

**Corrigendum cum Notice- 4 of Tender for Non-IT Infrastructure for
Tripura State Data Centre at Agartala**

Notice No. 4

S. No	Information	Details
2	Last date for submission of written queries for clarifications	7 th Dec (11am)
4	Release of response to clarifications	9 th Dec (6pm)
6	Last date (deadline) for submission of bids	12 th Dec (11 am)
7	Opening of technical bids	13 th Dec (11 pm) *Only qualified bidders will be informed for Financial bid opening process
	Place, time, and date of opening of financial proposals received in response to the RFP notice	Online and Offline Venue: NIXI-CSC Data Services Centre Conference Room 9th Floor, B-Wing, Statesman House Barakhamba Road, Connaught place Delhi, New Delhi DL 110001 IN Contact No.: Phone: +91-11-48202000 Date & Time: 19th Dec 2022 (11am) (zoom link will be shared with the remotely present technically qualified bidders)

Corrigendum No. 4

Page No./Block	Previous Content	Updated Content (To be read as)
57	The Rack units should have a perforated front door and plain split rear Door.	The Rack units should have a perforated front door and perforated rear Door.
58	<ul style="list-style-type: none"> • Manufacturer must certify that the products are Comply DIN41494 and Equivalent EIA/ISO/EN • /CEA Standard. 	this clause stand deleted
59	"Network Passive Infrastructure a.Copper cabling as per TIA/EIA guidelines b.Tier III complaint design c.25 years certification	"Technical Specifications for Passive Products 1. Criteria for the Passive Components OEM

<p>d. Copper cabling will be through different cable tray / basket for all the racks.</p> <p>e. A separate wall mount / floor mount rack to be install at staging room for other area as Distribution Rack.</p> <p>f. All Server Racks to be supplied are 800mm x 1200 mm with castor wheel and Network Racks to be supplied are 800mm x 1000 mm. All are having perforated door and height will be 42U.</p> <p>g. Each rack will have two numbers of PDU/iPDU/metered PDU with 32 AMP MCB and industrial type socket.</p> <p>h. Each row has to be provisioned with a network cum passive rack.</p> <p>A. General Specifications for Passive Components</p> <ol style="list-style-type: none"> 1. All Fiber and copper cabling and components should be from same OEM 2. Cabling should have 25 years of performance warranty (Attach Warranty declaration along with the Bid) 3. All the minimum compliances required in the passive cabling infrastructure (but not limited to), operating temperature, insulation, Covers/protectors (against dust), etc. 	<p>(the specifications are written below) *</p> <p>2. Passive Network Infrastructure Specifications</p> <p>(the specifications are written below)#</p>
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Technical Specifications for Passive Products

1. Criteria for the Passive Components OEM*

- a) OEM should be ISO 9001 ISO 14000 Certified.
- b) All networking passive material (Fiber and Copper) and Fiber Pathway System should be from one OEM make only.
- c) Material should have been manufactured in OEM's own manufacturing facilities, not outsourced.

- d) There should be minimum 20-25 years extended product warranty and Application Assurance as a part of certification of entire installed cable plant.
- e) The vendor /OEM should provide test reports generated from any testing software/ device for minimum 5000 nodes in support of experience to executing such requirement of margin (3 dB or higher) for Cat 6A of NEXT (worst case) for entire frequency range specified in ISO/IEC 11801.
- f) All proposed passive products should have data sheets available on the OEM website. URL of each product to be submitted along with the bid.
- g) OEM should have a Data Center Design Consultant (DCDC) certified personal sitting in India whose services can be utilized during the project. Certificate and HR letter from OEM to be submitted along with the bid as proof of the person being on OEM payrolls and sitting in India.
- h) All passive components should be RoHS complied. Declaration of – ROHS compliant should clearly be mentioned on data sheets of each Passive Components, or a separate RoHS declaration must be submitted.
- i) The Cat 6 U/UTP Cable should be complied with IEC 60332-3-22 features for environment safety.
- j) The OEM of passive components to be quoted by the bidder should be present in India from at least past 10 years. (Details must be provided). At least one Manufacturing Plant in India (Make in India).

