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, Lashed Aerial Cable and Optical Ground Wire-OPGW)

Annexure-Tx-A4-OFC: Optical Fibre Cable for Access Network Applications
(Indoor Cable, Outdoor Cable, Riser 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	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 1.5W Newton or 2670 N whichever is higher (W-mass of 1 Km of cable in Kg).	

10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Compressive load of 1500 N/2200 N	1500 N (for Un-armoured) 2200 N (for Armoured)
11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 20Nm	20 Nm for both Unarmoured cable and Armoured cable. 10 impacts shall be applied at the surface with the radius of 300mm.
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg with	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.

17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		UV Radiation Test	IEC 60068-2-1, ISO4892-2, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Lightning Test	FOTP-181, ITU-T K-47	The cable shall withstand the current level of ≥105 K Amp. There	Applicable for Armoured cable.

				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.	
23		Termite and Rodent Test		Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC. This test may be taken up as per IEC, once IEC finalises its standard.
24		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
25		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all raw materials are same in one of the cable design, then this test shall be skipped based on prior result.
26		Electrical continuity test	IEC 60794-1-24, IEC 60794-3-11	The metallic elements shall be continuous.	Applicable for Armoured cable.

27	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
28		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
29		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
30		Strippability test - Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
31		Strippability test - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
32	**Characteristics of Cable Elements**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- Breakout shall be accomplished without specialized tools or apparatus.	Applicable for Ribbon Fibre Only

	(Ribboned Fibre)			- 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.	
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 500 N.	Applicable for Ribbon Fibre Only
35		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 500 N.	Applicable for Ribbon Fibre Only
36		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 500 N.	Applicable for Ribbon Fibre Only
37		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation at 1550 nm : ≤ 0.05 dB when wrapped on a 60 mm diameter mandrel for100 turns	Applicable for Ribbon Fibre Only
38		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
39	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
40		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
41		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
42		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
44		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--

45	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
46		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
52		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
53		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
54		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A

55		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
56		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
57		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
58	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
59		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
60	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
61	**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.	

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	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 1.3 W Newton or 300 N whichever is higher (W-mass of 1 Km of cable in Kg).	
10		Crush Resistance	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to a compressive load of 1000 N	

11		Impact	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to Impact of 12.5 Nm	
12		Kink Test	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-5-10,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-5-10,	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.

17		Abrasion Resistance Test	IEC 60794-1-21, 60794-5-10,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-5-10,	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-5-10,	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.

21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Termite and Rodent Test		Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
23		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
24		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.

25	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
26		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
27		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
28		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
29		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
30	**Characteristics of Cable Elements**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
31		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- Breakout shall be accomplished without specialized tools or apparatus.	Applicable for Ribbon Fibre Only

	(Ribboned Fibre)			- 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.	
32		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
33		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
34		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
35		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
36		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
37	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
38		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
39		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
40		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
41		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--

42		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
43	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
44		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
45		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
46		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
50		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
51		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
52		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
53		Change in attenuation when fibre is coiled with	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 &	Applicable to respective type of Optical fibre used in the

		1 turn on 10 mm radius mandrel		G.657.B3 type of Optical fibre used in the cable	cable as per ITU-T G.652.A & G.657.B
54		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
55		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
56	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
57		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
58	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
59	**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.	

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	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 1.5W Newton or 3000 N whichever is higher (W-mass of 1 Km of cable in Kg).	

10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to a compressive load of 2500/3500 N	2500 N (for Un-armoured cable) 3500 N (for Armoured cable)
11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1310 & 1550nm: ≤ 0.05dB.when subjected to Impact of 25Nm	25 Nm for both Unarmoured cable and Armoured cable. 10 impacts shall be applied at the surface with the radius of 300mm.
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.

17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	

22		Termite and Rodent Test		Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
23		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	.
24		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
25		Lightning Test	FOTP-181, ITU-T K-47	The cable shall withstand the current level of 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.	Applicable for Armoured cable.

26		Electrical continuity test	IEC 60794-1-24, IEC 60794-3-11	The metallic elements shall be continuous.	Applicable for Armoured cable.
27	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
28		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
29		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
30		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
31		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
32	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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.	
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
35		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
36		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
37		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
38		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
39	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
40		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
41		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
42		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
44		Coating /Cladding	IEC 60793-2-50, 60793-1-21,		

		concentricity		--Do--	--Do--
45	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
46		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
52		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
53		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
54		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
55		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

56		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
57		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
58	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
59		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
60	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
61	**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.	

