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
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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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	$\leq 0.25 \text{ dB/Km}$	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	\leq 0.3 ps/ \sqrt{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: ≤ 0.05 dB & Fiber strain $\leq 0.25\%$ 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,	Change in attenuation at 1550nm: \leq	1500 N (for Un-armoured)
		60794-3-10, 60794-3-11,	0.05dB when subjected to a	2200 N (for Armoured)
			Compressive load of 1500 N/2200	
11	T	WEG (0704.1.01. (0704.2	N 1550	
11	Impact	IEC 60794-1-21, 60794-3, 60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: \leq 0.05dB when subjected to Impact	20 Nm for both Unarmoured cable and
		00794-3-10, 00794-3-11,	of 20Nm	Armoured cable. 10
				impacts shall be applied at
				the surface with the radius
				of 300mm.
12	Kink Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	There shall be no damage
		60794-3-10, 60794-3-11,	0.05dB when subjected to a Kink	to the sheath or to the cable
			with radius of 10D (D - diameter of	elements under visual examination without
			cable).	magnification
13	Bend Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	magimeation
10		60794-3-10, 60794-3-11,	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,	Change in attenuation at 1550nm: \leq	The bending rate shall be
		60794-3-10, 60794-3-11,	0.05dB when cable is flexed with 1	approximately one cycle in
			cycle in 2 sec to 5 sec with Pulley diameter of 20D (D- diameter of	2s to 5s and cable shall be free from any optical &
			cable) and Load of 5Kg with	visual physical damage.
15	Torsion Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	Cable shall be free from
		60794-3-10, 60794-3-11,	0.05dB when subjected to Torsion	any optical & visual
			with a load of 100N for 10 cycles.	physical damage.
16	Cable Drip Test	IEC 60794-1-21, 60794-3,	Sample is kept vertically with open	Not applicable for Dry-Dry
		60794-3-10, 60794-3-11,	end downwards in the oven for 24	Cable Design.
			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.	

17		Abrasion Resistance	IEC 60794-1-21, 60794-3,	Steel needle diameter $d = 1.0$ mm,	
1,		Test	60794-3-10, 60794-3-11,	load: 4 N	
		1030	00794-3-10, 00794-3-11,	No perforation & loss of legibility of	
				the marking on the sheath.	
18	Environmental	Temperature Cycling	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm: \leq	
10	Characteristics	Temperature Cycling	60794-3-10, 60794-3-11	0.05dB when subjected to	
	Characteristics		60794-3-10, 60794-3-11	5	
				following temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
	-			Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm: \leq	
			60794-3-10, 60794-3-11	0.05dB, when cable is exposed to	
				85 °C \pm 2 °C for a minimum of 168	
	_			hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3,	Test duration: 168 hour	No water shall be detected
			60794-3-10, 60794-3-11	Sample length: 3 m	at the unsealed end of the
				Water Head Height: 1m	sample. If a fluorescent dye
				No dye shall be detected when the	is used, an ultraviolet light
				end of the 3m length is examined	may be used for the
				with ultraviolet light detector. The	examination.
				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.	
21	1	UV Radiation Test	IEC 60068-2-1, ISO4892-2,	Type of lamp: 40watt UV-B lamp	
			ASTM G-154-12a, IEC	with peak emission at 313nm.	
			60794-1-22 Method F14,	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	Applicable for Armoured
			- ,	current level of ≥ 105 K Amp. There	cable.

23	Termite and Rodent Test		<pre>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.</pre> 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	IEC 60794-1-24, IEC 60794- 3-11	The metallic elements shall be continuous.	Applicable for Armoured cable.
	test	5-11	conunuous.	caule.

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 <u>.</u>
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		<u>Strippability test -</u> <u>Micromodule</u>	-	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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33	Elements	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 	
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	from each other. 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: \leq 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: \leq 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 for 100 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 44		Coating diameter Coating /Cladding concentricity	IEC 60793-2-50, 60793-1-21, IEC 60793-2-50, 60793-1-21,	Do Do	Do Do

45	Transmission	At 1550nm	ITU-T G.65x, G.650.1 and	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics of		IEC 60793-2-50, 60793-1-42,	TEC70012008 for respective type	type of Optical fibre used in
	Fibre used in the			of Optical fibre used in the cable	the cable as per ITU-T
	Cable (Chromatic			·····	G.65x
46	Dispersion)	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	ITU-T G.65x, G.650.1 and		
		wavelength range	IEC 60793-2-50, 60793-1-42,	Do	Do
51	Transmission	Change in attenuation	ITU-T G.65x ,ITU-T G.650.1,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	when fiber is coiled	IEC 60793-2-50 and IEC	TEC70012008 for respective type	type of Optical fibre used in
	of Fibre used in	with 100 turns on 60	60793-1-47,	of Optical fibre used in the cable	the cable as per ITU-T
	the cable	±1.0 mm diameter			G.65x
	(Fibre Macro	mandrel			
52	bend loss)	Change in attenuation	ITU-T G.65x ,ITU-T G.650.1,		
		when fiber is coiled	IEC 60793-2-50 and IEC	Do	Do
		with 1 turn around 32	60793-1-47,		
		± 0.5 mm diameter			
50		mandrel			
53		Change in attenuation	ITU-T G.652.D ,ITU-T	As per Annexure to TEC ER No:	Applicable to respective
		when fiber is coiled	G.650.1, IEC 60793-2-50 and	TEC70012008 for G.652.D type of	type of Optical fibre used in
		with 100 turns on 50 ±0.5 mm diameter	IEC 60793-1-47,	Optical fibre used in the cable	the cable as per ITU-T
		±0.5 mm diameter mandrel			G.652.D
54			ITU-T G.657.A, G.650.1 IEC	As non Approxima to TEC ED No.	Applicable to respective
54		Change in	60793-2-50,	As per Annexure to TEC ER No: TEC70012008 for G.657.A1 &	Applicable to respective type of Optical fibre used in
		attenuation when	60793-1-47	G.657.A2 type of Optical fibre used	the cable as per ITU-T
		fibre is coiled with	00/23-1-4/	in the cable	G.652.A
		10 turns on 15 mm			0.052.A
		radius mandrel			

55		Change in attenuation when fibre is coiled with 1 turn on 10 mm radius mandrel Change in	ITU-T G.657. A & G.657.B, G.650.1 and IEC 60793-2-50, 60793-1-47, ITU-T G.657.A & G.657.B,	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 As per Annexure to TEC ER No:	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B Applicable to respective
		attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel	G.650.1 and IEC 60793-2-50, 60793-1-47,	TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable	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,	\leq 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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	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, 60794-5-10,	Change in attenuation at 1550 nm: ≤ 0.05 dB & Fiber strain $\leq 0.25\%$ 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 1550 nm: ≤ 0.05 dB.when subjected to Impact of 12.5 Nm	
12	Kink Test	IEC 60794-1-21, 60794-5-10,	Change in attenuation at 1550nm: \leq 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: ≤ 0.05 dB 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 1550 nm: ≤ 0.05 dB 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: ≤ 0.05 dB 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	1		HEC (0704 1 01 (0704 5 10		
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	Temperature Cycling	IEC 60794-1-22, 60794-5-10,	Change in attenuation at	
	Characteristics			1550 nm: ≤ 0.05 dB when	
				subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+ 60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ 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	
				1550 nm: ≤ 0.05 dB, when cable	
				is exposed to 85 °C \pm 2 °C for a	
				minimum of 168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-5-10,	Test duration: 168 hour	No water shall be detected at
				Sample length: 3 m	the unsealed end of the
				Water Head Height: 1m	sample. If a fluorescent dye
				No dye shall be detected	is used, an ultraviolet light
				when the end of the 3m	may be used for the
				length is examined with	examination.
				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.	
	l			shan not be more than 20 cm.	

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	
22	Termite and Rodent Test		sheath. 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 26 27	Characteristics of Cable Elements (Buffer Tube)	Kink resistance Test Drainage Test/Compound Flow Watertightness / Water Blocking test	IEC 60794-1-23, IEC 60794-3, 60794-3-11 IEC 60794-1-21, IEC 60794-3, 60794-3-11 IEC 60794-1-22, 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. No Flow shall be detected when tested at a temperature of 70° C for a period of 24 Hrs. 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. Applicable to jelly filled Loose tube and Micromodule Not applicable for Dry Tube <u>.</u> 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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
31	Elements	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 breeless trans as dear	
	(Ribboned			- The fibre breakout procedure	
	Fibre)			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	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
		Resistance		subjected to a compressive load	Only
				of 500 N at 1550nm: ≤ 0.05 dB.	
33		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
			,	subjected to a compressive load	Only
				of 500 N at 1550nm: ≤ 0.05 dB.	
34		Ribbon Torsion	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
		Resistance		subjected to a compressive load	Only
				of 500 N at 1550nm: ≤ 0.05 dB.	
35		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
				wrapped on a 60 mm diameter	Only
				mandrel for 100 turns at 1550 nm	5
				$\therefore \le 0.05 \text{ dB}$	
36		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre
					Only
37	Geometrical	Mode Field Diameter at	ITU-T G.65x, G.650.1 and	As per Annexure to TEC ER	Applicable to respective type
	Characteristics	1310 nm/1550nm	IEC 60793-2-50, 60793-1-45	No: TEC70012008 for	of Optical fibre used in the
	of Fibre used in			respective type of Optical fibre	cable as per ITU-T G.65x
	the cable			used in the cable	L L
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	ITU-T G.65x, G.650.1 and		
		error	IEC 60793-2-50, 60793-1-20,	Do	Do
41		Coating diameter	IEC 60793-2-50, 60793-1-21,		
				Do	Do

42		Coating /Cladding	IEC 60793-2-50, 60793-1-21,		
		concentricity		Do	Do
43	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
44	Dispersion)	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	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	(Fibre Macro bend loss)	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		G.657.B3 type of Optical fibre	cable as per ITU-T G.652.A
		mandrel		used in the cable	& G.657.B
54		Change in attenuation	ITU-T G.657.A & G.657.B,	As per Annexure to TEC ER	Applicable to respective type
		when fibre is coiled with	G.650.1 and IEC 60793-2-50,	No: TEC70012008 for	of Optical fibre used in the
		1 turn on 7.5 mm radius	60793-1-47,	G.657.A2 & G.657.B3 type of	cable as per ITU-T G.652.A
		mandrel		Optical fibre used in the cable	& G.657.B
55		Change in attenuation	ITU-T G.657.B, G.650.1 and	As per Annexure to TEC ER	Applicable to respective type
		when fibre is coiled	IEC 60793-2-50,	No: TEC70012008 for	of Optical fibre used in the
		with 1 turn on 5 mm	60793-1-47	G.657.B3 type of Optical fibre	cable as per ITU-T G.657.B
		radius mandrel		used in the cable	
56	Mechanical	Peak Stripability force to	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER	Applicable to respective type
	Characteristics	remove primary coating		No: TEC70012008 for	of Optical fibre used in the
	of Fibre used in	of the fiber (Unaged,		respective type of Optical fibre	cable as per ITU-T G.65x
	the cable	Water aged, Damp heat		used in the cable	
		aged)			
57		Fiber Curl	IEC 60793-2-50, 60793-1-34,	Do	Do
58	Colour	MEK RUB Test	Draft IEC 60794-1-219,	Do	Do
	qualification for	(Methyl Ethyl Ketone)			
	color fibres				
59	Safety	The material used in the		The manufacturer shall submit	
	Requirement	manufacturing of the OFC		MSDS (Material safety Data	
		shall be non-toxic and		Sheet) for all the material used in	
		dermatologically safe in		manufacturing of Optical fibre	
		its life time and shall not		cable to substantiate the	
		be hazardous to health.		requirement.	
				_	