Note: Failing to comply with any of these terms and condition will lead to penalty.

2. Passive Network Infrastructure Specifications#

S. No.	Tender Specification	Compliance	Remarks
1	OM4 LC - MPO 2 connector Fiber Link Performance		
	The losses should not exceed the following dB values for the 2-connector channel for various lengths mentioned below proof supporting the same to be submitted:		
1	41 Meters: 1.16 dB for 850 nm and 1.08 dB for 1300 nm		
2	61 Meters: 1.22 dB for 850 nm and 1.10 dB for 1300 nm		
3	81 Meters: 1.28 dB for 850 nm and 1.12 dB for 1300 nm		
	The losses should not exceed the following dB values for the 4-connector channel for various lengths mentioned below proof supporting the same to be submitted:		
4	41 Meters: 1.72 dB for 850 nm and 1.64 dB for 1300 nm		
5	61 Meters: 1.78 dB for 850 nm and 1.66 dB for 1300 nm		
6	81 Meters: 1.84 dB for 850 nm and 1.68 dB for 1300 nm		
	The minimum distance of the following applications shall be supported by the OM4 four (4) connector link performance		
7	40GBASE-SR4 = 155 meters		
8	40GBiDi = 155 meters		
9	100GBASE-SR4 = 114 meters		
10	100GBASE-SR10 = 155 meters		
11	16G FC @ 850 nm = 155 meters		
12	32G FC @ 850 nm = 115 meters		
13	128G FC @ 850 nm = 100 meters		
	Tool reports / test report to be shared for above configuration.		

	24 Fiber MPO Trunk Cable (OM4, Multimode)		
1.	MPO trunk cables shall have 24 fiber strands with either 3 x 8F MPO connectors or 2 x 12F MPO connectors or 1 x 24F MPO connector at each end, all 3 variants are acceptable.		
2.	Boot color should be distinguishable between 8F / 12F / 24F MPO Connectors for easy identification.		
3.	The fiber inside the trunk cable shall comply to enhanced macrobend loss (i.e., lower loss) performance levels. The fiber core shall be bend insensitive.		
4.	The trunk cable jacket shall be LSZH (Low Smoke Zero Halogen) and compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2		
5.	The color of the jacket shall be as per the standards (i.e., Aqua Color), no other color shall be permitted.		
6.	The polarity of the trunk cable shall be Method B.		
7.	The performance of the individual trunk cables shall be very high. The insertion loss of the connectors shall be maximum 0.25 dB and the return loss shall be minimum 27 dB.		
8.	The Long-term tensile strength shall be at least 200 N and short-term tensile strength shall be 667 N.		
9.	The MPO connector shall be female on both sides (i.e., unpinned)		
10.	The operating temperature shall be -20 °C to +70 °C		
	12 Fiber MPO Trunk Cable (OM4, Multimode)		
11.	MPO trunk cables shall have 1 x 12F MPO connector at each end.		
12.	The fiber inside the trunk cable shall comply to enhanced macrobend loss (i.e., lower loss) performance levels. The fiber core shall be bend insensitive.		
13.	The trunk cable jacket shall be LSZH (Low Smoke Zero Halogen) and compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2		
14.	The color of the jacket shall be as per the standards (i.e., Aqua Color), no other color shall be permitted.		
15.	The polarity of the trunk cable shall be Method B.		
16.	The performance of the individual trunk cables shall be very high. The insertion loss of the connectors shall be maximum 0.25 dB and the return loss shall be minimum 27 dB.		
17.	The Long-term tensile strength shall be at least 200 N and short-term tensile strength shall be 667 N.		
18.	The MPO connector shall be female on both sides (i.e., unpinned)		
19.	Cable diameter shall not exceed 5.5 mm		
20.	The operating temperature shall be -20 °C to +70 °C		
	12 Fiber MPO Trunk Cable (OS2, Singlemode)		
21.	MPO trunk cable shall be with 12 fiber MPO connectors at both ends.		
22.	The fibers in the trunk cables shall be compliant G.652.D and G.657.A1 (Bend Insensitive)		