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

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

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 6W/4W Newton (W-mass of 1 Km of cable in Kg)	6W for ADSS cable for Hilly areas (with Ice loading) 4W for ADSS cable for Hilly areas (without Ice loading)

10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 2200 N at 1550nm: ≤ 0.05dB	
11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 20Nm	10 impacts shall be applied at the surface with the radius of 300mm.
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable)	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.
17		Aeolian Vibration Test	IEC 60794-1-21 Method E19, IEC60794-4-20 IEEE1222,	Vibration cycles - 10 million. The frequency of the test span shall be equal to and maintained at the nearest resonant frequency produced by a 16.1 km/hr wind (i.e., frequency = 82.92/diameter of cable in centimetres).	

				Change in attenuation at 1550nm: ≤ 0.05dB after the test.	
18		Galloping Test	IEC 60794-1-21 Method E26, IEC60794-4-20 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	
19		Creep Test	IEC 60794-4-20	A creep test shall be performed on an ADSS sample approximately 10 m long. The cable shall be terminated at each end, and a tension of at least 50% of the maximum rated cable loads shall be applied and sustained for duration of at least 1000 hrs. The elongation of the cable versus time shall be measured at suitable intervals and recorded. Change in attenuation at 1310 & 1550nm: ≤ 0.05dB after the test	
20		Snatch Test	IEC 60794-1-2-E9	Sample Length: 4.5 m and firmly clamped at the two ends so that sag of 300 mm, is formed. Testing load shall be 300 N/500 N and the radius of impacting surface of the crown of the hook shall be 12.5 mm. Change in attenuation at 1310 & 1550nm: ≤ 0.05dB after the test	
21		Electrical Test/ Tracking & Erosion Test	IEC60794-4-20 IEEE Std 1222-2003 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 high voltage power line

22		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
23	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
24		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
25		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
26		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
27		Check of the effect of	ISO175, Annex R2	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the	

		aggression media on the cable		solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
28		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
29	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
30		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
31		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
32		Strippability Test – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
33		Strippability Test Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two	Applicable for Micromodule only.

				fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	
34	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
35		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
36		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
37		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
38		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
39		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
40		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3 Annex R1,		Applicable for Ribbon Fibre Only
41	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used

	of Fibre used in the cable				in the cable as per ITU-T G.65x
42		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
44		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
45		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
46		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
47	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
48		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
52		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
53	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x

54		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
55		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
56		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.A
57		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.A & G.657.B
58		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.A & G.657.B

59		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
60	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
61		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
62	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
63	**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.	

A3.2 Parameter Group: Optical Fibre Cable-ADSS on Aerial alignment

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 6W/4W/3W (or 4500N) Newton (W-mass of 1 Km of cable in Kg).	6W for Aerial cable for Hilly areas (with Ice loading) 4W for Aerial cable for Hilly areas (without Ice loading) 3W (or 4500N) for Aerial cable for Urban areas
10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 2000 N.	

11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 20Nm	10 impacts shall be applied at the surface with the radius of 300mm
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18		Aeolian Vibration Test	IEC 60794-1-21 Method E19, IEC60794-4-20	Vibration cycles - 10 million.	

			IEEE1222,	The frequency of the test span shall be equal to and maintained at the nearest resonant frequency produced by a 16.1 km/hr wind (i.e., frequency = 82.92, diameter of cable in centimetres). Change in attenuation at 1550nm: ≤ 0.05dB after the test.	
19		Galloping Test	IEC 60794-1-21 Method E26, IEC60794-4-20 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	
20		Creep Test	IEC60794-4-20,	A creep test shall be performed on an ADSS sample approximately 10 m long. The cable shall be terminated at each end, and a tension of at least 50% of the maximum rated cable loads shall be applied and sustained for duration of at least 1000 hrs. The elongation of the cable versus time shall be measured at suitable intervals and recorded. Change in attenuation at 1310 & 1550nm: ≤ 0.05dB after the test	
21		Snatch Test	IEC 60794-1-2-E9	Sample Length: 4.5 m and firmly clamped at the two ends so that sag of 300 mm, is formed. Testing load shall be 300 N and the radius of impacting surface of the crown of the hook shall be 12.5 mm.	