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

A2.1	Parameter Group	Optical Fibre	Cable- Direct Buried
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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,	\leq 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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	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: ≤ 0.05 dB & Fiber strain $\leq 0.25\%$ 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,	Change in attenuation at 1550	2500 N (for Un-armoured
10	Crush Resistance		Change in attenuation at 1550nm: $\leq 0.05 dB$ when subjected to a	
		60794-3-10, 60794-3-11,	≤ 0.05 dB.when subjected to a	cable)
			compressive load of 2500/3500 N	3500 N (for Armoured cable)
11	Impact	IEC 60794-1-21, 60794-3,	Change in attenuation at 1310 &	25 Nm for both Unarmoured
		60794-3-10, 60794-3-11,	1550 nm: ≤ 0.05 dB.when	cable and Armoured cable.
			subjected to Impact of 25Nm	10 impacts shall be applied at
				the surface with the radius of
				300mm.
12	Kink Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm:	There shall be no damage to
		60794-3-10, 60794-3-11,	\leq 0.05dB when subjected to a Kink	the sheath or to the cable
			with radius of 10D (D - diameter	elements under visual
			of cable).	examination without
				magnification
13	Bend Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm:	
		60794-3-10, 60794-3-11,	\leq 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,	Change in attenuation at 1550nm:	The bending rate shall be
		60794-3-10, 60794-3-11,	\leq 0.05dB when cable is flexed with	approximately one cycle in
			1 cycle in 2 sec to 5 sec with	2s to 5s and cable shall be
			Pulley diameter of 20D (D-	free from any optical &
			diameter of cable) and Load of	visual physical damage.
			5Kg	
15	Torsion Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm:	Cable shall be free from any
		60794-3-10, 60794-3-11,	\leq 0.05dB when subjected to	optical & visual physical
			Torsion with a load of 100N for	damage.
			10 cycles.	
16	Cable Drip Test	IEC 60794-1-21, 60794-3,	Sample is kept vertically with open	Not applicable for Dry-Dry
	_	60794-3-10, 60794-3-11,	end downwards in the oven for 24	Cable Design.
			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.	

17	1	Almanian Desistance TE	IEC (0704 1 21 (0704 2	Ctarl man II. Banadan I. 10	
17		Abrasion Resistance Test	IEC 60794-1-21, 60794-3,	Steel needle diameter $d = 1.0$ mm,	
			60794-3-10, 60794-3-11,	load: 4 N	
				No perforation & loss of legibility	
				of the marking on the sheath.	
18	Environmental	Temperature Cycling	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm:	
	Characteristics		60794-3-10, 60794-3-11	\leq 0.05dB when subjected to	
				following temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
				Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm:	
			60794-3-10, 60794-3-11	\leq 0.05dB, when cable is exposed	
				to 85 °C \pm 2 °C for a minimum of	
				168 hours.	
20		Water Blocking Test	IEC 60794-1-22, 60794-3,	Test duration: 168 hour	No water shall be detected at
		_	60794-3-10, 60794-3-11	Sample length: 3 m	the unsealed end of the
				Water Head Height: 1m	sample. If a fluorescent dye
				No dye shall be detected when the	is used, an ultraviolet light
				end of the 3m length is examined	may be used for the
				with ultraviolet light detector. The	examination.
				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.	
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154-		
			7		
				• •	
21		UV Radiation Test	IEC 60068-2-1, ASTM G-154- 12a, IEC 60794-1-22 Method F14,	into the cable and it shall not be	

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	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 o aggression media on cable		 Efficacy 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		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-	The metallic elements shall be	Applicable for Armoured
07			3-11	continuous.	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 <u>.</u>
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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33	Elements (Ribboned Fibre)	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	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
		Resistance	,	subjected to a compressive load of	Only
				500 N at 1550nm: ≤ 0.05 dB.	5
35		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
				subjected to a compressive load of	Only
				500 N at 1550nm: ≤ 0.05 dB.	
36		Ribbon Torsion	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
		Resistance		subjected to a compressive load of	Only
				500 N at 1550nm: ≤ 0.05 dB.	
37		Ribbon Micro-bend	IEC 60794-1-31, IEC 60794-3	Change in attenuation when	Applicable for Ribbon Fibre
				wrapped on a 60 mm diameter	Only
				mandrel for100 turns at 1550 nm :	
				$\leq 0.05 \text{ dB}$	
38		Ribbon Stripability Test	IEC 60794-1-21, IEC 60794-3		Applicable for Ribbon Fibre
					Only
39	Geometrical	Mode Field Diameter at	ITU-T G.65x, G.650.1 and	As per Annexure to TEC ER No:	Applicable to respective type
	Characteristics	1310 nm/1550nm	IEC 60793-2-50, 60793-1-45	TEC70012008 for respective type	of Optical fibre used in the
	of Fibre used in			of Optical fibre used in the cable	cable as per ITU-T G.65x
40	the cable	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		-
	4		IEC 60793-2-50, 60793-1-20,	Do	Do
42		Core Clad concentricity	ITU-T G.65x, G.650.1 and		5
42	4	error	IEC 60793-2-50, 60793-1-20,	Do	Do
43		Coating diameter	IEC 60793-2-50, 60793-1-21,		
	4			Do	Do
44		Coating /Cladding	IEC 60793-2-50, 60793-1-21,		

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

56 57		Change in attenuation when fibre is coiled with 1 turn on 7.5 mm radius mandrel 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, ITU-T G.657.B, G.650.1 and IEC 60793-2-50,	As per Annexure to TEC ER No: TEC70012008 for G.657.A2 & G.657.B3 type of Optical fibre used in the cable As per Annexure to TEC ER No: TEC70012008 for G.657.B3 type	Applicable to respective type of Optical fibre used in the cable as per ITU-T G.652.A & G.657.B Applicable to respective type of Optical fibre used in the
		1 turn on 5 mm radius mandrel	60793-1-47	of Optical fibre used in the cable	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.	

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

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/vkm	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: \leq 0.05dB & Fiber strain \leq 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	Creat Day's	IEC (0704 1 01 (0704 2 (0704	Change in attenuetien at 1550m	
10	Crush Resistance	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	
		3-10, 60794-3-11,	0.05dB when subjected to a compressive	
			load of 2200 N at 1550nm: ≤ 0.05dB	
11	Impact	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	10 impacts shall be applied
		3-10, 60794-3-11,	0.05dB when subjected to Impact of	at the surface with the
			20Nm	radius of 300mm.
12	Kink Test	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	There shall be no damage
		3-10, 60794-3-11,	0.05dB when subjected to a Kink with	to the sheath or to the cable
			radius of 10D (D - diameter of cable)	elements under visual
				examination without
				magnification
13	Bend Test	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	
		3-10, 60794-3-11,	0.05dB when subjected to Bend around	
			a mandrel of diameter of 20D for 10	
			cycles,	
14	Repeated Bend	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: ≤	The bending rate shall be
	Test	3-10, 60794-3-11,	0.05dB when cable is flexed with 1 cycle	approximately one cycle in
			in 2 sec to 5 sec with Pulley diameter of	2s to 5s and cable shall be
			20D (D- diameter of cable) and Load of	free from any optical &
			5Kg	visual physical damage.
15	Torsion Test	IEC 60794-1-21, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	Cable shall be free from
		3-10, 60794-3-11,	0.05dB when subjected to Torsion with	any optical & visual
			a load of 100N for 10 cycles.	physical damage.
16	Cable Drip Test	IEC 60794-1-21, 60794-3, 60794-	Sample is kept vertically with open end	Not applicable for Dry-Dry
	r and	3-10, 60794-3-11,	downwards in the oven for 24 hours at	Cable Design.
			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.	
17	Aeolian Vibration	IEC 60794-1-21 Method E19,	Vibration cycles - 10 million.	
	Test	IEC60794-4-20	The frequency of the test span shall be	
		IEEE1222,	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).	
			62.72/ drameter of cable in centimettes).	

			Change in attenuation at 1550nm: \leq 0.05dB after the test.	
18	Galloping Test	IEC 60794-1-21 Method E26, IEC60794-4-20 IEEE 1222,	Galloping cycles – 100000The test frequency shall be the single-loop resonant frequency. The minimumpeak to-peak antinode amplitude/looplength ratio shall be maintained at avalue of 1/25, as measured in the activespan. Change in attenuation at 1310 &1550nm: ≤ 0.05 dB 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	IEC 60794-1-21, 60794-3, 60794-	Steel needle diameter $d = 1.0$ mm,	
		Resistance Test	3-10, 60794-3-11,	load: 4 N	
			, ,	No perforation & loss of legibility of	
				the marking on the sheath.	
23	Environmental	Tommonotumo	IEC 60794-1-22, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	
23	Characteristics	Temperature Cycling	3-10, 60794-3-11	0.05dB when subjected to following	
	Characteristics	Cyching	5-10, 00794-5-11	temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: + 60°C.	
				TB2 temperature: $+ 70^{\circ}$ C.	
				No. of temperature cycle : 2	
				Time at each temperature : 12hrs.	
24		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	
21		Cubic rights test	3-10, 60794-3-11	0.05 dB, when cable is exposed to $85 ^{\circ}\text{C}$	
			5 10, 00771 5 11	± 2 °C for a minimum of 168 hours.	
25		Water Blocking	IEC 60794-1-22, 60794-3, 60794-	Test duration: 168 hour	No water shall be detected
		Test	3-10, 60794-3-11	Sample length: 3 m	at the unsealed end of the
				Water Head Height: 1m	sample. If a fluorescent dye
				No dye shall be detected when the end	is used, an ultraviolet light
				of the 3m length is examined with	may be used for the
				ultraviolet light detector. The cable	examination.
				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.	
26		UV Radiation	IEC 60068-2-1, ASTM G-154-	Type of lamp: 40watt UV-B lamp with	
		Test	12a, IEC 60794-1-22 Method	peak emission at 313nm.	
			F14,	Duration: 2000 hours	
				There should not be any fading or	
				change in colour of the sheath.	
27		Check of the	ISO175, Annex R2	The test samples are put in the PH4 and	
		effect of		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 <u>.</u>
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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
35	Elements (Ribboned Fibre)	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: ≤ 0.05 dB.	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: ≤ 0.05 dB.	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: ≤ 0.05 dB.	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 for 100 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				in the cable as per ITU-T
	the cable	~			G.65x
42		Cladding	ITU-T G.65x, G.650.1 and IEC		
		Diameter	60793-2-50, 60793-1-20,	Do	Do
43		Cladding Non-	ITU-T G.65x, G.650.1 and IEC		
		circularity	60793-2-50, 60793-1-20,	Do	Do
44		Core Clad	ITU-T G.65x, G.650.1 and IEC		
		concentricity	60793-2-50, 60793-1-20,	Do	Do
		error			
45		Coating	IEC 60793-2-50, 60793-1-21,		
		diameter		Do	Do
46		Coating	IEC 60793-2-50, 60793-1-21,		
		/Cladding		Do	Do
		concentricity			
47	Transmission	At 1550nm	ITU-T G.65x, G.650.1 and IEC	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics of		60793-2-50, 60793-1-42,	TEC70012008 for respective type of	type of Optical fibre used
	Fibre used in the			Optical fibre used in the cable	in the cable as per ITU-T
	Cable (Chromatic			*	G.65x
48	Dispersion)	At 1625nm	ITU-T G.65x, G.650.1 and IEC		
	-		60793-2-50, 60793-1-42,	Do	Do
49		In 1285-1330nm	ITU-T G.65x, G.650.1 and IEC		
		band	60793-2-50, 60793-1-42,	Do	Do
50		In 1270-1340nm	ITU-T G.65x, G.650.1 and IEC		
		band	60793-2-50, 60793-1-42,	Do	Do
51		Zero Dispersion	ITU-T G.65x, G.650.1 and IEC		
		slope	60793-2-50, 60793-1-42,	Do	Do
52		Zero Dispersion	ITU-T G.65x, G.650.1 and IEC		
		wavelength range	60793-2-50, 60793-1-42,	Do	Do
53	Transmission	Change in	ITU-T G.65x ,ITU-T G.650.1,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	attenuation when	IEC 60793-2-50 and IEC 60793-	TEC70012008 for respective type of	type of Optical fibre used
	of Fibre used in	fiber is coiled	1-47,	Optical fibre used in the cable	in the cable as per ITU-T
	the cable	with 100 turns on	~ 7	- r · · · · · · · · · · · · · · · · · · ·	G.65x
	(Fibre Macro	$60 \pm 1.0 \text{ mm}$			

