

# NAGPUR METRO RAIL CORPORATION LIMITED

Date: 22.08.2016

## Tender No. N1TR01/2016

**Name of the work:** Design, Supply, Installation, Testing & Commissioning of Switching Substation, Receiving Cum Auxiliary Main Cum Traction Sub Stations Including High Voltage Cabling from Grid Substation, 33kV Cable Network, ASS & SCADA System for Nagpur Metro Rail Project

### Corrigendum-IV

**Part A: Reply to Pre-bid queries**

**Part B: Addendum**



508 General Manager  
(Procurement)  
NMRCL, Nagpur

**Part A: Reply to Pre-bid queries**

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
1	Part 1, Page 14 & 50	Cl. No. C14/ITB, Subclause no. ITB 14.8 BDS	Bidders shall quote for the entire work on a "single responsibility basis" ..... In the Bid Documents.	<p>We would like to inform you that Tender Specifications does not clarify the type of Contract(s) to be awarded to successful bidder i.e. Divisible or indivisible.</p> <p>We request you to please clarify the number of contractors to be made for this package.</p> <p>In addition to above, in case of divisible contract (if applicable), please clarify how many (with scope limits) contracts shall be awarded.</p> <p>Above is important for overall Tax structuing according to type of contract.</p> <p>Further please note that in case of Single Contract, WCT may be applicable on entire value of Contract instead of only on the Service portion.</p> <p>We understand that in case of applicability of WCT (in case of Single Contract), same shall be reimbursed by NMRCL at actuals. Please <u>confirm / clarify our understanding.</u></p>	The tender conditions are self-explanatory and no changes foreseen
2	Part 1, Page 44 & 11	Subclause no. ITB 11.4.1.14/BDS & Cl No. 1.1.3.2 GC	Commencement Date Effective Date	We understand that effective (zero) date of Contract shall be date of handing over of encumbrance free lan by NMRCL with fulfilment of Employer's obligations. We request you to please confirm the same.	The tender conditions are self-explanatory and no changes foreseen
3	Part 1, Page 49&50, Page 4 of 155	Subclause ITB 11.5.1 & 14.5 BDS Cl 1.7 / Pricing Document	Any new taxes or any statutory variation [which comes into effect after the last date of submission of Bid] in Customs Duty, Excise Duty and Sales Tax (VAT or CST as applicable) on finished product / item during the contractual completion shall be to the Employer's account for which the Contractor shall furnish the documentary evidence in support of thier claims. However, any increase in cost due to new taxes or change in existing taxes introduced during extended contractual period due to Contractors fault (shall be to Contractor's account).	<p>As per the said clause, we understand in case any new taxes or any statutory variation occur during the contractual period, the same shall be to the Employer's account and shall be reimbursed at actual for both in house and bought-out items. Please confirm.</p> <p>Also, any statutory variation during the delayed period shall be in Customer's account. In case the delay is for the reasons not attributable to Contractor.</p>	Your understanding is correct
		Cl No. 44 (Subclause 13.7 - Adjustments for Changes in Legislation)/PC	The Contract Price shall be adjusted to take into account any new taxes or any statutory variation in Custom Duty, Excise Duty and Sales Tax (VAT or CST as applicable) on finished product / item during the contractual completion period shall be to the Employer's account for which the Contractor shall furnish documentary evidence in support of thier claims. However, any increase in the cost due to new taxes or change in the existing taxes introduced during the extended contractual completion period due to the COntactor's fault shall be to the Contractor's account.		The clause is self-explanatory.
4	Part 1, Section IV and Part 3	Cl No. 4 (Pricing Document) Cl no. 14.7 GC Cl No. 48 (subclause 14.7) PC	Milestone payment schedule (MPS) Payment	We would like to inform you that, tender specifications does not clarify the Payment Terms applicable for this Project. We request you to kindly furnish the same.	Payment terms / procedure is descirbed in GC/PC (Clause 14 and subclauses).

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5	Part 3, page 27	CI No. 4.1 GC	Engineer's instructions	Any instructions given by the Engineer, Engineer's Representative of the Delagated Assistant shall be in writing only.  We request you to kindly accept the same.	Tender conditions prevail
6	Part 3, Page 49	CI No. 7.4 GC	The Engineer ... nstruct the contractor for any additional test.	Please confirm that necessary time extension for completion of job shall be granted by NMRCL in case any special test to be conducted by Contractor on Employer's instruction.	Tender clauses are self-explanatory
7	Part 3, Page 50	CI No. 7.6 GC	Notwithstanding any previous test or certification, the Engineer may instruct the Contractor to:	We understand that a reasoning shall be given by Engineer for the instructions to the Contractor as mentioned.  We request you to please confirm our understanding.	Tender clauses are self-explanatory
8	Part 3, Oage 51	CI No. 7.7 GC	Ownership of Plant and Material: Except as otherwise provided in the Contract, each item of Plant and Materials shall, to the extent consistent with the Laws of the Country, become the property of the Employer at whichever is the earlier of the following times, free from liens and other encumbrances:  (a) when it is incorporated in the Works (b) when the Contractor is paid the corresponding value of the Plant and Materials under Subclause 8.10 [Payment for Plant and Materials in event of Suspension].	We understand that ownership in equipment / material will transfer when such equipment / metarial is loaded on to mode of transport to site for works. Please clarify.	Tender conditions prevail
9	Part 3, Page 54	CI No. 8.6 GC	Rate of progress: Unless the Engineer notifies otherwise, the Contractor shall adopt these revised methods, which may require increases in the working hours and/or Goods, at the risk and cost of the Contractor. If these revised methods cause the Employer to incur additional costs, the Contractor shall subject to notice under sub-clause 2.5 [Employer's Claims] pay these costs to the Employer, in addition to delay damages (if any) under Subclause 8.7 below.	We would like to inform you that, if Contractor increases personnel for rate of progress, we do not foresee Employer incurring costs. Besides if there is actual delay in completion, delay damages (LD) shall be levied as a genuine pre-estimate. Contractor shall not be liable for extra cost under this clause because Delay damages shall be in full satisfaction. Please confirm.	Tender conditions prevail
10	Part 3, Page 55	CI no. 8.7 GC	Delay Damages: These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under subclause 15.2 [Termination by Employer] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract.	We would like to inform you that, Liquidated Damages shall be sole remedy for delay and in full satisfaction. Hence request you to please amend this clause as highlighted below in Blue.  These delay damages shall be the only damages due from the Contractor for such default, other than in the event of termination under Subclause 15.2 [Termination by Employer] prior to completion of the Works. These damages shall not relieve the Contractor from his obligation to complete the Works, or from any other duties, obligations or responsibilities which he may have under the Contract <b>and shall not prejudice the right of the Buyer to terminate the Contract after the maximum amount of liquidated damages has been reached, without any right to further indemnity or compensation.</b>	Tender conditions prevail
11	Part 3, Page 44 of 71 and 15 of 32	CI No. 9.1 GC & CI no. 22 PC	Taking Over Certificate	As per said clause, we understand that Taking over certificate shall be issued on completion of various sections of the jobs. In present case, we understand that Taking Over Certificate of each Substation and each Cable section shall be issued separately. Please confirm our understanding.	Refer GC Clause 10 and its subclauses regarding taking over, which are self-explanatory

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12	Part 3, Page 62 and 167	CI No. 11.4 GC and CI No. 42 PC	<p>If the Contractor fails to remedy the defect or damage by this notified date and this remedial work was to be executed at the cost of the Contractor under Subclause 11.2 [Cost of Remedying Defects], the Employer may (at his option):</p> <p>c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. Without prejudice to any other rights, under the Contract or otherwise, the Employer shall then be entitled to recover the reasonable costs incurred in remedying the defect or damage all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.</p>	<p>We would like to inform you that, clause 11.4 (c) is quite onerous for the Contractor. Request you to modify the same as highlighted below, so that only reasonable cost incurred by Employer in curing such defects is recoverable from Contractor as per clause 11.4 (a). Please confirm.</p> <p>c) if the defect or damage deprives the Employer of substantially the whole benefit of the Works or any major part of the Works, terminate the Contract as a whole, or in respect of such major part which cannot be put to the intended use. <del>Without prejudice to any other rights, under the Contract or otherwise,</del> the Employer shall then be entitled to recover the reasonable costs incurred in remedying the defect or damage <del>all sums paid for the Works or for such part (as the case may be), plus financing costs and the cost of dismantling the same, clearing the Site and returning Plant and Materials to the Contractor.</del></p>	Tender conditions prevail
13	Part 3, page 62 and 167	CI No. 11.4 GC and CI No. 42 PC		Further to the above, we would like to inform you that, the warranty obligations shall not apply if Employer uses the equipment beyond the recommended use as per O&M manual. Or fails to properly operate and maintain the equipment as per documentation. Please confirm.	Tender clauses are self-explanatory
14	Part 3, page 91	CI no. 17.1 GC	Indemnities	We would like to inform you that, the indemnity obligations of Contractor shall be limited to third party claims and for injury or property damages arising due to negligence and wilful misconduct of Contractor. Please confirm.	Tender clauses are self-explanatory
15	Part 3, page 95	CI no. 17.6 GC	<p>Limitation of Liability: Neither Party shall be liable to the other Party for loss of use of any Works, loss of profit, loss of any contract or for any indirect or consequential loss or damage which may be suffered by the other Party in connection with the Contract, other than as specifically provided in Subclause 8.7 [Delay Damages]; Subclause 11.2 [Cost of Remedying Defects]; Subclause 15.4 [Payment after Termination]; Subclause 16.4 [Payment on Termination]; Subclause 17.1 [Indemnities]; Subclause 17.4 (b) [Consequences of Employer's Risk] and Subclause 17.5 [Intellectual and Industrial Property Rights].</p> <p>The total liability of the Contractor to the Employer, under or in connection with the Contract other than under Subclause 4.19 [Electricity, Water and Gas], Subclause 4.20 [Employer's Equipment and Free issue Materials], Subclause 17.5 [Intellectual and Industrial Property Rights], shall not exceed the sum resulting from the application of a multiplier (less or greater than one) to the Accepted Contract Amount, as stated in the Contract Data, or (if such multiplier or other sum is not so stated) the Accepted Contract Amount. This subclause shall not limit liability in any case of fraud, deliberate default or reckless misconduct by the defaulting Party.</p>	<p>We would like to inform that, there are too many exceptions to the limitation of liability clause, making the clause non-effective.</p> <p>The exceptions leave the Contractor exposed to risk higher than 100% of the contract value. Therefore we request that there shall be no exceptions to the exclusion of indirect and consequential damages clause. And IPR infringement shall be the only exception to limitation of aggregate liability clause. These clauses shall prevail over any other clause and all liability shall cease to exist upon termination / expiration of contract.</p> <p>Please confirm.</p>	Tender conditions prevail
16	Part 3, page 123	CI No. 6 PC	Defect Liability Period	Defect liability period shall start within 30 days from the date of readiness of Substations for charging in case charging of Substation is delayed due to reasons not attributable to Contractor.	Tender conditions prevail

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17	Part 3, Page 187	Cl no. 69 PC	Safe Custody Bank Guarantee The Contractor shall submit a Safe Custody Bank Guarantee in the format given in Section X. Contract Forms against payments made for Plant and Equipment dispatched from manufacturer's works. The amount of safe custody Bank Guarantee shall be equal to 95% percent of the amount due as per relevant clause wherever applicable. The value of the Safe	We request you to delete the requirement of Safe Custody Bank Guarantee equal to 95% percent of the amount due, as this is not a standard requirement. Please confirm.	Tender conditions prevail
18	Part 3	Form C		We understand that Form C shall not be provided by NMRCL for this Contract	Form C shall be provided by NMRCL
19		Additional Clause	No Nuclear use	We request you to kindly include the below mentioned clause:  The Material / equipment / services sold by the Supplier are not intended for use in connection with any nuclear facility or activity, and the Purchaser warrants that it shall not use or permit other to use the material / equipment / services for such purpose, without advance written consent of Supplier.  Consent of Supplier under this section to any nuclear use, if any, will be conditioned upon additional terms and conditions that Supplier determines acceptable for protection against nuclear liability.	No changes foreseen
20	Parent Company Guarantee Format	1a	Parent company Undertaking: shall transfer assign or otherwise dispose of or deal with ownership of the whole or any part of EITHER [the shareholding or other interest in the Contractor] [see Note 3] OR [the shareholdings or other interests] [see Note 4] referred to in Recital (C) in any way which will affect the beneficial ownership and control in [the Contractor] [ see Note 3] of the Parent Company [and the other companies referred to in Recital (C)] [ see Note 5]; and	This clause pertains to the shareholding pattern of the Contractor and parent company and does not affect the performance of the Contract between the Employer and the Contractor. Hence, we request NMRCL to withdraw this clause.	The Para 1 of PCU amended (instead of Employer's consent, the company just need to inform the Employer).  Refer to Addendum
21	Parent Company Guarantee Format	21, 2b and 2c	Parent company undertaking:  (a) any suspension of the Works, variation or amendment to the Contract (including without limitation extension or time for performance) or any concession or waiver by the Employer in respect of the Contractor's obligations [and/or the obligations of [...]] [see Note 7];  (b) any provision of the Contract being or becoming illegal, invalid, void, voidable or unenforceable;  (c) the termination of the Contract or of the employment of the Contractor and/or [...] under the contract for any reason.	We request you to please delete said clause	Tender conditions prevail
22	Parent Company Guarantee Format	1	Parent company Guarantee:  In consideration of the Employer entering into the Contract with the Contractor, the Guarantor irrevocably and unconditionally guarantees to the Employer as a primary obligation and not as a surety due performance by the [Contractor	Request you to kindly add the following the at the end of Clause 1:  And that the Guarantor's liability shall be limited at 100% contract value. The guarantor shall be entitled to all defenses, limitations of liability available to the Contractor under the Contract.  These clarifications are already available to the Contractor as per GC/PC and hence shall be extended to the Parent company also.	The Para already incorporates such limitation of liability in Guarantor (no greater liability on Guarantor than that of Contractor).  No changes foreseen

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23	Parent Company Guarantee Format	3	Parent Company Guarantee  This Guarantee shall extend to any variation of or amendment to the Contract and to any agreement supplemental thereto agreed between	Please add the following at the end of Clause 3 Subject to the limit proposed in Clause 2 above  This is already covered in the GCC/SCC for the main Contractor.	Tender conditions prevail
24	Parent Company Guarantee Format	4	Parent Company Guarantee  This guarantee is a continuing guarantee and accordingly shall cover all of the obligations and liabilities of the [Contractor] [see Note 2] under the Contract and remain ...	Please add the following at the end of line 4  This guarantee shall however expire at the end of defect liability period set forth in GCC/SCC.  This is already covered in the GCC/SCC for the main contractor.	Refer response against SN 22 above (the liability on Guarantor is not greater than that on Contractor).  No changes foreseen
25	Parent Company Guarantee Format	4	Parent Company Guarantee  This guarantee is a continuing guarantee and accordingly shall cover all of the obligations and liabilities of the [Contractor] [see Note 2] under the Contract and remain ...	Please add the following at the end of line 4  Being however specified that the Employer shall not be entitled to any double recovery.	Refer response against SN 22 above (the liability on Guarantor is not greater than that on Contractor).  No changes foreseen
26	Parent Company Guarantee Format	6	Parent Company Guarantee  The Employer shall be entitled to assign the benefit of this Guarantee at any time without the consent of the Guarantor or the [Contractor] [see Note 2] being required	Please modify this clause as per below:  The Employer shall be entitled to assign the benefit of this Guarantee at any time with the prior written consent of the Guarantor and such consent shall not be unreasonably withheld by Guarantor.	Tender conditions prevail
27				We would like to inform you that all above request of modification in Parent Company Guarantee does not affect the overall liability of Contractor and can be considered for amendment	Refer above
28	Part 2, Section VII-B	CI No. 7.1.3.1.2	Transformer plus ventilation system noise level should not exceed 70 dB, at a distance of 1.5m	We would like to inform you that, the Noise level shall be as per NEMA standard TR-1. Request you to please accept the same.	Refer to SN 338 of previous clarifications
29	Part 2, Section VII-B	Clause no. 7.1.3.1.3 & Appendix B, CI 2.1	Rated power	As per this clause, the transformer rating is given as 10/12.5 MVA (ONAN/ONAF). However as per Part 2, Section VII-B, Appendix B, CI 2.1, the rating is 10 MVA (ONAN). Kindly confirm the actual requirement.	It is 10/12.5 MVA. CI 2.1 of Appendix B modified  Refer to Addendum
30	Part 2, Section VII-B	Clause no. 7.1.3.1.6.2	The on-load tap changer shall be single phase enclosure type, installed in a separated oil tank, offering 16 steps, each representing 1.667% of the nominal voltage as follows	We would like to inform you that, the OLTC shall be three phase intank type instead of single phase type. However, we confirm that diverter switch contacts shall be housed in a separate oil chamber not communicating with the oil in the main tank of the transformer. Request you to please accept the same.	Clause 7.1.3.1.6.2 amended (3 phase type) and new subclause 7.1.3.1.6.6 added (for alternate design of OLTC).  Refer to Addendum
31	Part 2, Section VII-B	Clause no. 7.1.3.1.8	Short circuit withstand	We would like to inform you that, tolerance on impedance shall be as per IEC 60076. Request you to please accept the same.	Tender conditions prevail
32	Part 2, Section VII-B	Clause no. 7.1.3.1.11	Windings	We would like to inform you that, curretn density for each winding should be not more than 2.5 A/mm2 at normal tap. Request you to please accept the same.	Tender conditions prevail
33	Part 2, Section VII-B	Clause no. 7.1.3.1.13	Tank	We would like to inform you that, the transformer tank shall be made of high quality low carbon mild steel in place of boiler plate steel and shall be connected to the earth directly instead of through current transformer. Request you to please accept the same.	Tender conditions prevail
34	Part 2, Section VII-B	Clause no. 7.1.3.1.15.4	Control and monitoring cabinets	We would like to inform you that, the cooler control cabinet and RTCC panel shall be of CRCA sheet steel instead of stainless steel and shall have the same paint as main tank instead of power coating. Request you to please accept the same.	Tender conditions prevail

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
35	Part 2, Section VII-B	Clause no. 7.1.3.1.17.1	For transport either by road, ship or rail, the transformer shall be filled with oil upto windings top and then with Nitrogen at recommended pressure upto the tank top or alternatively, the transformer may be filled with Nitrogen, in full, during transportation.	We would like to inform you that, for transport either by road, ship or rail, the transformer shall be filled with oil and then with Dry air instead of Nitrogen upto the tank top. Request you to please accept the same.	Clause no. 7.1.3.1.17.1 amended Refer to Addendum
36	Part 2, Section VII-B	Appendix B, Clause no. 2.2		We would like to inform you that, the operating voltage of OLTC shall be 72.5kV instead of 132kV and its insulation level shall be 325kVp and 140 kVrms as 72.5kV class OLTC shall be enough for neutral end application of 132kV HV winding. Request you to please accept the same.	Tender conditions prevail
37	Part 2, Section VII-B	Appendix C, Clause no. 1.1		We would like to inform you that, we have conducted Short Circuit test on 25 MVA, 132/33kV Power Transformer for RRVPNL. The short circuit test report for the same is attached for your reference. Since the offered transformer is of lesser rating than the Short Circuit tested transformer, we request you to kindly waive off the requirement of Short Circuit test for us based on this report.	Refer to Clause 9.2.6.1 of GS (Section VII-A) which is self-explanatory. No changes foreseen
38	Part 2, Section VII-B	Clause no. 6.3.2.2	Transformer noise level should not exceed 75dB measured at a distance of 1.5m	We would like to inform you that, the Noise level shall be as per NEMA standard TR-1. Request you to please accept the same.	Refer to SN 338 of previous clarifications
39	Part 2, Section VII-B	Clause no. 6.3.2.4.3		We would like to inform you that, the OLTC shall be intank type. However, we confirm that diverter switch contacts shall be housed in a separate oil chamber not communicating with the oil in the main tank of the transformer. Request you to please accept the same.	New subclause 6.3.2.4.8 added (for acceptance of alternate design) Refer to Addendum
40	Part 2, Section VII-B	Clause no. 6.3.2.9.6	Current density for each winding shall be not more than 2.5 A/mm <sup>2</sup>	We would like to inform you that, current density for each winding should be not more than 2.5 A/mm <sup>2</sup> at normal tap. Request you to please accept the same.	Tender conditions prevail
41	Part 2, Section VII-B	Clause no. 6.3.2.11.1	Tank and radiators	We would like to inform you that, the transformer tank shall be made of high quality low carbon mild steel in place of boiler plate steel and shall be connected to the earth directly instead of through current transformer.	Tender conditions prevail
42	Part 2, Section VII-B	Clause no. 6.3.2.13.5	Control and monitoring cabinets	We would like to inform you that, the cooler control cabinet and RTCC panel shall be of CRCA sheet steel instead of stainless steel and shall have the same paint as main tank instead of power coating.	Tender conditions prevail
43	Part 2, Section VII-B	Clause 6.3.2.15.1	For transport either by road, ship or rail, the transformer shall be filled with oil upto windings top and then with Nitrogen at recommended pressure upto the tank top or alternatively, the transformer may be filled with Nitrogen, in full, during transportation.	We would like to inform you that, for transport either by road, ship or rail, the transformer shall be filled with oil and then with Dry air instead of Nitrogen upto the tank top. Request you to please accept the same.	Clause no. 6.3.2.15.1 amended Refer to Addendum
44	Part 2, Section VII-B	Appendix C, Clause no. 3.1		We would like to inform you that, we have conducted Short Circuit test on 21.6/30.24 MVA, 132/27kV Traction Transformer for RDSO/CORE. The short circuit test report for the same is attached for your reference. Since the offered transformer is of lesser rating than the Short Circuit tested transformer, we request you to kindly waive off the requirement of Short Circuit test for us based on this report.	Refer to Clause 9.2.6.1 of GS (Section VII-A) which is self-explanatory. No changes foreseen
45	Part 1, Section IV	Annexure IV A, Appendix R	IEEMA Price Variation Formula	We would like to inform you that, the IEEMA Price Variation formula given for Transformers is older formula. IEEMA has revised the PV wef 1st April 2015. The same is attached for your reference. Kindly revise the same in the tender documents.	Confirmed and revised IEEMA circular (2015) is attached Refer to Addendum
46	Part 2, Section VII-B	Clause no. 7.1.1.42	The isolators shall be of two-column rotary center break type, with two moving parts (two rotating columns). They shall be protected against corona discharge by providing metallic ring.	We would like to inform you that, the same shall not be applicable for GIS. All movements are telescopic. Please confirm.	Clause 7.1.1.42 amended Refer to Addendum

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47	Part 2, Section VII-B	Clause no. 7.1.1.47	To unify the equipment, the current transformers shall be SF6 insulated. That means the active part of the CT, primary and secondary are enclosed into a chamber full of SF6 to ensure isolation between the both winding and to reduce the dimension of the active part. In this system the tank is at the primary potential, contrary to the general case of current transformer oil insulated where the tank is insulated.	We would like to inform you that, our CT LV cores are mounted outside the gas chamber. Request you to please accept the same.	Clause 7.1.1.47 amended  Refer to Addendum
48	Part 2, Section VII-B	Clause no. 7.1.1.49	Each incoming section shall be equipped with measuring and protection current transformer on each phase	Request you to kindly confirm whether there is a requirement of additional CT for metering	Confirmed, Clause 7.1.1.49 amended  Refer to Addendum
49	Part 2, Section VII-B	Clause no. 7.1.2.2.1	Each Incomer Bay (2 Nos.) consisting of: (f) Voltage Transformer with motor operated isolation device of rated insulation	We would like to inform you that, voltage transformer are provided by manual disconnecting links. Request you to please accept the same.	Tender conditions prevail
50	Part 2, Section VII-B	Clause no. 7.1.2.2.6	New Gas charging equipment with gas cylinders for each set of the newly constructed GIS substation covered in the scope of work; After commissioning this will become property of Employer. The Contractor would be required to hand over them in proper working condition with enough gas for one charging of complete system.	Please confirm if the above requirement is for Gas Handling Equipments mostly of DILLO make or Please provide us the specification for Gas charging equipment to consider	The clause is self-explanatory.
51	Part 2, Section VII-B	Clause no. 7.1.2.3.6	Internal insulation level between live parts and earth when the pressure of the gas goes to the atmospheric pressure should not be less than 1.2*(132 kV )/1.732kV.	We would like to inform you that, there is no relevant standard governing this condition. Please clarify.	Tender conditions prevail
52	Part 2, Section VII-B	Clause no. 7.1.2.3.20	It should be possible to remove and replace a fully assembled circuit breaker without interfering the operation of the adjacent feeder. All circuit breakers should be interchangeable.	We would like inform you that, Circuit Breakers active parts can be taken out and not the complete CB in the proposed design.	The clause is self-explanatory.
53	Part 2, Section VII-B			We would like to inform you that, only type test reports as per IEC 62271-203 will be provided during detail engineering. We do not envisage and additional / repetition of any type tests. Please confirm.	Refer to Clause 9.2.6.1 of GS (Section VII-A) which is self-explanatory.  No changes foreseen
54		Technical	Air conditioning and ventilation system	We understand that only Control Room will be air conditioned in the Control Room Building. We are envisaging air cooled Hi-wall split AC (2TR) (3-star rating) with 50% standby arrangement for Control Room. Please confirm	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
55		Technical	Air conditioning and ventilation system	We understand that Site offices (Project Manager office, Resident Engineer office, Site inspectors office, General office, rest room etc.) will be air-conditioned.  We are envisaging air-cooled hi-wall split AC (1TR / 1.5TR / 2TR) (3-star rating) without standby arrangement for site offices (Project Manager office, resident engineer office, site inspectors office, general office, rest room etc.). Please confirm	Yes, the site offices shall be air-conditioned. Further detailing shall be at the project execution stage.
56		Technical	Air conditioning and ventilation system	We would like to inform you that, only inside dry bulb temperature 20 to 27 degree C can be maintained but RH 60% cannot be maintained by split AC inside the Control Room of Control Room building. Please confirm.	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.