				Change in attenuation at 1310 & 1550nm: ≤ 0.05dB after the test	
22		Shotgun resistance Test	IEC 60794-1-2(E13 B) , IEC60794-4-20,		Applicable for ADSS cable on Aerial alignment, if required by user.
23	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
24		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
25		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
26		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours	

				There should not be any fading or change in colour of the sheath.	
27		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
28		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
29	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
30		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
31		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
32		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the	Applicable for Tight Buffer only.

				end of the tight buffer, leaving the fibre undamaged	
33		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
34	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
35		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
36		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
37		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only

38		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
39		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
40		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3 Annex R1,		Applicable for Ribbon Fibre Only
41	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
42		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
44		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
45		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
46		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
47	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
48		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
52		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--

53	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
54		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
55		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
56		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
57		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
58		Change in attenuation when fibre is	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

		coiled with 1 turn on 7.5 mm radius mandrel			
59		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
60	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
61		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
62	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
63	**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.	

A3.3 Parameter Group: Optical Fibre Cable- Lashed Aerial Cable

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 1.3 W or 500 N whichever is more	
10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to a compressive load of 1000 N	

11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to Impact of 12.5Nm	
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	

23		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
24	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
25		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
26		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
27		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 50 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
28		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.

29	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
30		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
31		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
32		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
33		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
34		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
35		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3 Annex R1,		Applicable for Ribbon Fibre Only
36	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
37		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
38		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
39		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--

40		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
41		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
42	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
43		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
44		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
45		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
46		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
49		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47, Annex R1	--Do--	--Do--

50		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
51		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-47 Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
52		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
53		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
54		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47 Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B

55	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
56		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
57	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
58	**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.	

A3.4 Parameter Group: Optical Ground Wire - OPGW

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength (Ultimate)	IEEE 1138: 2009 Annexure –	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. Optical performance of OPGW cable shall be monitored during this test. A permanent increase in Optical Attenuation shall not be greater than 0.05 dB at 1550nm wavelength	

10		Creep Test	IEEE 1138: 2009 Annexure –	A permanent increase in Optical Attenuation shall not be greater than 0.05 dB at 1550nm wavelength	
11		Stress Strain Test	IEEE 1138: 2009 Annexure –	The breaking strength of the OPGW cable shall meet or exceed 100% of the RTS of the cable. Optical performance of OPGW cable shall be monitored during the test. A permanent increase in Optical Attenuation shall not be greater than 0.05 dB at 1550nm wavelength	
12		Strain Margin Test	IEEE 1138: 2009 Annexure –	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	
13		Sheave Test	IEEE 1138 : 2009/IEC-60794-1-2-E9	The Ovality of the cable or optical units at the measured locations shall not exceed 10 %. Cracking or breaking of any component of the OPGW cable shall be visually examined. A permanent increase in Optical Attenuation shall not be greater than 0.05 dB at 1550nm wavelength	
14		Crush Test	IEEE 1138 : 2009/ IEC 60794-1-2-E3	Change in attenuation when subjected to a compressive load of 0.4 W N at 1550nm: ≤ 0.05dB. Ovality of the cable or optical fiber units shall be < 10 %.	
15		Bend Test	IEEE 1138 : 2009/IEC 60794-1-2-E11 (Procedure-I)	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles and there shall be no damage to the sheath or to the cable elements under visual examination without magnification	
16		Torsion Test	IEC 60794-1-2-E7	The length of the specimen under test shall be 10 meters and the load shall be 100 N (20% of the cable RTS).	

				The cable shall be examined physically for any cracking and breaking of OPGW 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 at 1550 nm wavelength	
17		Impact Test	IEC 60794-1-2-E4	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to Impact of 30 Nm	
18		Repeated Bending	IEC 60794-1-2-E6	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
19		Aeolian Vibration Test	IEEE 1138 : 2009, IEC 60794-1-2-E19	Vibration cycles – 10 million Change in attenuation at 1550nm: ≤ 0.05dB after the test	
20		Galloping Test	IEEE 1138 : 2009	Galloping cycles – 100000 Change in attenuation at 1550nm: ≤ 0.05dB after the test	
21		Drip Test	IEEE 1138: 2009/ TIA/EIA-455-81-B	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.	
22	**Electrical Characteristics**	DC Resistance	IEEE 1138: 2009 Annexure –	The actual dc resistance of the OPGW cable shall not exceed the dc resistance stated by the manufacturer at the specified temperature.	
23		Short Circuit Test	IEEE 1138 : 2009/IEC 60794-1-2-H1	Any cracking or breaking of any component of the optical sample shall constitute failure. This assessment is made with the naked eye.	