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,	\leq 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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	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: \leq 0.05dB & Fiber strain \leq 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: \leq 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
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	magnification
14	Repeated Bend Test	IEC 60794-1-21, 60794-3, 60794- 3-10, 60794-3-11,	Change in attenuation at 1550nm: \leq 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: \leq 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	
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			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: \leq	
			0.05dB after the test.	
19	Galloping Test	IEC 60794-1-21 Method E26,	Galloping cycles – 100000	
		IEC60794-4-20	The test frequency shall be the	
		IEEE 1222,	single-loop resonant frequency. The	
		7	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: \leq	
			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 &	
			1550 nm: ≤ 0.05 dB 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.	
L		1		

				Change in attenuation at 1310 &	
				1550 nm: ≤ 0.05 dB after the test	
22		Shotgun	IEC 60794-1-2(E13 B),		Applicable for ADSS cable
		resistance Test	IEC60794-4-20,		on Aerial alignment, if
					required by user.
23	Environmental	Temperature	IEC 60794-1-22, 60794-3, 60794-	Change in attenuation at 1550nm: \leq	
	Characteristics	Cycling	3-10, 60794-3-11	0.05dB when subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
24	-			Time at each temperature : 12hrs.	
24		Cable Aging test	IEC 60794-1-22, 60794-3, 60794-	Change in attenuation at 1550nm: ≤	
			3-10, 60794-3-11	0.05 dB, when cable is exposed to 85	
				$^{\circ}C \pm 2 \ ^{\circ}C$ for a minimum of 168	
25	-	W4 D1 1		hours.	
25		Water Blocking	IEC 60794-1-22, 60794-3, 60794-	Test duration: 168 hour	No water shall be detected at the unsealed end of the
		Test	3-10, 60794-3-11	Sample length: 3 m Water Head Height: 1m	sample. If a fluorescent dye
				e	is used, an ultraviolet light
				No dye shall be detected when the	may be used for the
				end of the 3m length is examined	examination.
				with ultraviolet light detector. The	examination.
				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.	
26	1	UV Radiation	IEC 60068-2-1, ASTM G-154-12a,	Type of lamp: 40watt UV-B lamp	
		Test	IEC 60794-1-22 Method F14,	with peak emission at 313nm.	
				Duration: 2000 hours	

					I
				There should not be any fading or	
				change in colour of the sheath.	
27		Check of the	ISO175	The test samples are put in the PH4	
		effect of		and PH10 solutions separately. After	
		aggression media		30 days these samples are taken out	
		on the cable		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	Telecordia GR 20, IEC 60794-3-11	Optical fibre, buffers/core tubes, and	Applicable as per IEC
		Compatibility	,	other core components shall meet the	60794-1-219 (draft) to
		1 2		requirements of the compatibility	control the quality of
				with buffer/core tube filling	material and life span of the
				material(s) and/or water-blocking	cable.
				materials that are in direct contact	If all RM are same in one of
				with identified components within	the cable design, then this
				the cable structure	test shall be skipped based on
					prior result.
29	Characteristics	Kink resistance	IEC 60794-1-23, IEC 60794-3,	No damage or kink on surface of	Applicable for all type of
	of Cable	Test	60794-3-11	tube when tested 4 times with Kink	Loose tube, Tight Buffer and
	Elements			radius less than 15xD, D is the	Micromodule.
	(Buffer Tube)			diameter of the tube.	
30	(Duffer Tube)	Drainage	IEC 60794-1-21, IEC 60794-3,	No Flow shall be detected when	Applicable to jelly filled
		Test/Compound	60794-3-11	tested at a temperature of 70° C for	Loose tube and Micromodule
		Flow		a period of 24 Hrs.	Not applicable for Dry Tube.
31		Watertightness /	IEC 60794-1-22, IEC 60794-3	No water shall be detected at the	Applicable for all type of
		Water Blocking	60794-3-11	unsealed end of the sample. If a	Loose tube, Tight buffer and
		test		fluorescent dye is used, an ultraviolet	Micromodule.
				light may be used for the	
				examination.	
32		Strippability and	IEC 60794-3, IEC 60793-1-32,	3 mm length of outer sheath of tight	Applicable for Tight Buffer
52		access to the fiber	IEC 60793-1-32:2010	buffer at a distance 30 mm from the	only.
		– Tight Buffer			omy.
	l	- right Duffel	l		

				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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
35	Elements (Ribboned Fibre)	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 1550 nm : $\leq 0.05 \text{ dB}$.	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 $500 \text{ N at } 1550 \text{ nm} \le 0.05 \text{ dB}.$	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 : $\leq 0.05 \text{dB}$.	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 for 100 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	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	the cable	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	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	the Cable (Chromatic	At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	Do	Do
49	Dispersion)	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	Change in	ITU-T G.65x ,ITU-T G.650.1, IEC	As per Annexure to TEC ER No:	Applicable to respective type
	Characteristics	attenuation when	60793-2-50 and IEC 60793-1-47,	TEC70012008 for respective type of	of Optical fibre used in the
	of Fibre used in	fiber is coiled with		Optical fibre used in the cable	cable as per ITU-T G.65x
	the cable	100 turns on 60			-
	(Fibre Macro	±1.0 mm diameter			
	bend loss)	mandrel			
54		Change in	ITU-T G.65x ,ITU-T G.650.1, IEC		
		attenuation when	60793-2-50 and IEC 60793-1-47,	Do	Do
		fiber is coiled with			
		1 turn around 32 \pm			
		0.5 mm diameter			
	_	mandrel			
55		Change in	ITU-T G.652.D ,ITU-T G.650.1,	As per Annexure to TEC ER No:	Applicable to respective type
		attenuation when	IEC 60793-2-50 and IEC 60793-1-	TEC70012008 for G.652.D type of	of Optical fibre used in the
		fiber is coiled with	47,	Optical fibre used in the cable	cable as per ITU-T G.652.D
		100 turns on 50			
		± 0.5 mm diameter			
	-	mandrel			
56		Change in	ITU-T G.657.A, G.650.1 IEC	As per Annexure to TEC ER No:	Applicable to respective type
		attenuation when	60793-2-50,	TEC70012008 for G.657.A1 &	of Optical fibre used in the
		fibre is coiled	60793-1-47	G.657.A2 type of Optical fibre used	cable as per ITU-T G.652.A
		with 10 turns on		in the cable	
		15 mm radius			
		mandrel			
57		Change in	ITU-T G.657. A & G.657.B,	As per Annexure to TEC ER No:	Applicable to respective type
		attenuation	G.650.1 and IEC 60793-2-50,	TEC70012008 for G.657.A1,	of Optical fibre used in the
		when fibre is	60793-1-47,	G.657.A2 & G.657.B3 type of	cable as per ITU-T G.652.A
		coiled with 1		Optical fibre used in the cable	& G.657.B
		turn on 10 mm			
		radius mandrel			
58	4		ITU-T G.657.A & G.657.B,	As per Annexure to TEC ER No:	Applicable to respective type
50		Change in	G.650.1 and IEC 60793-2-50,	TEC70012008 for G.657.A2 &	of Optical fibre used in the
		attenuation	60793-1-47,	G.657.B3 type of Optical fibre used	cable as per ITU-T G.652.A
		when fibre is	00/73-1-4/,	in the cable	& G.657.B
				In the cable	α U.03/.D

		.1 1 .1 1			
		coiled with 1			
		turn on 7.5 mm			
		radius mandrel			
59		Change in	ITU-T G.657.B, G.650.1 and IEC	As per Annexure to TEC ER No:	Applicable to respective type
		attenuation	60793-2-50,	TEC70012008 for G.657.B3 type of	of Optical fibre used in the
		when fibre is	60793-1-47	Optical fibre used in the cable	cable as per ITU-T G.657.B
		coiled with 1			
		turn on 5 mm			
		radius mandrel			
60	Mechanical	Peak Stripability	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No:	Applicable to respective type
	Characteristics	force to remove		TEC70012008 for respective type of	of Optical fibre used in the
	of Fibre used in	primary coating of		Optical fibre used in the cable	cable as per ITU-T G.65x
	the cable	the fiber (Unaged,			
		Water aged, Damp			
		heat aged)			
61		Fiber Curl	IEC 60793-2-50, 60793-1-34,	Do	Do
62	Colour	MEK RUB	Draft IEC 60794-1-219,	Do	Do
	qualification for	Test (Methyl			
	color fibres	Ethyl Ketone)			
63	Safety	The material used		The manufacturer shall submit	
	Requirement	in the		MSDS (Material safety Data Sheet)	
		manufacturing of		for all the material used in	
		the OFC shall be		manufacturing of Optical fibre cable	
		non-toxic and		to substantiate the requirement.	
		dermatologically		_	
		safe in its life time			
		and shall not be			
		hazardous to			
		health.			

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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	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: \leq 0.05dB & Fiber strain \leq 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	

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

11		Impact	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	
11		Impact	60794-3-10, 60794-3-11	0.05dB.when subjected to Impact of	
			00794-3-10, 00794-3-11	12.5Nm	
12		Kink Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	There shall be no damage
			60794-3-10, 60794-3-11,	0.05dB when subjected to a Kink with	to the sheath or to the cable
				radius of 10D (D - diameter of cable).	elements under visual
					examination without
					magnification
13		Bend Test	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	
			60794-3-10, 60794-3-11,	0.05dB when subjected to Bend around a	
				mandrel of diameter of 20D for 10	
				cycles,.	
14		Repeated Bend	IEC 60794-1-21, 60794-3,	Change in attenuation at 1550nm: \leq	The bending rate shall be
		Test	60794-3-10, 60794-3-11,	0.05dB when cable is flexed with 1 cycle	approximately one cycle in
				in 2 sec to 5 sec with	2s to 5s and cable shall be
				Pulley diameter of 20D (D- diameter of	free from any optical &
15	-	Torsion Test	IEC 60794-1-21, 60794-3,	cable) and Load of 5Kg	visual physical damage. Cable shall be free from
15		Torsion Test	60794-3-10, 60794-3-11,	Change in attenuation at 1550nm: \leq 0.05dB when subjected to Torsion with a	any optical & visual
			00794-3-10, 00794-3-11,	load of 100N for 10 cycles.	physical damage.
16		Cable Drip Test	IEC 60794-1-21, 60794-3,	Sample is kept vertically with open end	Not applicable for Dry-Dry
10		Cable Drip Test	60794-3-10, 60794-3-11,	downwards in the oven for 24 hours at	Cable Design.
				70° C and examine the paper placed	Cubic Design.
				below the cable for dripping of the jelly	
				after 24 hours. There should be no jelly	
				drip or oily impression on the paper.	
17	-	Abrasion	IEC 60794-1-21, 60794-3,	Steel needle diameter $d = 1.0 \text{ mm}$,	
1/		Resistance Test	60794-3-10, 60794-3-11,	Steel needle diameter $d = 1.0$ mm, load: 4 N	
		Resistance rest	00794-3-10, 00794-3-11,		
				No perforation & loss of legibility of	
10		The second secon		the marking on the sheath.	
18	Environmental	Temperature	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm: \leq	
	Characteristics	Cycling	60794-3-10, 60794-3-11	0.05dB when subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	