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57		Technical	Air conditioning and ventilation system	<p>We would like to inform you that, as per clause no. 6.5.2.5.4 (page no. 108 of 219 of tender specification) in Switchgear room inside dry bulb temperature to be maintained maximum 35 degree C and RH maximum 70%.</p> <p>However, as per clause 6.5.3.4.3 &amp; 6.5.3.4.4 (Page no. 111 of 219 of tender specification) forced ventilation is required.</p> <p>Request you to clarify the actual requirement.</p>	<p>The clauses are self-explanatory and these are in harmony with each other. The requirements shall be complied.</p> <p>No changes foreseen.</p>
58		Technical	Air conditioning and ventilation system	<p>We would like to inform you that, by dry type ventilation system with Fan, Temperature inside the room cannot be maintained. Inside room temperature shall be 5 degree C higher than Ambient temperature.</p> <p>Whereas by Wet type ventilation system (considering airwasher system) Room temperature can be maintained 5 degree C less than outside ambient temperature. Room temperature 35 degree C cannot be maintained throughout the year, because inside Room temperature will be changed based on outside ambient temperature.</p> <p>Request you to please clarify the type ventilation system to be considered for switchgear room.</p>	<p>The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.</p>
59		Technical	Air conditioning and ventilation system	<p>Request you to please confirm the which type ventilation system to be considered for Switchgear Room, positive or negative</p>	<p>The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.</p>
60		Technical	Air conditioning and ventilation system	<p>We would like to inform you that, as per clause 6.5.2.5.5 (page no. 108 of 219 of tender specification) in Battery room induced draft ventilation system is required considering 5 air change per hour.</p> <p>However, as per clause 6.5.2.4.3.3 (f) (page no. 106 of 219 of tender specification) air-conditioning to be done in the battery room.</p> <p>Both these clauses are contradictory, request you to please clarify which system to be considered for battery room.</p>	<p>Refer to earlier clarification and Addendum (battery room shall be draft ventilation)</p>
61		Technical	Air conditioning and ventilation system	<p>We are not envisaging any Ventilation system for GIS room (if any) in our offer. Please confirm</p>	<p>The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.</p>
62		Technical	Air conditioning and ventilation system	<p>We are envisaging propeller exhaust fan for toilet ventilation system in the Control Room building in our offer. Please confirm.</p>	<p>The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.</p>

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
63		Technical	Air conditioning and ventilation system	We are envisaging axial exhaust fan for toilet ventilation system in the Control Room building in our offer. Please confirm	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
64		Technical	Air conditioning and ventilation system	We are envisaging pressurized ventilation system with supply air axial / cabinet type fan and exhaust air axial / cabinet fan for dry type ventilation system of ground floor cellar of control room building in our offer. Please confirm	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
65		Technical	Air conditioning and ventilation system	No ventilation system is envisaged in our offer for any type of underground or overground tunnel. Please confirm.	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
66		Drawings		Request you to please furnish us the Overall Plot Plan / Substation layout drawing showing the upcoming various buildings, switchgear room building, control room building, transformers, site offices & switchyard panel rooms (if any), tunnel and existing fire pump house location.	It is Contractor's responsibility to develop designs, being a Design & Build contract. The substation plot location has been provided in the tender drawings already.
67		Drawings		Request you to furnish us the GA / Architectural drawing of Switchgear Room building, control room building, site offices (project manager office, resident engineer office, site inspectors office, general office, rest room etc.), tunnels, cable cellar, GIS room (if any) to calculate the HVAC & Fire equipment capacity.	It is Contractor's responsibility to develop designs, being a Design & Build contract. The substation plot location has been provided in the tender drawings already.
68		General		Request you to please furnish us the detail specification & make list of HVAC, fire protection and detection system.	It is Contractor's responsibility to develop designs and obtaining approval of Engineer.
69		Technical	Fire Protection & Detection System	We understand that, conventional type fire detection system alarm system to be considered only for Switchgear Room & Control room building. We are envisaging conventional type fire detection alarm system only for switchgear room and control room building in our offer. Please confirm.	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
70		Technical	Fire Protection & Detection System	Further to the above, we understand that, no other building fire detection alarm system is to be envisaged. Please confirm	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
71		Technical	Fire Protection & Detection System	We understand that, NIFPS system to be considered for 10 MVA and above capacity transformer as per tender specification clause no. 7.1.3.1.19 (page no. 130 of 219).  We are envisaging NIFPS system in our offer only for 10 MVA and above capacity transformer. Please confirm	The tender conditions are self-explanatory.
72		Technical	Fire Protection & Detection System	We understand that, no HVWS & hydrant system is required to be considered by bidder. Please confirm,	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
73		Technical	Fire Protection & Detection System	We would like to inform you that, portable fire extinguisher is envisaged in our offer for switchgear room & control room building & office, storage, work shop and hot work location & ground floor celler, power equipment room etc. Please confirm	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
74		Technical	Fire Protection & Detection System	We understand that gas flooding system to be considered for switchgear room as per clause 3.2.1.6.3 (d) (page 25 of 219) of tender spec). Please clarify which type of clean agent (IG 55 / IG 541 / IG 100 / NAFS 125 / NOVAC / FM 200) to be considered in our offer.	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
75	Part 2, PS	Table 11.1, Maintenance staff for PS & SCADA	Maintenance staff for PS & SCADA	We understand that with this clause, that manpower composition is only for maintenance purpose. Please confirm	Confirmed
76	Part 2, PS	Clause no. 11.1.1.2	Contractor shall set up PSI depot, corresponding stores, repair shops, which includes furniture, material racks staff cupboards, tools, instruments, material handling instruments, communication instruments, material consummable etc. in addition to proper upkeep of all the installations in PSI.	Request you to please clarify the contractor scope for setup of PSI depot, corresponding stores, repair shops. Request you to furnish us the details / drawings of the same to enable us to quote precisely.	The clause is self-explanatory. Further details to worked out by the Contractor and obtain approval of Engineer.
77	Part 2, PS	Clause no. 11.1.1.2	Contractor shall set up PSI depot, corresponding stores, repair shops, which includes furniture, material racks staff cupboards, tools, instruments, material handling instruments, communication instruments, material consummable etc. in addition to proper upkeep of all the installations in PSI.	Further to the above, request you to please furnish us the list of furniture, material racks staff cupboards, tools, instruments, material handling instruments, communication instruments, to be considered during AMC.	The clause is self-explanatory. Further details to worked out by the Contractor and obtain approval of Engineer.
78	Part 2, PS	Clause no. 11.1.2.1	Duties and responsibilities of Sr Engineer (PSI)	Request you to please clarify, the Sr Engineer (1 no.) is required to be deputed per substation or one (1) common Sr Engineer to be deputed for all substations - please clarify	Common for all substations No changes foreseen
79	Part 2, PS	Clause 11.1.2.7, 11.2.1.3, 11.2.1.4 & 11.2.1.5		We would like to inform you that we shall supply only list of tools, spares and testing instruments as per list / details provided in tender, however any additional tools, testing instruments & spares required shall be in customer scope. We shall help to identified the requirement of spares. Please confirm.	The clauses are self-explanatory
80				We would like to inform you that, replacement of faulty equipment with spare, cost towards repair of faulty equipment or its part, associated cost towards transportation / mobilization of faulty unit, staff for coordination, etc. are customer scope. Please confirm	The tender conditions are self-explanatory and no changes foreseen
81	Part 2, PS	Clause no. 11.1.2.6		We would like to inform you that, local transportation (vehicle) shall be in customer scope, if required at site. Please confirm	Your understanding is not correct. No changes foreseen
82	Part 2, PS	Clause no. 11.1.2.6		We would like to inform you that, the training to for staff shall be as per contractor's internal training schedules. Request you to please accept the same.	The training schedule proposal to be submitted by Contractor for approval of Engineer. No changes foreseen

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
83		General		We would like to inform you that, our maintenance team shall undertake day to day preventive maintenance & breakdown maintenance activities. However, in case of major equipment breakdown, OEM's Expert / Engineer will be deputed on additional charges on man-day basis. Deputation charges, requirement of special tools and tackles / test equipment (not supplied or listed under current contract) and its associated cost and formalities (like work order, etc.) will be in account of customer. Contractor's site team will support and coordinate with OEM engineer in reviving breakdown equipment. Please confirm.	The tender conditions are self-explanatory.
84		General		We would like to inform you that, special tools & tackles and test equipment (other than listed) required for maintenance activities or for equipment troubleshooting shall be arranged by NMRCL. Please confirm	The tender conditions are self-explanatory.
85		General		We would like to inform you that, spare SF6 gas and silica gel for replacement shall be customer scope of supply. Please confirm.	The tender conditions are self-explanatory.
86		General		We understand the spare and tools to be stocked are part of the main contract and those have to be maintained during DLP/AMC period.	The tender conditions are self-explanatory.
87		General		Request you to furnish us the list of major equipment which are classified as "major equipment" for which, a penalty of Rs 10000/- per day will be imposed in case the equipment is not working	Refer clause 9.2.7.1 of GS (Section VII-A). No changes foreseen
88	Part 2, PS	Clause no. 6.1.3	For validation of design of complete system, the Contractor shall arrange auditing of design of works within the scope of work which primarily covers Receiving cum Auxiliary cum Traction Substation, 33kV Power Supply system as per IEC and other relevant standards from reputed independent Agency (Auditor), who have already undertaken similar job in past for other metro system.	As per Qualification requirement of the tender it is clear that only an experienced company in the field of construction of substations can be participated in this package. Also requirement of present scope pertains to construction of 132/33/25kV RSS-cum-ASS-cum-TSS and laying of HT cable which will be a standard work for a qualified contractor.  Further, design prepared by Contractor can be vetted by Engineering department of NMRCL.  With this we do not foresee appointment of an independent agency (third party) for vetting of contractor's designs.  Considering above we request NMRCL to exclude appointment of an agency for vetting contractor's work from Contractor's scope.  If, NMRCL wants to get validation of design done by an independent agency same can be hired by customer directly. Contractor can submit his design to agency hired by NMRCL. Request NMRCL to delete the hiring of an agency for design validation from contractor's scope.  We request you to please accept our recommendation	Tender conditions prevail
89	Part 2, PS	Clause no. 3.2	145kV gas insulated (indoor type) switching substation at Mankapur GSS of MSETCL	We understand that 132kV SSS/GSS (in premises of PSA/MSETCL) is in present scope whereas incomer arrangement for 132kV line bays like 132kV cable support structure arrangement, laying of 132kV cable, FO cable and its accessories etc. are excluded from the present scope. Please confirm our understanding.	Your understanding is not correct. Please refer interface matrix (Appendix A to PS).
90	Part 2, PS	Clause no. 3.2	145kV gas insulated (indoor type) switching substation at Mankapur GSS of MSETCL	Further to the above we under that, cable trench within the boundary of the utility is excluded from the scope. Please confirm our understanding.	Your understanding is not correct. Please refer interface matrix (Appendix A to PS).

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
91	Technical	SLD no. NMRP/LIPL/EL/006 NMRP/LIPL/EL/007 NMRP/LIPL/EL/008	Single line diagram	As per tender SLD, there is no future bays / scope. Please confirm our understanding.	Please follow the PS and Tender Drawings
92	Technical	Clause no. 5.3 & SLD no. NMRP/LIPL/EL/009 NMRP/LIPL/EL/010 NMRP/LIPL/EL/011 NMRP/LIPL/EL/012 NMRP/LIPL/EL/013	33kV AMS & 25kV TSS	We understand that no future bay provision is to be considered for the 25kV & 33kV switchgears. Please confirm our understanding.	Please follow the PS and Tender Drawings
93	Technical	Clause no. 7.1.4.5	Low voltage AC distribution board	Kindly provide SLD and details BOQ for LVSB1 and LVSB2 board used in RSS for auxiliary supply.	The design is in scope of contractor as it is a Design & Build tender
94	Technical	Clause no. 7.1.4	Provision of 2 x 100/200kVA dry type transformers for station supply of RSS	Please confirm exact requirement (100kVA or 200kVA) of auxiliary dry type transformer at RSS.	Refer previous clarifications and addendum (it is 200kVA)
95	Technical	Clause 3.2.1.6.3	Panel gas flooding system	Request you to please clarify this requirement & furnish the technical requirement	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
96	Technical	General	Design services	We would like to inform you that, our offer shall be based on the rating / parameters specified in the NMRCL tender documents for all equipment material including 132kV/25kV switchgear, traction transformer, auxiliary main transformer, station auxiliary transformer, EHV/MV cable sizes and other major equipments etc.  Any change in the rating / parameters shall have cost implications and hence not envisaged. Request you to please accept the same.	Tender clauses are self-explanatory. The responsibility for design lies with the Contractor.
97	Technical	General	Type test requirement of Traction Transformer	Request you to please confirm requirement of short circuit type test for traction transformer.	Tender clauses are self-explanatory
98	Technical	Clause no. 7.1.2.10 & 7.4.2.1	Fault level / short time current	Reference to the cited clauses we understand that 132kV system fault (short circuit level) is 31.5kA for 3 sec duration. However, the 132kV cable sizing shall be done for 22kA for 3 seconds duration. Please confirm our understanding.	Your understanding is only partially correct. The 132kV cable sizing shall be done for 40kA for 3 sec duration. Please also refer addendum-45
99	Technical	General		Any ROW & related compensation for 132kV EHV cabling from RSS to MSETCL / PSA GSS is excluded from Bidder's scope. Please confirm	Tender clauses are self-explanatory
100	Technical	Typical SLD for RSS-cum-AMS-cum-TSS	Tender single line diagram	We understand that the 132kV, 33kV and 25kV end terminals of the transformers shall be directly connected through cables with cable box arrangement.  With this no outdoor AIS type 132/33/25kV surge arresters envisaged in scope. Please confirm whether our understanding is correct.	The Contractor to develop designs duly complying with requirements for approval of Engineer. It is a detailed design stage matter will be dealt with appropriately at that time.
101	Technical	Clause no. 7.1.1.11	Creepage distance and clearance	Request you to please confirm the following:  1. Please confirm whether 25kV/mm creepage is acceptable 2. We understand creepage is applicable for outdoor equipments / bushings only.	Tender conditions prevail

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
102	Technical	Clause no. 7.1.2.2.7	EOT crane with VVVF drive for continuous operation for GIS equipment handling	We understand EOT crane to be provided for the 132kV GIS only. No EOT crane is envisaged for 25kV and 33kV switchgear. Please confirm our understanding.	Confirmed
103	Technical	Clause no. 7.2.3.6.6	Rated lightning impulse withstand voltage of 25kV TSS (GIS)	We understand that the rated lightning impulse withstand voltage for 25kV GIS (for TSS) and its associated components like circuit breakers, CTs, VTs etc. shall be designed for 250kVp. This is in line with CI no. 7.2.3.6.6 of technical specifications for indoor 25kV GIS. Please confirm our understanding.	Please refer to previous clarifications and addendum.
104	Technical	Clause no. 7.2.3.6.6	Rated short time current of 25kV TSS (GIS)	We understand that the rated short time current for 25kV GIS (for TSS) and its associated components like circuit breakers, CTs etc. shall be designed for 16kA / 3 sec. Please confirm	Tender clauses are self-explanatory
105	Technical	General		We understand that the control & protection system of 33kV switchgear shall be integral to the switchboard and no separate LCC is envisaged for 33kV system. Please confirm whether our understanding is correct.	Your understanding is generally correct, however, designs is in the scope of Contractor.
106	Part 2, PS	Clause no. 7.2	Traction scope	We understand that traction substation consist of 132kV/25kV transformer, 27.5kV switchgear and 132kV cable is in Bidder scope. Further, distribution upto overhead equipment (OHE) with protecting and sectioning equipment, 25kV cable (from transformer to switchgear & outgoing feeders) FP, SP and SS is in the others scope. Please confirm our understanding.	Your understanding is not totally correct. For demarcation of responsibility, please refer to Appendix A (Interfaces) to PS.
107	Technical	General	132kV cable data sheet	We would like to inform you that, there is a mismatch in 132kV cable size indicated in the referred clauses. Request you to please confirm the size and no. of runs per phase of 132kV cable to be considered by Bidder.	Query not clear and no proper clause reference provided. Response to query, as such, is not feasible.
108	Part 2, PS	Clause no. 7.1.3.2.1	LV Auxiliary Transformers	We understand LV auxiliary transformer rating is 100kVA. Request you to please furnish data sheet of 100kVA instead of 200kVA.	It is 200kVA Refer to previously issued clarifications and addendums
109	Technical	General	33kV cables technical sheet	We understand that the incomer to 33kV AMS switchgear from 132/33kV AMS transformer shall be fed through 19/33kV cable of size 3C x 400 sqmm (1 run per feeder) AL conductor. Please confirm whether our understanding is correct.	Refer to previously issued clarifications and addendums
110	Technical	General	25kV cables technical sheet	We understand that the incomer to 25kV TSS switchgear from 132/27.5kV traction transformer shall be fed through 19/33kV cable of size 1C x 240 sqmm (1 run per feeder) AL conductor. Please confirm whether our understanding is correct.	Your understanding is not correct. Please refer PS and tender drawings for clarity.
111	Technical	General	33kV outgoing cables	Kindly provide the no. of runs along with size of the cable for 33kV outgoing feeders (supplied by others) which will terminate at 33kV switchgear panel. So that size of the indoor cable trench & provision for same in switchgear can be decided.	Please follow the PS and Tender Drawings and other parts of Bid documents. Response to a query without reference to specific clause is not feasible.
112	Technical	General	25kV outgoing cables	Kindly provide the no. of runs along with size of the cable for 25kV outgoing feeders (supplied by others) which will terminate at 25kV switchgear panel. So that size of the indoor cable trench & provision for same in switchgear can be decided.	Please follow the PS and Tender Drawings and other parts of Bid documents. Response to a query without reference to specific clause is not feasible.
113	Technical	General	132kV spare cable	We understand no spare cable to be considered for the 132kV cabling between RSS and GSS.	Your understanding is generally correct, however, designs is in the scope of Contractor.

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
114	Technical	Clause no. 7.4.2.4.1	132kV cable	We understand that 1C x 240 sqmm cross section shall be used for 132kV cable. Kindly clarify copper conductor or aluminium conductor.  Please also confirm whether this cable is FR or FRLS type.	Refer clause 7.4.1.2 (all cables FRLS)  No changes foreseen
115	Technical	General	132kV cable laying	Please furnish the drawing showing typical cross section of buried cable laying & cable trench crossings to be followed for EHV cabling within RSS & outside RSS.  Also request you to please furnish us the typical sketch of cable bridge.	The design is in scope of contractor as it is a Design & Build tender
116	Technical	General	33kV & 25kV cable laying	Please furnish the drawing showing typical cross section of buried cable laying to be followed for 33kV and 25kV cabling	The design is in scope of contractor as it is a Design & Build tender
117	Technical	General	Layout drawing of RSS	Please furnish the following drawings for making bid stage estimation of lot items:  1. General switchyard layout plan for respective RSS1 & RSS2 2. Elevation & section drawing for respective RSS1 & RSS2	The design is in scope of contractor as it is a Design & Build tender
118	Technical	General	Plot / site plan of RSS @ Sitabuldi RSS1 and RSS2	Please furnish the plot / site plan of respective RSS1 and RSS2 of proposed RSS	Refer to tender drawings for RSSs plot
119	Technical	General	EHV cable route plan	Request you to please furnish the tentative "Cable route plan for 132kV cable from existing AIS substation located at RSS1 & RSS2 to proposed new RSS of NMRCL substation at Sitabuldi.	Refer to tender drawings for 132kV route from MSETCL GSS to NMRCL RSS
120	Technical	General	Control and monitoring block diagram	Request you to please furnish the referred drawing for the respective RSS	The design is in scope of contractor as it is a Design & Build tender
121	Technical	Foundation for cable termination at PSA end	Item no. 1 - Take-off points at PSA substations for AIS substations	We envisage that foundation at PSA end (Mankapur MSETCL end GSS) for 132kV cable termination is not in Bidder scope. Please confirm our understanding.	Your understanding is not correct. Please refer interface matrix (Appendix A to PS).
122	Technical	General	Solar power panel ... solar based lighting	We understand that solar power panel, solar based lighting is excluded from scope as same is not specified in tender scope. Please confirm our understanding.	Please follow the PS and Tender Drawings and other parts of Bid documents. Response to a query without reference to specific clause is not feasible.
123	Technical	General	25kV & 33kV cable path inside RSS and ASS looping	Request you to kindly specify the cable path or route for 25kV & 33kV outgoing cables in order to estimate cable trench.	The design is in scope of contractor as it is a Design & Build tender. Site visit was organized by NMRCL for Bidders' appreciation of site.
124	Technical	General		We presume that cutting of trees, dismantling of road, any kind of dismantling work shall be done by NMRCL. Please confirm our understanding.	Please follow the PS and Tender Drawings and other parts of Bid documents. Response to a query without reference to specific clause is not feasible.
125	Technical	General		We understand that emergency LV DG set is not required for all the RSS. Please confirm our understanding.	Please follow the PS and Tender Drawings and other parts of Bid documents. Response to a query without reference to specific clause is not feasible.
126	Technical	Typical SLD for RSS cum AMS cum TSS	33kV surge arrester	Refer to tender SLD, surge arresters are not shown both for incomer & outgoing feeders in 33kV switchgear. Please review & confirm the exact requirement.	The design is in scope of contractor as it is a Design & Build tender

