ANNEXURES TO ER FOR OPTICAL FIBRE CABLE

Annexure-Tx-A1-OFC:	Optical Fibre Cable for Duct Applications (Duct, Micro Duct)
Annexure-Tx-A2-OFC:	Optical Fibre Cable for Direct Buried application
Annexure-Tx-A3-OFC:	Optical Fibre Cable for Aerial Applications (ADSS Over Power Line, ADSS on Aerial alignment, and Optical Ground Wire-OPGW)
Annexure-Tx-A4-OFC:	Optical Fibre Cable for Access Network Applications (Indoor Cable, Access Outdoor Cable, Indoor-Outdoor Cable, In-Home Cable)
Annexure-Tx-A5-OFC:	Optical Fibre Cable for Direct Surface Application (DSA)
Annexure-Tx-A6-OFC:	Hybrid Cable (Optical and Metallic)

Annexure-Tx-A1-OFC: Optical Fibre Cables for Duct Application (Duct, Micro-duct)

A1.1 Parameter Group: Optical Fibre Cables- Duct

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1.3 W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Compressive load of 1500 N/2000N	1500 N (for Un-armoured) 2000N (for Armoured)

8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 10Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles.	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D-diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15 dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C. No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a	

				minimum of 168 hours.	
15		Water Blocking Test / Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16		Termite and Rodent Test	The manufacturer shall submit Undertaking that the Anti-termite/Anti-Rodent dopants used if any, are non-toxic and non-hazardous		
17		Electrical continuity test	IEC 60794-1-24/IEC 60794-1-403	The metallic elements shall be continuous.	Applicable for cable having Metallic Armoured/ metallic Strength element
18	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
19	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
20		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only

21		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
22		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
23	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
24	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
28	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			

A1.2 Parameter Group: Optical Fibre Cables- Micro Duct

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1 W Newton (where, W - mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 500N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 1 Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	

10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C. No. of temperature cycle: 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	

15		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16		Termite and Rodent Test	The manufacturer shall submit Undertaking that the Anti-termite/Anti-Rodent dopants used if any, are non-toxic and non-hazardous		
17	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
18	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
19		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other	Applicable for Ribbon Fibre Only
20		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-	The ribbon shall not show any	Applicable for

			1-23	separation of individual fibres from the ribbon structure after completion of the twist test.	Ribbon Fibre Only
21		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
22	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
23	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
24	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			

Annexure-Tx-A2-OFC: Optical Fibre Cables for Direct Buried Application

A2.1 Parameter Group: Optical Fibre Cable- Direct Buried

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1.3 W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550 nm : ≤ 0.05 dB when subjected to a compressive load of 2500 N/3500 N	2500 N (for Un-armoured cable) 3500 N (for Armoured cable)
8		Impact	IEC 60794-1-21	Change in attenuation at 1310 & 1550nm: ≤ 0.05dB when subjected to Impact of 25Nm	3 Impact at 3 locations

9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm:≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles.	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D-diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	

15		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16		Termite and Rodent Test	The manufacturer shall submit Undertaking that the Anti-termite/ Anti-Rodent dopants used if any, are non-toxic and non-hazardous		
17		Electrical continuity test	IEC 60794-1-24/IEC 60794-1-403	The metallic elements shall be continuous.	Applicable for cable having Metallic Armoured/ metallic Strength element
18	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
19	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
20		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be	Applicable for Ribbon Fibre Only

				distinguished from each other.	
21		Ribbon Twist Test	Telecordia GR-20 /IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
22		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
23	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
24	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			

28	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206**)** for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219

Annexure-Tx-A3-OFC: Optical Fibre Cables for Aerial Applications (ADSS over Power line, ADSS on Aerial alignment and Optical Ground Wire-OPGW)