24		Lightning Arc Test	IEEE 1138 : 2009	There shall be no permanent increase in optical attenuation greater than 0.05 dB at 1550nm wavelengths. The minimum remaining strength of any of the tested cable sections shall be greater than the cable RTS	
25		Electrical Continuity Test		The metallic elements shall be continuous.	
26	**Environmental Characteristics**	Water Penetration Test	IEEE 1138 : 2009/IEC 60794-1-2-F5B	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	Test shall be conducted on the Optical Core Only. Other Components shall be removed before the start of the test. 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.
27		Temperature Cycle Test	IEEE 1138 : 2009 (6.4.3.7) / IEC-60794-1-2-F1	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
28		Salt Spray Corrosion Test	IEEE 1138 : 2009	At the end of the test, the cables are to be removed and dissected for corrosion damage. The cables have passed the test if: a) There are no locations where the aluminum-clad steel wires have been	

				pitted so as to expose the underlying steel strength member in any way what so ever. b) There are no locations where solid aluminum wires have been point pitted beyond a depth of 10% of the total individual wires diameter at the point of the pit. c) There is no damage to the internal fiber containment tubing. d) In the case of aluminum coated tubing, there can be no removal of the aluminum coating that exposes the underlying stainless steel tube. e) In the case of "other" coated tubing, there can be no removal of the coating that exposes the underlying tubing to the elements.	
29		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
30	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
31		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.

32		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
33		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010, Annex R2	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
34		Strippability and access to the fiber - Micromodule	Annex R2	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
35	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3, Annex R2	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
36		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3, Annex R2	- 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
37		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3 Annex R2	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
38		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3 Annex R2	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only

39		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3 Annex R2	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
40		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3 Annex R2	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
41		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3 Annex R1,		Applicable for Ribbon Fibre Only
42	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
43		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
44		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
45		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
46		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
47		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
48	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
49		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--

52		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
53		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
54	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
55		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
56		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
57		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
58		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
59		Change in attenuation when fibre is coiled with	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in

		1 turn on 7.5 mm radius mandrel			the cable as per ITU-T G.652.A & G.657.B
60		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
61	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
62		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
63	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
64	**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.	

Annexure-Tx-A4-OFC: Optical Fibre Cables for Access Network Applications (Indoor Cable, Outdoor Cable, Riser 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	ITU-T G.657, G.650.1 and IEC 60793-2-50, 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 1383nm	--Do--	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	--Do--	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	--Do--	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
5		Attenuation at 1625nm	--Do--	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	--Do--		
8		Cable Cut-off Wavelength	ITU-T G. 657, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--

9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 660 N/1.5 W	660 Newton for Flexible Cable 1.5 W for Non-Flexible Cable.
10		Crush Resistance	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 500 N	
11		Impact	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 1 J	
12		Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-2,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-2,	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.
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-2,	Steel needle diameter d = 1.0 mm, load: 4 N	

				No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-2,	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	

22		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
23	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
24		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
25		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
26		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
27		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their	Applicable for Micromodule only.

				mechanical strength after this operation.	
28	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
29		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
30		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
31		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
32		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
33		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
34		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
35	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
36		Cladding Diameter	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--

37		Cladding Non-circularity	--Do--	--Do--	--Do--
38		Core Clad concentricity error	--Do--	--Do--	--Do--
39		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
40		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
41	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
42		At 1625nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
43		In 1285-1330nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
44		In 1270-1340nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
45		Zero Dispersion slope	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
46		Zero Dispersion wavelength range	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
48		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A , G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

49		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
50		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
51	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
52		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
53	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
54	**Safety Requirement**	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
55		Flame Spread- Bunched cable	IEC/EN 60332-3-24: 2018, Cat C	Char less than 2.5 m at completion of the test	
56		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
57		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
58		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.	

A4.2 Parameter Group: Optical Fibre Cable –Outdoor

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 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 1383nm	--Do--	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	--Do--	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	--Do--	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
5		Attenuation at 1625nm	--Do--	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	--Do--		
8		Cable Cut-off Wavelength	ITU-T G. 657, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 2 W or 1000 Newton Whichever is higher.	