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
127	Part 2, PS	Clause no. 7.1.6.1.2	Soil resistivity	Kindly provide soil resistivity values for all substations (GSS, RSS1 and RSS2, ASS, TSS & Depots)	Bidders to perform investigation themselves
128	Part 2, PS	Clause no. 7.1.6.1.4, 7.1.6.1.5 & 7.1.6.1.6	Fault level for earthing design calculation	We understand that, we have to design earthing system with consideration of 22kA/1 sec fault current for all substations (GSS, RSS, ASS & TSS). Please confirm.  In addition to above we understand that the Current Division Factor Sf shall be considered 0.5 for calculation purpose. Please confirm	Your understanding is generally correct, however, designs is in the scope of Contractor. And the clauses are self-explanatory.  No changes foreseen
129	Technical	SLD No. NMRP/LIPL/EL/004	Mihan Depot (Depot SSP)	We understand that scope for supply of 33kV Switchgear, 33/27.5kV, 5MVA Transformer, 25kV GIS shown in SLD for Mihan depot and Depot SSP is not in our scope. Please clarify.	Your understanding is correct
130	Technical		Bill of Material	Request you to please furnish the detailed Bill of quantity of SSS, RSS, AMS, TSS and HV/EHV cabling along with the explanatory notes for each line item.	It is a Design & Build package not a BOQ tender
131	Part 2, GS	Clause no. 2.3	IT Requirement of Employer	Request you to please clarify the Bidder's scope for the proposed IT system for subject package. Further request you to clarify the items / facilities customer shall be providing for this purpose.	The clauses are self-explanatory. Employer shall provide centralized server and other centralized IT infrastructure. Contractor shall provide software licenses as indicated in the clause, hardware / computers and other necessary facilities which are usually needed.  No changes foreseen.
132	Technical	CI 5.5.2.10	The Local Control Cubicle (LCC) ...	For the subject package, we propose the BCU to be part of bay control and relay panel and necessary interfacing can be done between LCC & control relay panel. Please confirm	Tender conditions prevail
133	Technical	CI 3.1.6 & 3.2.6.1	The equipment required for the project shall feature all equipments and systems required to form part of 132kV HT system, 33 kV Auxiliary power supply, 25 kV traction supply, Power Supply SCADA, control & monitoring system.	Request you to please confirm the communication medium between ASS & RSS & OCC.	Please refer tender drawing
134	Technical	General	SCADA	We presume that communication infrastructure between ASS & RSS, RSS & OCC/BCC is not in scope of bidder .Please confirm.	Confirmed However, it is expected that Bidders read the document before raising avoidable queries
135	Technical	General	SCADA	We request you to please provide station wise Conceptual BOQ and Architecture for SCADA Equipment.	Bidders to workout themselves based on the specs and tender drawings
136	Technical	CI 1.3.2 (13)	Interface	For Line differential protection, we request you to exclude the Fiber/Copper cable required for line differential protection. Please confirm.	Tender conditions prevail
137	Technical	CI 3.2.1.7.2 / Part	Providing a 'Gateway' to support control and monitoring of all 132kV system from the MSETCL Control Room. The gateway shall be Ethernet compliant.	As per the said clause, we understand that only, Required gateway is to be provided. We presume Required Communication infrastructure between 132kV system & MSETCL control room is not part of contract. Please confirm our understanding.	Your understanding is generally correct, however, designs is in the scope of Contractor.
138	Technical	CI 5.5.2.6	The SAS system shall be connected to two control centers on a fiber optic network....	We presume that communication equipment viz. PLCC, FOTE, Fiber cable for remote communication is not part of this contract. Please confirm	Please refer tender drawing
139	Technical		Control cable	We presume that supply of control cable is limited if both end equipment is supplied by bidder. Please provide your concurrence on our understanding.	Query is not linked to any clause and as such, cannot be responded

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
140	Technical		Protection philosophy	Please provide the protection & control philosophy for ASS & TSS	Please refer tender documents / drawing (query raised against specific clause can only be responded)
141	Technical	Cl 5.2	Protection philosophy	Please provide the protection philosophy for 132kV GSS to SSS cable feeder	Bidders to refer tender documents and assess themselves
142	Technical			We understand CRP SAS scope is limited to supply at SSS 132KV GIS at Manakpur, MIHAN Depot, Lokmanya nagar depot, RSS EW and RSS NS. Please confirm.	Please refer tender documents / drawing (query raised against specific clause can only be responded)
143	Technical			We presume that MANKAPUR GSS end panel for Feeder-1 & 2 are already available. Please confirm	Please refer tender documents / drawing (query raised against specific clause can only be responded)
144	Technical			If GSS end end panel are to be supplied by the bidder. Please confirm the existing make of busbar & SAS	Site visit was organized by NMRCL. Further assessment to be done by Bidders.
145	Technical			We presume that main & redundant IED (BCU/BPU) shall be mounted in same panel. Please confirm	The clauses are self-explanatory
146	Technical			We would like to inform you that, since hot standby concept is not possible for BCU, we request you to take hot standby concept only for BCU. Kindly provide your concurrence.	The clauses are self-explanatory
147	Technical			Request you to please clarify, whether the TSS is being built under separate contract	Please read full RFP before raising query. Avoid raising queries for sake of it.
148	Technical			We understand that, for all TSS feeders ( UP/DOWN/DEPOT ) , necessary relays shall be supplied in separate contract. The same will not be required to integrate to SAS/SCADA. Please confirm	Please read full RFP before raising query. Avoid raising queries for sake of it.
149	Technical			Please confirm if TSS relays shall be on IEC61850	Please read full RFP before raising query. Avoid raising queries for sake of it.
150	Technical			Please confirm the make of Energy meters. As per past experience in METRO we have offered LNT make ER300P. Please clarify if the same is acceptable to MSETCL/NMRCL	Bidders to assess themselves
151	Technical			As per the tender documents, 2 sets of RSS are being supplied as part of this package, please clarify, how the Mahan Depot feeders and Lokmanya nagar feeders will be connected to RSS SAS ( NS and EW)	Please refer tender documents / drawing (query raised against specific clause can only be responded)
152	Technical			Request you to please clarify the Distance between DEPOT to RSS.	Please read full RFP before raising query. Avoid raising queries for sake of it.
153	Technical			Please confirm if the busbar protection can be of High imp type with separate LBB relays.	Query not clear and no proper clause reference provided. Response to query, as such, is not feasible.
154	Technical			As per specification requirement, Backup OC and EF relay for line/Transformer/BC can be part of BCU, however in specification clause each Protection and Control functions shall be separate. Please clarify if BCU can be used for 50/51 protection.	Combined BCU and BPU is acceptable, subject to compliance with the specified requirements. Clause 5.5.3.4.3.1 amended.  Refer to Addendum
155				As per SLD 25KV Traction feeders are also shown, since there is no BOQ, please clarify if Traction protection panels are to be supplied.	Please read full RFP before raising query. Avoid raising queries for sake of it.

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
156				We would like to inform you that, Busbar is only envisaged for RSS SS only, For 33KV and 25KV are without busbar, please clarify.	Please read full RFP before raising query. Avoid raising queries for sake of it.
157				Peasel clarify for traction feeder protection , if we need to provide Imp protection + Pilot wire protection. Are both part of same contract?	Please read full RFP before raising query. Avoid raising queries for sake of it.
158			Substation Automation / SCADA	We understand that the communication infrastructure (i.e. PLCC/ Fiber/ FOTE etc ) between Substations (SSS/ RSS/ TSS/ ASS) and OCC/ BCC shall be in scope of Employer/ Buyer  Please confirm our understanding	Refer Interface Tables (Appendix A to PS)
159			SCADA	We understand that the communication infrastructure (i.e. PLCC/ Fibre/ FOTE etc ) between OCC and BCC shall be in scope of Employer/ Buyer  Please confirm our understanding	Refer Interface Tables (Appendix A to PS)
160			SCADA	Please confirm the communication protocol between OCC and BCC	Please read full RFP before raising query. Avoid raising queries for sake of it.
161			SCADA	Please clarify the requirement of Supply of Video Projection System. If required, please specify the number of cubes, size of Cubes, Lamp based or LED based etc (e.g. LED based 70" 2 x 2 configuration)	Refer Interface Tables (Appendix A to PS)
162			SCADA	We understand that the UPS and Battery for Control Room Equipments at OCC and BCC shall be in scope of Employer/ Buyer  Please confirm our understanding	Please read full RFP before raising query. Avoid raising queries for sake of it.
163	Part 3, Page 62, Commercial	Cl. No. 11.2 GC	Defect Liability:  All work referred to in sub-paragraph (b) of Sub-Clause 11.1 [Completion of Outstanding Work and Remedying Defects] shall be executed at the risk and cost of the Contractor, if and to the extent that the work is attributable to: (a) any design for which the Contractor is responsible, (b) Plant, Materials or workmanship not being in accordance with the Contract	We would like to inform you that, the warranties and remedies are conditioned upon use of Goods as per the O&M manual. Normal wear and tear is excluded.  This clause provides the exclusive remedies for all claims based on failure of or defect in Products or Services, regardless of when the failure or defect arises, and whether a claim, however described, is based on contract, warranty, indemnity, tort/extra-contractual liability (including negligence), strict liability or otherwise. No implied or statutory warranty, or warranty or condition of merchantability or fitness for a particular purpose applies. Please confirm.	Clause is self-explanatory

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
164	Part 3, Page 86, Commercial	Cl. No. 15.4, GC	<p>Payment after Termination:</p> <p>After a notice of termination under Sub-Clause 15.2 [Termination by Employer] has taken effect, the Employer may:</p> <p>(a) proceed in accordance with Sub-Clause 2.5 [Employer's Claims],</p> <p>(b) withhold further payments to the Contractor until the costs of execution, completion and remedying of any defects, damages for delay in completion (if any), and all other costs incurred by the Employer, have been established, and/or</p> <p>(c) recover from the Contractor any losses and damages incurred by the Employer and any extra costs of completing the Works, after allowing for any sum due to the Contractor under Sub-Clause 15.3 [Valuation at Date of Termination]. After recovering any such losses, damages and extra costs, the Employer shall pay any balance to the Contractor.</p>	<p>We understand that upon termination under this clause, the Contractor shall be paid for the works completed until the date of termination plus the cost of leaving site in safe condition. Contractor shall be liable only for reasonable additional cost incurred in getting the balance work done. Liquidated damages or any other damages shall not be liability of Contractor in such event. Please confirm.</p>	Clause is self-explanatory
165	Part 3, Page 94, Commercial	Cl. No. 17.4, GC	<p>Intellectual and Industrial Property rights:</p> <p>The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.</p>	<p>Please modify as follows:</p> <p>The Contractor shall indemnify and hold the Employer harmless against and from any other claim which arises out of or in relation to <b>infringement of third party intellectual property rights from</b> (i) the manufacture, use, sale or import of any Goods, or (ii) any design for which the Contractor is responsible.</p> <p>The forgoing indemnity shall not apply if a) Goods and services are modified or revised; b) Goods and services are used in combination with other products which forms basis of infringement c) unauthorized use of Goods and services.</p>	Tender conditions prevail
166	Part 1, Page 178	Section 4, Bidding Form 21	Undertaking for passing on benefits of exemptions to NMRCL and for adjustment of amounts due from balance due	Please confirm if concessional benefits under project import are allowed for this project and necessary documents required for the same such as Project Essentiality certificate / DGFT notifications shall be made available to enable claims on concessional customs duty.	Please refer BDS and PC
167				Parent Company Guarantee – (page 7 & 8 of our queries dated 1st June 2016) - As such since we are handling all activities locally in India and already have very wide experience in handling substations and turnkey electrical projects, we request waiver to submit PCG.	<p>In case the local entity is qualifying on its own strength, then Parent Company Guarantee is not relevant.</p> <p>No changes foreseen</p>
168				132 kV GIS – please refer our query on page 10 of 20 of queries dated 1st June 2016 – regarding CT secondary core being outside gas chamber in our 145 kV GIS. We are following this practice due to its inherent advantages of ease of replacement apart from many others which are highlighted in a page attached herewith.	Refer to SN 47 above
169				132 kV GIS – In view of make in India policy of government of India, it is seen that various domestic funded projects are applying stricter norms and encouraging domestic manufacturers. Request to check attached documents and include similar policy to promote domestic manufacturers.	Tender conditions prevail

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
170				10/12.5 MVA, 132 / 33 kV, Auxiliary Main Transformer – Appendix C, Clause no. 1.1 ; Section VII-B, Chapter 6 : Page 3 of 14, - As such since we have already supplied similar rating transformers and have conducted Short Circuit Test on 132 / 33 kV25 MVA power transformer, requirement of short circuit test in similar transformer cases may please be waived.	Refer to Clause 9.2.6.1 of GS (Section VII-A) which is self-explanatory.  No changes foreseen
171				Traction transformer – As we have already conducted short circuit test on 25 MVA, 132 / 27 kV, traction transformer for RDSO / CORE, request to waive short circuit type test requirements for such cases.	Refer to Clause 9.2.6.1 of GS (Section VII-A) which is self-explanatory.  No changes foreseen
172				Safe custody Bank Guarantee – In the recent past, last tender floated by DMRC for Noida Metro NE 02, this clause was not applied and hence request to withdraw applicability of this clause. In the past cases as well, when this was applied , it was for specified few items and that too for payments made against despatch documents and not against receipt of material. Hence request withdrawal of this clause.	Tender conditions prevail
173	Part A, Reply to Pre-bid queries	SN 54 & 184 of pre-bid clarification	CAD drawings	As clarified under SN 54 & 184 of prebid clarifications, we request you to kindly furnish CAD drawings.	Refer to Addendum
174	Part A, Reply to Pre-bid queries	SN 88, 228 and 229	Loss figures vs. efficiencies values	We would like to bring to your kind notice that there is a discrepancy between clarification given under SN 88 versus SN 228 & 229. Further we again would like to reiterate that as per manufacturer's it is not possible to achieve efficiency values mentioned at 1/4 load for 33/0.415kV Auxiliary Transformer.  Hence, we request you to please confirm that loss values are final irrespective of efficiencies mentioned in specifications. Efficiency values mentioned in specifications need not be complied. Please confirm.	Clause 7.1.3.2.4 (d) amended  Refer to addendum
175	Part B, Addendum	SN 4 & 16	Vendor approval procedure / Manufacturer's qualification criteria	We would like to bring to your kind notice that there is a discrepancy between SN 4 & 16 of Part B, Addendum.  i.e. SN 4 stipulates <b>"performance reliability on at least ONE Mass Rapid Transit System or Suburban Railway System"</b> . However, SN 16 stipulates <b>"performance and reliability on TWO Mass Rapid Transit Systems (including Railway or Airports)"</b> .  This being an International Competitive Bidding, in order to encourage more competition and make the bid competitive, we request you to consider our below suggestion & request to modify the clause as follows:  <b>"Proposed Systems / subsystems shall have been in use and have established their satisfactory performance and reliability on at least Two ONE mass rapid transit systems (including Railway or Airports) in revenue service over a period of two years or more (either in India or in minimum two other countries)"</b> .	Para F.2 of Form 4.4 amended and clause in Appendix P of Pricing Document modified to be in harmony with each other.  Refer to Addendum

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
176	Part B, Addendum	SN 57	Training Programme	We would like to bring to your kind notice that as per second line of SN 57 "man-weeks" is specified but as per column 3 in the table "Man months" are specified. We request to please clarify whether the training programme is for man-weeks or man-months. Also please confirm that this shall be paid over and above the Contract Value, as this will not be included under any Cost Center of Price schedule. Please confirm	It is instructors man-weeks. The same is included in the Items C2/C3 of Cost Center C of Appendix MS of Pricing Document.  Refer to addendum
177	Part A, Reply to Pre-bid queries	SN 166	Traction Equipment (25kV) i.e. items from SN 41 to 50 removed from this package  Refer to Addendum	We would like to bring to your kind notice that though it is confirmed that SN 41 to 50 is deleted from Appendix M, this is not getting reflected in Part B addendum. Request you to add the same in the addendum.	Refer to previously issued clarifications and addendums (Item no. 14)
178	Part 2, Sec VII-B	Cl no. 4, Appendix F: List of deliverables	The Contractor (or their Designer) is obligated to develop the simulation software (traction power and EMC/EMI simulations) in association with an Indian design-engineering firm and an Indian educational institution. The IPR for the software shall vest with NMRCL, Indian design engineering firm and Indian educational institution jointly.  The design firm shall be in business of rendering metro / railway system consultancy for minimum 5 years in India ...	We would like to bring to your kind notice that there are OEMs available in the market who sell licenses for traction simulation studies, EMC/EMI studies. We request NMRCL to replace the new software development requirement with software license. When standard software licenses are available in the market there is no need to develop one more software which will save huge effort, cost & time etc. to NMRCL. We request you to kindly amend this clause. In case if NMRCL still envisages development of new simulation software, then we request NMRCL to kindly float it as a separate tender, as developing new simulation software is project in itself and kindly delet the requirement from this project scope.	The simulation studies shall be performed by Contractor using existing & validated software only.  Development of simulation software is an additional requirement on top of above for future use of NMRCL. This requiremet can also be fulfilled by providing a software tool for the use of NMRCL for simulating various design and O&M aspect. NMRCL shall have unencumbered use of this software tool.
179	Part 2, Section VIII, GC	Cl. No. 1.5, Page 16	Priority of documents	We would like to bring to your kind notice that the priority of documents listed under (d) to (h) are not in line with this Tender volumes. We request you to please update the priority of documents in context of this Tender.	Tender conditions prevail
180	Part 2, Sec-III, QCR	SN 3, 4.1	Staffing Schedule and Organization Chart	We would like to bring to your notice that the staffing requirements stipulated are on the higher side. Also please note that as per Access & Key Dates there is no overlap between (i) RSS, EHV cabloing works and (ii) ASS, 33kV cabloing work i.e. only by the time RSS, EHV cabling works are finished, the Access dates for ASS & 33kV cabling works will be given. Hence we do not foresee requirement of high manpower as stipulated in the tender. Hence, we request you to reduce the same as below:  2. Project Manager - 2 nos. 3. Deputy Manager - 2 nos. 4. Design Engineer PSI - 1 no. 6. Installation Engineer (PSI, ASS) - 3 teams 7. Civil & Structural Engineer - 1 no. 8. SCADA Engineer - 1 no.	Tender conditions prevail
181	Part 2, Sec VII-B, Appendix C	Cl. No. 1.9, Page 6 of 14	Auxiliary Transformer Test Sheet	We would like to bring to your kind notice that SN 3 Separate source voltage withstand test cannot be conducted at site due to non-availability of test equipment. However, the same can be carried out at manufacturer's factory premises as a routine test. Hence we request you to please delete SN 3 test requirement at site.	Tender conditions prevail
182		General	Power factor improvement	Is there any capacitor bank in TSS. Since we need to improve the PF of transformer, what are the protections need to offer in capacitor which is not mentioned in spec.	Refer to Clause 7.2.4.8 of PS (amended now)

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
183	Sec VII-C, Tender Drawings	NMRP/LIPL/EL/024		Web server shall be provided at OCC. But in architecture diagram webservers are shown at OCC and in BCC. Kindly clarify	Clause 5.6.2 of PS amended (web server envisaged at both OCC and BCC, but not in redundant configuration).  Refer to addendum
184	Part 2, Sec VII-B, Chapter 7	CI No. 5.6.2, Page 82 of 219	All operator consoles shall be web-enabled. It shall work through the web browser and be able to host a full graphic user interface. The web clients can connect to the SCADA services at the OCC/BCC through LAN, WAN or through the internet ...	Please confirm the number of remote client to be connected with web server. Also with the maximum number of concurrent secession. Please clarify whether we need to supply any hardware for the remote client.	Refer to SN 183 above
185	Part 2, Sec VII-B, Chapter 7	CI No. 5.6.3, Page 82 of 219	The SCADA systems shall be able to exchange various types of data with the other Application software	Kindly specify the external interfaces required for the SCADA system	The external interfaces required for SCADA includes AMS (Clause 1.11 of Appendix A of PS) and Integrated SCADA (in future).  No changes foreseen.
186	Part 2, Sec VII-B, Chapter 7	CI No. 7.1.3.1.6.2, Page 124 of 219	The on-load tap changer shall be single-phase enclosure type, installed in a separated oil tank, offering 16 steps ...	We propose OLTC with three phase intank type instead of single phase type. However, we confirm that diverter switch contacts shall be housed in a separate oil chamber not communicating with the oil in the main tank of the transformer. Kindly confirm	Refer to SN 30 above
187	Part A, Reply to Pre-bid queries	Overall SN 211		Kindly provide the details of existing SAS/SCADA system for interface purposes	Bidders to assess themself; NMRCL organized site visit to MSETCL and can again facilitate on request of Bidders.  No changes foreseen
188	Part A, Reply to Pre-bid queries	Overall SN 215		The incomer are coming from MSETCL Mankapur SS which uses ABT meters (Apex 300 type) please provide the details and make of ABT meters for interface purposes	Bidders to assess themself; NMRCL organized site visit to MSETCL and can again facilitate on request of Bidders.  No changes foreseen
189		General	Load details	Kindly provide the load list details of LV switchgear in ASS	This is interface item between Contractors.
190				Kindly clarify the scope of termination of 132kV incoming cables (to SSS) in existing Mankapur station.	Refer Interface Tables (Appendix A to PS)
191	Part 2, Sec VII-A	CI No. 1.13.3, Page 17 of 167	The contractor shall carry out all further site investigations necessary for the Permanent Works and to enable the determination of the methods of construction and the nature, extent and design of Temporaray Works.	We would like to bring to your kind notice that we were unable to carry out site investigation i.e., trial pits, soil resistivity test at Mankapur MSETCL substation, where we need to construct GSS as per the tender scope. MSETCL officials have denied to give permission to carry out any investigations. They have insisted that NMRCL should write to MSETCL head office, upon permission from their head office, they can allow us to carry out site investigations.  As you can appreciate, all Bidders would need basic details such as soil resistivity, trial pits for identifying soil profile, we request you to arrange necessary permission from MSETCL or alternatively kindly issue soil resistivity, soil profile details at Mankapur substation.	Bidders to assess themself; NMRCL organized site visit to MSETCL and can again facilitate on request of Bidders.  No changes foreseen
192	Oart 2, Sec VII-B, Chapter 3	3.2.6.1, Page 31	(e) Remote input / output (I/O) Units	We understand that Remote IO & RTU are same. Kindly confirm. OR provide spec for Remote IO and places where it shall be used	Your understanding is generally correct, however, designs is in the scope of Contractor.