A3.1 Parameter Group: Optical Fibre Cable-ADSS along Power Line

<table>
<tr><th>SN</th><th>Parameter Name</th><th>Individual Parameter Name</th><th>Standard Name</th><th>Limits/Values</th><th>Applicability</th></tr>
<tr><td>1</td><td rowspan="5">Transmission Characteristics</td><td>Attenuation at 1310nm</td><td>IEC 60793-1-40</td><td>≤ 0.36 dB/Km</td><td>Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x</td></tr>
<tr><td>2</td><td>Attenuation at 1550nm</td><td>IEC 60793-1-40</td><td>≤ 0.22 dB/Km</td><td>--Do--</td></tr>
<tr><td>3</td><td>Attenuation at 1625nm</td><td>IEC 60793-1-40</td><td>≤ 0.25 dB/Km</td><td>--Do--</td></tr>
<tr><td>4</td><td>PMD Cabled Loose Fibre</td><td>IEC 60793-1-48</td><td rowspan="2">≤ 0.3 ps/√km</td><td rowspan="2">--Do--</td></tr>
<tr><td>5</td><td>PMD Cabled Ribbon Fibre</td><td>IEC 60793-1-48</td></tr>
<tr><td>6</td><td>Mechanical Characteristics</td><td>Tensile Strength</td><td>IEC 60794-1-21</td><td>Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6 % when subjected to following Tensile load (in Newton) for Span Length as under:

<table><tr><td>Span Length</td><td>Tensile Load</td></tr><tr><td>≤50m</td><td>9.81 x 1.5 W</td></tr><tr><td>51m -100m</td><td>9.81 x 2.0 W</td></tr><tr><td>101m -150m</td><td>9.81 x 2.5 W</td></tr><tr><td>151m-200m</td><td>9.81 x 3.0 W</td></tr><tr><td>201m -300m</td><td>9.81 x 4.0 W</td></tr><tr><td>> 300m</td><td>9.81 x 6.0 W</td></tr></table>
where, W- mass of 1 Km of cable in Kg</td><td></td></tr>
</table>

7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 1500N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 10 Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22 ,	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13		Galloping Test	IEC 60794-1-21 / IEEE 1222	Galloping cycles – 100000 The test frequency shall be the single- loop resonant frequency. The minimum peak to-peak antinode amplitude/loop length ratio shall be maintained at a value of 1/25, as measured in the active span. Change in attenuation at 1310 & 1550nm: ≤ 0.05dB after the test	
14		Electrical Test/ Tracking & Erosion Test	IEC 60794-4-20/ IEEE Std 1222/ASTM D 2309-97	Tracking on the outside of sheath shall not result in erosion at any point of sheath.	Applicable for ADSS cable with Anti-track PE Jacket over power line ≥ 33 kV
15	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C	

				TB2 temperature: + 70°C No. of temperature cycle : 2	
16		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
17		Water Blocking Test/Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
18	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
19	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
20		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only
21		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
22		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
23	**Safety Requirement**	The material used in the manufacturing of the OFC shall be		The manufacturer shall submit MSDS (Material safety Data Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	

		non-toxic and dermatologically safe in its life time and shall not be hazardous to health.			
24	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
28	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			

A 3.2 Parameter Group: Optical Fibre Cable-ADSS on Aerial alignment

<table>
<tr><th>SN</th><th>Parameter Name</th><th>Individual Parameter Name</th><th>Standard Name</th><th>Limits/Values</th><th>Applicability</th></tr>
<tr><td>1</td><td rowspan="5">Transmission Characteristics</td><td>Attenuation at 1310nm</td><td>IEC 60793-1-40</td><td>≤ 0.36 dB/Km</td><td>Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x</td></tr>
<tr><td>2</td><td>Attenuation at 1550nm</td><td>IEC 60793-1-40</td><td>≤ 0.22 dB/Km</td><td>--Do--</td></tr>
<tr><td>3</td><td>Attenuation at 1625nm</td><td>IEC 60793-1-40</td><td>≤ 0.25 dB/Km</td><td>--Do--</td></tr>
<tr><td>4</td><td>PMD Cabled Loose Fibre</td><td>IEC 60793-1-48</td><td rowspan="2">≤ 0.3 ps/√km</td><td rowspan="2">--Do--</td></tr>
<tr><td>5</td><td>PMD Cabled Ribbon Fibre</td><td>IEC 60793-1-48</td></tr>
<tr><td>6</td><td>Mechanical Characteristics</td><td>Tensile Strength</td><td>IEC 60794-1-21</td><td>Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6 % when subjected to following Tensile load (in Newton) for Span Length as under:

<table><tr><td>Span Length</td><td>Tensile Load</td></tr><tr><td>≤ 50m</td><td>9.81 x 1.5 W</td></tr><tr><td>51m -100m</td><td>9.81 x 2.0 W</td></tr><tr><td>101m -150m</td><td>9.81 x 2.5 W</td></tr><tr><td>151m-200m</td><td>9.81 x 3.0 W</td></tr><tr><td>201m -300m</td><td>9.81 x 4.0 W</td></tr><tr><td>>300m</td><td>9.81 x 6.0 W</td></tr></table>
where, W- mass of 1 Km of cable in Kg</td><td></td></tr>
<tr><td>7</td><td>Crush Resistance</td><td>IEC 60794-1-21</td><td>Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 1500N</td><td></td></tr>
<tr><td>8</td><td>Impact</td><td>IEC 60794-1-21</td><td>Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 10Nm</td><td>3 Impact at 3 locations</td></tr>
</table>

9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13		Galloping Test	IEC 60794-1-21/ IEEE 1222	Galloping cycles – 100000 The test frequency shall be the single-loop resonant frequency. The minimum peak to-peak antinode amplitude/loop length ratio shall be maintained at a value of 1/25, as measured in the active span. Change in attenuation at 1550nm: ≤ 0.05dB after the test	
14	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C No. of temperature cycle : 2	
15		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm:	

				≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
16		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
17	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
18	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
19		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only
20		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
21		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
22	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	

23	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable
24	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable
25	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable
26	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable
27	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219

A3.3 Parameter Group: Optical Ground Wire - OPGW

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		--Do--
6	**Mechanical Characteristics**	Tensile Strength (Ultimate)	IEEE 1138	The ultimate tensile strength of the OPGW cable shall meet or exceed 100% of the RTS of the cable. Any outer layer strand failing below 75 % of the cable RTS shall constitute cable failure.	
7		Creep Test	IEEE 1138	Elongation of the cable for desired TS should meet the criteria.	
8		Stress Strain Test	IEEE 1138	(i) The breaking strength of the OPGW cable shall meet or exceed 100% of the RTS of the cable. (ii) Should meet the specified Modulus of elasticity(MOE) value of the OPGW cable.	
9		Strain Margin Test/ MRDT Test	IEEE 1138	The cable shall show no permanent increase in optical attenuation greater than 0.05 dB from preload to the maximum rated design tension (MRDT) of the cable at 1550nm wavelength	
10		Sheave Test	IEEE 1138 /IEC-	(i) The Ovality of the cable or	

			60794- 1-2-E9	optical units at the measured locations shall not exceed 10 %. (ii) There shall be no cracking or breaking of any component of the OPGW cable. This shall be visually examined. (iii) Attenuation shall not be greater than 0.1 dB/test fiber km at 1550nm wavelength	
11		Crush Test	IEEE 1138 / IEC 60794- 1-2-E3	(i) Ovality of the cable or optical fiber units shall be < 10 %. (ii) There shall be no cracking or breaking of any component of the OPGW cable. This shall be visually examined (iii) Attenuation shall not be greater than 0.05 dB/ fiber at 1550nm wavelength	
12		Bend Test	IEEE 1138 / IEC 60794-1-2-E11 (Procedure-I)	(i) There shall be no cracking or breaking of any component of the OPGW cable. This shall be visually examined (ii) Attenuation shall not be greater than 0.05 dB/ fiber at 1550nm wavelength	
13		Torsion Test/Twist Test	IEEE 1138	(i) There shall be no cracking or breaking of any component of the OPGW cable. This shall be visually examined. (ii) Attenuation shall not be greater than 0.10 dB/test fiber km at	

