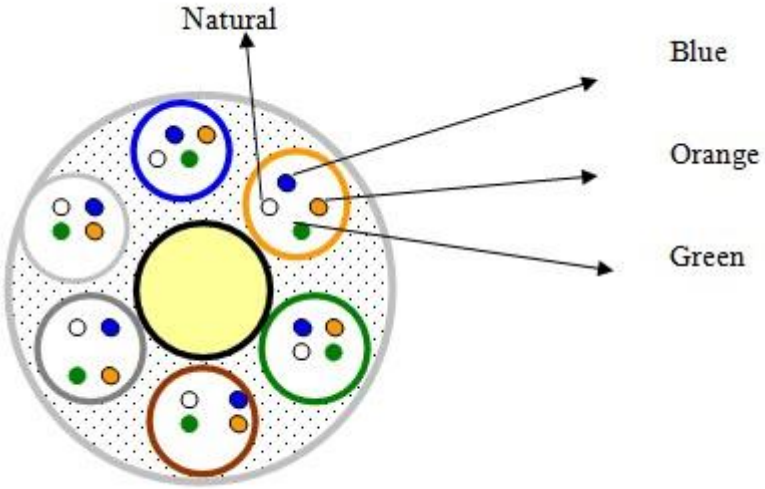
10	Violet
11	Rose/Pink
12	Natural

Color coding of Loose Tubes for 24 fibres (Refer Table - 1)



(Loose Tube Colour: Blue, Orange, Green, Brown, Slate, White)

Color coding of 24 Fibres within Loose Tubes (Refer Table - 2)



(Fiber Colour : Blue , Orange, Green, Natural)

Colour Coding scheme of the Optical Fibres & Loose tube

No. of Fibers/Buffer tube I	Fiber identification II	Loose tube identification III
1	Blue	Blue
2	Orange	Orange
3	Green	Green
4	Brown	Brown
5	Slate	Slate
6	White	White
7	Red	Red
8	Black	Black
9	Yellow	Yellow
10	Violet	Violet
11	Rose/Pink	Rose/Pink
12	Aqua/Natural	Aqua

5.0 Quality Requirements :

5.1 The cable shall be manufactured in accordance with the international quality standards ISO 9001-2015 (or latest issue)00 for which the manufacturer should be duly accredited. The Quality Manual shall be submitted by the manufacturer.

5.2 Raw Material:

5.2.1 The cable shall use the raw materials approved against the Standard for GR No TEC 89010:2021 (or latest release) No. GR/ORM-01/03 MAR. 04 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 other Conformity Assessment Body (CAB) recognized by TEC shall be submitted by the manufacturer.

5.2.2~~3~~ ~~The material used, other than above~~ Any other material~~s~~, 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. ~~Type Approval.~~

5.2.3 The raw materials used from multiple sources is permitted and the source/ sources of raw materials (Type and grade) from where these have been procured shall be submitted by the manufacturer.

5.2.4 The manufacturer can change the raw material from one approved source to other approved source with the approval of QA, BSNL. The change of source / grade of SM Optical Fibre and/or design of cable 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.

5.2.5 The material used in Micro optical fibre cable must not evolve hydrogen that will affect the characteristics of optical fibres. ~~fibre loss~~.

Note: A ~~T~~test certificate from a recognized laboratory or institute may be acceptable.

5.3 Cable Material Compatibility:

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. 6.3.34 of Telecordia document GR-20-CORE issue 4, July 2013 or as per IEC 60794-1-219). ~~GR-20-CORE issue 2, July 1998.~~

Note : The tests may be conducted in house (if facility exist) or may be conducted at CACT or any Conformity Assessment Body(CAB) recognized by TEC. 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.

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 lifetime and shall not be hazardous to health. The manufacturer shall submit MSDS (Material safety Data Sheet) for all the material used in manufacturing of OF Cable to substantiate the statement.

Note: Latest issue of the Standards mentioned in the GR, may be referred.

CHAPTER – 2

76.0 Documentation:

~~7~~6.1 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.

~~7~~6.2 All aspects of cable 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.

~~7.0 Safety Requirement:~~

~~7.1 The material used in the manufacturing of the Micro optical fibre cables shall be non toxic and dermatological safe in its life time and shall not be hazardous to health. The manufacturer shall submit MSDS (Material safety Data Sheet) for all the material used in manufacturing of Micro optical fibre cable to substantiate the statement~~

8.0 New Clause: Information for the Procurer/User:

8.1 It is suggested that the Optical fibre cable supplied 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.

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 10.2 and 10.3 shall be read in conjunction with the clause 6.2.4

ANNEXURE – I

CABLE DESIGN PARAMETER FOR 6 TO 24 FIBRES

The following parameters of the component parts of the Micro Optical fibre cable (6 to 24 fibres) are to be taken in to account while designing and manufacturing the cable of the required fiber count. These parameters shall be checked during evaluation of the Micro Optical fibre cables:

S. No.	Parameter	Unit	No. of Fibres Cables		
			6F Micro O.F. Cable	12F Micro O.F. Cable	24F Micro O.F. Cable
1	Tube OD	mm	1.7 ± 0.2	1.7 ± 0.2	3.5 ± 0.2
2	Colour of fibre		As per clause no.4.3.2	As per clause no. 4.3.2	As per clause no. 4.3.2
3	Colour of binder		--	--	BL,OR
4	Aramid yarn	Kg/Km	0.50	0.50	0.67
5	Diameter of Solid Aramid Reinforced	mm	0.50 ± 0.05	0.50 ± 0.05	0.50 ± 0.05

	Plastic Rod (4 Nos.)				
6	Outer Jacket Thickness	mm	≥ 0.5	≥ 0.5	≥0.5
7	Cable diameter	mm	3.8 ± 0.3	3.8 ± 0.3	5.6 ± 0.3
8	Nominal Cable weight	Kg/km	11 ± 2	11 ± 2	24 ± 3
9	Cable to be tested at defined load for fibre strain value of.	%	0.25	0.25	0.25

ANNEXURE – II

CABLE DESIGN PARAMETER FOR 48 to 72 FIBRES

The following parameters of the component ~~parts~~ of the Micro Optical fibre cable (48 to 72 fibres) are to be taken in to account while designing and manufacturing the cable of the required fiber count. These parameters shall be checked during evaluation of the Micro Optical fibre cables:

S. No.	Parameter	Unit	No. of Fibres Cables	
			48F Micro O.F. Cable	72F Micro O.F. Cable
1	Tube OD	mm	1.9 ± 0.1	1.9 ± 0.1
2	Nos. of Fibres in Loose tube	Nos.	8	12
3	Colour of fibre		As per clause no.4.3.4	As per clause no. 4.3.4
4	Colour of loose tube		BL,OR,GR,BR,SL,WH	BL,OR,GR,BR,SL,WH
5	Diameter of Solid	mm	2.0 ± 0.05	2.0 ± 0.05

	EAA Coated FRP Rod			
6	Outer Jacket Thickness	mm	≥ 0.5	≥ 0.5
7	Cable Diameter	mm	6.9 ± 0.3	6.9 ± 0.3
8	Nominal Cable weight	Kg/km	40 ± 4	40 ± 4
9	Cable to be tested at defined load for fibre strain value	%	0.25	0.25

ANNEXURE-III

SPECIFICATION OF ARAMID REINFORCED PLASTIC ROD (A.R.P. ROD)

APPLICATION:

The (ARP) rod is used as strength member for Micro optical fibre cable. The Aramid Reinforced Plastic rod shall be smooth and even surface, free from defects and manufactured from Aramid yarn & resin by continuous moulding / pultrusion method. The material shall not offer any health hazards. The ARP rod shall be coated with Ethelene acrylic acid. The thickness of coating shall be ≥ 20 µm.

CHARACTERISTICS:

S.NO.	PARAMETER	UNIT	REQUIREMENT	TEST METHOD
1.	Physical Dimensions of Coated Rod	mm	0.5 + 0.05	Micrometer
2.	Tensile Strength at break	Kg/mm²	≥ 150	ASTM D 3916
3.	Tensile Modulus	Kg/mm²	≥ 6500	ASTM D 638
4.	Elongation at break	%	≤ 3.3	ASTM D 3916

~~5.~~	~~Minimum Bend Diameter (≤16D) At 25 º C (D is the diameter of the rod)~~	~~mm~~	~~No Decomposition or Delamination~~	
~~6.~~	~~Heat Stress @ 80 º C. 24 hrs, 50x D (D is the diameter of the rod)~~		~~No Decomposition or Delamination~~	

LIST OF ABBREVIATIONS

ASTM - American Society for Testing and Materials

ARP - Aramid Reinforced Plastic

CAB - Conformity Assessment Body

CACT - Component Approval Centre for Telecommunications

BIS - Bureau of Indian Standards

dB - Decible

EIA - Electronic Industry Association

ESCR - Environmental Stress Crack Resistance

F - Force

FRP - Fibre Reinforced Plastic

FOTP - Fibre Optic Test Procedure

Gpa - Gega Pascal

HDPE - High Density Polyethylene

IEC - International Electro -Technical Commission

IS - Indian Standards

ISO - International Standard Organisations

ITU-T - International Telecommunication Union – Telecommunication Standardization Sector Transmission

KV - Kilo Volt

KM - Kilo meter

KPSI - Kilogram per sq. inch

MFD - Mode Field Diameter

MSDS - Material Safety Data Sheet

Nm - nanometer

N - Newton

OF - Optical Fibre

OTDR - Optical -Time Domain Reflectometer

~~Ps/nm~~	~~-~~	~~pico second/ nano meter~~
~~Ps~~	~~-~~	~~pico second~~
QA	-	Quality Assurance
QM	-	Quality Manual
~~RMS~~	~~-~~	~~Route Mean Square~~
~~SMOF~~	~~-~~	~~Single Mode Optical Fibre~~
SM	-	Single Mode
TEC	-	Telecommunication Engineering Centre
UV	-	Ultra Violet
µm	-	micrometer
°C	-	Degree Celsius

ANNEXURE-II

Comments on draft Standard titled "*Micro Duct Optical Fibre Cable*"

(Draft Standard No. TEC 85130:2025)

Name of Manufacturer/Stakeholder:

Organization:

Contact details:

Clause No.	Clause	Comments	Other Remarks, if any