

(MM3-CBS-REL-PYL)

“Procurement, Supply, Installation, Testing and Commissioning of various Power Supply works including associated Civil works, required for diversion of 220 kV and 33 kV Transmission Lines along with the Transmission towers belonging to M/s Reliance Infrastructure Ltd. in Aarey depot area for Mumbai Metro Line -3”

Addendum No. 5

Date: - 15<sup>th</sup> June 2017

Sr. No.	Description	Clause No. and Page No. of Original Tender Document	Amendment						
1.	Section VIII – Technical Specification	<p><b>Clause No. 2 (iii), Page No. 307</b></p> <p><b>(iii) Shipping, Handling &amp; Site Supporting</b></p> <table border="1" data-bbox="443 663 1290 799"><tr><td data-bbox="443 663 600 791">Pulling eye &amp; sealing of Cable ends</td><td data-bbox="600 663 1290 791">“.....”. The “Start” end of the cable shall be sealed with Polyurethane compound with PVC cap and hot melt adhesive lined heat shrinkable end cap.</td></tr></table>	Pulling eye & sealing of Cable ends	“.....”. The “Start” end of the cable shall be sealed with Polyurethane compound with PVC cap and hot melt adhesive lined heat shrinkable end cap.	<p><b>Clause No. 2 (iii), Page No. 307</b></p> <p><b>(iii) Shipping, Handling &amp; Site Supporting</b></p> <table border="1" data-bbox="1312 663 2179 831"><tr><td data-bbox="1312 663 1469 791">Pulling eye &amp; sealing of Cable ends</td><td data-bbox="1469 663 2179 831">“.....”. The “Start” end of the cable shall be sealed by fitting a metal end cap filled with polyurethane compound. The heat shrinkable tube shall be provided above a metal end cap.</td></tr></table>	Pulling eye & sealing of Cable ends	“.....”. The “Start” end of the cable shall be sealed by fitting a metal end cap filled with polyurethane compound. The heat shrinkable tube shall be provided above a metal end cap.		
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2.	Section VIII – Technical Specification	<p><b>Clause No. 2. (viii) (10), Page No. 310</b></p> <table border="1" data-bbox="443 935 1290 1098"><tr><td data-bbox="443 935 488 1098">10</td><td data-bbox="488 935 589 1098">Outer Sheath</td><td data-bbox="589 935 1290 1098">The outer sheath (with termite repellent, anti-rodent, U/V &amp; Free from chlorinated paraffin, resistant to sulphide found in the ground) shall consist of extruded black colored HDPE. “.....”.</td></tr></table>	10	Outer Sheath	The outer sheath (with termite repellent, anti-rodent, U/V & Free from chlorinated paraffin, resistant to sulphide found in the ground) shall consist of extruded black colored HDPE. “.....”.	<p><b>Clause No. 2. (viii) (10), Page No. 310</b></p> <table border="1" data-bbox="1312 935 2179 1098"><tr><td data-bbox="1312 935 1357 1098">10</td><td data-bbox="1357 935 1458 1098">Outer Sheath</td><td data-bbox="1458 935 2179 1098">The outer sheath (with termite repellent, anti-rodent, U/V resistant &amp; Free from chlorinated paraffin, resistant to sulphide found in the ground shall consist of extruded black coloured <b>HDPE</b>. “.....”.</td></tr></table>	10	Outer Sheath	The outer sheath (with termite repellent, anti-rodent, U/V resistant & Free from chlorinated paraffin, resistant to sulphide found in the ground shall consist of extruded black coloured <b>HDPE</b> . “.....”.
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<b>Sr. No.</b>	<b>Description</b>	<b>Clause No. and Page No. of Original Tender Document</b>	<b>Amendment</b>
3.	Section VIII – Technical Specification	<p><b>Clause No. 2. (ix) (a) (1), Page No. 311</b></p> <p><b>(ix) Constructional details</b></p> <p><b>(a) Conductor</b></p> <p>1. Single core conductor having Milliken construction, shall consist of stranded, Segmental, compacted circular annealed copper wires confirming to IEC 60228/IS 8130.</p>	<p><b>Clause No. 2. (ix) (a) (1), Page No. 311</b></p> <p><b>(ix) Constructional details</b></p> <p><b>(a) Conductor</b></p> <p>1. Single core conductor having Milliken construction, shall consist of stranded, Segmental, compacted circular annealed copper wires confirming to IEC 60228.</p>
4.	Section VIII – Technical Specification	<p><b>Clause No. 2 (c), Page No. 316</b></p> <p>C) The insulator housing shall be dry type or be filled with high viscosity cold pouring compound. Compounds to be heated during installation are not allowed. The termination construction must allow the thermal expansion of the cable insulation. For this purpose, the stress cone units must be made of flexible silicone rubber to allow the radial expansion of the cable insulation at all operation conditions.</p>	<p><b>Clause No. 2 (c), Page No. 316</b></p> <p>C) The insulator housing shall be dry type or be filled with high viscosity pouring compound. The termination construction must allow the thermal expansion of the cable insulation. For this purpose, the stress cone units must be made of flexible silicone Rubber to allow the radial expansion of the cable insulation at all operation conditions.</p>
5.	Section VIII – Technical Specification	<p><b>Clause No. 10. a. (2), Page No. 320</b></p> <p>2. It is very important that, these silicone rubber parts shall be packed in a special bag, allowing to store them up to <b>20</b> years starting from the date of production.</p>	<p><b>Clause No. 10. a. (2), Page No. 320</b></p> <p>2. It is very important that, these silicone rubber parts shall be packed in a special bag, allowing to store them up to minimum 5 years starting from the date of delivery at site.</p>