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
193	Oart 2, Sec VII-B, Chapter 5	5.6.1.2, Page 78	The PLCs and RTUs shall be able to monitor the status of the HV, traction and auxiliary equipment	We understand that PLC & RTU are same. Kindly confirm. OR provide spec for PLC and places where it shall be used	Your understanding is generally correct, however, designs is in the scope of Contractor.
194	Oart 2, Sec VII-B, Chapter 11	11.2.2.6, Page 210	RTU, MIMIC Panel	We understand that there is no requirement for MIMIC panel for RTU. They are separate and RTU does not require a MIMIC. Kindly confirm	Confirmed
195	Oart 2, Sec VII-B, Chapter 11	11.2.2.18, Page 216	RSS-cum-AMS-TSS & AC-DC	Single RTU to be provided or separate RTU	Functionality to be achieved; the design / choice shall be proposed by Contractor
196		General	SCADA-RSS	RSS shall be RTU based or BCU based. Kindly confirm	SAS specs to be referred, which are self-explanatory
197		General	SCADA - TSS (SP/SSP/SS)	Single RTU to be provided or separate RTU	Functionality to be achieved; the design / choice shall be proposed by Contractor
198		General	SCADA Please provide RTU quantity based on RSS/ASS/TSS/AMS/SP/SSP/SS	Total number of RTUs required in different locations with quantity	Bidders to assess themselves
199		General	SCADA - RTU Specification	Please provide complete RTU technical specification	Refer PS Further assessment / detailing by Bidders
200		General	SCADA	Cable protection between Grid substation and switching substation  a. CTs are not provided at Grid substation for achieving differential protection b. Distance between switching substation and Grid substation is not available c. Switching devices are not available at Grid substation to isolate from cable faults	Refer previous clarifications and addendum
201		General	SCADA	At Grid substation mankapur  a. Requirement of Busbar protection augmentation is not specified, please clarify. If same is required, make and type of existing Busbar protection details to be provided b. Is there any requirement of integration of new bays with existing RTU / SAS, if yes, please provide the details of the existing system (RTU/SAS) c. Is there any requirement of control & protection panel for 2 nos. of new bays.	a. Refer to interface matrices (Appendix A to PS)  b. Bidders to assess themselves and NMRCL organized site visit to MSETCL.  c. Refer to PS  No changes foreseen
202		General	SCADA	Detailed specification for OCC & BCC SCADA is not available as part of the tender specification, please provide the same	Please refer tender documents / drawing. Further detailing by Bidders themselves.
203		General	SCADA	We presume BCUs to be offered only for 132kV bays. All other interface to SCADA will be through RTU, please confirm.	Your understanding is not correct.  No changes foreseen
204	Part 2, Sec VII-B, Chapter 5	5.5.2.8 & 5.5.2.10		Since the SAS specification (cl.no. 5.5.2.8 & 9) called for redundant BCU and as per the clause 5.5.2.10 BCU to be mounted in integrated LCC. By considering redundant BCU for each bay, it may not be feasible to mount in the integrated LCC. Please check the requirement.	Tender clauses are self-explanatory  No changes foreseen

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
205		General	SCADA	We presume protection panel for 33kV & 25kV is in the scope of respective primary equipments vendor	It appears to be a query from sub-contractor to Bidder. Bidder may check the specs and assess themselves.
206	Part 2, Sec VII-B, Chapter 5	5.5.2.8		Specification (cl. 5.5.2.8 & 9) called for back-up IED, please confirm whether we need to quote in main scope or in optional scope. If we need to quote as an optional scope, how about the requirement of Ethernet switch and SAS sizing for the redundant IEDs. Also please confirm this is applicable for the voltage levels	Standby / backup IEDs are included in the main scope and this is applicable for all voltage levels.
207		General	SCADA	SAS specification called for standalone BCU & BPU, wherein combined control & protection (backup o/c) IEDs are acceptable in CRP specification, please amend the SAS specification accordingly	Refer to SN 154 above
208	Part 2, Sec VII-B, Chapter 7	7.1.1.42	The isolators shall be of two-column rotary centre break type, with two moving parts (two rotating columns). They shall be protected against corona discharge by providing metallic ring.	Not applicable for GIS. All movements are telescopic. Please confirm.	Refer to SN 46 above
209	Part 2, Sec VII-B, Chapter 7	7.1.1.47	To unify the equipment, the current transformers shall be SF6 insulated. That means the active part of the CT, primary and secondary are enclosed into a chamber full of SF6 to ensure isolation between the both winding and to reduce the dimension of the active part. In this system the tank is at the primary potential, contrary to the general case of current transformer oil insulated where the tank is insulated.	Our CT LV cores are mounted outside the Gas chamber, Please confirm.	Refer to SN 47 above
210	Part 2, Sec VII-B, Chapter 7	7.1.1.49	Each incoming section shall be equipped with measuring and protection current transformer on each phase	Kindly confirm whether you need additional CT for metering	Refer to SN 48 above
211	Part 2, Sec VII-B, Chapter 7	7.1.2.2.1	Each Incomer Bay (2 Nos.) consisting of: (f) Voltage Transformer with motor operated isolation device of rated insulation	VT are provided by manual disconnecting links, Please confirm	Tender conditions prevail
212	Part 2, Sec VII-B, Chapter 7	7.1.2.2.6	New Gas charging equipment with gas cylinders for each set of the newly constructed GIS substation covered in the scope of work; After commissioning this will become property of Employer. The Contractor would be required to hand over them in proper working condition with enough gas for one charging of complete system.	Please confirm if the above requirement is for Gas Handling Equipments mostly of DILO make or Please provide us the specification for Gas charging equipment to consider	The clause is self-explanatory.
213	Part 2, Sec VII-B, Chapter 7	7.1.2.3.6	Internal insulation level between live parts and earth when the pressure of the gas goes to the atmospheric pressure should not be less than $1.2 \times (132 \text{ kV}) / 1.732 \text{ kV}$ .	There is no relevant standard governing this condition. Please clarify.	Tender conditions prevail
214	Part 2, Sec VII-B, Chapter 7	7.1.2.3.20	It should be possible to remove and replace a fully assembled circuit breaker without interfering the operation of the adjacent feeder. All circuit breakers should be interchangeable.	Circuit Breakers active parts can be taken out and not the complete CB in the proposed design.	The clause is self-explanatory.
215	Part 2, Sec VII-A, Chapter 2	Cl no. 2.3, Page 26 of 167	IT Requirement of Employer	We understand from Cl. No. 2.3 IT Requirements that, the scope under this Tender shall be limited to "cost of software licenses and IT staff for data uploading". Please confirm. Other necessary IT implementation & hardware required such servers, storage systems, etc is not part of this Tender scope. Please confirm.	Refer to SN 131 above

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
216	Part 2, Sec VII-A, Chapter 2	Cl no. 2.3, Page 26 of 167	IT Requirement of Employer	<p>(i) Do we need to consider Progress reporter application in addition to P6 Primavera &amp; RIB 5D BIM software license?</p> <p>(ii) Do we need to consider ECM Visa along with Bentley AssetWise &amp; ProjectWise software license?</p> <p>(iii) Do we need to consider training to Contractor's personnel for all the software being supplied?</p> <p>(iv) Do we need to consider AMC charges for all the software being supplied? If yes, for how many years?</p>	<p>(i) Bidders may assess themselves</p> <p>(ii) As above</p> <p>(iii) Yes</p> <p>(iv) Yes, for contract duration</p>
217	Part 2, Sec VII-A, Chapter 6	Cl. No. 6.1, Page 60 of 167	All software to be developed or modified (re-engineered software) shall follow the normative requirements of EN50128 (Railway Applications: Software for Railway Control and Protection Systems). The Software shall be designed, developed and tested according to the Software Quality assurance Plan, Software Integrity Level (SIL) and the Software Lifecycle.	SIL are standards for "Railway applications – Communications, signaling and processing systems – Software for railway control and protection systems". The SCADA system under the present scope of supply is for monitoring and controlling of the electrical supply to the traction and NOT for railway control and protection systems. Hence, from the application perspective, the requirement of SIL (Safety Integrity Level) certification for SCADA is not applicable. Kindly confirm.	Confirmed
218		General	BOQ	Please Provide us the BOQ/BOM of the Complete Scope of work in order to assess the Competitive Tender Cost & to bring all the bidders at par.	Bidders to assess themselves
219		General	OFC details	Please clarify whether 1 Run of OFC per Circuit is required	The design is in scope of contractor as it is a Design & Build tender
220		General	Open cut drawing	Please Provide us the Open Cut Trench drawing for small road/gate crossings.	Refer tender drawings; further details to be developed by Contractor
221		General	Buried cable trench	The cable Trench drawing provided in tender document is showing D/C (6 cable) of 132 KV whereas as per requirement & scope of work 4 circuit of 132 KV cable has to be laid therefore please provide revised drawing. Also clarify whether all 4 circuit to be laid in same single cable trench or not.	Refer clarifications already issued (two trenches to be dug on either side of road for 4 circuits i.e. 2 circuits in each trench)
222		General	Power Supply	Since single source of power supply is from Mankapur Grid substation. Please specify the back-up source in case of power failure.	Bidders to follow tender specifications only
223		General	Location of substations	Please provide us the co-ordinates & exact location of proposed GIS at Mankapur substation & proposed RSS-1 & RSS-2.	Bidders to assess themselves and work out the arrangement within the land area earmarked (available in tender drawing)
224	Drawing no. NMRP/LIPL/EL/0 21		Road restoration	<p>As per this enclosed Drawing, there is a requirement for restoration of surface with 300mm deep boulder &amp; Bituminous /jelly. We presume that the same has to be constructed by the bidders. Please confirm.</p> <p>Also confirm that the related Supervision/Restoration/Road Cutting charges if required to be paid to Municipal corporations will be Reimbursed by NMRCL as per actuals.</p>	Tender conditions (along with clarifications / addendum previously issued) are self-explanatory.
225	Drawing no. NMRP/LIPL/EL/0 22		Typical details of RCC cable cover, warning slab, warning board, cable route marker etc.	<p>As mentioned in the drawing, please clarify the difference between:</p> <p>(A) RCC cable covers and warning slab</p> <p>(B) Warning boards and route markers</p>	Bidders to assess the requirement based on tender specification and drawings. Designs shall be developed by Contractor as per relevant standards and codes.

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
226			Drain / Nala crossing	Please provide us the Design and drawing for crossing of Nala / Drain near proposed RSS-1 and RSS-2 location	The design is in scope of contractor as it is a Design & Build tender
227	TD Section X "Contract Forms"	Parent Company Undertaking	Parent Co. Undertaking:  1. In consideration of the Employer entering into the Contract with the Contractor, the Parent Company hereby undertakes to the Employer that, <b>without the written consent of the Employer</b> , it will not ... ...	With reference to the response dated 25.06.2016 to pre-bid queries, we understand that no change is foreseen for submission requirement of Parent Co. Guarantee & Parent Co. Undertaking. However, we request you to modify the highlighted wording in the format of parent co. Undertaking as under:  1. In consideration of the Employer entering into the Contract with the Contractor, the Parent Company hereby undertakes to the Employer that, <b>without information to the Employer</b> , it will not ...  Please confirm that, the format can be modified as per the Company policy. This was acceptable to other Metro Projects currently under execution.	Suggestion of bidder accepted and Para 1 of Parent Company Undertaking format amended.  Refer to addendum
228	Part 2	Clause 7.6.1.1.C	Power sockets (16A) will require to be provided along the Viaduct, on both sides, at an approximate spacing of 50m (duly staggered so that every 25m one socket is available on any one side).	Please confirm if power socket to be provided on one side of viaduct or on both sides	The clause is self-explanatory (On both sides @50m)
229	Part 2	Clause 7.6.2.1	Power sockets shall be installed along the viaduct. From each station 2 cables have to be laid, one on each direction. Sockets shall be placed every 25 meters.	As per this clause power sockets to be provided on one side of viaduct at 25m distance. However, as per clause 7.6.1.1.C power sockets are asked on both sides at 50m distance.  Please confirm if power socket to be provided on one side or both sides. Please confirm distance between power sockets on one shall be 25m or 50m.	Clause 7.6.2.1 modified to provide clarity.  Refer to addendum
230	Part 2	Appendix B, SN 10	25kV Switchgear  Switchgear rated insulation voltage: 40kV	As per GTPs of 25kV switchgear rated insulation voltage is mentioned as 40kV.  As per clause 7.2.3.6.6 of PS rated insulation voltage of 25kV switchgear is 52kV.  We request to please modify the insulation voltage of 25kV GIS to the previous value of 40kV in line with previous GTP.	Only 25kV GIS switchgear will be used in this project, for which the insulation voltage level is indicated as 52kV in PS and Data sheet.  No changes foreseen
231	Part 2	Clause no. 7.2.4.8; SN 204 of pre-bid clarifications	Dynamic power factor improvement	As per clause 7.2.4.8.1, it is mandatory to provide dynamic reactive power compensation.  As per SN 204 of pre-bid clarifications, Contractor has to perform studies and propose suitable design.  Please note that this is IGBT based solution and is not used by any metro in India.  Considering above we request to delete the requirement. Alternatively request to kindly specify that the dynamic power factor improvement is to be provided subject to the system requirement as per output results of simulation studies.	Clause 7.2.4.8.1 amended and clauses 7.2.4.8.2 & 7.2.4.8.3 deleted  Refer to addendum

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
232	Part 2	Clause 7.3.6.2.1 Clause 4.2.7.3	33kV Protections  Availability of Power Supply	<p>As per clause 7.3.6.2.1 only zero sequence relay is asked at each incoming interrupter of ASS and in case of fault feeder at AMS is asked to trip.</p> <p>As per clause 4.2.7.3 power supply availability is asked as 99.9% minimum.</p> <p>Please note that without differential and backup protection in loop-in loop-out feeder of ASS, the availability requirement is not possible to achieve. Also as specifications do not mention above protections, no Bidder will consider it.</p> <p>As this is huge cost impact to avoid later date issues, we request you to evaluate the mentioned clauses and standard practice followed in other metros and clearly specify the protection philosophy including differential and backup protections in loop-in loop-out feeders.</p> <p>It is requested to please confirm that no relay is required in the ring main feeders as specified in tender.</p>	<p>The clauses are self-explanatory and Bidders to assess the requirements themselves.</p> <p>No changes foreseen</p>
233	Part 2	Clause 3.3.7.4, SN 81 of reply to prebid query	ASS Transformer Capacities	In reference to SN 81, as reply to prebid query we understand that as E&M load is not available we have to consider transformer sizes mentioned in PS. Please confirm that if during execution, transformer size changes from bid stage, the change would be considered for compensation to the Contractor.	<p>Confirmed.</p> <p>Refer to addendum SN 1 &amp; 8</p>
234	Part 2	PS	Equipment Rathings: GTP	As per our initial assessment the defined capacities and ratings of equipments are not sufficient for the loads and duties as specified. We request you to reassess and inform the revised ratings.	<p>Bidders to refer tender documents and assess themselves</p> <p>No changes foreseen</p>
235	Part 2	PS - Appendix D, Clause 8.2.4.2; GS Clause 6.1 and 6.2	<p>For safety relevant function, the Contractor shall mitigate random and systematic failures by use of adequate design principles / methods as defined by the CENELEC Standards EN 50128 and 50129 (IEC 62278 and IEC 62279) according to the SIL identification.</p> <p>Clause 6.1: Prescriptive framework Clause 6.2: Software framework</p>	<p>EN 50128 (Railway applications - Communication, signaling and processing systems - software for railway control and protection systems) and EN 50129 (Railway applications - Communication, signaling and processing systems - Safety related electronic systems for signaling) specifies the process and technical requirements for the development of software to use in area of communication or signaling.</p> <p>These standards are not applicable for power supply and traction system.</p> <p>We request you to delete these standards from mentioned clauses of PS and GS.</p>	<p>These are general clauses for safety related issues for system design. If any mentioned standard is not relevant for a particular system design, it may not be considered.</p> <p>No changes foreseen</p>

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
236	Part 2	SN 324 of reply to prebid query and PS Appendix F Clause 4 of Para (3)	<p>The Contractor (or their Designer) is obligated to develop the simulation software (traction power and EMC/EMI simulations) in association with an Indian design-engineering firm and an Indian educational institution. The IPR for the software shall vest with NMRCL, Indian design-engineering firm and Indian educational institution jointly.</p> <p>The design firm shall be in business of rendering metro / railway system consultancy for minimum 5 years in India</p>	<p>As per vendor approval criteria Proposed Systems/ sub-systems shall have been in use and established their satisfactory performance and reliability on at least Two mass rapid transit systems (including Railway or Airports) in revenue service over a period of three years or more either outside the country of origin at an average in two different countries or in Indian metros</p> <p>The above mentioned requirement and referred clause of PS contradict each other. We understand that every bidder should develop the system studies on proven simulation software.</p> <p>Hence the clause to develop the software in association with Indian</p>	<p>The simulation studies shall be performed by Contractor using existing &amp; validated software only.</p> <p>Development of new software deleted from the scope of this tender.</p> <p>Refer Addendum</p>
237	Part 2, Section VII-B	<p>Clause 6.3.2.5.1 (Page 93/219)</p> <p>Data sheet 4.1 (Page 10/75)</p>	<p>Clause 6.3.2.5.1. states that The Traction Transformer shall be designed to operate in <b>ONAN/ONAF</b> mode (Synthetic Ester Oil natural /air natural /air forced)</p> <p>However in Data sheet 4.1: For 132 kV /25 KV Traction, 15 MVA, Transformer Cooling mode is specified as <b>ONAN</b> only</p>	<p>Since Clause 6.3.2.5.1 indicates cooling mode ONAN/ONAF and data sheet indicates only ONAN , it is therefore requested to please finally confirm the cooling mode of the 132 kV / 25 kV Traction Transformer along with the corresponding MVA rating</p>	<p>Clause 6.3.2.5.1 amended (only ONAN)</p> <p>Refer to Addendum</p>
238	Addendum 1 SN 46, Part 2, Section VII-B (PS), Clause 7.4.2.4.1	Clause 7.4.2.4.1 for 132kV cables	<p>As indicated in Addendum 1:</p> <p>The conductor shall be made of copper with a minimum cross section of 240 sqmm</p>	<p>Substantial Length of 132 kV Cable from Switching Station to both RSS (6.2 km – 2 feeders of 3 phases for each RSS) has to be laid.</p> <p>If 132 kV Cable is of Copper Conductor, it will be highly prone to theft.</p> <p>In all metro projects, outdoor cables running from Utility Substation to RSS are of Aluminum conductor though to cater the load demand and meet fault level, size of cable was selected up to 630 Sq mm.</p> <p>In view of above, it is requested to amend the specification of 132 kV cable by changing the conductor material from Copper to Aluminum. Fault level may be changed from 3 sec to 1 sec, which is more than enough before the fast acting Relays operates.</p> <p>Sizing of conductor may be increased from 240 sq mm, if required based upon load requirement.</p>	Tender conditions, as amended in previous addendums, prevail.
239	Addendum 1 SN 18, Part 2, Section VII-A GS	Appendix 7, 7.0	<p>Noise Monitoring</p> <p>(Used for this Contract for the relevant activities viz. 132kV cable works and RSS civil works)</p>	<p><b>Please elaborately describe the requirement i.e. Maximum Noise level.</b> e.g. Noise level for 132 kV cable works depends upon various factors like strength of existing structure to be cut, Type of Machine and tools to be deployed for cutting , noise due to other parallel working utility agencies , etc</p>	<p>Refer SHE Manual</p> <p>No further changes foreseen</p>
240	Part 2, Section VII-B, Reply of Queries no. 315	Clause 5.6.9.1	<p>The emergency trip switches will be used for switching off the Traction Power Supply of corridor 1, corridor 2 or depot in case of emergency. The ETS switches are installed in OCC/BCC and at each RSS</p>	<p>Please confirm the role of ETS to be installed at OCC/BCC and each RSS is to switch off the Traction Power Supply from above mentioned locations only.</p> <p>It is worthwhile to mention that above feature is already available in the OCC/BCC and RSS. Provision of ETS will be a redundant.</p> <p>Requested to take a decision in view of above.</p>	<p>Clauses 5.6.9.1 and 5.6.9.2 modified</p> <p>Refer to addendum</p>

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
241	Addendum 1	Last date of bid submission	Last date of submission of Bid: 28.07.2016	<p>We have received the Addendum 2 with clarification on 25th of June. As per Addendum 1, last date of submission is extended to 28.07.2016.</p> <p>Since we have some further clarifications &amp; 1 month's time is not sufficient to analyze data and revise all the documents in line with the addendum.</p> <p>In view of the above, we request you to kindly extend the last date of Bid Submission by additional 4 weeks i.e. 31st August 2016 to have a good quality offer.</p>	Request will be considered based on time remaining after due clearance is received from KfW.
242	Pricing Document	IEEMA formula for transformers	IEEMA formula for Transformers	<p>The formula provided in the tender is obsolete and replaced with a revision of April 2015.</p> <p>Please confirm latest formula shall be applicable for Price variation.</p>	Refer to SN 45 above
243	Part B, Addendum, Corrigendum 3	SN 4, 15 & 16	Proposed Systems/ sub-systems shall have been in use and have established their satisfactory performance and reliability on at least Two ONE mass rapid transit systems (including Railway or Airports) in revenue service over a period of two years or more ( <b><i>either in India or in minimum two other countries</i></b> ).	<p>We understand from the clause under reference that, foreign manufacturers who have not supplied in India should have satisfactory performance from <b>two other countries</b>. However please note that "mass rapid transit systems or airports" is very small business domain. It is very stringent to insist previous experience in two different countries from same business domain, which is very rare. There are not enough manufacturers who would have supplied in two different countries for MRTS or Airports. Hence we request you to modify the clause as "either in India <b><i>or in minimum two other countries (including country of origin of manufacturer), out of which one performance should be from MRTS (Railway or Airports) and another from any utility project</i></b>". Please accept.</p>	Refer to SN 175 above
244	Part 3, Sec-IX, PC	SN 6, Page 123 & SN 132, ROD	24 months from the date of issue of Taking Over Certificate for the whole of the Works. During the Defects Liability Period the Contractor shall provide, free of cost, competent and skilled personnel and maintain adequate stock of spares so as to promptly fulfill his obligations during the Defects Liability Period as laid down in GC and Works Requirements	<p>We would like to bring to your kind notice that as per Key Dates, Pg No. 132. Revenue Operation dates for individual sections i.e., PS, Reach 1, Reach 2, Reach 3 &amp; Reach 4 is specified. Hence please confirm that DLP period for individual sections shall commence from the date of issue of respective sections' Taking Over Certificate i.e., before commencement of Revenue Operation of respective sections. Please confirm.</p>	Tender conditions prevail

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
245	PS and Pre-bid response dated 25.06.2016	Clause 10.2.7 & Clause 10.2.6	<p>Clause 10.2.7 states "The initial contract spares list shall cover the items as per Appendix M of Pricing Document."</p> <p>Also, Clause 10.2.6 states " The spares list shall distinctly group spares covering Reach 1&amp;3 and spares covering Reach 2&amp;4."</p>	<p>Pre-bid response dated 25.06.2016 provides instruction to consider the clause 10.2.7 for quantity of spares.</p> <p>We would like to bring your kind attention that the Quantities provided in "Appendix M" are for unit rate of Additional items which do not seems to cover the spares list. For example. Qty of 25 kV Cable is 1 KM which is very high And if same is to be considered for spares also, then Price of 2 KM cable shall be loaded to the Contract Price.</p> <p>Also Structure of Appendix M do not allow us to separately fill up the prices of spares in "Section MS" as it requires section wise spares prices.</p> <p>We Request you to kindly provide the Clear list of section wise contract spares.</p> <p>It is also very important to make All bidders At Par on spares prices as it involves a big portion of Contract Price.</p>	<p>A Note inserted below Cost Center D of Section MS (Appendix L) to clarify the matter.</p> <p>Refer to Addendum</p>
246	Pricing Document	Appendix M	APPENDIX M: ADJ (ADDITIONAL / UNIT PRICES)	<p>We request you to delete item no. 41 to 50 as these items are for OHE scope of Works which is not part of this tender.</p> <p>Also, Please confirm that the Unit prices of the items which are not part of the scope of this tender are not to be quoted. E.g. item 41 to 50 above etc.</p>	Refer to SN 177 above
247		Section II. Bid Data Sheet ITB 4.2 ( e ) & Section III 4.2 ( c )	No Bidder can be a subcontractor while submitting a Bid individually or as a partner of a JV / Consortium in the same bidding process. A Bidder, if acting in the capacity of subcontractor in any Bid, may participate in more than one Bid, but only in that capacity.	<p>We understand this clause is Referring to Sub-contractors and OEMs for Equipment / Systems. Kindly Clarify.</p> <p>Please also note that there are many OEMs who are having large product portfolio as well as project departments in the same house. We have been working with different reputed OEMs for our different projects all over the world, specially for GIS equipment. Although their project department may be interested to participate in this bidding process, their product verticals are also interested to get associated with EPCs like us as OEMs. Request you to kindly also accept the MOUs of different OEMs ( multiple in nos) for Equipment / Systems specially for GIS equipment, in case if they are submitting a Bid individually or as a partner of a JV / Consortium in the same bidding process.</p>	The clauses are self-explanatory and no changes foreseen
248		Section III 4.2 ( d ) & 4.2 ( c )	"Experience of 132 kV and above cable laying ..." & "Minimum of Supply, Installation, Testing and Commissioning of 110kV and above Substation Systems"	<p>Referring to the clause against Sub-station system experience, participants with experience of 110KV S/S are being accepted to participate in the bidding process. However, for the experience of cable laying voltage level is specific as 132KV and above. Please note that, for the S/S with system voltage 110 KV, the voltage level of the associated HV cables to be considered as 110KV. Hence we request you to kindly accept the experience of 110KV and above cable laying.</p>	Refer Addendum

Overall SN	Vol No.	Clause no.	Bid Condition	Bidder's Queries	NMRCL's Response
249		Section III 4.2 ( a )	Minimum of Design, Detail Engineering, Supply, Installation, Testing and Commissioning of at least two (2) nos. of 25kV Traction Substation for elevated / at-grade / underground sections of Metro rail or suburban rail or mainline railway or depot.	Please note that traction S/Ss are having voltage level of 132/25KV or 110/25KV. We understand by mentioning 25KV traction S/S you are referring to 132/25KV or 110/25KV Traction S/Ss. Please confirm.	TSS may also have configuration of 66kV/25kV or other configuration as well.  No changes foreseen
250	Part-2, Sec-IX, Part-B, PS	Cl.No. 46 & Corrigendum-II, Part-A, SN 10		Please clarify whether NMRCL shall issue "C" form for obtaining Consession Sales Tax for inter-state transaction on slae in transit basis	As of now, NMRCL will not be able to issue "C" form. I f it is issued later the tax benefit shall be transferred to NMRCL.
251	Part-2, Sec-VIIB, Works Requirement	Clause No. 6.1.3	For Validation of design of complete system, the Contractor shall arrange auditing of design of works within the scope of work which primarily covers Receiving cum Auxillary cum Traction Substation, 33 kV Power Supply system as per IEC and other relevant Standards from reputed independent Agency (Auditor), who have already undertaken similar job in past for other Metro system.	We would like to bring to your kind notice that as per the clause under reference only Design validation audit of complete system to be carried out. However as per Pricing Document, Cost Centre A5 under various sections i.e., NSPS, NSR1, NSR2, EWR3 EWR4, NSD, EWD, SSS, HVC, RSS calls for "Validation / Auditing of Design and <b>Installation Works</b> ".  Kindly clarify whether Validation/ Auditing is limited to Design only or it includes installation works as well.	Validation/Auditing is limited to Design only. Please refer addemdum-44

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**Corrigendum IV Part B (Addendum)**