23.	The trunk cable jacket shall be LSZH (Low Smoke Zero Halogen) and compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2		
24.	The color of the jacket shall be as per the standards (i.e., Yellow Color), no other color shall be permitted.		
25.	The polarity of the trunk cable shall follow Method B.		
26.	The performance of the trunk cables shall be very high. The insertion loss of the connectors shall not exceed 0.67 dB and the return loss shall be minimum 55 dB.		
27.	The Long-term tensile strength shall be at least 200 N and short-term tensile strength shall be 667 N.		
28.	The MPO connector shall be female on both sides (i.e., unpinned)		
	3x8F or 2x12F or 1x24F MPO to 24F LC, Method B, OM4 Cassette/Module		
29.	The cassette shall have either 3 nos. of 8F or 2 nos. of 12F or 1 no. of 24F MPO connectors at the rear of the cassette. The front shall have 12 duplex (24 single) LC ports.		
30.	The cassette shall be OM4 and should have an identification of Aqua color at the front or rear of the cassette as per standards such as ANSI/TIA 568 C.3.		
31.	The insertion loss (mating) shall not be more than 0.3 dB.		
32.	The cassette shall be accompanied with dust caps or any other method for protection against dust for unused ports.		
33.	The rear MPO ports shall be male (i.e., pinned)		
34.	The Cassettes/Module should be intelligent upgradable without the removal of patch cords or without replacing the module (i.e., there should be no network disruption).		
35.	Single variant cassette/module to be used at both ends of the channel (i.e., there should be a single Part Number cassette at either side of the link)		
36.	The cassette/module shall follow Method B polarity.		
	3x8F or 2x12F MPO to 24F LC, Method B, OS2, Singlemode Cassette/Module		
37.	The cassette shall have either 3 nos. of 8F or 2 nos. of 12F MPO connectors at the rear of the cassette. The front shall have 12 duplex (24 single) LC ports.		
38.	The cassette shall be OS2 (Singlemode) and should have an identification of Blue color at the front or rear of the cassette.		
39.	Fiber inside the cassette/module shall be compliant to G.657.A1		
40.	The insertion loss (mating) shall not be more than 0.3 dB.		
41.	The cassette shall be accompanied with dust caps or any other method for protection against dust for unused ports.		
42.	The rear MPO ports shall be male (i.e., pinned)		
43.	The Cassettes/Module should be intelligent upgradable without the removal of patch cords or without replacing the module (i.e., there should be no network disruption).		
44.	Single variant cassette/module to be used at both ends of the channel (i.e., there should be a single Part Number cassette at either side of the link)		
45.	The cassette/module shall follow Method B polarity.		
	MPO Adapter Plate (8 Port)		

46.	The adapter plate shall support both Multimode and Singlemode fiber trunk cables.		
47.	To be used wherever parallel transmission (i.e., more than 2 fiber strands) on 8F or 12F or 24F trunk cables takes place.		
48.	The adapter plate shall be accompanied with dust caps or any other method for protection against dust for unused ports from one side.		
49.	The adapter should be intelligent upgradable without the removal of patch cords or without replacing the adapter (i.e., there should be no network disruption).		
50.	The adapters shall be compliant to TIA/EIA FOCIS 5, which is commonly referred to as “aligned keys” or “key-up to key-up.” Therefore, an aligned-key adapter shall be present for each mated pair of MPO connectors.		
	1U Fiber Panel (Type 1)		
51.	Shall have 4 slots which various fiber configurations.		
52.	Shall have a fiber management trough in the front for patch cord management.		
53.	The rear should have a cable support bar for proper dressing of the incoming cables at the back.		
54.	The panel shall be intelligent upgradable without the removal of patch cords (i.e., there should be no network disruption).		
	1U Fiber Panel (Type 2)		
55.	Shall have 4 slots for various fiber density and type configurations.		
56.	Shall have a fiber management trough in the front for patch cord management.		
57.	Shall have knockouts on the rear side for incoming trunk cables and for properly securing the cables to avoid any stress during sliding the panel out.		
58.	Shall be sliding type for easy access for management.		
59.	The panel shall be intelligent upgradable without the removal of patch cords (i.e., there should be no network disruption).		
	2U Fiber Panel (to be used for locations where high number of MPO trunks are to be terminated)		
60.	Shall have 12 slots for various fiber configurations in a 2U size.		
61.	Shall be able to configure 144 Duplex (288 Fiber) LC ports in the panel.		
62.	Shall have a fiber management trough in the front for patch cord management.		
63.	Shall have knockouts on the rear side for incoming trunk cables and for properly securing the cables to avoid any stress during sliding the panel out.		
64.	Shall have sliding tray for easy access for management.		
65.	Shall have a split tray layout having 2 slots per tray. The 2U variant shall have total of 6 trays.		
66.	The panel shall be intelligent upgradable without the removal of patch cords (i.e., there should be no network disruption).		
	OM4 MPO (Female) to MPO (Male), Array Cord, LSZH		
67.	Shall have 12 F MPO Connector (Female) on one side and 12 F MPO Connector (Male) on second side.		
68.	The jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		