	1		1	
			TA1 temperature: - 10°C.	
			TB1 temperature: $+ 60^{\circ}$ C.	
			TB2 temperature: $+70^{\circ}$ C.	
			No. of temperature cycle : 2	
			Time at each temperature : 12hrs.	
19	Cable Aging test	IEC 60794-1-22, 60794-3,	Change in attenuation at 1550nm: \leq	
		60794-3-10, 60794-3-11	0.05dB, when cable is exposed to 85 $^{\circ}C \pm$	
			2 °C for a minimum of 168 hours.	
20	Water Blocking	IEC 60794-1-22, 60794-3,	Test duration: 168 hour	No water shall be detected
	Test	60794-3-10, 60794-3-11	Sample length: 3 m	at the unsealed end of the
			Water Head Height: 1m	sample. If a fluorescent dye
			No dye shall be detected when the end	is used, an ultraviolet light
			of the 3m length is examined with	may be used for the
			ultraviolet light detector. The cable	examination.
			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.	
21	UV Radiation	IEC 60068-2-1, ASTM G-154-	Type of lamp: 40watt UV-B lamp with	
	Test	12a, IEC 60794-1-22 Method	peak emission at 313nm.	
		F14,	Duration: 2000 hours	
			There should not be any fading or change	
			in colour of the sheath.	
22	Check of the	ISO175	The test samples are put in the PH4 and	
	effect of		PH10 solutions separately. After 30 days	
	aggression		these samples are taken out from the	
	media on the		solutions and examined for any corrosion	
	cable		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	
L				I

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	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	(Buffer Tube)	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 <u>.</u>
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	Ribbon	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre	Applicable for Ribbon
	of Cable	Dimension		count Ribbon	Fibre Only
30	Elements (Ribboned Fibre)	Separability of individual fibres from	IEC 60794-1-23, IEC 60794-3	Breakout shall be accomplished without specialized tools or apparatus.The fibre breakout procedure shall not	Applicable for Ribbon Fibre Only
		ribbon		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.	
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: \leq 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: \leq 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: \leq 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 for 100 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	IEC 60793-2-50, 60793-1-21,		
40		diameter	ILC 00775-2-50, 00775-1-21,	Do	Do
41	-	Coating	IEC 60793-2-50, 60793-1-21,		D0
41		/Cladding	IEC 00795-2-50, 00795-1-21,	Do	Do
		concentricity		D0	D0
42	Transmission	At 1550nm	ITU-T G.65x, G.650.1 and IEC	As per Annexure to TEC ER No:	Applicable to respective
42	Characteristics	At 1550IIII	60793-2-50, 60793-1-42,	TEC70012008 for respective type of	type of Optical fibre used in
	of Fibre used in		00793-2-30, 00793-1-42,	Optical fibre used in the cable	the cable as per ITU-T
	the Cable			Optical fibre used in the cable	G.65x
43	(Chromatic	At 1625nm	ITUTC (5- C (50 1 and IEC		0.03X
43		At 1625nm	ITU-T G.65x, G.650.1 and IEC	D	D
4.4	Dispersion)	1 1005 1000	60793-2-50, 60793-1-42,	Do	Do
44		In 1285-1330nm	ITU-T G.65x, G.650.1 and IEC	5	5
	-	band	60793-2-50, 60793-1-42,	Do	Do
45		In 1270-1340nm	ITU-T G.65x, G.650.1 and IEC	_	
	-	band	60793-2-50, 60793-1-42,	Do	Do
46		Zero Dispersion	ITU-T G.65x, G.650.1 and IEC		
		slope	60793-2-50, 60793-1-42,	Do	Do
47		Zero Dispersion	ITU-T G.65x, G.650.1 and IEC		
		wavelength	60793-2-50, 60793-1-42,	Do	Do
		range			
48	Transmission	Change in	ITU-T G.65x ,ITU-T G.650.1,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	attenuation when	IEC 60793-2-50 and IEC 60793-	TEC70012008 for respective type of	type of Optical fibre used in
	of Fibre used in	fiber is coiled	1-47, Annex R1	Optical fibre used in the cable	the cable as per ITU-T
	the cable	with 100 turns			G.65x
	(Fibre Macro	on $60 \pm 1.0 \text{ mm}$			
	bend loss)	diameter			
		mandrel			
49]	Change in	ITU-T G.65x ,ITU-T G.650.1,		
		attenuation when	IEC 60793-2-50 and IEC 60793-	Do	Do
		fiber is coiled	1-47, Annex R1		
		with 1 turn			
		around 32 ± 0.5			
		mm diameter			
		mandrel			
L		munurer	1		

50	Change in attenuation when fiber is coiled with 100 turns on 50 \pm 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	Peak Stripability force to remove primary coating	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
	the cable	of the fiber (Unaged, Water aged, Damp heat aged)		L L L L L L L L L L L L L L L L L L L	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.	

SN	Parameter	Individual	Standard Name	Limits/Values	Applicability
	Name	Parameter Name			
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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	\leq 0.3 ps/ \sqrt{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 (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	

A3.4 Parameter Group: Optical Ground Wire - OPGW

10		IEEE 1120 2000 A		
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-	The Ovality of the cable or optical units at	
_		1-2-E9	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-	Change in attenuation when subjected to a	
1.		1-2-E3	compressive load of 0.4 W N at 1550nm:	
		1 2 1.5	≤ 0.05 dB. Ovality of the cable or optical	
			fiber units shall be < 10 %.	
15	Bend Test	IEEE 1138 : 2009/IEC 60794-	Change in attenuation at 1550nm: \leq	
15	Dena rest	1-2-E11 (Procedure-I)	0.05dB when subjected to Bend around a	
		1-2-L11 (110000010-1)	mandrel of diameter of 20D for 10 cycles	
			and there shall be no damage to the sheath	
			or to the cable elements under visual	
16	TT T T C		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).	

17		Impact Test	IEC 60794-1-2-E4	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 Change in attenuation at 1550nm: \leq	
17		impact Test	IEC 00794-1-2-E4	0.05dB.when subjected to Impact of 30 Nm	
18		Repeated Bending	IEC 60794-1-2-E6	Change in attenuation at 1550nm: \leq 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: \leq 0.05dB after the test	
20		Galloping Test	IEEE 1138 : 2009	Galloping cycles -100000 Change in attenuation at 1550nm: \leq 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	IEEE 1138 : 2009	There shall be no permanent increase in	
24		Test	ILLL 1130 . 2007	optical attenuation greater than 0.05 dB at	
		1051		1550nm wavelengths.	
				The minimum remaining strength of any	
				of the tested cable sections shall be	
				greater than the cable RTS	
25		Electrical		The metallic elements shall be continuous.	
23		Continuity Test		The metanic elements sharf be continuous.	
26	Environmental	Water Penetration	IEEE 1138 : 2009/IEC 60794-	Test duration: 168 hour	Test shall be conducted on
20	Characteristics	Test	1-2-F5B	Sample length: 3 m	the Optical Core Only.
	Characteristics	1030	1-2-1 50	Water Head Height: 1m	Other Components shall be
				No dye shall be detected when the end of	removed before the start of
				the 3m length is examined with ultraviolet	the test.
				light detector. The cable sample under test	No water shall be detected
				for 7 days, shall be ripped open after the	at the unsealed end of the
				test and then it shall be examined for	sample. If a fluorescent dye
				seepage of water into the cable and it shall	is used, an ultraviolet light
				not be more than 20 cm.	may be used for the
					examination.
27		Temperature	IEEE 1138 : 2009 (6.4.3.7) /	Change in attenuation at 1550nm: \leq	
27		Cycle Test	IEC-60794-1-2-F1	0.05dB when subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+ 60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
				Time at each temperature : 12hrs.	
28		Salt Spray	IEEE 1138 : 2009	At the end of the test, the cables are to be	
		Corrosion Test		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	

29		Cable Material Compatibility	Telecordia GR 20, IEC 60794- 3-11	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. 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	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	(Buffer Tube)	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 <u>.</u>

32		Watertightness /	IEC 60794-1-22, IEC 60794-3	No water shall be detected at the unsealed	Applicable for all type of
32		Water Blocking	60794-3-11	end of the sample. If a fluorescent dye is	Loose tube, Tight buffer
		test	00794-3-11	used, an ultraviolet light may be used for	and Micromodule.
		test		the examination.	and wheromodule.
33		Strippability and	IEC 60794-3, IEC 60793-1-32,	3 mm length of outer sheath of tight	Applicable for Tight Buffer
		access to the fiber	IEC 60793-1-32:2010,	buffer at a distance 30 mm from the end	only.
		– Tight Buffer	Annex R2	of the tight buffer, leaving the fibre	
		6		undamaged	
				-	
34		Strippability and	Annex R2	It must be possible to remove the sheath	Applicable for
		access to the fiber		manually by squeezing it between two	Micromodule only.
		- Micromodule		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.	
35	Characteristics	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3,	As per IEC standard of different fibre	Applicable for Ribbon
	of Cable		Annex R2	count Ribbon	Fibre Only
36	Elements	Separability of	IEC 60794-1-23, IEC 60794-3,	- Breakout shall be accomplished without	Applicable for Ribbon
	(Ribboned	individual	Annex R2	specialized tools or apparatus.	Fibre Only
	Fibre)	fibres from ribbon		- 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	
	4			fibres to be distinguished from each other.	
37		Ribbon	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a	Applicable for Ribbon
		Compression	Annex R2	compressive load of 500 N at 1550nm: \leq	Fibre Only
20	4	Resistance	WEG (0704.1.01. WEG (0704.0.	0.05dB.	
38		Ribbon Twist Test	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a	Applicable for Ribbon
			Annex R2	compressive load of 500 N at 1550nm: \leq 0.05dB.	Fibre Only
				0.0JuD.	

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: \leq 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 for 100 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	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	(Chromatic Dispersion)	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	ITU-T G.65x, G.650.1 and		
52		slope	IEC 60793-2-50, 60793-1-42,	Do	Do
53	_	Zero Dispersion	ITU-T G.65x, G.650.1 and		D0
55		wavelength range	IEC 60793-2-50, 60793-1-42,	Do	Do
54	Transmission	<u> </u>		As per Annexure to TEC ER No:	Applicable to respective
54		Change in	ITU-T G.65x ,ITU-T G.650.1,		
	Characteristics	attenuation when	IEC 60793-2-50 and IEC	TEC70012008 for respective type of	type of Optical fibre used in
	of Fibre used in	fiber is coiled with	60793-1-47,	Optical fibre used in the cable	the cable as per ITU-T
	the cable	100 turns on 60			G.65x
	(Fibre Macro	± 1.0 mm diameter			
	bend loss)	mandrel			
55		Change in	ITU-T G.65x ,ITU-T G.650.1,	_	_
		attenuation when	IEC 60793-2-50 and IEC	Do	Do
		fiber is coiled with	60793-1-47,		
		1 turn around $32 \pm$			
		0.5 mm diameter			
	_	mandrel			
56		Change in	ITU-T G.652.D ,ITU-T	As per Annexure to TEC ER No:	Applicable to respective
		attenuation when	G.650.1, IEC 60793-2-50 and	TEC70012008 for G.652.D type of	type of Optical fibre used in
		fiber is coiled with	IEC 60793-1-47,	Optical fibre used in the cable	the cable as per ITU-T
		100 turns on 50			G.652.D
		± 0.5 mm diameter			
		mandrel			
57		Change in	ITU-T G.657.A, G.650.1 IEC	As per Annexure to TEC ER No:	Applicable to respective
		attenuation when	60793-2-50,	TEC70012008 for G.657.A1 & G.657.A2	type of Optical fibre used in
		fibre is coiled with	60793-1-47	type of Optical fibre used in the cable	the cable as per ITU-T
		10 turns on 15 mm			G.652.A
		radius mandrel			
58		Change in	ITU-T G.657. A & G.657.B,	As per Annexure to TEC ER No:	Applicable to respective
		attenuation when	G.650.1 and IEC 60793-2-50,	TEC70012008 for G.657.A1, G.657.A2 &	type of Optical fibre used in
		fibre is coiled with	60793-1-47,	G.657.B3 type of Optical fibre used in the	the cable as per ITU-T
		1 turn on 10 mm		cable	G.652.A & G.657.B
		radius mandrel			
59]	Change in	ITU-T G.657.A & G.657.B,	As per Annexure to TEC ER No:	Applicable to respective
		attenuation when	G.650.1 and IEC 60793-2-50,	TEC70012008 for G.657.A2 & G.657.B3	type of Optical fibre used in
		fibre is coiled with	60793-1-47,	type of Optical fibre used in the cable	•