SN	Part No.	Section	Clause ref.	Existing description	Replaced with									
1.	Part 1	Section III. Qualification Criteria and Requirements	Appendix 4.4-E: Proforma for submitting No-load iron loss and full load copper loss figure	Items at 4.4E Table <table border="1" data-bbox="790 395 1397 432"> <tr> <td>SN 4</td> <td>33kV/415V, 250 kVA</td> <td>- 72 Nos.</td> </tr> </table>	SN 4	33kV/415V, 250 kVA	- 72 Nos.	Items at 4.4E Table <table border="1" data-bbox="1447 395 2076 464"> <tr> <td>SN 4</td> <td>33kV/415V, 250 kVA</td> <td>- 62 Nos.</td> </tr> <tr> <td>SN 5</td> <td>33kV/415V, 400 kVA</td> <td>- 10 Nos.</td> </tr> </table> <p>Quantity of item at SN 4 changed and new item at SN 5 added</p>	SN 4	33kV/415V, 250 kVA	- 62 Nos.	SN 5	33kV/415V, 400 kVA	- 10 Nos.
SN 4	33kV/415V, 250 kVA	- 72 Nos.												
SN 4	33kV/415V, 250 kVA	- 62 Nos.												
SN 5	33kV/415V, 400 kVA	- 10 Nos.												
2.	Part 1	Section IV. Bidding Forms	Form 4.4 Bidder's Technical Proposal; Para F.2	The System, including all Sub-systems and Equipment shall be of proven design practice. Sub-systems and Equipment of similar design philosophy shall have been in use and have established their performance reliability on at least one Mass Rapid Transit System or Suburban Railway System in Revenue Service over a period of at least two years (either in India or in minimum two other countries). Bidders are required to submit Performance certificates from users in support of the above performance requirements.	The System, including all Sub-systems and Equipment shall be of proven design practice. Sub-systems and Equipment of similar design philosophy shall have been in use and have established their performance reliability <b>either on (i) at least one Mass Rapid Transit System or Suburban Railway System (including Railway or Airports) in Revenue Service over a period of at least two years in India; or (ii) at least two Mass Rapid Transit System or Suburban Railway System (including Railway or Airports) in Revenue Service over a period of at least two years in minimum two other countries.</b> Bidders are required to submit Performance certificates from users in support of the above performance requirements.									
3.	Part 1	Section IV; Annexure IV-A Pricing Document	Appendix L: Section MS; Cost Center B (Preliminaries and General Requirements)	Item B11 (Simulation software development)	<b>Deleted</b>									
4.	Part 1	Section IV; Annexure IV-A Pricing Document	Appendix L: Section MS; Cost Center D(Spares, Special Tools, Testing Equipment and	New note inserted	<b>Note:</b> As for the spares are concerned, the items already covered in Appendix M need not be included in the above. Spares, other than mentioned in Appendix M (ADJ: Adjustment / Unit Prices) may be suitably detailed and covered in the above Cost Centre D. Further, in the Appendix M, the total quantity indicated									

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with
			Measuring Instruments)		may be appropriately bifurcated by Bidders in two parts viz. for Reach 1 & 3 and Reach 2 & 4.
5.	Part 1	Section IV; Annexure IV-A Pricing Document	Appendix M: ADJ: (Adjustment / Unit Prices) and Corrigendum -II Part B: Addendum SN.14	Items at SN 41 to 50 of the Table (Traction equipment 25kV)	Items at SN 41 to SN 50 of the Table Deleted.  New items introduced in of the Table as below: SN 51: 250 KVA, 33/0.415 kV Dry Type Transformer – 1 No. SN 52: 400 KVA, 33/0.415 kV Dry Type Transformer – 1 No.
6.	Part 1	Section IV; Annexure IV-A Pricing Document	Appendix P (Vendor Approval ...)  Para (3) under 'Systems and Subsystems'	Proposed Systems/ sub-systems shall have been in use and have established their satisfactory performance and reliability on at least Two mass rapid transit systems (including Railway or Airports) in revenue service over a period of two years or more (either in India or in minimum two other countries). Systems/ Sub-systems/ components used in Indian metros do not get automatically qualified for use unless specifically approved by the Engineer for this project. If required by the Engineer, Contractor shall provide certificate of satisfactory performance for a period of two years or more from the Metro operators. Where similar System/ Sub-systems of a different rating are already proven in service as per the above criteria then the supply shall be based on such sub-systems.	Proposed Systems/ sub-systems shall have been in use and have established their satisfactory performance and reliability <b>either</b> on (i) at least <b>one</b> Mass Rapid Transit System or Suburban Railway System <b>(including Railway or Airports)</b> in Revenue Service over a period of at least two years in India; <b>or (ii) at least two Mass Rapid Transit System or Suburban Railway System (including Railway or Airports) in Revenue Service over a period of at least two years</b> in minimum two other countries. Systems/ Sub-systems/ components used in Indian metros do not get automatically qualified for use unless specifically approved by the Engineer for this project. If required by the Engineer, Contractor shall provide certificate of satisfactory performance for a period of two years or more from the Metro operators. Where similar System/ Sub-systems of a different rating are already proven in service as per the above criteria then the supply shall be based on such sub-systems.
7.	Part 1	Annexure IV-A Pricing Document	Appendix R: IEEMA formula for price variation	IEEMA/PVC/DIST-AL/2003 (R-1), Effective from Jan 01, 2009 Price Variation Clause for transformers	<b>IEEMA/PVC/PWR TRF above 400kV/DE/2015; Effective from 1<sup>st</sup> April 2015 ... Price Variation Clause for Power Transformers</b>
8.	Part 2	Section VII-B (PS)	3.2.7.4	The following Transformers capacities are proposed for the different stations and Depots:	The following Transformers capacities are proposed for the different stations and Depots:

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with
				(a) 250kVA - 2 Nos. for typical Elevated / at-grade Stations (b) 1600kVA - 2 Nos. for ASS at depots	(a) 250/400kVA - 2 Nos. for typical Elevated / at-grade Stations (b) 1600kVA - 2 Nos. for ASS at depots
9.	Part 2	Section VII-B (PS)	5.5.3.4.3.1	The protection functions are independent of bay control function. The protection shall be provided by separate protection IEDs (numerical relays) and other protection devices as per section Relay & Protection.	The protection functions are independent of bay control function. The protection shall be provided by separate protection IEDs (numerical relays) and other protection devices as per section Relay & Protection. <b>Combined protection and control IEDs are also acceptable subject to them meeting all the specified requirements.</b>
10.	Part 2	Section VII-B (PS)	5.6.2	All operator consoles shall be web-enabled. It shall work through the web browser and be able to host a full graphic user interface. The web clients can connect to the SCADA services at the OCC/BCC through LAN, WAN or through the internet.	All operator consoles shall be web-enabled. It shall work through the web browser and be able to host a full graphic user interface. The web clients can connect to the SCADA services at the OCC/BCC through LAN, WAN or through the internet. <b>Firewall shall be provided with web servers. Number of remote client to be connected to web server shall be 20 and maximum number of concurrent users shall be 10. No hardware is envisaged in the scope of Contractor for remote client.</b>
11.	Part 2	Section VII-B (PS)	5.6.9.1	The Emergency Trip Switches will be used for switching off the Traction Power Supply of corridor 1, corridor 2 or depot in case of emergency. The ETS switches are installed in OCC/BCC and at each RSS.	<b>Appropriate mechanism (e.g. SCADA based) shall</b> be used for switching off the Traction Power Supply of corridor 1, corridor 2 or depot in case of emergency.
12.	Part 2	Section VII-B (PS)	5.6.9.2	After activating an ETS an individual signal is sent to SCADA. Accordingly to a trip matrix proposed by the Contractor, SCADA macro switches off relevant circuit breakers and send signal to indicate the electrical section de-energized.	Accordingly to a trip matrix proposed by the Contractor, SCADA macro switches off relevant circuit breakers and send signal to indicate the electrical section de-energized.
13.	Part 2	Section VII-B (PS)	6.3.2.4.8	New sub-clause	Alternate design of OLTC such as in-tank type may be considered subject to diverter switch contacts to be housed in a separate oil chamber not communicating with the oil in the main tank of the transformer. And

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with
					such design shall be reliable, proven and duly complying with all the requirements, documentary evidence of which shall be submitted by Contractor for approval of Engineer.
14.	Part 2	Section VII-B (PS)	6.3.2.5.1	The Traction Transformer shall be designed to operate in ONAN/ONAF mode (synthetic esters oil natural / air natural/air forced).	The Traction Transformer shall be designed to operate in ONAN mode (synthetic esters oil natural / air natural).
15.	Part 2	Section VII-B (PS)	6.3.2.15.1	For transport either by road, ship or rail, the transformer shall be filled with oil up to windings top and then with Nitrogen at recommended pressure up to the tank top or alternatively the transformer may be filled with Nitrogen, in full, during transportation.  The bushing, breather, wheels and all other external parts shall be removed on condition that they can be mounted at site.	For transport either by road, ship or rail, the transformer shall be filled with oil up to windings top and then with Nitrogen at recommended pressure up to the tank top or alternatively the transformer may be filled with Nitrogen, in full, during transportation. <b>Alternate proven and industry accepted methods (e.g. transformer filled with oil and then with dry air upto the tank top) may also be considered, for which the Contractor shall provide appropriate documents for approval by the Engineer.</b>  The bushing, breather, wheels and all other external parts shall be removed on condition that they can be mounted at site.
16.	Part 2	Section VII-B (PS)	7.1.1.42	The isolators shall be of two-column rotary center break type, with two moving parts (two rotating columns). They shall be protected against corona discharge by providing metallic ring.	The isolators shall be of appropriate design (e.g. telescope movement) suitable for GIS switchgear and shall be provided with appropriate protection.
17.	Part 2	Section VII-B (PS)	7.1.1.47	To unify the equipment, the current transformers shall be SF6 insulated. That means the active part of the CT, primary and secondary are enclosed into a chamber full of SF6 to ensure isolation between the both winding and to reduce the dimension of the active part. In this system the tank is at the primary potential, contrary to the general case of current transformer oil insulated where the tank is insulated.	To unify the equipment, the current transformers shall be SF6 insulated. That means the active part of the CT, primary and secondary are enclosed into a chamber full of SF6 to ensure isolation between the both winding and to reduce the dimension of the active part. In this system the tank is at the primary potential, contrary to the general case of current transformer oil insulated where the tank is insulated. <b>Alternate design with CT</b>

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with
					<b>LV cores mounted outside the gas chamber may be considered subject to compliance to specified requirements and the same being proven, for which documentary evidence shall be submitted by the Contractor for approval by Engineer.</b>
18.	Part 2	Section VII-B (PS)	7.1.1.49	Each incoming section shall be equipped with measuring and protection current transformer on each phase.	Each incoming section shall be equipped with measuring and protection current transformer on each phase. <b>Additional CT for metering shall be provided.</b>
19.	Part 2	Section VII-B (PS)	7.1.3.2.4 (d)	Efficiency at different load conditions:	<b>Indicative</b> Efficiency at different load conditions ( <b>the losses value indicated in Appendix B Data Sheet shall be overriding considerations over the indicative efficiency values mentioned herein</b> ):
20.	Part 2	Section VII-B (PS)	7.1.3.1.6.2	The on-load tap changer shall be single-phase enclosure type, installed in a separated oil tank, offering 16 steps, each representing 1.667% of the nominal voltage as follows: <ul style="list-style-type: none"> <li>For 132 kV + 6 x 2200 V - 9 x 2200 V</li> </ul>	The on-load tap changer shall be <b>three</b> -phase enclosure type, installed in a separated oil tank, offering 16 steps, each representing 1.667% of the nominal voltage as follows: <ul style="list-style-type: none"> <li>For 132 kV + 6 x 2200 V - 9 x 2200 V</li> </ul>
21.	Part 2	Section VII-B (PS)	7.1.3.1.6.6	New sub-clause	Alternate design of OLTC such as in-tank type may be considered subject to diverter switch contacts to be housed in a separate oil chamber not communicating with the oil in the main tank of the transformer. And such design shall be reliable, proven and duly complying with all the requirements, documentary evidence of which shall be submitted by Contractor for approval of Engineer.
22.	Part 2	Section VII-B (PS)	7.1.3.1.17.1	For transport either by road, ship or rail, the transformer shall be filled with oil up to windings top and then with Nitrogen at recommended pressure up to the tank top or alternatively, the transformer may be filled with Nitrogen, in full, during transportation.	For transport either by road, ship or rail, the transformer shall be filled with oil up to windings top and then with Nitrogen at recommended pressure up to the tank top or alternatively, the transformer may be filled with Nitrogen, in full, during transportation. <b>Alternate proven and industry accepted methods (e.g.</b>

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with
				The bushing, breather, wheels and all other external parts shall be removed on condition that they can be mounted at site.	<b>transformer filled with oil and then with dry air upto the tank top) may also be considered, for which the Contractor shall provide appropriate documents for approval by the Engineer.</b>  The bushing, breather, wheels and all other external parts shall be removed on condition that they can be mounted at site.
23.	Part 2	Section VII-B (PS)	7.2.4.8.1	The Contractor has to provide a dynamic reactive compensation system in each TSS for total load of 15 MVA to be shared by two transformers (132/25kV).	If required as per studies, the Contractor shall provide switched capacitor bank for reactive power compensation, in each TSS for total load of 15 MVA (132/25kV). The bank should be operable in 2/3 steps to improve the power factor to more than 0.95.
24.	Part 2	Section VII-B (PS)	7.2.4.8.2	The power factor of the load at TSS may be taken as 0.8 and the dynamic compensation shall improve the power factor to more than 0.95.	Deleted
25.	Part 2	Section VII-B (PS)	7.2.4.8.3	All the above values are tentative and the Contractor has to design as per actual reactive power compensation required.	Deleted
26.	Part 2	Section VII-B (PS)	7.6.2.1	Power sockets shall be installed along the viaduct. From each station 2 cables have to be laid, one on each direction. Sockets shall be placed every 25 meters. They shall be 16 A rated current with 5-pins / 3-phases plus neutral plus earth. They shall ensure a protection of IP 65. Not more than 2 sockets will be operated in one circuit at any time. That is to say, the cable should be designed for carrying a continuous rated current of 32A, after considering the de-rating factors as applicable. The cable along the viaduct should be of the same cross section (min. 25 sq. mm.) throughout.	Power sockets shall be installed along the viaduct. From each station cables have to be laid on each direction. Sockets shall be placed every <b>50 meters on either side of the viaduct (duly staggered so that every 25m one socket is available on any one side)</b> . They shall be 16 A rated current with 5-pins / 3-phases plus neutral plus earth. They shall ensure a protection of IP 65. Not more than 2 sockets will be operated in one circuit at any time. That is to say, the cable should be designed for carrying a continuous rated current of 32A, after considering the de-rating factors as applicable. The cable along the viaduct should be of the same cross section (min. 25 sq. mm.) throughout.
27.	Part 2	Section VII-B	9.6.9.4	Contractor shall submit a training programme for	Contractor shall submit a training programme for

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SN	Part No.	Section	Clause ref.	Existing description	Replaced with																																								
		(PS)		<p>following instructor-weeks for Power supply system in following areas:</p> <table border="1"> <thead> <tr> <th>SN</th> <th>Description</th> <th>Total Period (Man Months)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Design of 132kV GIS RSS</td> <td>3</td> <td></td> </tr> <tr> <td>2</td> <td>Design of 33kV auxiliary network system</td> <td>3</td> <td>During the Design Stage</td> </tr> <tr> <td>3</td> <td>Design of 25 kV traction supply (TSS)</td> <td>3</td> <td></td> </tr> <tr> <td>4</td> <td>Manufacturing facilities, Testing methods and procedures, Working Metro installations. Short Module course on System description, architecture and installation practices of Power supply system</td> <td>12</td> <td></td> </tr> </tbody> </table> <p><b>Note: The above requirement is tentative and Employer may alter the same suitably. However, the total provision of Contractor's trainers shall be in line with Pricing Document.</b></p>	SN	Description	Total Period (Man Months)	Remarks	1	Design of 132kV GIS RSS	3		2	Design of 33kV auxiliary network system	3	During the Design Stage	3	Design of 25 kV traction supply (TSS)	3		4	Manufacturing facilities, Testing methods and procedures, Working Metro installations. Short Module course on System description, architecture and installation practices of Power supply system	12		<p>following instructor-weeks for Power supply system in following areas:</p> <table border="1"> <thead> <tr> <th>SN</th> <th>Description</th> <th>Total Period (Man weeks)</th> <th>Remarks</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Design of 132kV GIS RSS</td> <td>3</td> <td></td> </tr> <tr> <td>2</td> <td>Design of 33kV auxiliary network system</td> <td>3</td> <td>During the Design Stage</td> </tr> <tr> <td>3</td> <td>Design of 25 kV traction supply (TSS)</td> <td>3</td> <td></td> </tr> <tr> <td>4</td> <td>Manufacturing facilities, Testing methods and procedures, Working Metro installations. Short Module course on System description, architecture and installation practices of Power supply system</td> <td>12</td> <td></td> </tr> </tbody> </table> <p><b>Note: The above requirement is tentative and Employer may alter the same suitably. However, the total provision of Contractor's trainers shall be in line with Pricing Document.</b></p>	SN	Description	Total Period (Man weeks)	Remarks	1	Design of 132kV GIS RSS	3		2	Design of 33kV auxiliary network system	3	During the Design Stage	3	Design of 25 kV traction supply (TSS)	3		4	Manufacturing facilities, Testing methods and procedures, Working Metro installations. Short Module course on System description, architecture and installation practices of Power supply system	12	
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SN	Part No.	Section	Clause ref.	Existing description				Replaced with																			
				Shall supply and provide connection between SP / SSP / SS (and 5MVA TSS at Mihan Depot) and SCADA RTU	equipment and connection arrangement	depot)			<b>Shall terminate the control / SCADA cables from SS/SSP at RTU end</b>	arrangement <b>Shall supply and provide connection / cables between SP / SSP / SS (and 5MVA TSS at Mihan Depot) and SCADA RTU</b>	depot)																
29.	Part 2	Section VII-B (PS), Appendix A: Interfaces	Table 3.5, Item 2 & 6 (Interface with viaduct Contractor)	<table border="1"> <thead> <tr> <th>Item No.</th> <th>Item Description</th> <th>PST Contractor</th> <th>Viaduct Contractors</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>Earthing and bonding arrangements at viaducts</td> <td>PST Contractor shall provide designs / drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet etc. and the extent of welding required to be done on Reinforcement bars.  <b>PST Contractor shall provide the necessary earthing connections between BEC /ITL earthing plates etc. and the earth</b></td> <td>Will supply and provide welding of Reinforcement bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Shall provide earth terminals for connection.  Shall coordinate with PST Contractor for verification of earthing and bonding measures adopted in the structure, as per the recommendations</td> </tr> </tbody> </table>				Item No.	Item Description	PST Contractor	Viaduct Contractors	2	Earthing and bonding arrangements at viaducts	PST Contractor shall provide designs / drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet etc. and the extent of welding required to be done on Reinforcement bars.  <b>PST Contractor shall provide the necessary earthing connections between BEC /ITL earthing plates etc. and the earth</b>	Will supply and provide welding of Reinforcement bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Shall provide earth terminals for connection.  Shall coordinate with PST Contractor for verification of earthing and bonding measures adopted in the structure, as per the recommendations	<table border="1"> <thead> <tr> <th>Item No.</th> <th>Item Description</th> <th>PST Contractor</th> <th>Viaduct Contractors</th> </tr> </thead> <tbody> <tr> <td>2</td> <td>Earthing and bonding arrangements at viaducts</td> <td>PST Contractor shall provide designs / drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet etc. and the extent of welding required to be done on Reinforcement bars.  Shall install support / brackets for Earth cable on viaduct (both UP and DN directions, including the station area)  Shall coordinate with Viaduct Contractors for verification of earthing and bonding measures adopted in the</td> <td>Will supply and provide welding of Reinforcement bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Shall provide earth terminals for connection.  Shall coordinate with PST Contractor for verification of earthing and bonding measures adopted in the structure, as per the recommendations</td> </tr> </tbody> </table>				Item No.	Item Description	PST Contractor	Viaduct Contractors	2	Earthing and bonding arrangements at viaducts	PST Contractor shall provide designs / drawings showing arrangement of Earth terminals required to be provided on piers, pedestals, segments, parapet etc. and the extent of welding required to be done on Reinforcement bars.  Shall install support / brackets for Earth cable on viaduct (both UP and DN directions, including the station area)  Shall coordinate with Viaduct Contractors for verification of earthing and bonding measures adopted in the	Will supply and provide welding of Reinforcement bars and earth terminals according to drawings ensuring continuity of reinforcement bars of viaduct segments piers and parapet segments. Shall provide earth terminals for connection.  Shall coordinate with PST Contractor for verification of earthing and bonding measures adopted in the structure, as per the recommendations
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SN	Part No.	Section	Clause ref.	Existing description		Replaced with									
					<p><b>terminals. This will include supply of cable to connect BEC and other connecting plates.</b></p> <p>Shall install support / brackets for Earth cable on viaduct (both UP and DN directions, including the station area)</p> <p>Shall coordinate with Viaduct Contractors for verification of earthing and bonding measures adopted in the structure, as per the recommendations in approved design.</p>	in approved design.	<table border="1"> <tr> <td></td> <td></td> <td>structure, as per the recommendations in approved design.</td> <td>in approved design.</td> </tr> <tr> <td>6</td> <td>Earthing connection for handrails</td> <td>PST Contractor will provide drawings showing arrangement of earth terminals required to be provided for earthing the hand rail</td> <td>The Viaduct Contractor shall coordinate and provide arrangement / provisions for necessary earth connection at handrails</td> </tr> </table>			structure, as per the recommendations in approved design.	in approved design.	6	Earthing connection for handrails	PST Contractor will provide drawings showing arrangement of earth terminals required to be provided for earthing the hand rail	The Viaduct Contractor shall coordinate and provide arrangement / provisions for necessary earth connection at handrails
		structure, as per the recommendations in approved design.	in approved design.												
6	Earthing connection for handrails	PST Contractor will provide drawings showing arrangement of earth terminals required to be provided for earthing the hand rail	The Viaduct Contractor shall coordinate and provide arrangement / provisions for necessary earth connection at handrails												
				6	<p>Earthing connection for handrails</p> <p>PST Contractor will provide drawings showing arrangement of earth terminals required to be provided for earthing the hand rail</p> <p><b>PST Contractor</b></p>	The Viaduct Contractor shall coordinate and provide arrangement / provisions for necessary earth connection at handrails									

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SN	Part No.	Section	Clause ref.	Existing description			Replaced with
						shall provide earth cable connection and connect the hand rail (with 35 mm <sup>2</sup> copper or equivalent connection)	
30.	Part 3	Section X, Contract Forms	Parent Company Undertaking (Para 1)	In consideration of the Employer entering into the Contract with the Contractor, the Parent Company hereby undertakes to the Employer that, without the written consent of the Employer, it will not [and will ensure that none of the companies referred to in Recital (C) will] [see Note 5]:			In consideration of the Employer entering into the Contract with the Contractor, the Parent Company hereby undertakes to the Employer that, <b>without information to</b> the Employer, it will not [and will ensure that none of the companies referred to in Recital (C) will] [see Note 5]:
31.	Part 1	Section III. Eligibility and Qualification Criteria	4.1 General Construction Experience Column 'Requirement' and Corrigendum-2 Part B: Addendum SN.1	Experience under <b>railway (metro, railway, suburban, monorail, high speed rail etc.) system</b> construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last 5 [five] years, starting 1 <sup>st</sup> January 2011.			Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last 5 [five] years, starting 1 <sup>st</sup> January 2011.
32.		Part A, Reply to Pre-bid queries	SN 54 & 184 of pre-bid clarification	New addition - CAD drawings			The CAD drawings developed by NMRCL are attached as Part-C (Corrigendum-4)