				1550nm wavelength	
14		Aeolian Vibration Test	IEEE 1138	(i) There shall be no cracking or breaking of any component of the OPGW cable or the supporting hardware. This shall be visually examined. (ii) Attenuation shall not be greater than 0.2 dB/test fiber km at 1550nm wavelength	
15		Galloping Test	IEEE 1138	(i) There shall be no Cracking or breaking of any component of the OPGW cable or the supporting hardware. This shall be visually examined. (ii) Attenuation shall not be greater than 0.2 dB/test fiber km at 1550nm wavelength	
16		Drip Test	IEEE 1138	At the end of 24 h, the water-blocking compound shall not flow (drip or leak) at 65 °C. Flow quantity should meet the criteria.	
17	**Electrical Characteristics**	DC Resistance	IEEE 1138	The actual dc resistance of the OPGW cable shall not exceed the dc resistance stated by the manufacturer at the specified temperature.	
18		Short Circuit Test	IEEE 1138 /IEC 60794- 1-2-H1	(i) Any cracking or breaking of any component of the optical sample shall constitute failure. This assessment is made with the naked eye. (ii) Attenuation shall not be greater than 0.05 dB/test fiber km at 1550nm wavelength (iii) There shall be no birdcaging of any of the strands of the optical sample. (iv) Temperature of any metallic	

				component and inside of fiber unit shall not exceed the criteria.	
19		Lightning Arc Test	IEEE 1138 / IEC 60794-1-402	(i) After the lightning strike application, the cable sample shall experience no permanent increase in optical attenuation greater than 0.10 dB for the concatenated loop at nominally 1550 nm wavelength. (ii) In all five qualifying lightning strike locations, visually, there shall be no damage (holes, cracks, etc.) to the integrity of the metallic tube. (iii) The minimum remaining strength of any of the tested cable sections shall be greater than the 70% of the cable RTS	
20	**Environmental Characteristics**	Water Penetration Test	IEEE 1138	(i) A 1.0 m section of OPGW cable shall be prepared for this test.All components of the cable shall be removed from the fluid-blocked optical fiber unit that contains the optical fibers. (ii) No water shall leak through the open end of the 1.0 m sample. If the first sample fails, one additional 1.0 m sample, taken from a section of OPGW cable immediately adjacent to the first sample, may be tested for acceptance.	

21		Temperature Cycle Test	IEEE 1138	Attenuation shall not be greater than 0.2 dB/test fiber km at 1550nm wavelength	
22	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
23	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
24	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried out as per IEC 60794-1-219			

Annexure-Tx-A4-OFC: Optical Fibre Cables for Access Network Applications (Indoor Cable, Access Outdoor Cable, Indoor-Outdoor Cable, In-Home Cable)

A4.1 Parameter Group: Optical Fibre Cable –Indoor

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.40 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.30 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.40 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1 W Newton (where, W-mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 1000N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 1 Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤	The bending rate shall be

				0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15 dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
15		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the

				with ultraviolet light detector.	examination.
16	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
17	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
18		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only
19		Ribbon Twist Test	Telecordia GR-20 /IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
20		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: $\leq$ 0.05dB	Applicable for Ribbon Fibre Only
21	**Safety Requirement**	Flame Spread-Single cable/Flame propagation for single cable/Flame retardant test single cable/ Flammability test single cable	IEC 60332-1-2	Char less than 0.54 m at completion of test	
22		Flame Spread- Bunched cable/ Flame propagation for bunched cable/Flame retardant test bunched cable/Flammability test	IEC 60332-3-24, Cat C	Char less than 2.5 m at completion of the test	Applicable for riser applications only

		bunched cable			
23		Smoke Test/Smoke density/Smoke density under fire conditions/Smoke density of cable burning	IEC 61034-2	Minimum transmittance 60%	
24		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)/pH Test/pH & Conductivity/Conductivity Test/Degree of acidity	IEC 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
25		The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the statement.	
26	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
28	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
29	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
30	**Colour**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for			

	qualification for color fibres	respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219

A4.2 Parameter Group: Optical Fibre Cable- Access Outdoor

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310 nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550 nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1 W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤0.05dB when subjected to a compressive load of 500N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 10Nm.	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles.	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-	Cable shall be free from any optical & visual physical damage.

				85A for 10 cycles.	
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1temperature:-10°C TB1 temperature:+60°C. TB2 temperature: +70°C. No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
15		Water Blocking Test/Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
17	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
18		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus.	Applicable for Ribbon Fibre Only

				- The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	
19		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
20		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
21	**Safety Requirement**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
22	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
23	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
24	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Mechanical**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective			

	Characteristics of Fibre used in the cable	type of Optical fibre used in the cable
26	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried out as per IEC 60794-1-219

A4.3 Parameter Group: Optical Fibre Cables - Indoor-Outdoor

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km (A1) ≤ 0.37 dB/Km (A2) ≤ 0.37 dB/Km (B3)	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		--Do--
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB when subjected to a Tensile load of 9.81 x 1W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm : ≤ 0.05dB when subjected to a compressive load of 1000 N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm : ≤ 0.05dB when subjected to Impact of 10Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.