		1 turn on 7.5 mm			the cable as per ITU-T
		radius mandrel			G.652.A & G.657.B
60		Change in	ITU-T G.657.B, G.650.1 and	As per Annexure to TEC ER No:	Applicable to respective
		attenuation	IEC 60793-2-50,	TEC70012008 for G.657.B3 type of	type of Optical fibre used in
		when fibre is	60793-1-47	Optical fibre used in the cable	the cable as per ITU-T
		coiled with 1			G.657.B
		turn on 5 mm			
61	Mechanical	radius mandrel Peak Stripability	IEC 60793-2-50, 60793-1-32,	As per Appevure to TEC ED No:	Applicable to respective
01	Characteristics	force to remove	IEC 00793-2-30, 00793-1-32,	As per Annexure to TEC ER No: TEC70012008 for respective type of	type of Optical fibre used in
	of Fibre used in	primary coating of		Optical fibre used in the cable	the cable as per ITU-T
	the cable	the fiber (Unaged,		optical note used in the cubic	G.65x
		Water aged, Damp			
		heat aged)			
62		Fiber Curl	IEC 60793-2-50, 60793-1-34,		
				Do	Do
63	Colour	MEK RUB	Draft IEC 60794-1-219,		
	qualification for	Test (Methyl		Do	Do
	color fibres	Ethyl Ketone)			
64	Safety	The material used		The manufacturer shall submit MSDS	
	Requirement	in the		(Material safety Data Sheet) for all the	
		manufacturing of the OFC shall be		material used in manufacturing of Optical	
		non-toxic and		fibre cable to substantiate the requirement.	
		dermatologically			
		safe in its life time			
		and shall not be			
		hazardous to			
		health.			

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	\leq attenuation at 1310 nm	Do
3		Attenuation at 1490 nm	Do	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	Do	$\leq 0.22 \text{ dB/Km} (A1)$ $\leq 0.23 \text{ dB/Km} (A2)$ $\leq 0.24 \text{ dB/Km} (B3)$	Do
5		Attenuation at 1625nm	Do	$\leq 0.25 \text{ dB/Km}(A)$ $\leq 0.26 \text{ dB/Km}(B3)$	Do
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48		
7		PMD Cabled Ribbon Fibre	Do	\leq 0.3 ps/ $\sqrt{\rm km}$	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: \leq 0.05dB & Fiber strain \leq 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: \leq 0.05dB when subjected to Impact of 1 J	
12		Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: \leq 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: \leq 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: \leq 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: \leq 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	

	Т				1
				No perforation & loss of legibility of	
1.0				the marking on the sheath.	
18	Environmental	Temperature Cycling	IEC 60794-1-22,	Change in attenuation at 1550nm: \leq	
	Characteristics		60794-2,	0.05dB when subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+ 60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
				Time at each temperature : 12hrs.	
19		Cable Aging test	IEC 60794-1-22,	Change in attenuation at 1550nm: \leq	
			60794-2,	0.05dB, when cable is exposed to 85	
				$^{\circ}C \pm 2 \ ^{\circ}C$ for a minimum of 168	
				hours.	
20		Water Blocking Test	IEC 60794-1-22,	Test duration: 168 hour	No water shall be detected at the
			60794-2,	Sample length: 3 m	unsealed end of the sample. If a
				Water Head Height: 1m	fluorescent dye is used, an
				No dye shall be detected when the	ultraviolet light may be used for
				end of the 3m length is examined	the examination.
				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.	
21		Check of the effect of	ISO175	The test samples are put in the PH4	
		aggression media on the		and PH10 solutions separately. After	
		cable		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	
L	1				

22		$C = 11$ $M \neq 1$			
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 <u>.</u>
25		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3	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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
29	Elements (Ribboned Fibre)	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 1550 nm: ≤ 0.05 dB.	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 1550 nm: ≤ 0.05 dB.	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 1550 nm: ≤ 0.05 dB.	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 for 100 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	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	the cable	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	IEC 60793-2-50,		
		concentricity	60793-1-21,	Do	Do
41	Transmission	At 1550nm	ITU-T G.657, G.650.1	As per Annexure to TEC ER No:	Applicable to respective type of
	Characteristics		and IEC 60793-2-50,	TEC70012008 for respective type of	Optical fibre used in the cable
	of Fibre used in		60793-1-42,	Optical fibre used in the cable	as per ITU-T G.65x
42	the Cable	At 1625nm	ITU-T G.657, G.650.1		
	(Chromatic		and IEC 60793-2-50,	Do	Do
	Dispersion)		60793-1-42,		
43		In 1285-1330nm band	ITU-T G.657, G.650.1		
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
44		In 1270-1340nm band	ITU-T G.657, G.650.1		
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
45		Zero Dispersion slope	ITU-T G.657, G.650.1		_
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
46		Zero Dispersion	ITU-T G.657, G.650.1		
		wavelength range	and IEC 60793-2-50,	Do	Do
		~	60793-1-42,		
47	Transmission	Change in attenuation	ITU-T G.657.A,	As per Annexure to TEC ER No:	Applicable to respective type of
	Characteristics	when fibre is coiled with	G.650.1 and IEC	TEC70012008 for G.657.A1 &	Optical fibre used in the cable
	of Fibre used in	10 turns on 15 mm radius	60793-2-50, 60793-1-	G.657.A2 type of Optical fibre used	as per ITU-T G.652.A
40	the cable	mandrel	47	in the cable	
48	(Fibre Macro	Change in attenuation	ITU-T G.657. A ,	As per Annexure to TEC ER No:	Applicable to respective type of
	bend loss)	when fibre is coiled with 1	G.650.1 and IEC	TEC70012008 for G.657.A1,	Optical fibre used in the cable
		turn on 10 mm radius	60793-2-50, 60793-1-	G.657.A2 & G.657.B3 type of	as per ITU-T G.652.A &
		mandrel	47	Optical fibre used in the cable	G.657.B

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49		Change in attenuation	ITU-T G.657.A &	As per Annexure to TEC ER No:	Applicable to respective type of
		when fibre is coiled with 1	G.657.B, G.650.1 and	TEC70012008 for G.657.A2 &	Optical fibre used in the cable
		turn on 7.5 mm radius	IEC 60793-2-50,	G.657.B3 type of Optical fibre used	as per ITU-T G.652.A &
		mandrel	60793-1-47, Annex R1	in the cable	G.657.B
50		Change in attenuation	ITU-T G.657.B,	As per Annexure to TEC ER No:	Applicable to respective type of
		when fibre is coiled with 1	G.650.1 and IEC	TEC70012008 for G.657.B3 type of	Optical fibre used in the cable
		turn on 5 mm radius	60793-2-50, 60793-1-	Optical fibre used in the cable	as per ITU-T G.657.B
		mandrel	47, Annex R1		-
51	Mechanical	Peak Stripability force to	IEC 60793-2-50,	As per Annexure to TEC ER No:	Applicable to respective type of
	Characteristics	remove primary coating of	60793-1-32,	TEC70012008 for respective type of	Optical fibre used in the cable
	of Fibre used in	the fiber (Unaged, Water		Optical fibre used in the cable	as per ITU-T G.65x
	the cable	aged, Damp heat aged)		•	•
52		Fiber Curl	IEC 60793-2-50,		
			60793-1-34,	Do	Do
53	Colour	MEK RUB Test	Draft IEC 60794-1-		
	qualification for	(Methyl Ethyl Ketone)	219,	Do	Do
	color fibres				
54	Safety	Flame Spread-Single cable	IEC/EN 60332-1-2	Char less than 0.54 m at completion	
	Requirement			of test	
55		Flame Spread- Bunched	IEC/EN 60332-3-24:	Char less than 2.5 m at completion of	
		cable	2018, Cat C	the test	
56		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
57		Acid gas (Toxicity) (Test	IEC/EN 60754-2	pH not less than 4.3	
		on toxic gases evolved		Conductivity not more than 10	
		during combustion of		μS/mm	
		materials from cables)			
58		The material used in the		The manufacturer shall submit MSDS	
		manufacturing of the OFC		(Material safety Data Sheet) for all the	
		shall be non-toxic and		material used in manufacturing of	
		dermatologically safe in		Optical fibre cable to substantiate the	
		its life time and shall not		statement.	
		be hazardous to health.			
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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,	$ \leq 0.36 \text{ dB/Km (A1)} \\ \leq 0.37 \text{ dB/Km (A2)} \\ \leq 0.37 \text{ 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	\leq attenuation at 1310 nm	Do
3		Attenuation at 1490 nm	Do	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	Do	$ \leq 0.22 \text{ dB/Km (A1)} \\ \leq 0.23 \text{ dB/Km (A2)} \\ \leq 0.24 \text{ dB/Km (B3)} $	Do
5	-	Attenuation at 1625nm	Do	$\leq 0.25 \text{ dB/Km}(A)$ $\leq 0.26 \text{ dB/Km}(B3)$	Do
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48		
7		PMD Cabled Ribbon Fibre	Do	\leq 0.3 ps/ $\sqrt{\rm km}$	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: ≤ 0.05 dB & Fiber strain $\leq 0.25\%$ when subjected to a Tensile load of 2 W or 1000 Newton Whichever is higher.	

A4.2 Parameter Group: Optical Fibre Cable –Outdoor

10	Crush Resistance	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: \leq 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 1550 nm: ≤ 0.05 dB.	
12	Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: \leq 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: \leq 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: \leq 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	
19		Cable Aging test	IEC 60794-1-22, 60794-2,	Time at each temperature : 12hrs. Change in attenuation at 1550nm: \leq 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 <u>.</u>
26		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3	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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
30	Elements (Ribboned Fibre)	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 $1550 \text{nm} \le 0.05 \text{dB}$.	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 $1550 \text{nm} \le 0.05 \text{dB}$.	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 $1550 \text{nm} \le 0.05 \text{dB}$.	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 for 100 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
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36	Geometrical Characteristics of Fibre used in	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	the cable	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	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	Cable (Chromatic Dispersion)	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	Change in attenuation	ITU-T G.657.A,	As per Annexure to TEC ER No:	Applicable to respective type of
10	Characteristics	when fibre is coiled with	G.650.1 and IEC	TEC70012008 for G.657.A1 &	Optical fibre used in the cable as
	of Fibre used in	10 turns on 15 mm radius	60793-2-50, 60793-1-	G.657.A2 type of Optical fibre used	per ITU-T G.652.A
	the cable	mandrel	47	in the cable	per 110-1-0.052.11
49	(Fibre Macro	Change in attenuation	ITU-T G.657. A ,	As per Annexure to TEC ER No:	Applicable to respective type of
	bend loss)	when fibre is coiled with	G.650.1 and IEC	TEC70012008 for G.657.A1,	Optical fibre used in the cable as
	,	1 turn on 10 mm radius	60793-2-50, 60793-1-	G.657.A2 & G.657.B3 type of	per ITU-T G.652.A & G.657.B
		mandrel	47	Optical fibre used in the cable	r
50		Change in attenuation	ITU-T G.657.A &	As per Annexure to TEC ER No:	Applicable to respective type of
		when fibre is coiled with	G.657.B, G.650.1 and	TEC70012008 for G.657.A2 &	Optical fibre used in the cable as
		1 turn on 7.5 mm radius	IEC 60793-2-50,	G.657.B3 type of Optical fibre used	per ITU-T G.652.A & G.657.B
		mandrel	60793-1-47, Annex R1	in the cable	
51		Change in attenuation	ITU-T G.657.B,	As per Annexure to TEC ER No:	Applicable to respective type of
		when fibre is coiled with	G.650.1 and IEC	TEC70012008 for G.657.B3 type	Optical fibre used in the cable as
		1 turn on 5 mm radius	60793-2-50, 60793-1-	of Optical fibre used in the cable	per ITU-T G.657.B
		mandrel	47, Annex R1	_	
52	Mechanical	Peak Stripability force to	IEC 60793-2-50,	As per Annexure to TEC ER No:	Applicable to respective type of
	Characteristics	remove primary coating	60793-1-32,	TEC70012008 for respective type	Optical fibre used in the cable as
	of Fibre used in	of the fiber (Unaged,		of Optical fibre used in the cable	per ITU-T G.65x
	the cable	Water aged, Damp heat			
		aged)			
53		Fiber Curl	IEC 60793-2-50,		
			60793-1-34,	Do	Do
54	Colour	MEK RUB Test	Draft IEC 60794-1-		
	qualification for	(Methyl Ethyl Ketone)	219,	Do	Do
	color fibres				
55	Safety	The material used in the		The manufacturer shall submit	
	Requirement	manufacturing of the OFC		MSDS (Material safety Data Sheet)	
		shall be non-toxic and		for all the material used in	
		dermatologically safe in		manufacturing of Optical fibre	
		its life time and shall not		cable to substantiate the	
		be hazardous to health.		requirement.	
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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	\leq attenuation at 1310 nm	Do
3		Attenuation at 1490 nm	Do	\leq 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	\leq 0.25 dB/Km (A) \leq 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	\leq 0.3 ps/ \sqrt{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: \leq 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: \leq 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