69.	The performance of the patch cords shall be very high. The insertion loss of the MPO connectors shall not exceed 0.25 dB and the return loss shall be minimum 27 dB.		
70.	Tensile load long term shall be maximum 100 N and tensile load short term shall be maximum 334 N		
71.	Shall be compliant to Telcordia GR-409		
	OM4 LC to LC, Fiber Patch Cord, 1.6 mm Duplex, LSZH		
72.	Shall have LC connectors on both sides		
73.	The jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
74.	The performance of the trunk cables shall be very high. The insertion loss of the connectors shall not exceed 0.24 dB and the return loss shall be minimum 27 dB.		
75.	Jacket color should be Aqua as per the colors decided by the standards such as ANSI/TIA-568. 3-D.		
76.	Shall be compliant to Telcordia GR-409		
	OM4 LC Uniboot to LC Uniboot, Fiber Patch Cord, 2 mm Duplex, LSZH		
77.	Shall have LC Uniboot connectors on both sides		
78.	Shall have the feature of changing the polarity in the field if required.		
79.	The jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
80.	The performance of the patch cord shall be very high. The insertion loss of the connectors shall not exceed 0.15 dB and the return loss shall be minimum 35 dB.		
81.	Jacket color should be Aqua as per the colors decided by the standards such as ANSI/TIA-568. 3-D.		
	OS2, Singlemode, LC to LC, Fiber Patch Cord, 1.6 mm Duplex, LSZH		
82.	Shall have LC connectors on both sides		
83.	The fibers in the patch cords shall be compliant to G.652.D and G.657. A1.		
84.	The jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
85.	The performance of the patch cords shall be very high. The insertion loss of the connectors shall not exceed 0.34 dB and the return loss shall be minimum 50 dB.		
	OM4 MPO/8 (Female) to LC, 8-Fiber, LSZH		
86.	Shall have MPO Connector (Female) on one side and 4 duplex LC Connectors on second side.		
87.	The jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
88.	The performance of the patch cords shall be very high. The insertion loss of the MPO connectors shall not exceed 0.2 dB and the return loss shall be minimum 27 dB.		
89.	The performance of the patch cords shall be very high. The insertion loss of the LC connectors shall not exceed 0.15 dB and the return loss shall be minimum 35 dB.		
90.	Shall be compliant to Telcordia GR-409		
	SM OS2 MPO/8 (Female) to LC, 8-Fiber, LSZH		