11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry- Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15 dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
15		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 Hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
17	**Characteristics of**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only

18	**Cable Elements (Ribboned Fibre)**	Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only
19		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
20		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
21	**Safety Requirement**	Flame Spread-Single cable/Flame propagation for single cable/Flame retardant test single cable/ Flammability test single cable	IEC 60332-1-2	Char less than 0.54 m at completion of test	Test applicable only for indoor component of the cable in case cable design involves part of main cable to be used as indoor cable
22		Smoke Test/Smoke density/Smoke density under fire conditions/Smoke density of cable burning	IEC 61034-2	Minimum transmittance 60%	Test applicable only for indoor component of the cable in case cable design involves part of main cable to be used as indoor cable
23		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables) /pH Test/pH & Conductivity/Conductivity Test/Degree of acidity	IEC 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	Test applicable only for indoor component of the cable in case cable design involves part of main cable to be used as indoor cable
24		The material used in the		The manufacturer shall submit MSDS (Material safety Data Sheet) for all the	

		manufacturing of the OFC shall be non-toxic and dermatologically safe in its life time and shall not be hazardous to health.		material used in manufacturing of Optical fibre cable to substantiate the requirement.	
25	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
28	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
29	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			

A4.4 Parameter Group: Optical Fibre Cable – In-home

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values (as per ITU-T L.111)	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.40 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.30 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.40 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, /ITU-T Rec. L.111	Length under test:0.5 m. Test loads: rated tensile load, TS = 5 N, long term load, TL = 30 % of TS. Attenuation change: no change at 1550nm No fibre and cable breakage.	
7		Crush Resistance	IEC 60794-1-21, /ITU-T Rec. L.111	Compressive force: 490 N/ 100 mm. Compression time:1 min. Attenuation change: 0.20 dB under the load, no change after test at 1550 nm. No fibre and cable breakage.	
8		Impact	IEC 60794-1-21, /ITU-T Rec. L.111	Impact energy:0.3 kg at 0.1 m height. Hammer: flat hammer. Number/location of impacts: 3 places separated at least 0.5 m, 1 impacts at each place. Maximum attenuation change: no change after the test at 1550 nm. No fibre and cable breakage, imprint on cable could be compromised.	
9		Bend Test	IEC 60794-1-21, /ITU-T Rec. L.111	Number of turns in the helix: 4 Mandrel diameter: minimum bend diameter (as per 6.2.1/L.111) + 10 %.	

				Test temperature: -10 ℃ Maximum attenuation change: 0.20 dB during the test, no change after the test at 1550 nm. No fibre and cable breakage.	
10		Repeated Bend Test	IEC 60794-1-21, /ITU-T Rec. L.111	Number of cycles:10. Tensioning: minimum tension; support the specimen as needed. Bending radius: per 6.2.1. Maximum attenuation change: no change after the test at 1550 nm. No fibre and cable breakage.	
11		Torsion Test	IEC 60794-1-21, /ITU-T Rec. L.111	Test gauge length:0.5 m. Tensioning: minimum tension; support the specimen as needed. Attenuation change: no change at 1550 nm No fibre and cable breakage.	
12	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, /ITU-T Rec. L.111	Change in attenuation at 1550nm: ≤ 0.15 dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C. TB1 temperature: + 60°C. TB2 temperature: + 70°C. No. of temperature cycle : 2	
13		Cable Aging test	IEC 60794-1-22, /ITU-T Rec. L.111	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
14	**Safety Requirement**	Flame Spread-Single cable/Flame propagation for single cable/Flame retardant test single cable/ Flammability test single cable	IEC 60332-1-2	Char less than 0.54 m at completion of test	