A4.3 Parameter Group: Optical Fibre Cable – Riser

12		Kink Test	IEC 60794-1-21, 60794-2,	Change in attenuation at 1550nm: \leq 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: \leq 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: \leq 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: \leq 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: \leq 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: \leq 0.05dB, when cable is exposed to 85 °C \pm 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	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	(Buffer Tube)	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		<u>Strippability test -</u> <u>Micromodule</u>	-	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	Ribbon Dimension	IEC 60794-1-23, IEC	· · ·	Angliashla fag Dibbag
25		Ribbon Dimension	60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon
26	of Cable				Fibre Only
26	Elements	Separability of individual	IEC 60794-1-23, IEC	- Breakout shall be accomplished without	Applicable for Ribbon
	(Ribboned	fibres from ribbon	60794-3	specialized tools or apparatus.	Fibre Only
	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.	
27		Ribbon Compression	IEC 60794-1-31, IEC	Change in attenuation when subjected to a	Applicable for Ribbon
21		Resistance	60794-3	compressive load of 500 N at 1550nm: \leq	Fibre Only
		Resistance	00794-3	0.05dB.	Fibre Only
28		Ribbon Twist Test	IEC 60794-1-31, IEC	Change in attenuation when subjected to a	Applicable for Ribbon
20		KIDDOII I WISt Test	60794-3	compressive load of 500 N at 1550nm: \leq	Fibre Only
			00794-3	0.05dB.	Fibre Only
29		Ribbon Torsion	IEC 60794-1-31, IEC	Change in attenuation when subjected to a	Applicable for Ribbon
2)		Resistance	60794-3	compressive load of 500 N at 1550nm: \leq	Fibre Only
		Resistance	00774-3	0.05dB.	The Only
30		Ribbon Micro-bend	IEC 60794-1-31, IEC	Change in attenuation when wrapped on a	Applicable for Ribbon
20			60794-3	60 mm diameter mandrel for 100 turns at	Fibre Only
				$1550 \text{ nm} : \le 0.05 \text{ dB}$	
31		Ribbon Stripability Test	IEC 60794-1-21, IEC		Applicable for Ribbon
		r i j	60794-3		Fibre Only
32	Geometrical	Mode Field Diameter at	ITU-T G.657, G.650.1	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	1310 nm/1550nm	and IEC 60793-2-50,	TEC70012008 for respective type of	type of Optical fibre used
	of Fibre used		60793-1-45	Optical fibre used in the cable	in the cable as per ITU-T
	in the cable				G.657
33		Cladding Diameter	ITU-T G.657, G.650.1		
		_	and IEC 60793-2-50,	Do	Do
			60793-1-20,		

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	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	(Chromatic Dispersion)	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	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	(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

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

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	\leq attenuation at 1310 nm	Do
3		Attenuation at 1490 nm	Do	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	Do	$\leq 0.22 \text{ dB/Km} (A1)$ $\leq 0.23 \text{ dB/Km} (A2)$ $\leq 0.24 \text{ dB/Km} (B3)$	Do
5		Attenuation at 1625nm	Do	$\leq 0.25 \text{ dB/Km}(A)$ $\leq 0.26 \text{ dB/Km}(B3)$	Do
6		PMD Cabled Loose Fibre	ITU-T G.657, G.650.1 and IEC 60793-2-50, 60793-1-48		
7		PMD Cabled Ribbon Fibre	Do	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	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: \leq 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 : \leq 0.05dB when subjected to a compressive load of 1000 N.	

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

11		Turnerat	JEC (0704 1 21	Channel in attance tion at 1550 mm a	
11		Impact	IEC 60794-1-21,	Change in attenuation at 1550nm : \leq	
			60794-3, 60794-3-10,	0.05dB.when subjected to Impact of 12.5	
	-		60794-3-11,	Nm	
12		Kink Test	IEC 60794-1-21,	Change in attenuation at 1550nm: \leq	There shall be no damage
			60794-3, 60794-3-10,	0.05dB when subjected to a Kink with	to the sheath or to the
			60794-3-11,	radius of 10D (D - diameter of cable).	cable elements under
					visual examination
					without magnification
13		Bend Test	IEC 60794-1-21,	Change in attenuation at 1550nm: \leq	
			60794-3, 60794-3-10,	0.05dB when subjected to Bend around a	
			60794-3-11,	mandrel of diameter of 20D for 10	
				cycles,.	
14]	Repeated Bend Test	IEC 60794-1-21,	Change in attenuation at 1550nm: ≤	The bending rate shall be
		-	60794-3, 60794-3-10,	0.05dB when cable is flexed with 1 cycle	approximately one cycle
			60794-3-11,	in 2 sec to 5 sec with	in 2s to 5s and cable shall
				Pulley diameter of 20D (D- diameter of	be free from any optical
				cable) and Load of 5Kg	& visual physical damage.
15		Torsion Test	IEC 60794-1-21,	Change in attenuation at 1550nm: ≤	Cable shall be free from
			60794-3, 60794-3-10,	0.05dB when subjected to Torsion with a	any optical & visual
			60794-3-11,	load of 100N for 10 cycles.	physical damage.
16		Cable Drip Test	IEC 60794-1-21,	Sample is kept vertically with open end	Not applicable for Dry-
		*	60794-3, 60794-3-10,	downwards in the oven for 24 hours at 70°	Dry Cable Design.
			60794-3-11,	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.	
17		Abrasion Resistance Test	IEC 60794-1-21,	Steel needle diameter $d = 1.0$ mm, load: 4	
			60794-3, 60794-3-10,	N	
			60794-3-11,	No perforation & loss of legibility of the	
			,	marking on the sheath.	
18	Environmental	Temperature Cycling	IEC 60794-1-22,	Change in attenuation at 1550nm: \leq	
	Characteristics		60794-3, 60794-3-10,	0.05dB when subjected to following	
			60794-3-11	temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
L	1				1

			TB1 temperature: $+60^{\circ}$ C.	
			TB2 temperature: $+70^{\circ}$ C.	
			No. of temperature cycle : 2	
			Time at each temperature : 12hrs.	
19	Cable Aging test	IEC 60794-1-22,	Change in attenuation at 1550nm: \leq	
		60794-3, 60794-3-10,	0.05dB, when cable is exposed to 85 $^{\circ}C \pm$	
		60794-3-11	2 °C for a minimum of 168 hours.	
20	Water Blocking Test	IEC 60794-1-22,	Test duration: 168 hour	No water shall be detected
		60794-3, 60794-3-10,	Sample length: 3 m	at the unsealed end of the
		60794-3-11	Water Head Height: 1m	sample. If a fluorescent
			No dye shall be detected when the end of	dye is used, an ultraviolet
			the 3m length is examined with ultraviolet	light may be used for the
			light detector. The cable sample under test	examination.
			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.	
21	UV Radiation Test	IEC 60068-2-1, ASTM	Type of lamp: 40watt UV-B lamp with	
		G-154-12a, IEC	peak emission at 313nm.	
		60794-1-22 Method	Duration: 2000 hours	
		F14,	There should not be any fading or change	
		1 17,	in colour of the sheath.	
22	Termite and Rodent Test	Annex R1	Following minimum parametric test for	No Indian/Global
22	Termite and Rodent Test	Annex Ki	Anti-termite dopant shall be carried out	standard. One similar
			- Non- toxicity	standard is under draft
			- Thermal Stability	
			•	stage in IEC forum. This
			- Long life span/half-life	test maybe taken up as per
			- Efficacy	IEC, once IEC finalises
22		100175	The test server last server and in the DITA 1	its standard.
23	Check of the effect of	ISO175	The test samples are put in the PH4 and	
	aggression media on the		PH10 solutions separately. After 30 days	
	cable		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	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	Tube)	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 <u>.</u>
27		Watertightness / Water Blocking test	IEC 60794-1-22, IEC 60794-3 60794-3	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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
31	Elements (Ribboned Fibre)	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: \leq 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: \leq 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: \leq 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 for 100 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,		
		C	60793-1-21,	Do	Do
42		Coating /Cladding	IEC 60793-2-50,		
		concentricity	60793-1-21,	Do	Do
43	Transmission	At 1550nm	ITU-T G.657, G.650.1	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics of		and IEC 60793-2-50,	TEC70012008 for respective type of	type of Optical fibre used
	Fibre used in the		60793-1-42,	Optical fibre used in the cable	in the cable as per ITU-T
	Cable (Chromatic				G.65x
44	Dispersion)	At 1625nm	ITU-T G.657, G.650.1		
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
45		In 1285-1330nm band	ITU-T G.657, G.650.1		
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
46		In 1270-1340nm band	ITU-T G.657, G.650.1		
			and IEC 60793-2-50,	Do	Do
			60793-1-42,		
47		Zero Dispersion slope	ITU-T G.657, G.650.1		-
			and IEC 60793-2-50,	Do	Do
10			60793-1-42,		
48		Zero Dispersion	ITU-T G.657, G.650.1		-
		wavelength range	and IEC 60793-2-50,	Do	Do
10	T		60793-1-42,		A 11 11
49	Transmission	Change in attenuation when fibre is coiled with	ITU-T G.657.A,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	10 turns on 15 mm radius	G.650.1 and IEC	TEC70012008 for G.657.A1 & G.657.A2	type of Optical fibre used
	of Fibre used in the cable		60793-2-50, 60793-1- 47	type of Optical fibre used in the cable	in the cable as per ITU-T G.652.A
50	the cable (Fibre Macro	mandrel Change in attenuation		As non Approxima to TEC ED No:	
50	(Fibre Macro bend loss)	Change in attenuation when fibre is coiled with	ITU-T G.657. A , G.650.1 and IEC	As per Annexure to TEC ER No:	Applicable to respective
	Denu 1088)	1 turn on 10 mm radius		TEC70012008 for G.657.A1, G.657.A2 & G.657 B2 tune of Optical fibra used in the	type of Optical fibre used
			60793-2-50, 60793-1-	G.657.B3 type of Optical fibre used in the	in the cable as per ITU-T C_{652} A $\approx C_{657}$ P
		mandrel	47	cable	G.652.A & G.657.B

C 1	ſ	C1 :			A 1º 11 /
51		Change in attenuation	ITU-T G.657.A &	As per Annexure to TEC ER No:	Applicable to respective
		when fibre is coiled with	G.657.B, G.650.1 and	TEC70012008 for G.657.A2 & G.657.B3	type of Optical fibre used
		1 turn on 7.5 mm radius	IEC 60793-2-50,	type of Optical fibre used in the cable	in the cable as per ITU-T
		mandrel	60793-1-47,		G.652.A & G.657.B
52		Change in attenuation	ITU-T G.657.B,		
		when fibre is coiled with	G.650.1 and		
		1 turn on 5 mm radius	IEC 60793-2-50,		
		mandrel	60793-1-47		
53	Mechanical	Peak Stripability force to	IEC 60793-2-50,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	remove primary coating	60793-1-32,	TEC70012008 for respective type of	type of Optical fibre used
	of Fibre used in	of the fiber (Unaged,		Optical fibre used in the cable	in the cable as per ITU-T
	the cable	Water aged, Damp heat			G.65x
		aged)			
54		Fiber Curl	IEC 60793-2-50,		
			60793-1-34,	Do	Do
55	Colour	MEK RUB Test	Draft IEC 60794-1-		
	qualification for	(Methyl Ethyl Ketone)	219,	Do	Do
	color fibres				
56	Safety	Flame Spread-Single	IEC/EN 60332-1-2	Char less than 0.54 m at completion of	
	Requirement	cable		test	
57		Flame Spread- Bunched	IEC/EN 60332-3-24:	Char less than 2.5 m at completion of the	
		cable	2018, Cat C	test	
58		Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
59		Acid gas (Toxicity) (Test	IEC/EN 60754-2	pH not less than 4.3	
		on toxic gases evolved		Conductivity not more than 10 μ S/mm	
		during combustion of			
		materials from cables)			
60		The material used in the		The manufacturer shall submit MSDS	
		manufacturing of the		(Material safety Data Sheet) for all the	
		OFC shall be non-toxic		material used in manufacturing of Optical	
		and dermatologically safe		fibre cable to substantiate the requirement.	
		in its life time and shall		1	
		not be hazardous to			
		health.			
		nounn.			