10		Crush Resistance	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 1000N.	
11		Impact	IEC 60794-1-21, 60794-2,	Change in attenuation when subjected to Impact of 12.5 Nm at 1550nm: ≤ 0.05dB.	
12		Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-2,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N **f**or 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-2,	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.
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-2,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	

18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-2,	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on	

				the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
23		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all raw materials are same in one of the cable design, then this test shall be skipped based on prior result.
24	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
25		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
26		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
27		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
28		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails,	Applicable for Micromodule only.

				and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	
29	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
30		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
31		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
32		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
33		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
34		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only

35		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
36	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm /1550 nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
37		Cladding Diameter	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
38		Cladding Non-circularity	--Do--	--Do--	--Do--
39		Core Clad concentricity error	--Do--	--Do--	--Do--
40		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
41		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
42	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
43		At 1625nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
44		In 1285-1330nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
45		In 1270-1340nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
46		Zero Dispersion slope	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		Zero Dispersion wavelength range	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--

48	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
49		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A , G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
50		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
51		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
52	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
53		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
54	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
55	**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.	

A4.3 Parameter Group: Optical Fibre Cable –Riser

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 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 1383nm	--Do--	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	--Do--	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	--Do--	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
5		Attenuation at 1625nm	--Do--	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	--Do--		
8		Cable Cut-off Wavelength	ITU-T G. 657, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550 nm: ≤ 0.05dB when subjected to a Tensile load of 1.3 W or 660 N /1320 N whichever is higher	660N (upto 12 fibre) 1320 N (for 24/48 fibre)
10		Crush Resistance	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 1000N / 500N	1000 N for Tight buffer 500N for Micromodule
11		Impact	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB.when subjected to Impact of 12.5Nm/6Nm	12.5 J for Tight Buffer 6 J for Micromodule

12		Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-2,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Abrasion Resistance Test	IEC 60794-1-21, 60794-2,	Steel needle diameter d = 1.0 mm, load: 4 N, No perforation & loss of legibility of the marking on the sheath.	
17	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-2,	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
18		Cable Aging test	IEC 60794-1-22, 60794-2	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
19		Termite and Rodent Test	Annex R1	Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity	No Indian/Global standard. One similar standard is under draft

				- Thermal Stability - Long life span/half-life - Efficacy	stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
20		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
21		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
22	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
23		Strippability test - Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
24		Strippability test - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over	Applicable for Micromodule only.

				at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	
25	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
26		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
27		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
28		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
29		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
30		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
31		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
32	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
33		Cladding Diameter	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--

34		Cladding Non-circularity	--Do--	--Do--	--Do--
35		Core Clad concentricity error	--Do--	--Do--	--Do--
36		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
37		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
38	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
39		At 1625nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
40		In 1285-1330nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
41		In 1270-1340nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
42		Zero Dispersion slope	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
43		Zero Dispersion wavelength range	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
44	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
45		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A , G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

46		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
47		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47 Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
48	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
49		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
50	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
51	**Safety Requirements**	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
52		Flame Spread- Bunched cable	IEC/EN 60332-3-24: 2018, Cat C	Char less than 2.5 m at completion of the test	
53		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
54		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
55		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.	

A4.4 Parameter Group: Optical Fibre Cables -Indoor/Outdoor

SN	Parameter Name	Individual Parameter Name	Standard Name	Limits/Values	Applicability
1	**Transmission Characteristics**	Attenuation at 1310nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 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 1383nm	--Do--	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	--Do--	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	--Do--	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
5		Attenuation at 1625nm	--Do--	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	--Do--		
8		Cable Cut-off Wavelength	ITU-T G. 657, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550 nm: ≤ 0.05dB when subjected to a Tensile load of 1.3 W or 500 N which is higher	
10		Crush Resistance	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm : ≤ 0.05dB when subjected to a compressive load of 1000 N.	

11		Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm : ≤ 0.05dB.when subjected to Impact of 12.5 Nm	
12		Kink Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	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.
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20cm.	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.
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Termite and Rodent Test	Annex R1	Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
23		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables.	

				The sample should not show any effect of these solutions on the sheath and other marking of the cable	
24		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
25	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
26		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
27		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
28		Strippability and access to the fiber – Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
29		Strippability and access to the fiber - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres.	Applicable for Micromodule only.

				The fibres must retain their mechanical strength after this operation.	
30	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
31		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
32		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
33		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
34		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
35		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
36		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
37	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
38		Cladding Diameter	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--

39		Cladding Non-circularity	--Do--	--Do--	--Do--
40		Core Clad concentricity error	--Do--	--Do--	--Do--
41		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
42		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
43	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
44		At 1625nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
45		In 1285-1330nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
46		In 1270-1340nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		Zero Dispersion slope	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		Zero Dispersion wavelength range	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
50		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A , G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

51		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
52		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47		
53	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
54		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
55	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
56	**Safety Requirement**	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
57		Flame Spread- Bunched cable	IEC/EN 60332-3-24: 2018, Cat C	Char less than 2.5 m at completion of the test	
58		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
59		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
60		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.	