15		Smoke Test/Smoke density/Smoke density under fire conditions/Smoke density of cable burning	IEC 61034-2	Minimum transmittance 60%	
16		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables) /pH Test/pH & Conductivity/Conductivity Test/Degree of acidity	IEC 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
17		The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
18	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
19	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
20	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
21	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
22	**Colour**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective			

	qualification for color fibres	type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219

Annexure-Tx-A5-OFC: Optical Fibre Cables for Direct Surface Application (DSA)

A5.1 Parameter Group: Optical Fibre Cable –DSA

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values (as per ITU-T Rec. L.110)	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	--Do--
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1 W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 2200N	
8		Impact	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 25Nm	3 Impact at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D	

				for 10 cycles.	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when cable is flexed with 1 cycle in 2sec to 5sec with Pulley diameter of 20D (D- diameter of cable) and Load shall be as per FOTP 104. Total number of cycles be 25.	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C. TB1 temperature: + 60°C. TB2 temperature: + 70°C. No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
15		Water Blocking Test/Water	IEC 60794-1-22	Test duration: 24 Hours	No water shall be detected

		Penetration Test		Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16		Termite and Rodent Test	The manufacturer shall submit Undertaking that the Anti-termite/Anti-Rodent dopants used if any, are non-toxic and non-hazardous		
17		Electrical continuity test	IEC 60794-1-24/IEC 60794-1-403	The metallic elements shall be continuous.	Applicable for cable having Metallic Armoured/ metallic Strength element
18	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
19	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
20		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished	Applicable for Ribbon Fibre Only

				from each other.	
21		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-1-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
22		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only
23	**Safety Requirements**	The material used in the manufacturing of the OFC 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 Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	
24	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
25	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
26	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
27	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
28	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			

Annexure-Tx-A6-OFC: Hybrid Cables (Optical and Metallic)

A6.1 Parameter Group: Hybrid Cables (Optical and Metallic)

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values (as per ITU-T Rec. L.109/ IEC 62807-3 (under study)	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	IEC 60793-1-40	≤ 0.36 dB/Km	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1550nm	IEC 60793-1-40	≤ 0.22 dB/Km	--Do--
3		Attenuation at 1625nm	IEC 60793-1-40	≤ 0.25 dB/Km	--Do--
4		PMD Cabled Loose Fibre	IEC 60793-1-48	≤ 0.3 ps/√km	
5		PMD Cabled Ribbon Fibre	IEC 60793-1-48		--Do--
6	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21	Change in attenuation at 1550 nm ≤ 0.05dB & Fiber strain ≤ 0.6% when subjected to a Tensile load of 9.81 x 1 W Newton (where, W- mass of 1 Km of cable in Kg)	
7		Crush Resistance	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected compressive load of 2000N or as agreed by user	
8		Impact	IEC 60794-1-21	Change in attenuation when subjected to Impact load of 25Nm, at 1550nm: ≤ 0.05dB.	3 impacts at 3 locations
9		Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
10		Repeated Bend Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB	The bending rate

				when cable is flexed with 1 cycle in 2 sec to 5 sec with Pulley diameter of 20D (D-diameter of cable) and Load shall be as per FOTP 104 Total number of cycles be 25.	shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
11		Torsion Test	IEC 60794-1-21	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load as per FOTP-85A for 10 cycles.	Cable shall be free from any optical & visual physical damage.
12		Cable Drip Test	IEC 60794-1-22	Sample is kept vertically with open end downwards in the oven for 24 hours at 70° C and examine the paper placed below the cable for dripping of the jelly after 24 hours. There should be no jelly drip or oily impression on the paper.	Not applicable for Dry-Dry Cable Design.
13	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.15 dB when subjected to following temperature cycle: TA2 temperature: - 20°C TA1 temperature: - 10°C TB1 temperature: + 60°C TB2 temperature: + 70°C No. of temperature cycle : 2	
14		Cable Aging test	IEC 60794-1-22	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
15		Water Blocking Test/ Water Penetration Test	IEC 60794-1-22	Test duration: 24 hours Sample length: 3 m Water Head Height: 1m No dye shall be detected when the end of the 3m length is examined with ultraviolet light detector.	No water shall be detected at the unsealed end of the sample. If a fluorescent dye is used, an ultraviolet light may be used for the examination.
16		Lightning Test	ITU-T Rec. L.109 FOTP-	The cable shall withstand the current level of	Applicable for