## **ATTACHMENTS OF ADDENDUM NO. 5**

### **Contract No.: MM3-CBS-REL-PYL**

“Procurement, Supply, Installation, Testing and Commissioning of various power supply works including associated civil works, required for diversion of 220kv and 33 kv Transmission Lines along with the Transmission towers belonging to M/s Reliance Infrastructure Ltd. In Aarey depot area for Mumbai Metro Line-3”

Transit damage	The seller shall be responsible for any transit damage due to improper packing.
Pulling eye & sealing of Cable ends	A cable pulling eye shall be provided at “Finish” end of cable on each drum. Suitable fillings/putty shall be used for sealing gap between outer sheath and pulling eye. Heat shrinkable sleeves on the pulling eye shall also be provided. The “Start” end of the cable shall be sealed by fitting a metal end cap filled with polyurethane compound. The heat shrinkable tube shall be provided above a metal end cap.
Drum identification label	<p>The following information shall be marked on the drum:</p> <ol style="list-style-type: none"> <li>a. Trade name or trade mark; if any</li> <li>b. Manufacturer's &amp; Buyer's name</li> <li>c. Cable construction</li> <li>d. No. of Core &amp; Cross sectional area of the conductor of the cable</li> <li>e. Type of cable and voltage for which it is suitable</li> <li>f. Length of the cable on the drum, Cable length initial reading &amp; end reading shall be marked on drum. Cable starting end shall be taken out from winding to read this drum reading with proper sealing to protect against external damage.</li> <li>g. Direction of rotation of drum (an arrow) and Purchase order number with date and SAP item code</li> <li>h. Month &amp; Year of Manufacturing</li> <li>i. Port of Destination</li> <li>j. Drum Serial no.</li> <li>k. Size of drum (Diameter of drum &amp; Width)</li> <li>l. Gross weight of the drum</li> </ol>

(iv) **Design consideration**

- (a) The cable shall be suitable for buried installation with uncontrolled back filling. The cable shall withstand all mechanical and thermal stresses, which are likely to occur during its normal steady state and transient operation conditions.
- (b) The metallic screen shall be designed to withstand earth fault current liable to occur in the system during conductor to ground fault
- (c) The thermal resistivity of the soil is not exceeding 150°C cm/watt.
- (d) The cable shall be designed to have a minimum useful life of not less than fifty years.
- (e) Each cable length shall be provided with a pulling socket pulling eye, which shall be fitted to pulling end. The pulling socket eye end shall be able to take the pulling tension of as per standard along with factor of safety of 1.25. The supplier shall confirm whether the cable can take this pulling load.
- (f) The outer sheath of the cable shall be given adequate chemical treatment in order to protect itself from rodent and termite attack.
- (g) The conductor shall be clean, uniform in size and shape, smooth and free from harmful effects.