A4.5 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	ITU-T G.657, G.650.1 and IEC 60793-2-50, 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 1383nm	--Do--	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	--Do--	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	--Do--	≤ 0.22 dB/Km (A1) ≤ 0.23 dB/Km (A2) ≤ 0.24 dB/Km (B3)	--Do--
5		Attenuation at 1625nm	--Do--	≤ 0.25 dB/Km (A) ≤ 0.26 dB/Km (B3)	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	--Do--		
8		Cable Cut-off Wavelength	ITU-T G. 657, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**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.	
10		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.	
11		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.	
12		Kink Test	IEC 60794-1-21, ITU-T Rec. L.111	Minimum bend diameter: as per 6.2.1/L.111 No kink and fibre/cable breakage.	
13		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 °C. Maximum attenuation change: 0.20 dB during the test, no change after the test at 1550 nm. No fibre and cable breakage.	
14		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.	
15		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.	
16	**Environmental Characteristics**	Temperature Cycling	IEC 60794-1-22, ITU-T Rec. L.111	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
17		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.	
18		Damp Heat Test	IEC 60793-1-50 ITU-T Rec. L.111	Change in attenuation at 1550 nm: ≤ 0.05dB when exposed to Temperature：40℃±2℃ Relative humidity：95% Time：96h	
19		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
20		Cable Material Compatibility	Telecordia GR 20, IEC60794	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable.

				materials that are in direct contact with identified components within the cable structure	If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
21	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
22		Cladding Diameter	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
23		Cladding Non-circularity	--Do--	--Do--	--Do--
24		Core Clad concentricity error	--Do--	--Do--	--Do--
25		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
26		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
27	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
28		At 1625nm	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
29		In 1285-1330nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
30		In 1270-1340nm band	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
31		Zero Dispersion slope	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
32		Zero Dispersion wavelength range	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
33	**Transmission Characteristics**	Change in attenuation when fibre is coiled with	ITU-T G.657.A, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 &	Applicable to respective type of Optical fibre

	of Fibre used in the cable	10 turns on 15 mm radius mandrel		G.657.A2 type of Optical fibre used in the cable	used in the cable as per ITU-T G.652.A
34	**(Fibre Macro bend loss)**	Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A , G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
35		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
36		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47 Annex R1	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
37	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable Striping length: 15 mm, Stripping force: 5~18 N (if the primary and secondary coating are removed together.)	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
38		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
39	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
40	**Safety Requirement**	Flame retardant	IEC TR62222 IEC 60332-1-2	Flame retardant should meet fire safety regulations	
41		Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
42		Flame Spread- Bunched cable	IEC/EN 60332-3-24: 2018, Cat C	Char less than 2.5 m at completion of the test	

43		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
44		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2	pH not less than 4.3 Conductivity not more than 10 µS/mm	
45		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.	

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	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550 nm: ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of 3500 Newton	

10		Crush Resistance	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a compressive load of 5000 N	
11		Impact	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Impact of 25N	
12		Kink Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	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.
17		Abrasion Resistance Test	ITU-T Rec. L.110 IEC 60794-1-21, 60794-3-70,	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	

18	**Environmental Characteristics**	Temperature Cycling	ITU-T Rec. L.110 IEC 60794-1-22, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	ITU-T Rec. L.110 IEC 60794-1-22, 60794-3-70,	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	ITU-T Rec. L.110 IEC 60794-1-22, 60794-3-70,	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.
21		UV Radiation Test	ITU-T Rec. L.110 IEC 60068-2-1, , ISO4892-2, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Lightning Test	ITU-T Rec. L.110 FOTP-181, ITU-T K-47	The cable shall withstand the current level of greater than 105 K. Amp. There shall not be any damage to the fibre & Inner Sheath of the cable and	Applicable for Armoured cable.

				change in attenuation of the fibre after the test shall be < 0.05 dB for 1550 nm.	
23		Termite and Rodent Test		Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
24		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
25		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	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	Applicable as per IEC 60794-1-219 (draft) to control the quality of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
26		Electrical continuity test	ITU-T Rec. L.110 IEC 60794-1-24, IEC 60794-3-11	The metallic elements shall be continuous.	Applicable for Armoured cable.
27	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.