			181, ITU-T K-47	greater than 105 K. Amp. There shall not be any damage to the fibre & Inner Sheath of the cable and change in attenuation of the fibre after the test shall be < 0.05 dB for 1550 nm.	Armoured cable.
17		Termite and Rodent Test	The manufacturer shall submit Undertaking that the Anti-termite/Anti-Rodent dopants used if any, are non-toxic and non-hazardous		
18		Electrical continuity test	IEC 60794-1-24/IEC 60794-1-403	The metallic elements shall be continuous.	. Applicable for cable having Metallic Armoured/ metallic Strength element
19	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23	No damage or kink on surface of tube when tested 4 times with Kink radius less than 15xD, D is the diameter of the tube.	Applicable for all type of Loose tube, Tight Buffer and Micromodule.
20	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
21		Separability of individual fibres from ribbon	IEC 60794-1-23	- Breakout shall be accomplished without specialized tools or apparatus. - The fibre breakout procedure shall not be permanently detrimental to the fibre optical and mechanical performance; - Any colour coding of fibres shall remain sufficiently intact to enable individual fibres to be distinguished from each other.	Applicable for Ribbon Fibre Only
22		Ribbon Twist Test	Telecordia GR-20/ IEC 60794-3-23	The ribbon shall not show any separation of individual fibres from the ribbon structure after completion of the twist test.	Applicable for Ribbon Fibre Only
23		Ribbon Torsion Resistance	IEC 60794-1-31	Change in attenuation at 1550nm: ≤ 0.05dB	Applicable for Ribbon Fibre Only

24	**Electrical Characteristics – Power Feeding Wires**	As per clause 6.1.2 of ITU-T L.109	IEC 60228 IEC 60502-1 IEC 60227-1 IEC 61156-1 IEC 61196-1-10x BS EN 50525 BS EN 60304	The cross-section of the metallic wire should be designed according to the transmission voltage, transmission distance and the power consumption. Under extreme operating conditions, the heat generated by conductors should not make the cable temperature exceed the maximum allowed temperature in detailed specifications of the cable element materials.	IEC 60228 for following Conductor Strands/Class: • Class 1: Solid conductor • Class 2: Stranded conductor intended for fixed installation • Class 5: Flexible conductor • Class 6: Very Flexible conductor Conductor Size/Area (AWG/SQMM) to be decided on Power delivery over distances based on max allowable Voltage drop The Insulated Copper Conductor Shall be meet the Electrical requirement of BS EN 50525 Colour Scheme for Conductor Insulation shall be as per BS EN 60304 Maximum No of Cores: 2 to 12 cores

					Operating Temp: -10 deg C to 60 deg C Low Voltage Application: 12, 24,48 & 57 V DC Low & Medium Power (15 W to 100 W) Distance support up to 1000 meter
25	**Electromagnetic compatibility**	Transfer impedance and Coupling attenuation	IEC 61156-1	Cable shall be electromagnetically complied.	
26	**Safety Requirements**	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
27		Flame Spread-Bunched cable	IEC/EN 60332-3-24, Cat C	Char less than 2.5 m at completion of the test	
28		Smoke Test	IEC/EN 61034-2 ASTM D5424	Minimum transmittance 60%	ASTM D5424 for Smoke density
29		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2		
30		Requirements for fire performance of Optical/metallic hybrid cables should meet fire safety regulations.	IEC TR 62222		Test on electric and optical fibre cables under fire condition
31		The material used in the manufacturing of the OFC shall be non- toxic and dermatologically		The manufacturer shall submit MSDS (Material safety Data Sheet) for all the material used in manufacturing of Optical fibre cable to substantiate the requirement.	

		safe in its life time and shall not be hazardous to health.			
32	**Geometrical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
33	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
34	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
35	**Mechanical Characteristics of Fibre used in the cable**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable			
36	**Colour qualification for color fibres**	The manufacturer shall submit MTCTE Certificate in compliance to ER of Optical Fibre(ER No. TEC70112206) for respective type of Optical fibre used in the cable OR Test shall be carried as per IEC 60794-1-219			