(v) **Current rating**

	Make of Compound for Insulation & Inner / outer Semi-conducting compound	Borealis / Dow Chemicals. only
6	Inner Longitudinal and radial water seal	Semi conducting water swalleble tapes shall be applied over the insulating screen Selection of Swelling height & time, weight, volume resistivity of tape shall be justified by technical calculation / documents
7	Metal screening (If required, to meet the short circuit rating)	The metallic screen shall consists of concentric layer of annealed copper wires, followed by a copper tape binder applied in helical form
8	Outer Longitudinal and radial water sealing bedding (Applicable only if metallic screening is provided as per Cl 3.7 )	Semi-conducting water Swalleble tapes shall be applied over the metallic screening.
9	Metallic sheath	The metallic extruded sheath shall consist of Extruded Corrugated Aluminium sheathing, provided with high-viscosity bitumen-based compound coating The minimum thickness at any point of metallic sheath shall be in line with IEC recommendations, meeting short circuit requirement of REL. ®
10	Outer Sheath	The outer sheath (with termite repellent, anti-rodent, U/V resistant & Free from chlorinated paraffin, resistant to sulphide found in the ground shall consist of extruded black coloured HDPE. Minimum thickness of outer sheath at any point shall be 4.3 mm (mentioned in GTP Sr. No. 38 also) & Nominal thickness shall be in line with IEC standards. Extruded Semi conductive layer on outer sheath shall be considered.
11	Cable Rating	The cable shall be suitable to carry continuously rated load current on 220 KV, single circuit, without exceeding the maximum conductor temperature of 90 deg. C.
		b) The current rating shall be calculated based on the following data unless the same are different from those indicated in Part -B: i) Soil thermal resistivity – 1.40 deg.C Mtr / Watt ii) Ambient temperature – 50 deg C iii) Ground temperature 35 deg C. iv) Trefoil formation v) As per the type of bonding recommended by the vendor vi) depth of laying □ 2000 mm As per the proposed laying methodology (refer Annexure attached in Volume 2 )  Any other additional requirement for cable laying, if necessary can be recommended for R-Infra-T
12	Drum Length	Economic drum length is to be determined by the contractor. However for bidding purpose the drum length of the cable shall be considered as 500 M. Approximate total requirement shall be as per Part B of this Specification. Exact length shall be confirmed at

		later stage after confirmation by contractor of route length + cable required for terminations and joints. The tolerance in drum length shall be + 2 %. The overall quantity tolerance shall be + 2 %.
13	Short length of cables	Manufacturer shall be required to take prior approval from Engineering and Procurement for any short length supply. Manufacturer shall not be allowed to put two cable pieces of different short lengths in same cable drum.
14	Embossing	The extruded outer sheath shall be embossed with Sequential length marking at interval of every one meter. The ‘Start’ end meter marking and ‘Finish’ end meter marking and the drum lengths shall be printed on the drum flange along with other markings. The outer sheath shall also be embossed with (min.) a) Voltage designation b) Type of construction / cable code (e.g. 2XLYC2Y) c) Nominal cross sectional area of conductor & material d) Manufacturers name & trade mark e) Name of buyer (RInfra-T, Mumbai) f) Month & year of manufacturing g) P.O. No. & Date h) Batch No. or Lot No. or Drum no. (For traceability purpose, in case of any future issues / problem in cable) ®
15	Cable Accessories	As per IEC standards with latest amendments. Silicon or EPDM rubber based stress cones are acceptable.  a) The straight through joints shall be pre-molded type with metal casing (for sheath continuity) and compound filled FRP / HDPE casing.  b) Outdoor termination (composite type -with resin-glass fiber tube equipped with silicone sheds (including connectors /clamp). Outdoor type terminations / housing shall be suitable for hot line washing with Insulator creepage distance of 8500 mm minimum

(ix) **Constructional details**

(a) **Conductor**

1. Single core conductor having Milliken construction, shall consist of stranded, Segmental, compacted circular annealed copper wires conforming to IEC -60228.
2. The wires shall be made of high conductivity copper and shall be stranded and compacted.