28		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
29		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
30		Strippability test - Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
31		Strippability test - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	Applicable for Micromodule only.
32	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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	Applicable for Ribbon Fibre Only

				individual fibres to be distinguished from each other.	
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
35		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
36		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
37		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
38		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
39	**Geometrical Characteristics of Fibre used in the cable**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
40		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
41		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
42		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
44		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
45	**Transmission Characteristics of Fibre used in the Cable (Chromatic**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
46		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--

47	**Dispersion)**	In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
52		Change in attenuation when fiber is coiled with 1 turn around 32 ± 0.5 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--
53		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
54		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
55		Change in attenuation when fibre is coiled with 1	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B

		turn on 10 mm radius mandrel			
56		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
57		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
58	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
59		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
60	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--
61	**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.	

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	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 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 1383nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ attenuation at 1310 nm	--Do--
3		Attenuation at 1490 nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.26 dB/Km	--Do--
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.22 dB/Km	--Do--
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	≤ 0.25 dB/Km	--Do--
6		PMD Cabled Loose Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48		
7		PMD Cabled Ribbon Fibre	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-48	≤ 0.3 ps/√km	--Do--
8		Cable Cut-off Wavelength	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-44	1260nm Max.	--Do--
9	**Mechanical Characteristics**	Tensile Strength	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550 nm ≤ 0.05dB & Fiber strain ≤ 0.25% when subjected to a Tensile load of cable as agreed by user	
10		Crush Resistance	ITU-T Rec. L.109	Change in attenuation at 1550nm: ≤ 0.05dB when	

			IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	subjected compressive load of 2000N or as agreed by user	
11		Impact	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation when subjected to Impact load of 25Nm, at 1550nm: ≤ 0.05dB.	
12		Kink Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to a Kink with radius of 10D (D - diameter of cable).	There shall be no damage to the sheath or to the cable elements under visual examination without magnification
13		Bend Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Bend around a mandrel of diameter of 20D for 10 cycles,.	
14		Repeated Bend Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	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 of 5Kg	The bending rate shall be approximately one cycle in 2s to 5s and cable shall be free from any optical & visual physical damage.
15		Torsion Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB when subjected to Torsion with a load of 100N for 10 cycles.	Cable shall be free from any optical & visual physical damage.
16		Cable Drip Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	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.

17		Abrasion Resistance Test	ITU-T Rec. L.109 IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11	Steel needle diameter d = 1.0 mm, load: 4 N No perforation & loss of legibility of the marking on the sheath.	
18	**Environmental Characteristics**	Temperature Cycling	ITU-T Rec. L.109 IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB 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 Time at each temperature : 12hrs.	
19		Cable Aging test	ITU-T Rec. L.109 IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Change in attenuation at 1550nm: ≤ 0.05dB, when cable is exposed to 85 °C ± 2 °C for a minimum of 168 hours.	
20		Water Blocking Test	ITU-T Rec. L.109 IEC 60794-1-22, 60794-3, 60794-3-10, 60794-3-11	Test duration: 168 hour 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. The cable sample under test for 7 days, shall be ripped open after the test and then it shall be examined for seepage of water into the cable and it shall not be more than 20 cm.	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.

21		UV Radiation Test	ITU-T Rec. L.109 IEC 60068-2-1, , ISO4892-2, ASTM G-154-12a, IEC 60794-1-22 Method F14,	Type of lamp: 40 watt UV-B lamp with peak emission at 313nm. Duration: 2000 hours There should not be any fading or change in colour of the sheath.	
22		Lightning Test	ITU-T Rec. L.109 FOTP-181, ITU-T K-47	The cable shall withstand the current level of 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.	Applicable for Armoured cable.
23		Termite and Rodent Test		Following minimum parametric test for Anti-termite dopant shall be carried out - Non- toxicity - Thermal Stability - Long life span/half-life - Efficacy	No Indian/Global standard. One similar standard is under draft stage in IEC forum. This test maybe taken up as per IEC, once IEC finalises its standard.
24		Check of the effect of aggression media on the cable	ISO175	The test samples are put in the PH4 and PH10 solutions separately. After 30 days these samples are taken out from the solutions and examined for any corrosion etc. on the sheath and other markings of the cables. The sample should not show any effect of these solutions on the sheath and other marking of the cable	
25		Cable Material Compatibility	Telecordia GR 20, IEC 60794-3-11	Optical fibre, buffers/core tubes, and other core components shall	Applicable as per IEC 60794-1-219 (draft) to control the quality