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S. No	Part No.	Section	Clause Ref.	Existing Description	Replaced with												
33	Part 1	Section III. Eligibility and Qualification Criteria	4.2 (d) Specific Construction & Contract Management Experience and Item 3 of Corrigendum-II PartB, Addendum	Experience of 132 kV and above cable laying One work for a route length of 2km OR Two works for total route length of 3km	Experience of 110 kV and above cable laying One work for a route length of 2km OR Two works for total route length of 3km  (Replaced Clause 4,2 (d) appear below table.)												
34	Part 1	Section III. Eligibility and Qualification Criteria	4. Experience <b>(Footnote)</b>	New addition - SN 7	7. The completion certificates submitted against specific work requirement must be supported with performance certificate of the User/Employer.												
35	Part 2	Section VII B Particular Specification, Appendix F	4. Eligibility Criteria for Designer	The Contractor (or their Designer) is obligated to develop the simulation software (traction power and EMC/EMI simulations) in association with an Indian design-engineering firm and an Indian educational institution. The IPR for the software shall vest with NMRCL, Indian design engineering firm and Indian educational institution jointly.	This particular para is deleted from within clause no.4, Appendix F.												
36	Part 2	Section VII-A (GS)	2.3	IT Requirements of Employer	The existing clause 2.3 is replaced. Full text of the replaced clause 2.3 appear below this table:												
37	Part 2	Section VII-B (PS)	4.4.4.2	The traction system shall be able to allow the degraded operation in 2041, as per Operation Plan under the following degraded modes: one out of the two TSS is out of order.	The traction system shall be able to allow the <b>normal</b> operation in 2041, as per Operation Plan under the following degraded modes: one out of the two TSS is out of order.												
38	Part 2	Section VII-B (PS)	6.3.1.1 (a)	132 kV/27.5kV Traction Transformer (02 nos.)	132 kV/27.5kV Traction Transformer (02 nos.), <b>each minimum 15 MVA rating</b>												
39	Part 2	Section VII-B (PS)	7.2.3.6.6 (Item 3 of Table)	<table border="1"> <thead> <tr> <th>SN</th> <th>Description</th> <th>Particular</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>Rated Insulation Voltage</td> <td>52 kV</td> </tr> </tbody> </table>	SN	Description	Particular	3	Rated Insulation Voltage	52 kV	<table border="1"> <thead> <tr> <th>SN</th> <th>Description</th> <th>Particular</th> </tr> </thead> <tbody> <tr> <td>3</td> <td>Rated Insulation Voltage</td> <td><b>40 kV</b></td> </tr> </tbody> </table>	SN	Description	Particular	3	Rated Insulation Voltage	<b>40 kV</b>
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S. No	Part No.	Section	Clause Ref.	Existing Description	Replaced with
40	Part 2	Section VII-B (PS); Appendix B: Technical Sheets	10.9 (Table) 25kV GIS	Item 5: Rated insulation voltage ... 52kV	Item 5: Rated insulation voltage ... 40kV
41	Part 2	Section VII-B (PS)	7.5.3	Data communication between the Intelligent Electronic Devices, the Remote Terminal Units, the Programmable Logic Controllers and the SCADA Local Concentration Device shall be via the communications network, using open standard protocol IEC 61850. Proprietary standards are not allowed.	Data communication between the Intelligent Electronic Devices, the Remote Terminal Units, the Programmable Logic Controllers and the SCADA Local Concentration Device shall be via the communications network, using open standard protocol IEC 61850 / <b>IEC 60870-5-103</b> . Proprietary standards are not allowed.
42	Part 3	Section IX. PC Part B	SN 2 (Sub-Clause 4.2A)	New note is added at the bottom of the clause	<b>Note:</b> The Parent Company Undertaking and Parent Company Guarantee shall not be necessary in the case the Bidder is not using experience / credentials of its Parent Company (Associate / Affiliate) for the purpose of qualifying requirements (as per Section III. Eligibility and Qualification Criteria of Part 1).
43	Part 1	Annexure-IV-A: Pricing Document Appendix – P: Vendor Approval and Selection Procedure	(8)	New Note	In respect of equipment which are to be handed over to Maharashtra State Electricity Transmission Co. Ltd. MSETCL, like EHV cable (with accessories) and Take-off arrangement including GIS at Mankapur substation, the vendor selection & approval shall be as per the requirement of MSETCL.
44	Part 1	Annexure-IV-A: Pricing Document Appendix- D to I, K1, K2, K3	Cost Centre A: Detail Design A5, A7, A6, A7 respectively	Validation / Auditing of Design and Installation of .....	Validation / Auditing of Design of.....

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S. No	Part No.	Section	Clause Ref.	Existing Description	Replaced with
45	Part 2	Section VIIB; Particular Specification	7.4.2.2  (Corrigendum-II, Part-A, Item SN 90)	Cable operation characteristics  In normal situation, each cable ..... .....also, will be required. The 132kV cables shall be able to withstand a short circuit current of 22 kA, for 3 sec.	Cable operation characteristics  In normal situation, each cable ..... .....also, will be required. The 132kV cables shall be able to withstand a short circuit current of 40 kA, for 3 sec.
46	Part 2	Section VIIB; Particular Specification	7.4.2.8	New Note	The cable along with its accessories should also be compliant to GTR of MSETCL, which is place as new Appendix-H to the particular specification.
47	Part 2	Section VIIB; Particular Specification	Appendix - H	New addition	Appendix – H Specification of EHV cable & accessories. (Please refer attached pdf document)

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Ref: Item No. 31 above

31 Part 1: Section III							
Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
<b>4. Experience</b>							
4.1	<b>General Construction Experience</b>	Experience under construction contracts in the role of prime contractor, JV member, sub-contractor, or management contractor for at least the last 5 <i>[five]</i> years, starting 1 <sup>st</sup> January 2011.	Must meet requirement	N/A	Must meet requirement	N/A	Form EXP – 4.1

Ref: Item No. 33 above

Part 1: Section III							
Eligibility and Qualification Criteria				Compliance Requirements			Documentation
No.	Subject	Requirement	Single Entity	Joint Venture (existing or intended)			Submission Requirements
				All Parties Combined	Each Member	One Member	
<b>4. Experience</b>							
4.2 (d)		Experience of 110 kV and above cable laying One work for a route length of 2km OR Two works for total route length of 3km	<i>Must meet requirement</i>	N/A	N/A	<i>Must meet requirement</i>	Form <a href="#">EXP – 4.2 (b)</a>

Ref: Item No. 36 above

Part 2. Section VII A (GS)

**2.3 IT Requirement of Employer**

2.3.1 Employer is in the process of implementing an Enterprise wide IT system project titled “Digital Project Management Platform”. The objective of the IT project is to develop a working environment that enables higher efficiency and effectiveness, not only in internal functions, but also across the entire ecosystem of the Employer including Contractors. The IT project envisaged following application stack:

- (a) Collaborative document control and management services (using Bentley ProjectWise and AssetWise solution)
- (b) Scheduling services (using Oracle Primavera P6 Enterprise Project Portfolio Management (EPPM))
- (c) Project Management with progress and performance reporting (using Primavera P6 & Unifier solution)
- (d) Progress and performance reporting with visualization (using RIB iTWO )
- (e) Enterprise wide ERP SAP implementation

2.3.2 The proposed IT system has been conceptualized for facilitating preservation of important artifacts (plans, drawings, notes, documents, reports etc.) in a secure and manageable environment in digitized format. Appropriate triggers shall generate dashboards and management reports every time an event causes a substantial shift in the project risk or a deviation in processes is developed. The envisaged system would expedite decision-making, ensure better planning and coordination between different functions, better data management, effective reporting, knowledge management etc. Program management shall provide senior management with critical information related to various contracts, activities and funds in the form of management dashboards with inbuilt triggers to ensure timely decision-making. Clause 1.1.6 details out the bidder’s expected involvement on NMRCL’s Digital platform

2.3.3 The effective use of such IT platform requires availability of system at all requisite locations i.e. with Employers’ various offices, Engineer’s offices, Contractors’ end, major sub-contractors’ end, design consultant ends etc. with certain definite users’ rights. Data uploading by various authorized and trained users is key to effective implementation of the IT system. It is expected that contractor would have previously worked on the similar packages also it is understood that such envisaged IT platform is already a part of detailed scope of work of successful bidder. However, NMRCL has conceptualized the creation of a 5D BIM platform which would be the single collaborative environment among all stakeholders including contractors, General consultants, detailed design consultants etc. for efficient & seamless flow of information.

2.3.4 In view of the above, the Contractor shall be required to:

- (a) Follow and comply the system guidelines to be issued by Employer/GC
- (b) Comply all the software system competency.
- (c) Upload / definition of Project Plans as per the template and using software defined by the Employer/GC;
- (d) Maintenance and updating of uploaded Project Plans in software used by the Employer/GC;
- (e) Upload of drawings / designs created by the Contractor as per the classification and on the software platform defined by the Employer/GC;
- (f) Key contract related communication and progress related data as per processes defined on the software platform deployed by the Employer/GC
- (g) Asset details need to be updated in the system in the format prescribed by the Employer/GC;

Bidder is expected to review section 2.3.6 for more details for bidder’s expected involvement on NMRCL’s Digital platform

2.3.5 Employer and its IT Implementation Agency shall render necessary assistance for the training of contractor staff.

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- 2.3.6 Bidder will need to be accessing NMRCL's digital platform for at least the mentioned functions as applicable as per bidder's respective scope of work. However the function list is indicative and precise activities from bidder on NMRCL's digital platform will be updated and communicated to bidder on time to time basis.

Following are the deliverables in form of collaboration with 5D BIM by Bidder:

- 2.3.6.1 Creation of 3D engineered intelligent Models using discipline specific modelling/engineering applications.
- 2.3.6.2 Creating 2D drawings in CAD – plan, section, elevation and other relevant details (based on specific engineering disciplines) to be accessed by the contractors for construction.
- 2.3.6.3 Bidder need to comply with the following requirements in regards to the production of all the CAD (3D/2D) data files and building information modeling (BIM) work.

### 2.3.6.3.1 Model file production principles

- 1) Bidder need to follow British Standard BS 1192:2007+A2:2016 for Collaborative production of architectural, engineering and construction information - Code of practice as a guide for drawing practice, convention, CAD data structure and translation.
- 2) Bidder need to model all design and construction information as an individual discipline model and then collaborate it in single master 3D composite model, using object based software, allowing for 2D models to be extracted as required.
- 3) Bidder need to create and share details of individual components of 3D models for each discipline involved.
- 4) Bidder need to share all individual discipline models as well the collaborated single master model through the Engineering Information Collaboration System for review by GC/NMRCL. Clash detection and resolution process will run in this composite area. All 3D model data together with all 2D drawing extractions needs to be spatially coordinated with the Geospatial System. UTM/WGS84 coordinate system needs to be followed for proper geo-referencing of all the engineered 3D models that will be created.

### 2.3.6.3.2 Model file composition

- 1) Bidder need to generate model files using seed files/template (2D and 3D). Seed files/template will standardize all the new drawings that one creates. It will standardize the same global origin, color table, cell library attachments, working units, views etc.
- 2) Model files needs to contain one model view and one sheet view
- 3) All graphical elements need to be placed in the model view
- 4) Model files need to have a title box placed in the sheet view
- 5) All model files need to be created at 1:1 scale

### 2.3.6.3.3 Model Outputs

- 1) Within the engineering collaboration system the central premise is that only approved data is shared. Each discipline WIP area can only reference data from the shared area i.e. approved data. When this data comes together in the composite model it can be fully coordinated and composite renditions can be produced in 3D.

### 2.3.6.3.4 Model Reviews

- 1) Bidder needs to ensure that the level of complexity and granularity for each discipline CAD model is appropriate for the stage of Works.
- 2) Bidder needs to ensure that all disciplines integrate and coordinate their outputs in terms of both spatial and functional provision. This shall be demonstrated through the extensive use of coordinated design review sessions which shall include for the coming together of all relevant discipline models into a common master model (model composite) where

## NMRCL Tender N1 TR 1/2016

engineering assurance and coordination checks shall take place.

### 2.3.6.3.5 Existing Infrastructure data sets

- 1) Bidder need to model existing infrastructure and systems in sufficient detail as to provide integration with the works under contract
- 2) Bidder need to clearly highlight the unresolved areas of non-coordination in structure/services/finishes/clashes on the drawings and the model at all times in case of existing infrastructure data sets
- 3) Bidder need to report back to the owner any discrepancy with the existing data for their action

### 2.3.6.3.6 Coordination and integration – Drawing Packages

- 1 Within the BIM environment each of the disciplines need to reference other models in a timely manner for coordination purposes. The head of each discipline group shall decide the extent and nature of supporting discipline data that shall be displayed in each of their own discipline drawing submissions. Clash detection software routines needs to be run on the multi-discipline model and on combined master models and any clashes resolved. The reports of which will be submitted on request of the Engineer
- 2 Specific drawing packages are required from each discipline. The drawings need to comprise of 2D extractions of the 3D models from the engineering collaboration system.
- 3 All CAD drawings need to be comprised of 2D models extracted from the 3D master model. Any subsequent design scheme changes that are required to be fully coordinated shall be modeled in 3D and the drawing extraction re-run to produce revised plots.
- 4 All plot composition files need to be checked as prescribed by the workflow setup in the engineering collaboration system before submission to the Engineer.

2.3.6.4 The bidder shall take full advantage of the 3D object attributes available in the BIM environment to prove cost, constructional logic, fabrication, and program as required by the NMRCL/GC. Engagement modality expected for Project Management works including 4D & 5D BIM requirements: -

1. Bidder shall allocate a Project Coordinator who would be a single-point contact for NMRCL for monitoring day-to-day progress on the Project.
2. Bidder will access the web-based Project Monitoring application (Primavera) of NMRCL
3. Bidder will have to create Work Breakdown Structure (WBS) for its scope of work in the master project prepared and released by NMRCL on Primavera.
4. Bidder will have to create all the relationships between various activities to generate a Critical Path Network on Primavera.
  - The project plan will be detailed to reflect the planned construction progress as per the 3D BIM model. This is must, as Primavera plan will get linked to 3D BIM collaborated intelligent model to reflect and review time based planned progress of project on a BIM model. Bidder's project plan on NMRCL Primavera platform will be required at this level.
5. Once the network has been scheduled and baseline by NMRCL/GC, the Project Coordinator will have to provide periodical updates for various activities.
6. Bidder will also be required to furnish key cost / budget details along with resources on NMRCL's Primavera platform. Level of details for time plan, cost, and resources from bidder will be communicated to bidder at appropriate stage.
7. During the execution stage bidder will be required to operate on NMRCL's Primavera platform to reflect minimum details towards work performed, progress achieved, resources consumed, forecast dates, forecast resources, remaining work along with any other key details as Required by NMRCL / GC. NMRCL will be communicating on level of details as well frequency of such interactions at appropriate stage.
8. Bidder shall update and revise their work program on the integrated master schedule of the project subject to directions & approval from NMRCL.

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9. Bidder will be required to periodically capture actual progress visualization of respective package work using suitable technology which can be updated in 5D BIM platform.
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- 2.3.6.5 In order to adopt 5D BIM platform bidder need to follow Employer's Information Requirement (EIR) Document which will be prepared by Owners Support Office (OSO) in consultation with General Consultant (GC) and handed over to the Bidder. The EIR will enlist the standards, methods and procedures that one has to follow in order to be BIM Compliant. EIR will have details such as CAD standards, BIM standards, Asset Dictionary, Asset Classes, file naming convention, layer naming convention, Attribute Standards, etc.
  - 2.3.6.6 SAP ERP (Component of Digital Project Platform):  
In order to adopt SAP ERP platform contractor will be required to follow Employer's Information Requirement (EIR) Document which will be prepared by OSO in consultation with General Consultant (GC) and handed over to the contractor. The EIR will enlist the standards, methods, procedures and data related to defined functionality coverage in SAP ERP.
  - 2.3.6.7 Minimum login credentials (as decided by NMRCL) per bidder will be provided by NMRCL to the bidder to access NMRCL digital platform as per clause 1.1.3. In case, bidder envisages more user licenses for their internal data preparation through their internal user (like detailed drawing or project plan preparation by multiple users) which is required for finalizing data to be entered in NMRCL's digital platform, then it will be bidder's responsibility to ensure own licenses. However the access to NMRCL's digital platform will be through provided user credential only.
  - 2.3.6.8 The engineering collaboration platform will be provided by NMRCL and is mandated for the structure and the controlled sharing of the information created during the process.

Cir. No.: 85/DIV/TRF/05

June 05, 2015

To Members of IEEMA Transformer Division, SEBs, Utilities & Listed Purchasing organizations

**Sub: Revision in PV clause of "Power Transformers"**

IEEMA has been operating Price variation clauses for various electrical equipment including Transformers. Transformers PV clauses were evolved and made operational from June 2003 & subsequently revised in January 2009.

With the passage of time and over the last five years, it is observed by the Transformer industry due to revision in utility specifications with very high capitalization rates, changes in raw material cost and components etc., the current PVC formula for 'Power Transformer' do not give the correct variation. Hence there is a need of revision in the formulae. Also a new formula shall be developed for UHV segment i.e. 765kV & 1200kV and Reactors. It is also desired that prices of raw materials need to be closer to actual market prices and lag period for these raw material prices should be in line with contemporary manufacturing practices; for fair price variation.

The Transformer division of IEEMA has deliberated on this subject; collected costing data from major manufacturers for various types of Power Transformers and Reactors. They also arrived at appropriate changes in sources of various raw materials. Following Two Categories of PV clauses have been finalized for Power Transformers.

- 1) Transformers and Reactors of ratings **Above 10 MVA or voltage above 33 kV up to 400 kV**
- 2) Transformers and Reactors of ratings **Above 10 MVA and above 400 kV**

The salient features of the proposed PV clauses are as under.

- a) Fixed cost component has been reduced to 10
- b) Steel Plates 10mm (retail) price as published by Joint Plant Committee (JPC) will represent Iron & Steel portion in place of Wholesale Price Index Number (WPI) for Ferrous Metal. This will make way to publish monthly PV Circular within 4-5 days after completion of the month.
- c) CRGO LAMINATION price of appropriate Grade/s sourced from processing centres will be used.

All above changes are also made effective in respective PV clauses for Deemed Export contracts.

Proposed Draft revised PV clauses was circulated vide Cir. No. 52 dated 7<sup>th</sup> April 2015. Since, no adverse comments have been received; we are making operational these new PV clauses for Power Transformers w.e.f. 1<sup>st</sup> April 2015

We are publishing a separate monthly Price variation circular (Ref:IEEMA(PVC)/PWR\_TRF/04/2015) applicable to only these two PV clauses. Circular for the month of April and May 2015 are attached along with new PV clauses.

Old PV clause for Power Transformers w.e.f. 1<sup>st</sup> January 2009 will be treated as discontinued after 1<sup>st</sup> April 2015.

We recommend incorporating this new PV clause of Power Transformer in all future tenders. We recommend following methodology to arrive at price variation for all the pending contracts having old IEEMA PV clause of Power Transformer (w.e.f. 1<sup>st</sup> January 2009)

1. Calculate 'P' from the date of tendering /base date of the contract as per old (w.e.f. January 2009) IEEMA PV clause of Power Transformer up to April 2015 i.e. considering prices published in monthly PV circular of April 2015 as per old PV clause of Power Transformer at the denominator
2. Treat the above calculated 'P' and 'P<sub>0</sub>' and calculate final price variation using new (w.e.f. April 2015) IEEMA PV clause for Power Transformer from April 2015 i.e. considering prices published in monthly PV circular of April 2015 as per new PV clause of Power Transformer at the numerator; up to the date of delivery i.e. by considering appropriate prices as per new PV clause of Power Transformer.

Monthly PV circular for Transformer vide ref. IEEMA/PVC/TRF(R-1) which is currently being published will continue to be published to operate PV clauses for Distribution (BEE Star 3 & above and Non-BEE) and REC range Transformers w.e.f. January 2009

Deputy Director General

Encl.: New PV clauses of Power Transformers (wef. 1<sup>st</sup> April 2015) and monthly PV circular for April & May 2015

**PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS AND REACTORS  
COMPLETE WITH ALL ACCESSORIES AND COMPONENTS  
of ratings above 10 MVA and voltage above 400 kV  
Of supplied against domestic contracts**

This price variation clause is applicable for 'Power Transformers', ratings above 10 MVA and voltage above 400 kV. The clause is to be used for domestic contracts. A separate price variation IEEMA/PVC/PWR TRF\_ above 400 KV/DE/2015 has been evolved for above types of Transformers supplied against export/deemed export contracts under special imprest licensing scheme.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100} \left( 10 + 18 \frac{C}{C_0} + 21 \frac{ES}{ES_0} + 10 \frac{IS}{IS_0} + 8 \frac{IM}{IM_0} + 23 \frac{TO}{TO_0} + \frac{W}{W_0} \right)$$

Wherein,

- P = Price payable as adjusted in accordance with the above formula.
- P<sub>0</sub> = Price quoted/confirmed.
- C<sub>0</sub> = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **ONE** month prior to the date of tendering.
- ES<sub>0</sub> = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- IS<sub>0</sub> = Average price of steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- IM<sub>0</sub> = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- TO<sub>0</sub> = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- W<sub>0</sub> = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of tendering.

IEEMA/PVC/PWR TRF\_ above 400 KV 2015/1/3

For example, if date of tendering falls in June 2015, applicable prices of Copper Wire Bars (C<sub>0</sub>), Transformer Oil (TO<sub>0</sub>), Steel Plates 10 mm thick (IS<sub>0</sub>), CRGO Electrical Steel Laminations (ES<sub>0</sub>) and Insulating material (IM<sub>0</sub>) should be as on 1<sup>st</sup> May 2015 and all India average consumer price index no. (W<sub>0</sub>) should be for the month of 1<sup>st</sup> March 2015.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR TRF/\_/\_ **ONE** month prior to the date of tendering.

- C = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **THREE** months prior to the date of delivery.
- ES = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day for the month, **THREE** months prior to the date of delivery.
- IS = Average price of Steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of delivery.
- IM = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **THREE** months prior to the date of delivery.
- TO = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of delivery.
- W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2015, applicable prices of Copper Wire Bars (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES) should be as on 1<sup>st</sup> September 2015 and Transformer Oil (TO), Steel Plates 10 mm thick (IS) should be 1<sup>st</sup> November 2015 and all India average consumer price index no. (W) should be for the month of September 2015.

The date of delivery is the date on which the transformer is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Notes: (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi etc. transformers manufacturers import major raw materials like Copper, CRGO Steel Sheets and Plates etc. The landed cost of these imported raw materials includes applicable custom duty but exclusive of modvatable CVD.

(b) All prices are as on first working day of the month.

(c) The details of prices are as under:

1. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of rating above 10 MVA and above 400 kV
  3. Price of steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT as on 1<sup>st</sup> working day of the month.
  4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1<sup>st</sup> working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.
- (d) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

$$P = \frac{P_0}{92} \left( 10 + 18 \frac{C}{C_0} + 21 \frac{ES}{ES_0} + 10 \frac{IS}{IS_0} + 10 \frac{IM}{IM_0} + 23 \frac{W}{W_0} \right)$$

Where description of P, P<sub>0</sub>, C, ES, IS, IM, W etc. remains same as mentioned earlier.


  
 Deputy Director General

IEEMA/PVC/PWR TRF\_ above 400 KV 2015/3/3

**PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS AND REACTORS  
 COMPLETE WITH ALL ACCESSORIES AND COMPONENTS  
 of ratings above 10 MVA or voltage above 33 kV up to 400 kV  
 Of supplied against domestic contracts**

This price variation clause is applicable for 'Power Transformers', ratings above 10 MVA or voltage above 33 kV up to 400 kV. The clause is to be used for domestic contracts. A separate price variation IEEMA/PVC/PWR TRF\_upto 400 KV/DE/2015 has been evolved for above types of Transformers supplied against export/deemed export contracts under special imprest licensing scheme.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100} \left( 10 + 29 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 7 \frac{IS}{IS_0} + 5 \frac{IM}{IM_0} + 7 \frac{TO}{TO_0} + \frac{W}{W_0} \right)$$

Wherein,

- P = Price payable as adjusted in accordance with the above formula.
- P<sub>0</sub> = Price quoted/confirmed.
- C<sub>0</sub> = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **ONE** month prior to the date of tendering.
- ES<sub>0</sub> = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- IS<sub>0</sub> = Average price of steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- IM<sub>0</sub> = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- TO<sub>0</sub> = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- W<sub>0</sub> = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of tendering.

IEEMA/PVC/PWR TRF\_upto 400 KV2015/1/3

For example, if date of tendering falls in June 2015, applicable prices of Copper Wire Bars (C<sub>0</sub>), Transformer Oil (TO<sub>0</sub>), Steel Plates 10 mm thick (IS<sub>0</sub>), CRGO Electrical Steel Laminations (ES<sub>0</sub>) and Insulating material (IM<sub>0</sub>) should be as on 1<sup>st</sup> May 2015 and all India average consumer price index no. (W<sub>0</sub>) should be for the month of 1<sup>st</sup> March 2015.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR\_TRF/\_/\_ **ONE** month prior to the date of tendering.