91.	Shall have MPO Connector (Female) on one side and LC Connectors (4 nos.) on second side.		
92.	Shall be SM OS2 fiber and the jacket shall be LSZH (Low Smoke Zero Halogen) and shall be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
93.	The performance of the patch cords shall be very high. The insertion loss of the MPO connector shall not exceed 0.35 dB and the return loss shall be minimum 65 dB. The insertion loss of the LC connectors shall not exceed 0.25 dB and the return loss shall be minimum 50 dB.		
94.	Shall be compliant to Telcordia GR-409		
	CAT 6A U/UTP Channel Requirements		
95.	NEXT - Minimum 3 dB above the standards. Should support a minimum of 4 connector Channel with a minimum 3 dB guaranteed NEXT		
96.	The Category 6A system should support channels that are shorter than 15 meters for 4 connector channels without any minimum length requirements. This is essential in a Data Center environment. 4 Connector ETL Test Report for the same to be submitted.		
	CAT 6A U/UTP Horizontal Cable		
97.	The Cable should meet ANSI/TIA 568C.2 Category 6A Specifications		
98.	The cable should consist of Eight 23 AWG copper conductors. Copper Clad Aluminum or any other combinations are not allowed		
99.	The nominal Outside diameter should be maximum or lower than 7.24 mm.		
100.	The cable shall be Low-Smoke Zero Halogen (LSZH) and must comply with the following Fire Safety standards IEC 60332-3-22, IEC 60754-2, and IEC 61034-2.		
101.	The horizontal cable shall have a unique print string on the cable jacket. This unique identifier shall also be used for on-line reference to a full set of factory tests that were performed on a sample from the same mater reel. The on-line reference must be available on the SCS vendor public website, such that it can be accessed at any time. This is to ensure genuineness of the product.		
102.	The cable and cordage shall be "True UTP" components that do not include internal or external shields, screened components or drain wires. No Special Grounding requirements.		
103.	Should have ETL/UL verified Certificate. Certificate to be submitted.		
104.	Should support a minimum of 4 connector Channel with a minimum 3 dB guaranteed NEXT over and above the standard TIA 568 C.2. The bidder to submit a test report with minimum 2000 nodes all having above 3 dB NEXT headroom from a single project.		
	Category 6A U/UTP Information Outlets		
105.	The 8-pin modular (RJ-45) jacks shall comply with IEC 60603-7-4		

106.	The Category 6A outlets shall be backward compatible with Category 6 and 5E cords and cables.		
107.	The information outlet shall have a Current Rating of 1.5 A at 20°C		
108.	The information outlet will have insertion life of 750 cycles minimum.		
109.	Certifications: UL/ETL Listed		
	CAT 6A LSZH U/UTP RJ45 Patch Cords		
110.	The system must support patch cord lengths of 1 meter minimum and equipment cords of 2 meter minimum and The Patch cords shall be solid core construction for better performance.		
111.	Cords shall be equipped with 8-pin modular plugs on each end.		
112.	Nominal cordage diameter shall be maximum or lower than 7.24 mm.		
113.	The patch cord shall be Low-Smoke Zero Halogen (LSZH) and must comply with the following Fire Safety standards IEC 60332-3-22, IEC 60754-2, and IEC 61034-2.		
114.	The cordage shall be UTP components that do not include internal or external shields, screened components or drain wires.		
	CAT 6A 24 port Jack Panel		
115.	Shall be 24 port panel capable of terminating 24 CAT 6A U/UTP cables.		
116.	Shall be UL Listed		
117.	When configured in worst-case 100-meter channels with full cross-connects and consolidation points with the other products proposed in this tender, the panel shall be capable of delivering the minimum guaranteed channel performance		
118.	The panel shall be equipped with a removable rear mounted cable management bar and front and rear labels		
119.	The panel must be capable of supporting an upgrade to an intelligent system without any interruption to service due to patch cord removal or terminal block re-termination.		
120.	Operating Temperature Range = 14°F to 140°F (-10°C to 60°C) Storage Temperature Range = -40°F to 158°F (-40°C to 70°C)		
121.	The panel should be intelligent upgradable without the removal of patch cords (i.e., no network disruption).		
	1, 2 & 4 Port Face Plate		
122.	Shall be available in 1 port, 2 port and 4 port square versions.		
123.	Color: White Width: 86.36 mm (3.4 in) Height: 86.36 mm (3.4 in) Depth: 13.72 mm (0.54 in) The dimensions of the faceplate have been included so that the furniture cutting can be standardized.		
124.	Flammability Rating: UL 94 V-0 Safety Standard: UL Listed		
125.	Shall be compatible with CAT 5e/CAT 6/CAT 6A information outlets.		
	12 Fiber Multimode OM4 Indoor & Outdoor LSZH Cable		