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,	$ \leq 0.36 \text{ dB/Km (A1)} \\ \leq 0.37 \text{ dB/Km (A2)} \\ \leq 0.37 \text{ 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	$\leq 0.26 \text{ dB/Km}$	Do
4		Attenuation at 1550nm		$\leq 0.22 \text{ dB/Km}(A1)$	
			Do	$\leq 0.23 \text{ dB/Km}(A2)$	Do
				$\leq 0.24 \text{ dB/Km}(B3)$	
5		Attenuation at 1625nm		\leq 0.25 dB/Km (A)	
			Do	\leq 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		
7		PMD Cabled Ribbon Fibre	Do	\leq 0.3 ps/ \sqrt{km}	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.	

A4.5 Parameter Group: Optical Fibre Cable – In-home

			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,	Impact energy:
		ITU-T Rec. L.111	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,	Minimum bend diameter: as per
		ITU-T Rec. L.111	6.2.1/L.111
			No kink and fibre/cable breakage.
13	Bend Test	IEC 60794-1-21,	Number of turns in the helix: 4
10		ITU-T Rec. L.111	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,	Number of cycles: 10.
14	Repeated Dend Test	ITU-T Rec. L.111	Tensioning: minimum tension;
		110-1 Rec. L.111	support the specimen as needed.
			Bending radius: per 6.2.1.
			Maximum attenuation change: no
			change after the test at 1550 nm.
1.7			No fibre and cable breakage.
15	Torsion Test	IEC 60794-1-21,	Test gauge length:0.5 m.
		ITU-T Rec. L.111	Tensioning: minimum tension;
			support the specimen as needed.

				Attenuation change: no change at 1550 nm	
				No fibre and cable breakage.	
16	Environmental	Temperature Cycling	IEC 60794-1-22, ITU-T Rec. L.111	Change in attenuation at 1550nm: \leq	
	Characteristics		110-1 Kec. L.111	0.05dB when subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+ 60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
	_			Time at each temperature : 12hrs.	
17		Cable Aging test	IEC 60794-1-22,	Change in attenuation at 1550nm: ≤	
			ITU-T Rec. L.111	0.05dB, when cable is exposed to 85	
				$^{\circ}C \pm 2 \ ^{\circ}C$ for a minimum of 168	
	-			hours.	
18		Damp Heat Test	IEC 60793-1-50	Change in attenuation at 1550 nm: \leq	
			ITU-T Rec. L.111	0.05dB when exposed to	
				Temperature : 40°C±2°C	
				Relative humidity : 95%	
				Time : 96h	
19		Check of the effect of	ISO175	The test samples are put in the PH4	
		aggression media on the		and PH10 solutions separately. After	
		cable		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	Telecordia GR 20, IEC60794	Optical fibre, buffers/core tubes, and	Applicable as per IEC
1		Compatibility		other core components shall meet the	60794-1-219 (draft) to
				requirements of the compatibility	control the quality of
				with buffer/core tube filling	material and life span of
				material(s) and/or water-blocking	the cable.

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	 materials that are in direct contact with identified components within the cable structure As per Annexure to TEC ER No: TEC70012008 for respective type of Optical fibre used in the cable 	If all RM are same in one of the cable design, then this test shall be skipped based on prior result. Applicable to respective type of Optical fibre used in the cable as per ITU-T G.657
22	the cable	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	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	(Chromatic Dispersion)	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	10 turns on 15 mm radius		G.657.A2 type of Optical fibre used	used in the cable as per
	the cable	mandrel		in the cable	ITU-T G.652.A
34	(Fibre Macro	Change in attenuation		As per Annexure to TEC ER No:	Applicable to respective
54	bend loss)	when fibre is coiled with	ITU-T G.657. A, G.650.1 and	TEC70012008 for G.657.A1,	type of Optical fibre
		1 turn on 10 mm radius	IEC 60793-2-50, 60793-1-47	G.657.A2 & G.657.B3 type of	used in the cable as per
		mandrel	ILC 00793-2-30, 00793-1-47	Optical fibre used in the cable	ITU-T G.652.A &
					G.657.B
35		Change in attenuation	ITU-T G.657.A & G.657.B,	As per Annexure to TEC ER No:	Applicable to respective
		when fibre is coiled with	G.650.1 and IEC 60793-2-50,	TEC70012008 for G.657.A2 &	type of Optical fibre
		1 turn on 7.5 mm radius	60793-1-47, Annex R1	G.657.B3 type of Optical fibre used	used in the cable as per
		mandrel		in the cable	ITU-T G.652.A &
					G.657.B
36		Change in attenuation	ITU-T G.657.B, G.650.1 and	As per Annexure to TEC ER No:	Applicable to respective
		when fibre is coiled with	IEC 60793-2-50, 60793-1-47	TEC70012008 for G.657.B3 type of	type of Optical fibre
		1 turn on 5 mm radius	Annex R1	Optical fibre used in the cable	used in the cable as per
		mandrel			ITU-T G.657.B
37	Mechanical	Peak Stripability force to	IEC 60793-2-50, 60793-1-32,	As per Annexure to TEC ER No:	Applicable to respective
	Characteristics	remove primary coating		TEC70012008 for respective type of	type of Optical fibre
	of Fibre used in	of the fiber (Unaged,		Optical fibre used in the cable	used in the cable as per
	the cable	Water aged, Damp heat		Striping length: 15 mm, Stripping	ITU-T G.65x
		aged)		force: 5~18 N (if the primary and	
				secondary coating are removed	
				together.)	
38		Fiber Curl	IEC 60793-2-50, 60793-1-34,		
				Do	Do
39	Colour	MEK RUB Test	Draft IEC 60794-1-219,		
	qualification	(Methyl Ethyl Ketone)		Do	Do
	for color fibres				
40	Safety	Flame retardant	IEC TR62222	Flame retardant should meet fire	
	Requirement		IEC 60332-1-2	safety regulations	
41		Flame Spread-Single	IEC/EN 60332-1-2	Char less than 0.54 m at completion	
		cable		of test	
42		Flame Spread- Bunched	IEC/EN 60332-3-24: 2018,	Char less than 2.5 m at completion of	
		cable	Cat C	the test	

43	Smoke Test	IEC/EN 61034-2	Minimum transmittance 60%	
44	Acid gas (Toxicity) (Test	IEC/EN 60754-2	pH not less than 4.3	
	on toxic gases evolved		Conductivity not more than 10	
	during combustion of		μS/mm	
	materials from cables)			
45	The material used in the		The manufacturer shall submit	
	manufacturing of the OFC		MSDS (Material safety Data Sheet)	
	shall be non-toxic and		for all the material used in	
	dermatologically safe in		manufacturing of Optical fibre cable	
	its life time and shall not		to substantiate the requirement.	
	be hazardous to health.			

Annexure-Tx-A5-OFC: Optical Fibre Cables for Direct Surface Application (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,	\leq 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,	\leq 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,	\leq 0.26 dB/Km	Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 0.22 dB/Km	Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-40,	\leq 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	\leq 0.3 ps/ \sqrt{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.110 IEC 60794-1-21, 60794-3-70,	Change in attenuation at 1550 nm: \leq 0.05dB & Fiber strain \leq 0.25% when subjected to a Tensile load of 3500 Newton	

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10				
10	Crush Resistance	ITU-T Rec. L.110	Change in attenuation at 1550nm: \leq	
		IEC 60794-1-21, 60794-3-70,	0.05dB when subjected to a	
			compressive load of 5000 N	
11	Impact	ITU-T Rec. L.110	Change in attenuation at 1550nm: \leq	
		IEC 60794-1-21, 60794-3-70,	0.05dB when subjected to Impact of	
			25N	
12	Kink Test	ITU-T Rec. L.110	Change in attenuation at 1550nm: \leq	There shall be no damage to
		IEC 60794-1-21, 60794-3-70,	0.05dB when subjected to a Kink with	the sheath or to the cable
			radius of 10D (D - diameter of cable).	elements under visual
				examination without
				magnification
13	Bend Test	ITU-T Rec. L.110	Change in attenuation at 1550nm: \leq	
		IEC 60794-1-21, 60794-3-70,	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	Change in attenuation at 1550nm: \leq	The bending rate shall be
	1	IEC 60794-1-21, 60794-3-70,	0.05dB when cable is flexed with 1	approximately one cycle in 2s
		· · · · · · · · · · · · · · · · · · ·	cycle in 2sec to 5sec with Pulley	to 5s and cable shall be free
			diameter of 20D (D- diameter of	from any optical & visual
			cable) and Load of 5Kg	physical damage.
			cubic) and Load of Frig	physical damage.
15	Torsion Test	ITU-T Rec. L.110	Change in attenuation at 1550nm: \leq	Cable shall be free from any
		IEC 60794-1-21, 60794-3-70,	0.05dB when subjected to Torsion	optical & visual physical
			with a load of 100N for 10 cycles.	damage.
16	Cable Drip Test	ITU-T Rec. L.110	Sample is kept vertically with open	Not applicable for Dry-Dry
	F	IEC 60794-1-21, 60794-3-70,	end downwards in the oven for 24	Cable Design.
			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.	
17	Abrasion Resistance	ITU-T Rec. L.110	Steel needle diameter $d = 1.0 \text{ mm}$,	
1/	Test	IEC 60794-1-21, 60794-3-70,	Steel needle diameter $d = 1.0$ mm, load: 4 N	
	1081	11000794-1-21,00794-5-70,		
			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: \leq 0.05dB, when cable is exposed to 85 °C \pm 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.