- C = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **TWO** months prior to the date of delivery.
- ES = Price of CRGO Electrical Steel Lamination (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day for the month, **TWO** months prior to the date of delivery.
- IS = Average price of Steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of delivery.
- IM = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **TWO** months prior to the date of delivery.
- TO = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of delivery.
- W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2015, applicable prices of Copper Wire Bars (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES) should be as on 1<sup>st</sup> October 2015 and Transformer Oil (TO), Plates 10 mm thick (IS) should be 1<sup>st</sup> November 2015 and all India average consumer price index no. (W) should be for the month of September 2015.

The date of delivery is the date on which the transformer is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

IEEMA/PVC/PWR TRF\_upto 400 KV2015/2/3

Notes: (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi etc. transformers manufacturers import major raw materials like Copper, CRGO Steel Sheets and Plates etc. The landed cost of these imported raw materials includes applicable custom duty but exclusive of modvatable CVD.

(b) All prices are as on first working day of the month.

(c) The details of prices are as under:

1. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of rating above 10 MVA or voltage above 33 kV up to 400 kV
3. Price of steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT as on 1<sup>st</sup> working day of the month.
4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1<sup>st</sup> working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.

(d) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

$$P = \frac{P_0}{93} \left( 10 + 29 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 7 \frac{IS}{IS_0} + 5 \frac{IM}{IM_0} + 15 \frac{W}{W_0} \right)$$

Where description of P, P<sub>0</sub>, C, ES, IS, IM, W etc. remains same as mentioned earlier.


  
 Deputy Director General

IEEMA/PVC/PWR TRF\_upto 400 KV2015/3/3

**PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS AND REACTORS  
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 of ratings above 10 MVA or voltage above 33 kV up to 400 kV  
 supplied against export/deemed export contracts against duty free inputs  
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This price variation clause is applicable for 'Power Transformers', ratings above 10 MVA or voltage above 33 kV up to 400 kV. The clause is to be used for export/deemed export contracts against duty free inputs under special imprest licensing scheme. A separate price variation IEEMA/PVC/PWR TRF\_upto 400 KV/2015 has been evolved for above types of Transformers supplied against domestic contracts.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100} \left( 10 + 29 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 7 \frac{IS}{IS_0} + 5 \frac{IM}{IM_0} + 7 \frac{TO}{TO_0} + 15 \frac{W}{W_0} \right)$$

Wherein,

- P = Price payable as adjusted in accordance with the above formula.
- P<sub>0</sub> = Price quoted/confirmed.
- C<sub>0</sub> = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **ONE** month prior to the date of tendering.
- ES<sub>0</sub> = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- IS<sub>0</sub> = Average price of steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- IM<sub>0</sub> = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- TO<sub>0</sub> = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- W<sub>0</sub> = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of tendering.

IEEMA/PVC/PWR TRF\_upto 400 KV 2015/DE/1/3

For example, if date of tendering falls in June 2015, applicable prices of Copper Wire Bars (C<sub>0</sub>), Transformer Oil (TO<sub>0</sub>), Steel Plates 10 mm thick (IS<sub>0</sub>), CRGO Electrical Steel Laminations (ES<sub>0</sub>) and Insulating material (IM<sub>0</sub>) should be as on 1<sup>st</sup> May 2015 and all India average consumer price index no. (W<sub>0</sub>) should be for the month of 1<sup>st</sup> March 2015.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR TRF/DE/\_/\_ ONE month prior to the date of tendering.

- C = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, TWO months prior to the date of delivery.
- ES = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day for the month, TWO months prior to the date of delivery.
- IS = Average price of Steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, ONE month prior to the date of delivery.
- IM = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, TWO months prior to the date of delivery.
- TO = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, ONE month prior to the date of delivery.
- W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, THREE months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2015, applicable prices of Copper Wire Bars (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES) should be as on 1<sup>st</sup> October 2015 and Transformer Oil (TO), Plates 10 mm thick (IS) should be 1<sup>st</sup> November 2015 and all India average consumer price index no. (W) should be for the month of September 2015.

The date of delivery is the date on which the transformer is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

IEEMA/PVC/PWR TRF\_upto 400 KV2015/DE/2/3

Notes: (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi etc. In deemed export contract under special imprest licence, the basic inputs like Copper, CRGO steel lamination and Insulating pressboards etc, are imported duty free. While modvatable CVD is already excluded, the customs duty is also removed from basic prices.

(b) All prices are as on first working day of the month.

(c) The details of prices are as under:

1. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of rating above 10 MVA or voltage above 33 kV up to 400 kV
  3. Price of steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT as on 1<sup>st</sup> working day of the month.
  4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1<sup>st</sup> working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.
- (d) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

$$P = \frac{P_0}{93} \left( 10 + 29 \frac{C}{C_0} + 27 \frac{ES}{ES_0} + 7 \frac{IS}{IS_0} + 5 \frac{IM}{IM_0} + 15 \frac{W}{W_0} \right)$$

Where description of P, P<sub>0</sub>, C, ES, IS, IM, W etc. remains same as mentioned earlier.


  
 Deputy Director General

IEEMA/PVC/PWR TRF\_upto 400 KV2015/DE/3/3

IEEMA/PVC/PWR TRF\_ above 400 KV/DE/2015

Effective from: 1<sup>st</sup> April 2015

**PRICE VARIATION CLAUSE FOR POWER TRANSFORMERS AND REACTORS  
COMPLETE WITH ALL ACCESSORIES AND COMPONENTS  
of ratings above 10 MVA and voltage above 400 kV  
supplied against export/deemed export contracts against duty free inputs  
under special imprest licensing scheme**

This price variation clause is applicable for 'Power Transformers', ratings above 10 MVA and voltage above 400 kV. The clause is to be used for export/deemed export contracts against duty free inputs under special imprest licensing scheme. A separate price variation IEEMA/PVC/PWR TRF\_ above 400 KV/2015 has been evolved for above types of Transformers supplied against domestic contracts.

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P_0}{100} \left( 10 + 18 \frac{C}{C_0} + 21 \frac{ES}{ES_0} + 10 \frac{IS}{IS_0} + 10 \frac{IM}{IM_0} + 8 \frac{TO}{TO_0} + 23 \frac{W}{W_0} \right)$$

Wherein,

- P = Price payable as adjusted in accordance with the above formula.
- P<sub>0</sub> = Price quoted/confirmed.
- C<sub>0</sub> = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, **ONE** month prior to the date of tendering.
- ES<sub>0</sub> = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- IS<sub>0</sub> = Average price of steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- IM<sub>0</sub> = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** months prior to the date of tendering.
- TO<sub>0</sub> = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, **ONE** month prior to the date of tendering.
- W<sub>0</sub> = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, **THREE** months prior to the date of tendering.

IEEMA/PVC/PWR TRF\_ above 400 KV 2015/DE/1/3



**IEEMA/PVC/PWR TRF\_ above 400 KV/DE/2015**

**Effective from: 1<sup>st</sup> April 2015**

For example, if date of tendering falls in June 2015, applicable prices of Copper Wire Bars ( $C_0$ ), Transformer Oil ( $TO_0$ ), Steel Plates 10 mm thick ( $IS_0$ ), CRGO Electrical Steel Laminations ( $ES_0$ ) and Insulating material ( $IM_0$ ) should be as on 1<sup>st</sup> May 2015 and all India average consumer price index no. ( $W_0$ ) should be for the month of 1<sup>st</sup> March 2015.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/PWR TRF/DE/\_/\_ ONE month prior to the date of tendering.

- C** = Average LME settlement price of copper wire bars (refer notes)  
This price is as applicable for the month, THREE months prior to the date of delivery.
- ES** = Price of CRGO Electrical Steel Lamination (refer note)  
This price is as applicable on the 1<sup>st</sup> working day for the month, THREE months prior to the date of delivery.
- IS** = Average price of Steel Plates 10 mm thick (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, ONE month prior to the date of prior to the date of delivery.
- IM** = Price of Insulating Materials (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, THREE months prior to the date of delivery.
- TO** = Price of Transformer Oil (refer notes)  
This price is as applicable on the 1<sup>st</sup> working day of the month, ONE month prior to the date of delivery.
- W** = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)  
This index number is as applicable on the first working day of the month, THREE months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in December 2015, applicable prices of Copper Wire Bars (C), Insulating material (IM), CRGO Electrical Steel Lamination (ES) should be as on 1<sup>st</sup> September 2015 and Transformer Oil (TO), Steel Plates 10 mm thick (IS) should be 1<sup>st</sup> November 2015 and all India average consumer price index no. (W) should be for the month of September 2015.

The date of delivery is the date on which the transformer is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

IEEMA/PVC/PWR TRF\_ above 400 KV 2015/DE/2/3



## IEEMA/PVC/PWR TRF\_ above 400 KV/DE/2015

Effective from: 1<sup>st</sup> April 2015

Notes: (a) All prices of raw materials are exclusive of modvatable excise/CV duty amount and exclusive of any other central, state or local taxes, octroi etc. In deemed export contract under special imprest licence, the basic inputs like Copper, CRGO steel lamination and Insulating pressboards etc, are imported duty free. While modvatable CVD is already excluded, the customs duty is also removed from basic prices.

(b) All prices are as on first working day of the month.

(c) The details of prices are as under:

1. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  2. The price of CRGO is the price of CRGO Electrical Steel Lamination in Rs./MT suitable for Transformers of rating above 10 MVA and above 400 kV
  3. Price of steel is the average retail price of steel plates 10 mm thick as published by Joint Plant Committee (JPC) in Rs./MT as on 1<sup>st</sup> working day of the month.
  4. The price of Insulating materials (in Rs./Kg) of pre-compressed pressboards of size 10 mm thick, 3200 mm x 4100 mm is the average C&F price in free currency per MT converted into Indian Rupees with applicable exchange rates prevailing as on 1<sup>st</sup> working day of the month as quoted by primary suppliers. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty.
  5. The price of Transformer Oil (in Rs./K.Ltr) is the average price on ex-refinery basis as quoted by primary producers for supply in drums.
- (d) Some purchasers are purchasing oil immersed Transformers from manufacturers without first filling of oil. Oil for first filling is procured and filled by the purchasers. For such supplies PVC formula, excluding Oil will apply as under:

$$P = \frac{P_0}{92} \left( 10 + 18 \frac{C}{C_0} + 21 \frac{ES}{ES_0} + 10 \frac{IS}{IS_0} + 10 \frac{IM}{IM_0} + 23 \frac{W}{W_0} \right)$$

Where description of P, P<sub>0</sub>, C, ES, IS, IM, W etc. remains same as mentioned earlier.


  
 Deputy Director General

IEEMA/PVC/PWR TRF\_ above 400 KV 2015/DE/3/3

# **09 Appendix H**

## **Specification for EHV cabling**

# **ANNEXURE A**

## **220 kV/132 KV EHV XLPE CABLE SPECIFICATION**

## INDEX

S.NO.	PARTICULARS
1	SCOPE
2	STANDARDS
3	CLIMATIC CONDITIONS AND LAYING CONDITIONS
4	DESIGN & TECHNICAL DETAILS
5	MATERIAL AND CABLE CONSTRUCTION
6	MANUFACTURING PROCESS
7	QUALITY ASSURANCE
8	TESTING
9	TESTING FACILITIES AND TESTS CERTIFICATES
10	INSPECTION AND TRAINING AT MANUFACTURER'S WORKS
11	MARKING ON OUTER SHEATH
12	SEALING AND DRUMMING
13	STANDARD LENGTH AND QUANTITY TOLERANCE
14	DETAILS OF PAST EXPERIENCE
15	GUARANTEED TECHNICAL PARTICULARS
16	ABSOLUTE GUARANTEES
Annexure-V2-S1-1	DESIRED TECHNICAL PARTICULARS OF XLPE CABLE

## TECHNICAL SPECIFICATION FOR 220 kV/132 KV XLPE CABLE

### 1.0 SCOPE

- 1.1 Scope includes manufacture, testing before dispatch and delivery FOR destination of **220 kV, 1000 sq. mm, & 132 KV , 1000 sq mm** Single core, circular stranded **Milken** copper conductor XLPE power cable conforming to the **IEC 62067/ IEC 60840 / IS 7098 (Part-III)**.

### 2.0 STANDARDS:

- 2.1 Unless otherwise stated hereafter, rating, characteristics, test and procedures etc. concerning the **220 kV/132 KV** XLPE cable shall be preferably as per IS, IEC standards given below and shall be in compliance with the latest edition or revisions thereof and meeting the constructional details and testing requirement as stipulated in foregoing also.

IEC-60228	Conductor for insulated cable.
IEC-60229	Tests on cable over sheaths
IEC-60230	Impulse tests on cables and their accessories.
IEC-60270	Partial discharge measurements
IEC-60287-1-1	Calculation of continuous current carrying capacity.
IEC-60502	Power Cables with extruded insulation and their accessories.
IEC 80840	Tests for power cables with extruded insulation for rated voltage upto 150 kV.
IEC-62067	Tests for power cables with extruded insulation for rated voltage above 150 kV upto 500 kV.
BIS: 7098 (Part-3)	XLPE Cable specification for working voltages from 66 kV upto and including 220 kV.
IEEE:48	Tests procedures and requirements for high voltage cable terminations.

- 2.2 The **220 kV/132 KV** XLPE cable may conform to any other authorities' standards, which ensures an equal or better quality than the standard mentioned above. The equivalence of IS or IEC be mentioned/ indicated by bidder (wherever only one of them are mentioned in the specification) to ensure that the required technical parameters/ tests as per specifications are complied. The bidder must specifically indicate the standards to which the cable conforms and indicate all deviations (if any) from the preferred IS/ IEC codes that affect performance and rating.
- 2.3 Compliance of the **220 kV/132 KV** XLPE cable manufactured with the provisions of this specification does not relieve him of the responsibility of furnishing **220 kV/132 KV** XLPE cable and accessories of proper design, electrically and mechanically suited to meet the operating guarantees at the specified service conditions.

2.4 If there are, in the opinion of the bidder, any conflicts between these codes and this specification, these contradictions shall be brought to the attention of the owner.

### 3.0 CLIMATIC CONDITIONS AND LAYING CONDITIONS

The XLPE Power cable shall be suitable for continuous & satisfactory operation under following conditions:-

#### 3.1 System parameters & Climatic Conditions:-

##### **System parameters:**

##### **Voltage Grade :**

i)	Phase to phase	-	220 KV	132 KV
ii)	Phase to neutral (in KV)	-	127 KV	76
iii)	Highest voltage for equipment between conductors/phases(in KV)	-	245	145 KV

##### **Climatic Conditions :**

i)	Peak ambient temperature in shade	50°C
ii)	MaximumTemp in shade	45°C
iii)	Minimum Temp in shade	3.5°C
iv)	Maximum daily average temperature	40°C.
v)	Maximum relative humidity	100%
vi)	Minimum relative humidity	10%
vii)	Maximum annual rainfall	1450 mm
viii)	Maximum wind pressure	150 kg/Sq.mm
ix)	Maximum Altitude above mean Sea level	1000 M
x)	Isoceraunic level	50 days/year
xi)	Moderately hot and humid tropical climate, conductive to rust and fungus growth	

The climatic conditions are prone to wide variations in ambient conditions and the equipment offered shall be suitable for installation at any of the stations in Maharashtra state.

### 3.2 Conditions of Laying:-

- i) Laid directly in ground /metaled road at 1.8 M below ground level.
- ii) Installed outdoor in free air in vertical position.
- iii) Drawn into underground ducts/trenches below metaled road.
- iv) Laid directly in open trench in GIS/AIS Grid sub station.

### 3.3 Condition of installation of XLPE cable:

- |       |                             |  |
|-------|-----------------------------|--|
| i)    | Ground Temp.                | 35 °C  |
| ii)   | Maximum conductor temp.     | 90 °C  |
| iii)  | Air temperature             | 50 °C  |
| iv)   | Depth of burial             | 1.2 m. approx.   |
| v)    | Formation                   | Ckt. in trefoil/<br>horizontal as required                 |
| vi)   | Bonding of metallic sheath  | Cross Bonding  |
| vii)  | Number of 3 phase circuits  | Ckt-I  |
| viii) | Thermal Resistivity of soil | 120 °C. cm/W to be<br>maintained with<br>thermal backfill. |

## 4.0 DESIGN & TECHNICAL DETAILS

4.1 1000 sq.mm (as per load current & short circuit requirement) Single Core XLPE cable suitable for 132/220 kV nominal system shall have construction as under:

The cable shall be made of stranded, compacted circular conductor, electrolytic grade copper, taped with semi conducting tape. Conductor screening shall be with extruded semi conducting thermosetting compound layer. The cable shall be insulated with completely dry cured XLPE insulation. Insulation screening for non-metallic part shall be with extruded semi-conducting thermosetting compound layer. Taping with semi conducting water swellable tape shall be provided for longitudinal water sealing. Screening for metallic part shall be with annular/ring type corrugated Aluminium sheathed in combination with bedding of semi-conducting tape(s) followed by suitable non-metallic tape binder and overall

extruded black, HDPE with outer conductive coating. Power cable shall conform to the IS 7098 (Part-III)/ IEC 60840/62067 and foregoing paras of this specification.

- 4.2 The covering shall be watertight, electrically insulated, rodent proof and vermin proof.
- 4.3 The offered XLPE cable for 132/220 kV earthed system shall meet the technical particulars indicated in Annexure-1
- 4.4 The XLPE Cable shall be suitable for use where combined ambient temperature and temperature rise due to load result in conductor temperature not exceeding 90 °C under normal operation and 250°C under short circuit conditions.
- 4.5 Offered XLPE cable end termination as well as jointing kits shall be of rated short circuit current of 40 kA for duration of 3 seconds.
- 4.6 132/220 kV XLPE cable shall be designed to withstand the mechanical, electrical and thermal stresses under the steady state and transient / fault conditions and shall be suitable for proposed method of installation.
- 4.7 The cable shall be suitable for underground buried installation with controlled thermal back fill to maintain thermal resistivity at 120° C cm/W. Some of areas are likely to be flooded by water in rainy season.
- 4.8 The sheath/screen bonding system shall provide a continuous current path through the cable sheath & jointing kits and shall be bonded. The bonding ends shall be suitably earthed with/without SVL as per the approved configuration / design.
- 4.9 The sheath voltage under full load conditions shall not exceed the voltage specified / allowed in relevant standards for safety of personal as well satisfactory working of cable. Sheath shall be solidly grounded at suitable locations (middle as well as at terminals substations) with / without SVL. Bidder must indicate details of configuration proposed along with sufficient calculation with the bid so as to limit induced voltage of sheath within 65 V.
- 4.10 The charging current of the cable shall be as low as possible.
- 4.11 The XLPE cable shall be capable of withstanding the normal stress associated with transportation, erection, reeling and unreeling operations without getting deformed.
- 4.12 The XLPE cable shall be used on System Voltage of 132/220 kV for 3-phase AC earthed system. The cables shall be suitable for continuous operation at a power frequency voltage 10% higher than system voltage.
- 4.13 Cables will be protected from over voltages caused by lightning strikes or switching

surges by means of station type lightning arrestors located at terminal point/substations. The terminal substation yard equipment and all overhead 132/220 kV transmission lines will be shielded against direct lightning strokes by overhead ground wires.

4.14 Repaired cables shall not be acceptable.

## 5.0 MATERIAL AND CABLE CONSTRUCTION:-

### 5.1 Conductor:

5.1.1 The stranded/segmented/ miliken , very well compacted, round conductor shall be made of annealed plain copper wires complying to the requirements of flexibility Class-2 of IEC-60228 / IS: 8130. The conductor shall have high compactness & smooth surface finish.

5.1.2 The minimum number of wires in conductor and D.C. resistance shall be as per table-II of IEC-60228 / IS: 8130. The grade and quality of the copper used for the conductor shall be as per IEC/IS standard but shall not be less than the

International Annealed Copper Standard (IACS) of 100% conductivity with purity of the order of 99.9%.

5.1.3 The nominal area of conductor shall be 1000 Sq.mm (as per load current & short circuit requirement)

### 5.2 Conductor Screen:

5.2.1 The conductor screen consisting of semi conducting compound layer conforming IEC, shall be provided over the conductor by extrusion which will not only eliminate the risk of electric discharge at the interface between conductor and insulation but will also present a very smooth protrusion free interface with the insulation to eliminate any localized stress concentration. The screen shall be firmly bonded to XLPE insulation. The outer surface of the conductor screen shall be circular and free from irregularities.

5.2.2 The minimum thickness of extruded conductor screen shall be 1.0 mm. The outer surface of the conductor screen shall be circular and free from irregularities. A non-hygroscopic semi-conducting tape, if required, shall be applied to the conductor under extruded layer to prevent penetration of compound in to the conductor interstices.

### 5.3 Insulation:-

5.3.1 The insulation composed of a special super clean grade layer of cross linked polyethylene (XLPE) shall comply with the requirement of IEC60840/ IEC-62067. The insulation shall be applied by extrusion over the conductor screen and vulcanized using dry curing process to form a compact homogeneous body free

from micro voids and contaminants.

5.3.2 The eccentricity of insulation should not be more than 10%.

5.4 **Insulation Screening:**

5.4.1 The insulation screening shall consist of two parts, namely, non-metallic and metallic. It shall be firmly bonded to the insulation.

5.4.2 **Non-Metallic Part (extrusion):-**

5.4.2.1 A non-metallic insulation screen of semi-conducting compound similar to conductor screen (clause 5.2) for similar purpose shall be applied directly over the insulation core by extrusion and shall be continuous and cover whole surface area of insulation. It shall be firmly bonded to the insulation.

5.4.2.2 The minimum thickness of extruded insulation screen layer shall be 0.8 mm, the ovality of the core shall be not more than 5%.

5.4.3 **Non-metallic part (taped)-Longitudinal water barrier:**

5.4.3.1 Under-sheath water barrier shall consist of a synthetic semi-conducting moisture swellable layer (non woven synthetic tape with suitable water swellable absorbent tape with suitable overlap) covering the whole surface area of the insulation screen. The barrier shall restrict longitudinal water penetration under the metallic sheath. The nominal thickness of water swellable tape shall be 0.3 mm.

5.4.3.2 The semi conducting compound and the semi conducting tape shall be compatible with the insulating material and suitable for the operating temperature of the cable.

5.4.4 **Metallic Part – Radial Water Barrier:-**

The metallic sheath of corrugated Aluminium sheath shall be provided over the non-metallic part of the insulation screening. The details of metallic sheaths are as under:

5.4.4.2 **Corrugated Aluminium Sheath:-**

- i) When the corrugated aluminium sheath is used, it shall be applied by extrusion/seam-weld and then passing through a corrugating head. The corrugating head contains rotating dies to form the valleys between the ribs in ring formation and produce to correct diameter of sheath to fit over the insulation. The sheath shall be free from pinholes, flaws and other imperfections. The corrugations should be Annular only to prevent the ingress of water in the cable.

- ii) Anti-corrosive compound shall be applied over the aluminium sheath.

#### 5.5 **Outer Sheath:-**

5.5.1 The outer sheath shall consist of an extruded layer of black, PE ST-7 or PVC ST 2 as per IEC-60840/62067/60502/ IS-7098 (Part-3).

5.5.2 The nominal thickness of outer sheath shall not be less than the value calculated as per the recommendation of IEC 60502-2/ IS-7098 (Part-3). The outer sheath shall be of sufficient hardness to discourage termite and rodent attack.

#### 5.5.3 **Outer conductive coating / layer:**

The outer conductive layer shall be of **Graphite coating / an extruded semi-conducting layer over the outer sheath** applied at works. This conductive layer / coating must facilitate testing of the non-metallic outer sheath. This test is important to ensure the physical integrity of the cable from time to time be it at the factory, after transportation, directly after laying upon completion of the installation, or periodically thereafter

#### 6.0 **MANUFACTURING PROCESS:**

6.1 **XLPE cable should be processed in a modern triple head extrusion manufacturing line. XLPE extrusion and curing through Vertical Catanery Vulcanisation system (VCV) or horizontal Mitsubishi Dainichi Continuous Vulcanizing (MDCV) will be used to ensure circularity and concentricity of the extruded layers around the conductor and Continuous Catanery Vulcanizing (CCV) process is also acceptable for 220 KV cable manufacturing.**

6.2 The conductor screen, insulation and insulation screen shall be extruded in one simultaneous triple extrusion process (Clause 14.2.1 of IS: 7098-3) through common triple crosshead. The extruders and triple crosshead shall be designed to prevent stagnation of materials to eliminate hot spots and ensure smoothness of the conductor screen and screen surfaces. Insulation thickness should be controlled on-line using X-ray monitoring system.