126.	12-core Multimode OM4 OFC, Tight buffered, LSZH, Non-Armored, Yellow Color.		
127.	Standard Compliance: IEC 60793-2-10, type A1a.3a and TIA492AAAD (OM4).		
128.	Fiber core shall be bend-insensitive OM4 fiber		
129.	Construction Compliance: Telcordia GR-20 (water penetration) and Telcordia GR-409.		
130.	Flame test method, the cable should be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
131.	Jacket: UV Stabilized and Black Color		
132.	Fiber cable Diameter Over Jacket should be maximum 7.5 mm, Tensile Strength should be 400 N (long term) and 1300 N (short term), and Compression of the fiber cable should be minimum of 22 N/mm.		
133.	Construction: Shall have aramid yarns, rip cord, central strength member, water blocking system.		
134.	Operating Temperature: -40 °C to +70 °C		
135.	Maximum, cabled attenuation 1.00 dB/km @ 1300 nm & 3.00 dB/km @ 850 nm.		
	12 Fiber Multimode Cassettes Loaded with Pigtails		
136.	Shall be Multimode OM4		
137.	Regulatory Compliance: REACH-SVHC Safety Standard: UL		
138.	Number of Fiber: 12 Interface, Front: LC Adapter Color: Aqua		
139.	Optical Performance Insertion Loss, Typical: 0.27 dB Return Loss, Min: 20.0 dB		
140.	Alignment Sleeve Material: Zirconia (ceramic) The blue adapters shall have hinged shutters on them for dust protection. Pigtails shall have 12 (Twelve) different colors: Blue / Orange / Green / Brown / Slate / White/ red/ black/ yellow/ violet/ rose/ aqua		
	12 Fiber Singlemode Indoor Cable		
141.	12-core Singlemode OFC, Tight buffered, Gel free, LSZH, Yellow Color.		
142.	Fiber Optic Cable: 9/125µm, OS2, AS PER ITU-T G.652.D, G.657.A1(Bend Insensitive)		
143.	Gel-Free cable is tested in accordance with Telcordia GR-409		
144.	Fiber cable Diameter Over Jacket should be maximum 7 mm, Tensile Strength should be 200 N (long term) and 667 N (short term), and Compression of the fiber cable should be minimum of 10 N/mm.		
145.	Flame test method, the cable should be compliant to IEC 60332-3, IEC 60754-2, IEC 61034-2.		
146.	The cabled attenuation shall be 0.5 dB/km @ 1310nm and 0.5 dB/km @ 1550nm		
147.	Installation temp shall be at least between the range of -10- and +60-degree C. Operating Temp shall be at least between the range of -20- and +70-degree C. The storage Temp shall be at least between the range of -40- and +70-degree C.		

	12 Fiber Singlemode Cassettes Loaded with Pigtails		
148.	Shall be Singlemode OS2		
149.	Regulatory Compliance: RoHS 2011/65/EU Safety Standard: UL		
150.	Number of Fiber: 12 Interface, Front: LC Adapter Color: Blue		
151.	Optical Performance Insertion Loss, Typical: 0.30 dB Return Loss, Min: 55.0 dB		
152.	Ferrule Geometry: Pre-radiused The blue adapters shall have hinged shutters on them for dust protection. Pigtails shall have 12 (Twelve) different colors: Blue / Orange / Green / Brown / Slate / White/ red/ black/ yellow/ violet/ rose/ aqua		
	Fiber Pathway System		
153.	The Fiber pathway should be UL listed, proof of the same shall be submitted		
154.	The Fiber Pathway System shall maintain a minimum 2-inch bend radius throughout the system.		
155.	Basic components shall include horizontal and vertical straight sections, horizontal and vertical elbows, downspouts, junctions and numerous support hardware and flex-tube kits.		
156.	The fiber raceways system shall be available in 2x2, 2x6, 4x4, 4x6, 4x12 and 4x24 inch dimensions.		
157.	Should be available in Yellow color		
158.	All components shall be UL94V-0 flame resistant and shall not contain any PVC material. The Straight Sections and Molded Fittings shall be UL 2024 compliant as well.		

Note: The Bidders can choose the specifications of the cables within the Scope of this corrigendum specifications based on there design requirements.