				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	of material and life span of the cable. If all RM are same in one of the cable design, then this test shall be skipped based on prior result.
26		Electrical continuity test	ITU-T Rec. L.109 IEC 60794-1-24, IEC 60794-3-11	The metallic elements shall be continuous.	Applicable for Armoured cable.
27	**Characteristics of Cable Elements (Buffer Tube)**	Kink resistance Test	IEC 60794-1-23, IEC 60794-3, 60794-3-11	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.
28		Drainage Test/Compound Flow	IEC 60794-1-21, IEC 60794-3, 60794-3-11	No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs.	Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube.
29		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3-11	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.	Applicable for all type of Loose tube, Tight buffer and Micromodule.
30		Strippability test - Tight Buffer	IEC 60794-3, IEC 60793-1-32, IEC 60793-1-32:2010	3 mm length of outer sheath of tight buffer at a distance 30 mm from the end of the tight buffer, leaving the fibre undamaged	Applicable for Tight Buffer only.
31		Strippability test - Micromodule	-	It must be possible to remove the sheath manually by squeezing it between two fingers without pinching it with your finger nails, and pulling on each side of the required break point. Once the sheath has been broken, it must slide easily over	Applicable for Micromodule only.

				at least 10 cm to expose the end fibres. The fibres must retain their mechanical strength after this operation.	
32	**Characteristics of Cable Elements (Ribboned Fibre)**	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33		Separability of individual fibres from ribbon	IEC 60794-1-23, IEC 60794-3	- 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
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
35		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
36		Ribbon Torsion Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550nm: ≤ 0.05dB.	Applicable for Ribbon Fibre Only
37		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when wrapped on a 60 mm diameter mandrel for100 turns at 1550 nm : ≤ 0.05 dB	Applicable for Ribbon Fibre Only
38		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre Only
39	**Geometrical Characteristics**	Mode Field Diameter at 1310 nm/1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-45	As per Annexure to TEC ER No: TEC70012008 for	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x

	of Fibre used in the cable			respective type of Optical fibre used in the cable	
40		Cladding Diameter	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
41		Cladding Non-circularity	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
42		Core Clad concentricity error	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-20,	--Do--	--Do--
43		Coating diameter	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
44		Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21,	--Do--	--Do--
45	**Transmission Characteristics of Fibre used in the Cable (Chromatic Dispersion)**	At 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
46		At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
47		In 1285-1330nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
48		In 1270-1340nm band	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
49		Zero Dispersion slope	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
50		Zero Dispersion wavelength range	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	--Do--	--Do--
51	**Transmission Characteristics of Fibre used in the cable (Fibre Macro bend loss)**	Change in attenuation when fiber is coiled with 100 turns on 60 ±1.0 mm diameter mandrel	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
52		Change in attenuation when fiber is coiled with 1 turn around 32	ITU-T G.65x ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	--Do--	--Do--

		± 0.5 mm diameter mandrel			
53		Change in attenuation when fiber is coiled with 100 turns on 50 ±0.5 mm diameter mandrel	ITU-T G.652.D ,ITU-T G.650.1, IEC 60793-2-50 and IEC 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.652.D type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.D
54		Change in attenuation when fibre is coiled with 10 turns on 15 mm radius mandrel	ITU-T G.657.A, G.650.1 IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 & G.657.A2 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A
55		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1, G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
56		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	ITU-T G.657.A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B
57		Change in attenuation when fibre is coiled with 1 turn on 5 mm radius mandrel	ITU-T G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47	As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657.B
58	**Mechanical Characteristics of Fibre used in the cable**	Peak Stripability force to remove primary coating of the fiber (Unaged, Water aged, Damp heat aged)	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.65x
59		Fiber Curl	IEC 60793-2-50, 60793-1-34,	--Do--	--Do--
60	**Colour qualification for color fibres**	MEK RUB Test (Methyl Ethyl Ketone)	Draft IEC 60794-1-219,	--Do--	--Do--

61	**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

62	**Electromagnetic compatibility**	Transfer impedance and Coupling attenuation	IEC 61156-1	Cable shall be electromagnetically complied.	
63	**Safety Requirements**	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion of test	
64		Flame Spread-Bunched cable	IEC/EN 60332-3-24: 2018, Cat C	Char less than 2.5 m at completion of the test	
65		Smoke Test	IEC/EN 61034-2 ASTM D5424	Minimum transmittance 60%	ASTM D5424 for Smoke density
66		Acid gas (Toxicity) (Test on toxic gases evolved during combustion of materials from cables)	IEC/EN 60754-2,		
67		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
68		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.	