2. **220 kV Outdoor terminations**

- (a) Outdoor terminations shall be self-supporting and suitable of installing in areas with heavy industrial pollution, tropical or near coastal areas. Therefore, the insulators creepage distance must be suitable for pollution class E according to IEC 60815-1. The corresponding specific creepage distance of the insulator shall be measured over the r.m.s. value of the phase to ground maximal system voltage.
- (b) The termination shall be suitable for installation in vertical or in inclined position up to 45° on transmission line (T/L) Towers. For this purpose and to reduce weight on T/L towers, the insulator housing shall be of Polymer type suitable to exposure to the full solar UV radiation. The base of the termination shall be insulated from supporting steelwork by mounting upon pedestal type insulators.
- (c) The insulator housing shall be dry type or be filled with high viscosity pouring compound. The termination construction must allow the thermal expansion of the cable insulation. For this purpose, the stress cone units must be made of flexible silicone Rubber to allow the radial expansion of the cable insulation at all operation conditions.
- (d) The termination contact top bolt shall provide a sliding system allowing the axial movement of the cable conductor thus avoiding cable bending In the termination insulator housing. The termination conductor connector shall be of compression type or bolted type. The cable manufacturer and/or contractor will liaise fully with the accessory manufacturer in the definition of the necessary base of the termination as well as necessary outer diameter at the top of the connector of in order to ensure that the cable terminations will interface correctly with the support structure and connection to the Transmission line.

3. **Link boxes**

- (a) Link boxes shall be made of stainless steel plate of sufficient mechanical strength and enclose links and surge arrestors. The insulated type straight through joints shall be connected to cross link box by means of single core cable and through links and surge arrestors to be connected to earth. Provision for transposition of sheath and screen by cross bonding shall be made in cross-link boxes. The insulating plate to mount the terminals inside link box shall be of epoxy resin.
- (b) The link plate and earthing terminal shall be of copper. Underground type link boxes shall be of water proof design to withstand for permanent installation in pits with 1 m depth below the ground surface. The normal type of straight through joints shall also be connected to link box by means of single core cable and through links. The connecting terminals and disconnecting link shall be of copper. The link boxes in between the route shall be of buried type and those at the termination and shall be of structure-mounted type.

4. **Link Box with SVL (Surge voltage Limiter)**

- (a) In order to minimize transient over voltage on cable outer sheath, Link Box with SVL shall be installed at insulated joints at either cross bonded positions or unearthed ends of single point bonded sections. Under some circumstances, SVL may be installed across the insulation flange on a SF6 Gas Termination. The SVL (Surge voltage Limiter) shall be of the non-linear resistor type and shall be made of zinc oxide

7. **Transit damage:** The seller shall be responsible for any transit damage due to improper packing.
8. **Equipment identification label:** The following information shall be marked on the Package:
- Trade name or trade mark; if any
  - Manufacturer's & Buyer's name
  - Type of cable sq.mm and voltage for which it is suitable
  - Month & Year of Manufacturing
  - Port of Destination
  - Equipment Serial no.
  - Gross weight of Package

9. **Storage conditions & guidelines:**

- i) Parts or materials of high voltage accessories may have different storage durations and conditions. The storage durations shall be listed in the tables.
- ii) Expiry and production date shall be labeled at the packaging of the relevant parts and materials.
- iii) Having maximum shelf life of components in accessories kit shall be preferred on priority during evaluation of vendor.
- iv) Storage conditions of silicone rubber parts (stress cones and joint bodies) & Silicone oil shall be specifically mentioned:
- v) Maximum storage time & production date/ expiry date shall be specifically mentioned for each component in kit content as per following format:

Material Description	Maximum Storage time / Shelf life	Expiry date / Production date

- vi) Guidance for safe and correct handling of packed accessories shall be specifically mentioned.

10. **Special storage packing**

(a) **for silicone rubber parts (stress cones and joint bodies):**

- 1. Single piece silicone rubber stress cones used in terminations and silicone rubber joint bodies used for joints, shall have a maximum storage time. The material shall be able to stored significantly for longer period. The influence of moisture on the silicone rubber part during the storage time must be considered during packing of material.
- 2. It is very important that, these silicone rubber parts shall be packed in a special bag, allowing to store them up to minimum 5 years starting from the date of delivery at site.

(b) **for silicone oil**