				1 1	1
				change in attenuation of the fibre	
				after the test shall be < 0.05 dB for	
				1550 nm.	
23		Termite and Rodent		Following minimum parametric test	No Indian/Global standard.
		Test		for Anti-termite dopant shall be	One similar standard is under
				carried out	draft stage in IEC forum. This
				- Non- toxicity	test maybe taken up as per
				- Thermal Stability	IEC, once IEC finalises its
				- Long life span/half-life	standard.
				- Efficacy	
24		Check of the effect	ISO175	The test samples are put in the PH4	
24		of aggression media	150175	and PH10 solutions separately. After	
		on the cable		30 days these samples are taken out	
		on the cable		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	Telecordia GR 20, IEC 60794-	Optical fibre, buffers/core tubes, and	Applicable as per IEC 60794-
		Compatibility	3-11	other core components shall meet the	1-219 (draft) to control the
				requirements of the compatibility	quality of material and life
				with buffer/core tube filling	span of the cable.
				material(s) and/or water-blocking	If all RM are same in one of
				materials that are in direct contact	the cable design, then this test
				with identified components within	shall be skipped based on prior
				the cable structure	result.
26					
26		Electrical continuity	ITU-T Rec. L.110	The metallic elements shall be	Applicable for Armoured
		test	IEC 60794-1-24, IEC 60794- 3-11	continuous.	cable.
27	Characteristics	Kink resistance Test	IEC 60794-1-23, IEC 60794-	No domogo or kink on ourfoco of	Applicable for all type of Lease
21		KINK resistance rest	-	No damage or kink on surface of	Applicable for all type of Loose
	of Cable		3, 60794-3-11	tube when tested 4 times with Kink	tube, Tight Buffer and
	Elements			radius less than 15xD, D is the	Micromodule.
	(Buffer Tube)			diameter of the tube.	

28		Drainage	IEC 60794-1-21, IEC 60794-	No Flow shall be detected when	Applicable to jelly filled Loose
		Test/Compound	3, 60794-3-11	tested at a temperature of 70° C for a	tube and Micromodule
		Flow		period of 24 Hrs.	Not applicable for Dry Tube.
29		Watertightness /	IEC 60794-1-22, IEC 60794-3	No water shall be detected at the	Applicable for all type of
_/		Water Blocking test	60794-3-11	unsealed end of the sample. If a	Loose tube, Tight buffer and
				fluorescent dye is used, an ultraviolet	Micromodule.
				light may be used for the	
				examination.	
30		Strippability test -	IEC 60794-3, IEC 60793-1-	3 mm length of outer sheath of tight	Applicable for Tight Buffer
		Tight Buffer	32,	buffer at a distance 30 mm from the	only.
			IEC 60793-1-32:2010	end of the tight buffer, leaving the	
				fibre undamaged	
31		Strippability test -	-	It must be possible to remove the	Applicable for Micromodule
		Micromodule		sheath manually by squeezing it	only.
				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.	
32	Characteristics	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre	Applicable for Ribbon Fibre
	of Cable			count Ribbon	Only
33	Elements	Separability of	IEC 60794-1-23, IEC 60794-3	- Breakout shall be accomplished	Applicable for Ribbon Fibre
	(Ribboned	individual		without specialized tools or	Only
	Fibre)	fibres from ribbon		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.	
34		Ribbon Compression Resistance	IEC 60794-1-31, IEC 60794-3	Change in attenuation when subjected to a compressive load of 500 N at 1550 nm : $\leq 0.05 \text{ dB}$.	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 1550 nm : $\leq 0.05 \text{ dB}$.	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 1550 nm : $\leq 0.05 \text{ dB}$.	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 for 100 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	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	the cable	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	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	the Cable (Chromatic	At 1625nm	ITU-T G.65x, G.650.1 and IEC 60793-2-50, 60793-1-42,	Do	Do

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

		10 **			1
		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 P	Parameter Group	Hybrid Cables (Optica	and Metallic)
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SN	Parameter	Individual	Standard Name	Limits/Values	Applicability
	Name	Parameter Name		(as per ITU-T Rec. L.109/	
				IEC 62807-3 (under study)	
1	Transmission	Attenuation at 1310nm	ITU-T G.65x, G.650.1 and	\leq 0.36 dB/Km	Applicable to respective type of
	Characteristics		IEC 60793-2-50, 60793-1-40,		Optical fibre used in the cable as per ITU-T G.65x
2		Attenuation at 1383nm	ITU-T G.65x, G.650.1 and	\leq attenuation at 1310 nm	
			IEC 60793-2-50, 60793-1-40,		Do
3		Attenuation at 1490	ITU-T G.65x, G.650.1 and	\leq 0.26 dB/Km	
		nm	IEC 60793-2-50, 60793-1-40,		Do
4		Attenuation at 1550nm	ITU-T G.65x, G.650.1 and	\leq 0.22 dB/Km	
			IEC 60793-2-50, 60793-1-40,		Do
5		Attenuation at 1625nm	ITU-T G.65x, G.650.1 and	\leq 0.25 dB/Km	
			IEC 60793-2-50, 60793-1-40,		Do
6		PMD Cabled Loose	ITU-T G.65x, G.650.1 and		
		Fibre	IEC 60793-2-50, 60793-1-48	_	
7		PMD Cabled Ribbon	ITU-T G.65x, G.650.1 and		
		Fibre	IEC 60793-2-50, 60793-1-48	$\leq 0.3 \text{ ps/}\sqrt{\text{km}}$	Do
8		Cable Cut-off	ITU-T G.65x, G.650.1 and		
		Wavelength	IEC 60793-2-50, 60793-1-44	1260nm Max.	Do
9	Mechanical	Tensile Strength	ITU-T Rec. L.109	Change in attenuation at 1550	
	Characteristics		IEC 60794-1-21, 60794-3,	$nm \le 0.05 dB$ & Fiber strain \le	
			60794-3-10, 60794-3-11	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	
				1550 nm: ≤ 0.05 dB when	

				1
		IEC 60794-1-21, 60794-3,	subjected compressive load of	
		60794-3-10, 60794-3-11	2000N or as agreed by user	
11	Impact	ITU-T Rec. L.109	Change in attenuation when	
		IEC 60794-1-21, 60794-3,	subjected to Impact load of	
		60794-3-10, 60794-3-11	$25Nm$, at $1550nm$: $\leq 0.05dB$.	
12	Kink Test	ITU-T Rec. L.109	Change in attenuation at	There shall be no damage to the
		IEC 60794-1-21, 60794-3,	1550nm: < 0.05dB when	sheath or to the cable elements
		60794-3-10, 60794-3-11	subjected to a Kink with radius of	under visual examination
			10D (D - diameter of cable).	without magnification
13	Bend Test	ITU-T Rec. L.109	Change in attenuation at	
1.0		IEC 60794-1-21, 60794-3,	1550 nm: ≤ 0.05 dB when	
		60794-3-10, 60794-3-11	subjected to Bend around a	
		00771310,00771311	mandrel of diameter of 20D for	
			10 cycles,.	
14	Repeated Bend Test	ITU-T Rec. L.109	Change in attenuation at	The bending rate shall be
14	Repeated Dend Test	IEC 60794-1-21, 60794-3,	1550nm: < 0.05 dB when cable is	approximately one cycle in 2s to
		60794-3-10, 60794-3-11	flexed with 1 cycle in 2 sec to 5	5s and cable shall be free from
		00794-3-10, 00794-3-11	sec with	any optical & visual physical
			Pulley diameter of 20D (D-	damage.
			diameter of cable) and Load of	damage.
			,	
15	Tensien Test		5Kg	Califa al all la fraz faz as a
15	Torsion Test	ITU-T Rec. L.109	Change in attenuation at	Cable shall be free from any
		IEC 60794-1-21, 60794-3,	1550 nm: ≤ 0.05 dB when	optical & visual physical
		60794-3-10, 60794-3-11	subjected to Torsion with a load	damage.
			of 100N for 10 cycles.	
16	Cable Drip Test	ITU-T Rec. L.109	Sample is kept vertically with	Not applicable for Dry-Dry
		IEC 60794-1-21, 60794-3,	open end downwards in the oven	Cable Design.
		60794-3-10, 60794-3-11	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.	
L		1		

17	1				
17		Abrasion Resistance	ITU-T Rec. L.109	Steel needle diameter $d = 1.0$	
		Test	IEC 60794-1-21, 60794-3,	mm, load: 4 N	
			60794-3-10, 60794-3-11	No perforation & loss of	
				legibility of the marking on the	
				sheath.	
18	Environmental	Temperature Cycling	ITU-T Rec. L.109	Change in attenuation at	
	Characteristics		IEC 60794-1-22, 60794-3,	1550 nm: ≤ 0.05 dB when	
			60794-3-10, 60794-3-11	subjected to following	
				temperature cycle:	
				TA2 temperature: - 20°C	
				TA1 temperature: - 10°C.	
				TB1 temperature: $+ 60^{\circ}$ C.	
				TB2 temperature: $+70^{\circ}$ C.	
				No. of temperature cycle : 2	
				Time at each temperature :	
				12hrs.	
19		Cable Aging test	ITU-T Rec. L.109	Change in attenuation at	
17		Cable Aging test	IEC 60794-1-22, 60794-3,	1550 nm: ≤ 0.05 dB, when cable	
			60794-3-10, 60794-3-11	is exposed to 85 °C \pm 2 °C for a	
			00794-3-10, 00794-3-11	minimum of 168 hours.	
20	-	Watan Dlaalin a Taat	ITU-T Rec. L.109	Test duration: 168 hour	No water shall be detected at the
20		Water Blocking Test			
			IEC 60794-1-22, 60794-3,	Sample length: 3 m	unsealed end of the sample. If a
			60794-3-10, 60794-3-11	Water Head Height: 1m	fluorescent dye is used, an
				No dye shall be detected when	ultraviolet light may be used for
				the end of the 3m length is	the examination.
				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.	

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 <u>.</u>
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		<u>Strippability test -</u> <u>Micromodule</u>	-	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	Ribbon Dimension	IEC 60794-1-23, IEC 60794-3	As per IEC standard of different fibre count Ribbon	Applicable for Ribbon Fibre Only
33	Elements (Ribboned Fibre)	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: ≤ 0.05 dB.	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: ≤ 0.05 dB.	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: ≤ 0.05 dB.	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 for 100 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			respective type of Optical fibre	
	the cable			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-	ITU-T G.65x, G.650.1 and		
		circularity	IEC 60793-2-50, 60793-1-20,	Do	Do
42		Core Clad	ITU-T G.65x, G.650.1 and		
		concentricity error	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	At 1550nm	ITU-T G.65x, G.650.1 and	As per Annexure to TEC ER	Applicable to respective type of
	Characteristics of		IEC 60793-2-50, 60793-1-42,	No: TEC70012008 for	Optical fibre used in the cable
	Fibre used in the			respective type of Optical fibre	as per ITU-T G.65x
	Cable (Chromatic			used in the cable	
46	Dispersion)	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	ITU-T G.65x, G.650.1 and	_	_
		wavelength range	IEC 60793-2-50, 60793-1-42,	Do	Do
51	Transmission	Change in attenuation	ITU-T G.65x ,ITU-T G.650.1,	As per Annexure to TEC ER	Applicable to respective type of
	Characteristics	when fiber is coiled	IEC 60793-2-50 and IEC	No: TEC70012008 for	Optical fibre used in the cable
	of Fibre used in	with 100 turns on 60	60793-1-47,	respective type of Optical fibre	as per ITU-T G.65x
1	the cable	± 1.0 mm diameter		used in the cable	
	(Fibre Macro	mandrel			
52	bend loss)	Change in attenuation	ITU-T G.65x ,ITU-T G.650.1,	5	
		when fiber is coiled	IEC 60793-2-50 and IEC	Do	Do
		with 1 turn around 32	60793-1-47,		

		± 0.5 mm diameter			
		± 0.5 min 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	As per clause 6.1.2 of	IEC 60228	The cross-section of the metallic	IEC 60228 for following
	Characteristics –	ITU-T L.109	IEC 60502-1	wire should be designed	Conductor Strands/Class:
	Power Feeding		IEC 60227-1	according to the transmission	Class 1: Solid conductor
	Wires		IEC 61156-1	voltage, transmission distance	• Class 2: Stranded conductor
			IEC 61196-1-10x	and the power consumption.	intended for fixed installation
					Class 5: Flexible conductor
			BS EN 50525	Under extreme operating	Class 6: Very Flexible
			BS EN 60304	conditions, the heat generated by	conductor
				conductors should not make the	
				cable temperature exceed the	Conductor Size/Area
				maximum allowed temperature	(AWG/SQMM) to be decided
				in detailed specifications of the	on Power delivery over
				cable element materials.	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
					00504
					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.	