6.3 The cross linking, curing shall be carried out in one operation and shall be a dry curing process under high pressure to eliminate the formation of voids in the insulation and contaminations in the dielectric.

6.4 Process conditions such as curing and cooling temperature, production speed etc. shall be closely monitored during manufacture to ensure a good degree of cross-linking through the whole insulation.

6.5 The manufacturing process shall be desired to eliminate irregularities like

protrusions, voids and contamination etc. to ensure the long-term reliability of the cable.

- 6.6 Loading of the extruder in the manufacturing plant shall be performed entirely closed and dust proof. The entire line of processing should be controlled from a computerized central control console. Contamination shall be avoided by use of a fully enclosed material handling system. To avoid contamination XLPE Granules must be transported using gravitational material feeding system.

## **7.0 QUALITY ASSURANCE**

- 7.1 Raw materials used for manufacture of cable shall be of highest quality and material received by manufacturer should be checked / tested to ensure that it meets manufacturer's material specification. The materials shall be clean and packed in moisture and dust proof packing.

- 7.2 As the Quality control of EHV XLPE cables while manufacturing is very critical so expert supervision is required for raw material testing, in process checks and also for final testing. A specially trained quality assurance team should be in place for maintenance of the quality at an optimum level at the plant. Complete details of manufacturing process along with details of automatic manufacturing plant, list of officers /staff to supervise the manufacturing and other details desired shall be furnished by bidder in the bid.

## **8.0 TESTING**

### **8.1 GENERAL**

- 8.1.1 This schedule gives tests to be carried out on [132/220KV](#), single core XLPE type cables and associated accessories being supplied under these specifications. The schedule of tests to be followed shall be generally as per IS-7098 (Part-3)/ IEC 60840/62067

- 8.1.2 The facilities available for site tests shall be clearly and implicitly brought out in the tender. The site tests shall be carried out during and after laying/installation by the supplier.

- 8.1.3 This test schedule can be modified at the discretion of the purchaser to omit or to include additional tests. Power frequency test shall be carried out at a frequency of 50 Hz.

### **8.2 TESTS:**

- 8.2.1 The tests shall be carried out in accordance with IS-7098 (Part-3)/ IEC- /60840/62067.

### **8.3 ROUTINE TESTS**

The manufactured cable shall be subjected to test as prescribed in the different IS/IECs for routine, acceptance and type test and any other test mandatory under relevant IS/IEC.

The following routine tests shall be carried out on each manufactured length.

- a) Conductor resistance test
- b) Voltage test
- c) DC voltage test on outer sheath
- d) Partial discharge test

#### **8.4 Acceptance Test :**

The following tests shall be carried out on samples taken to represent a batches.:

- a) Conductor examination as per clause 10.4 of IEC-62067/60840
- b) Check on dimensions as per clause 10.6,10.7 & 10.8 of IEC 62067/60840 regarding the :
  - i) Measurement of thickness of insulation.
  - ii) Measurement of thickness of metallic sheath.
  - iii) Measurement of thickness of outer PE/PVC sheath.
  - iv) Measurement of external diameter.
- c) Hot set test for XLPE insulation as per clause 10.9 of IEC 62067
- d) Bending test as per clause 12.4.3,of IEC60840 ,Clause 12.4.4 of IEC62067 to “demonstrate manufacture’s specification in this regard.”
- e) Measurement of capacitance , tan delta and Partial discharge.
- f) High Voltage test

#### **Frequency of Tests:**

The above special (acceptance) tests shall be made on one length from each manufacturing series of the same type and size of cable, but shall be limited to not more than 10% of the number of lengths in any contract, rounded to upper unity.

#### **8.5 TYPE TEST(s)**

The offered type of EHV cable should have been successfully type tested as per labs mention in section A3 of Vol. I, tender specifications.

The electrical test shall be carried out on cable system (cable & accessories) in accordance with clause 12 of IEC- 60840 / IEC 62067 and in accordance with the sequence prescribed in clause 12.3 of IEC 60840/62067/ IS-7098 (Part-3) with relevant clauses before the dispatch of cable from contractor's works in any of the

above mentioned laboratories. Contractor shall quote type test charges for individual test in his bid.

Test shall be carried out in the following sequence:

- a) Bending test on the cable followed by installation of accessories and a partial discharge test at ambient temperature.
- b) Tan delta measurement
- c) Heating cycle voltage test
- d) Partial discharge tests
  - at ambient temperature, and
  - at high temperature.(This test shall be carried out after the final cycle of item c above or alternatively, after the lightning impulse voltage test in item f below)
- e) Lightning impulse voltage test followed by a power frequency voltage test.
- f) Partial discharge tests, if not previously carried out in item (d) above.
- g) Tests of outer protection for buried joints

B) Test on Cable components :

- a) Check for cable construction
- b) Resistivity of semi conducting layers
- c) Test for determining the mechanical properties of insulation before and after ageing
- d) Test for determining the mechanical properties of non-metallic sheath before and after ageing
- e) Ageing tests on pieces of complete cable to check compatibility of materials
- f) Pressure test at high temperature on sheath
- g) Hot spot test on XLPE insulation
- h) Carbon black content of PE sheath
- i) Shrinkage test on XLPE insulation
- j) Longitudinal water penetration test for water tightness between core and metallic sheath

**Note: 1.)** These tests may be applied to a joint which has passed test in item c) heating cycle voltage test, or to a separate joint which has passed at least three thermal cycles.

**2.)** If the cable and joint are not be subjected to wet conditions in service (i.e. not directly buried in earth or not intermittently or continuously immersed in water) these tests may be omitted.

i) Examination of the cable system with cable and accessories shall be carried out after completion of the tests above.

## **8.6 NON-ELECTRICAL TYPE TESTS**

- i) All non-electrical type tests shall be performed in accordance with the provisions laid in clause 12.5 of IEC 60840/62067 IS-7098 (Part-3) with relevant clauses.
- ii) The cost of the type test for all accessories shall be furnished separately. This shall be considered for evaluation. However, the purchaser reserves the right to waive off any of the type tests in which case the test charges quoted will be taken for adjustment purpose.
- iii) Insulation resistance after laying each cable length shall withstand a voltage of 10 kV DC between each reinforcement and external conducting surface and for one minute as per clause no.16 of IEC-60840, 14.1 of IEC/62067. In addition, the serving insulation resistance shall be measured and checked with the values obtained in the routine factory test.
- iv) On completion of the cable laying and jointing work the complete installation shall be tested as per clause 14.1 and 14.2 of IEC-62067. Clause 16 of IEC 60840. The testing kit required for the tests shall be arranged by the tendered.

**8.7 SPECIAL TESTS:** A Short circuit test on aluminum sheath of cable shall be conducted at CPRI, to ensure that metal sheath withstands 40kA for 3 seconds.

### **8.0A Tests at site after installation:**

Pre-commissioning tests on site, which shall be performed by the successful bidder, shall include the following

- a) DC voltage test on outer sheath at 10KV (DC) for one minute between metallic sheath/screen and external conducting surface.
- b) Conductor resistance of each complete circuit.
- c) AC system voltage ( $U_0$ ) for 24 Hrs to keep the cable on idle charge with minimum protection setting to protect the cable in 24 Hrs.

## **9.0 TESTING FACILITIES AND TESTS CERTIFICATES**

- 9.1 The XLPE Cables should meet the requirement of all tests including special tests as specified in clause 8 above. The bidder shall furnish latest complete tests certificates for all type tests (not older than five years as on the date of Bid opening) prescribed in clause 8 for the similar voltage class offered from any NABL accredited testing laboratory.
- 9.2 The bidder must have all testing facilities available at their works for testing the material as per clause 8 above. Detailed list of testing equipment along with relevant tests must be furnished with the tender otherwise offers is likely to be rejected.

## **10.0 INSPECTION & TRAINING AT MANUFACTURER'S WORKS**

- 10.1 The 132/220 kV XLPE cable should be manufactured and tested while manufacturing as per approved Quality Assurance plan and foregoing specification. Supplier shall intimate the programme of manufacturing of the XLPE cable in advance. The inspection during manufacturing shall be carried out by the MSETCL engineers at various stages of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress.
- 10.2 Training program and associated charges shall be as per price schedules.
- 10.3 Inspection and acceptance of any equipment/material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective.
- 10.4 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments /meters/apparatus etc should be got calibrated by the supplier from time to time from independent test laboratory/house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments / original manufacturer having credibility to NABL/NPL or equivalent.
- 10.5 The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).
- 10.6 The purchaser reserves the right to insist for witnessing the sample/routine tests of the bought out raw material/items used in manufacturing of cables.

#### **11.0 MARKING ON OUTER SHEATH.**

- 11.1 The following particulars shall be marked on cable outer sheath :
- i. Manufacturer's name/ or trade name
  - ii. Voltage grade viz. 76/132KV 127/220 kV
  - iii. Cable size ( no. of core x conductor cross section)
  - iv. Year of manufacture.
  - v. Purchaser's name i.e. MSETCL
- 11.2 The spacing between one set of marking and the beginning of the next on the legend shall not exceed 150 mm.

- 11.3 Besides above, progressive sequential marking of length shall also be provided at every one meter, which shall be clear and legible sequential length working by embossing in same colour as that of outer sheath is permitted.

## **12.0 SEALING AND DRUMMING**

- 12.1 Immediately after the works tests, both ends of every length of cable shall be sealed by means of heat shrinkable end caps. On the leading end a pulling eye shall be fixed.
- 12.2 Cables shall be wound on **returnable** metallic drums. All the drums shall be arranged to take a round spindle and be legged with strong closely fitting wooden battens so as to prevent damage in the cable. Each drum shall bear an identification number permanently stenciled or branded on the outside of the flange.
- 12.3 Cable reels shall be of rugged construction, with a drum diameter of ample dimensions to accommodate the single conductor. Manufacturer shall be responsible for any damage to the cables during transit. Changes in the shape of the cable during transit shall not result in deformation in metallic drum. .A detail of Steel Drum/reel is to be furnished by bidder in their bid.
- 12.4 The cable drum/ reel shall carry the following information clearly marked on one flange of the drum.
- a) Manufacturer's name, Brand or trade mark.
  - b) Conductor of cable.
  - c) Type of cable and voltage grade.
  - d) Size of cable.
  - e) Length of cable on the drum.
  - f) Direction of rotation of drum (by means of an arrow).
  - g) Net weight
  - h) Gross weight.
  - i) Year of manufacture.
  - j) Confirming to IEC/IS No.....
  - k) Purchase order details.
  - l) Name of owner.
  - m) Name of consignee.

## **13.0 STANDARD LENGTH AND QUANTITY TOLERANCE**

- 13.1 Standard length of cable per drum shall be of 400-500M. Longer drum length shall be preferred. The bidder shall indicate offered Standard length of cable per drum. A tolerance of  $\pm 3\%$  will be permissible on standard drum length. The ordered quantity of the cable(s) can be supplied with quantity tolerance of  $(\pm) 2\%$ . Exact drum length shall be decided after route survey after award of contract.

**14.0 GUARANTEED TECHNICAL PARTICULARS**

14.1 The bidder shall furnish guaranteed technical particulars of cable in the relevant Annexure 1 enclosed

**15.0 ABSOLUTE GUARANTEES**

15.1 All commissioning tests and performance tests shall be treated as absolute guarantee and in the event of failure in any of such test(s) the bidder shall take steps to rectify/replace/modify at his cost the defective components(s), assemblies. The equipment after such rectification/repair shall be re-tested at bidder cost at site

15.2 The satisfactory performance of materials supplied shall be guaranteed for a period of 12 months from the date of commissioning of 132/ 220 kV complete cable system.

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**DESIRED TECHNICAL PARTICULARS OF XLPE CABLE for 220 KV Cable**

<b>S. No.</b>	<b>Particulars</b>	<b>Technical Details</b>
	Cable	Single Core, Copper Conductor XLPE cable
1.	Applicable standard	Conforming to IEC 62067, IS 7098(part-3) amended up to date.
2.	System voltage & frequency	220 ± 10% kV, 50 Hz ±3%
3.	Rated& Highest System Voltage	245 kV
4.	Suitable for earthed system	YES
5.	<b>CONDUCTOR</b>	
i)	Material	Annealed Plain Copper wires Conforming to IEC 60228/IS: 8130
ii)	Nominal cross-sectional area	1000 Sq.mm
iii)	Construction of conductor/flexibility class	Class-2, IEC 228 / IS: 8130
iv)	Max. DC Resistance at 20°C	0.0176 Ohms per km
v)	Max. AC Resistance at 90°C	0.0233 Ohms per km
vi)	Shape and formation	Stranded <b>Milliken</b> very well compacted circular conductor
vii)	Approx overall diameter of conductor	to be indicated
6.	<b>CONDUCTOR SCREENING</b>	
i)	Material & type	Extruded, semi conducting compound layer.
ii)	Grade	As per IEC/IS
iii)	Thickness	1.0 mm
iv)	Resistivity of semiconducting screen	Shall not exceed 1000 ohm mtr
7.	<b>INSULATION</b>	

i)	Material	Cross linked polyethylene(XLPE)
ii)	Special Super clean grade Nominal thickness of insulation	As per IEC-62067/ 7098 (Part 3)
iii)	Dielectric power factor at rated voltage	Shall be in line with IS 7098 part III/ IEC 62067
8.	<b>INSULATION SCREENING</b>	
<b>A</b>	Non-metallic part(extruded)	
i)	Material	Extruded semi conducting Compound layer.
ii)	Grade	As per IEC/IS: 7098 (Part 3)
iii)	Min. thickness.	0.8 mm
iv)	Resistivity of semiconducting screen	Shall not exceed 500 ohm mtr.
<b>B</b>	Non-metallic part (taped) longitudinal water barrier over insulation screen.	
i)	Material	Synthetic Non-woven semi conducting Water swell-able tape
ii)	Min. thickness	As per standard.
<b>C</b>	<b>METALLIC SHEATH</b>	
i)	Material	Annular Corrugated Aluminium sheath seamless/seamwelded
ii)	Min. Thickness(mm)	Conforming to IS-60502-2/ IS: 7098 (Part 3) Table 6A/ 6B
iii)	Short Circuit Current Withstand Metallic annular Aluminium sheath	40 kA for three Second
9.	<b>OUTER SHEATH</b>	
i)	Material	Extruded Layer of Black PE or PVC type ST-2 as per IEC-62067 / IS: 7098 (Part 3)
ii)	Min. thickness of outer sheath	As per standard
10.	Conducting layer over outer sheath	Graphite coating
11.	Approx overall diameter of cable (mm)	To be indicated
12.	Approx. weight per meter of cable (kg/m)	To be indicated
13.	Recommended minimum installation radius.	To be indicated
14.	Maximum D.C. Resistance of conductor at 90 deg C in ohm/km.	As per standard
15.	Minimum continuous current rating for each circuit when laid in ground in <u>trefoil formation</u> and other condition given in specification.	<b>905 Amps. after all de-rated factors</b>
16.	Maximum allowable temperature for	

	cable and accessories.	
i)	At rated full load and at site conditions.	90 <sup>0</sup> C
ii)	Safe overload capacity at site conditions.	10%
iii)	Emergency Overloading temp for 3 Hrs	130° C
iv)	The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90 <sup>0</sup> C).	250 <sup>0</sup> C
17.	Basic impulse insulation level (1.2/50 micro second wave)	1050 kV.
18.	Power frequency withstand voltage	As per Standard
19.	Symmetrical Short circuit rating for one second duration for Annular Aluminium Sheath	40 kA for 3 Sec.
20	Short circuit current for conductor	143 KA for 1 sec
21.	Drum Length	500-600 mtr. /As per requirement.
22.	Expected cable life.	35 years.

**DESIRED TECHNICAL PARTICULARS OF XLPE CABLE for 132 KV Cable**

<b>S. No.</b>	<b>Particulars</b>	<b>Technical Details</b>
	Cable	Single Core, Copper Conductor XLPE cable
1.	Applicable standard	Conforming to IEC 60840, IS 7098(part-3) amended up to date.
2.	System voltage & frequency	132 ± 10% kV, 50 Hz ±3%
3.	Rated& Highest System Voltage	145 kV
4.	Suitable for earthed system	YES
5.	<b>CONDUCTOR</b>	
i)	Material	Annealed Plain Copper wires Conforming to IEC 60228/IS: 8130
ii)	Nominal cross-sectional area	As per load current & short circuit requirement
iii)	Construction of conductor/flexibility class	Class-2, IEC 228 / IS: 8130
iv)	Max. DC Resistance at 20°C	0.0176 Ohms per km
v)	Max. AC Resistance at 90°C	0.0233 Ohms per km
vi)	Shape and formation	Stranded <b>Milliken</b> very well compacted circular conductor
vii)	Approx overall diameter of conductor	to be indicated
6.	<b>CONDUCTOR SCREENING</b>	
i)	Material & type	Extruded, semi conducting compound layer.
ii)	Grade	As per IEC/IS
iii)	Thickness	1.0 mm
iv)	Resistivity of semiconducting screen	Shall not exceed 1000 ohm mtr

7.	<b>INSULATION</b>	
i)	Material	Cross linked polyethylene(XLPE)
ii)	Special Super clean grade Nominal thickness of insulation	As per IEC-60840/ 7098 (Part 3)
iii)	Dielectric power factor at rated voltage	Shall be in line with IS 7098 part III/ IEC 60840
8.	<b>INSULATION SCREENING</b>	
<b>A</b>	Non-metallic part(extruded)	
i)	Material	Extruded semi conducting Compound layer.
ii)	Grade	As per IEC/IS: 7098 (Part 3)
iii)	Min. thickness.	0.8 mm
iv)	Resistivity of semiconducting screen	Shall not exceed 500 ohm mtr.
<b>B</b>	Non-metallic part (taped) longitudinal water barrier over insulation screen.	
i)	Material	Synthetic Non-woven semi conducting Water swell-able tape
ii)	Min. thickness	As per standard.
<b>C</b>	<b>METALLIC SHEATH</b>	
i)	Material	Annular Corrugated Aluminium sheath seamless/seamwelded
ii)	Min. Thickness(mm)	Conforming to IS-60502-2/ IS: 7098 (Part 3) Table 6A/ 6B
iii)	Short Circuit Current Withstand Metallic Annular Aluminium sheath	40 kA for three Second
9.	<b>OUTER SHEATH</b>	
i)	Material	Extruded Layer of Black PE or PVC type ST-2 as per IEC-60840 / IS: 7098 (Part 3)
ii)	Min. thickness of outer sheath	As per standard
10.	Conducting layer over outer sheath	Graphite coating
11.	Approx overall diameter of cable (mm)	To be indicated
12.	Approx. weight per meter of cable (kg/m)	To be indicated
13.	Recommended minimum installation radius.	To be indicated
14.	Maximum D.C. Resistance of conductor at 90 deg C in ohm/km.	As per standard
15.	Minimum continuous current rating for each circuit when laid in ground in <u>trefoil formation</u> and other condition given in specification.	As per load current & short circuit requirement

16.	Maximum allowable temperature for cable and accessories.	
i)	At rated full load and at site conditions.	90 <sup>0</sup> C
ii)	Safe overload capacity at site conditions.	10%
iii)	Emergency Overloading temp for 3 Hrs	130° C
iv)	The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90 <sup>0</sup> C).	250 <sup>0</sup> C
17.	Basic impulse insulation level (1.2/50 micro second wave)	650 kV.
18.	Power frequency withstand voltage	As per Standard
19.	Symmetrical Short circuit rating for one second duration for Annular Aluminium Sheath	40 kA for 3 Sec.
20	Short circuit current for conductor	143 KA for 1 sec
21.	Drum Length	500-600 mtr. /As per requirement.
22.	Expected cable life.	35 years.

# **ANNEXURE B**

## **245 kV/132 KV XLPE CABLE TERMINATIONS AND JOINTING KITS**

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8	LINK BOX FOR EARTHING & EARTHING CABLE WITH PVC INSULATION
9	SUPPORTING STRUCTURE & ANGLE BRACKET SUPPORTS FOR CABLE
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20	GUARANTEED AND OTHER TECHNICAL PARTICULARS
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Annexure-V2-P3-S2-1	DESIRED TECHNICAL PARTICULARS FOR CABLE END TERMINATION AND STRAIGHT THROUGH JOINT KIT

**TECHNICAL SPECIFICATION FOR 245 kV/ 132 KV CABLE  
TERMINATION AND JOINTING KITS FOR 1 X 1000 SQ. MM XLPE  
CABLE**

**1.0 SCOPE**

- 1.1 The scope includes supply, testing at manufacturer's works before dispatch and delivery of Internationally reputed make of following types of cable sealing ends, (end terminals/pot heads), and straight through joints conforming to relevant IEC, unless otherwise stipulated in the Section-II and all other accessories as well as consumables etc. suitable for XLPE cable (Section-I). These kits and accessories shall be integral part of 245kV/132KV cable system.
- I. 245kV/132KV rated , indoor cable sealing ends confirming to IEC 62067 / IEC 60840 suitable for terminating 245kV/132KV highest voltage XLPE cables for interconnection with 220 kV/132KV Gas Insulated Switchgear on proposed 220 kV substation and 132 kV Substation along with clamping arrangements of cable.
  - II. 132 kV rated, Outdoor cable sealing ends confirming to IEC 60840 for terminating the 132kV highest voltage XLPE cables to outdoor 132 kV AIS Bay at 132 kV switchyard along with all the necessary supporting structure, fittings & mountings.
  - III 245 kV/132 KV rated, Outdoor Straight through joints confirming to IEC 62067 / IEC 60840 for jointing of highest voltage 245 kV/132 KV XLPE buried under ground cables.
- 1.2 Single/ Three phase Earth Link boxes with all associated accessories (for the connection of the cable sheath of 220 kV/132 KV rated XLPE cable) suitable for cross bonding arrangement of the complete cabling system.
- 1.3. **One set of special tools and equipment for handling, assembly, installation, erection and dismantling of the 220 kV/132 KV XLPE cables and auxiliary equipment as per bills of material.**
- List of special tools and testing equipments which will be brought for installation and commissioning of the cable system by contractor (on returnable basis) shall be enclosed with bid.
- 1.4 All the testing devices and instruments etc. for final acceptance testing and commissioning shall be responsibility of the contractor and no separate cost/ rental is payable. The testing devices etc. shall be taken back by the contractor after successful testing & commissioning. List of special tools and equipment required for testing of power cable shall be enclosed with bid.

- 1.5 It is not the intent to specify completely herein, all details of design and construction of the equipment/system and accessories required. However, the cable system and its installation shall be complete with all accessories, conform in all respects, to high standard of engineering, design and workmanship and be capable of performing the continuous commercial operation up to guarantee in a manner acceptable to MSETCL.

## 2.0 STANDARDS

Unless otherwise stated hereafter, rating, characteristics, test and procedures etc. concerning the 220 kV/132KV XLPE cable accessories shall preferably be as per IEC standards wherever existing and shall be in compliance with the latest editions or revisions thereof. Although a few preferred IEC standards are mentioned below but the list is not exhaustive and may be improved.

IEC-60840	Tests for power cables with extruded insulation for rated voltage upto 150 kV.
IEC-62067	Tests for power cables with extruded insulation for rated voltage above 150 kV upto 500 kV.
IEC : TS 60859	Cable connection for Gas insulated metal enclosed switchgear for rated voltages of 72.5 kV and above.
IEC: 62271-203	Gas-insulated metal- enclosed switchgear for rated voltages of 72.5 kV and above.
IEC: 60228	Conductor for insulated cable
IEC: 60229	Tests on cable over sheaths
IEC: 60230	Impulse tests on cables and their accessories
IEC: 60270	Partial discharge measurements
IEC: 60287	Calculation of continuous current carrying capacity
IEC: 60502	Power Cables with extruded insulation and their accessories.
BIS: 7098 (Part-3)	XLPE cable specification-for working voltages from 66 kV up to and including 220 kV.
IEEE 48-1990	IEEE Standard Test, Procedure & requirement for high voltage alternating current cable terminations

## 3.0 SYSTEM CONFIGURATION

- 3.1 The 220 kV/132 systems will be solidly grounded. Cables will be protected from over voltages caused by lightning strikes or switching surges by means of station type lightning arrestors located at terminal point/ substations. The terminal

substation yard equipment and all overhead 220 kV/132KV transmission lines will be shielded against direct lightning strokes by overhead ground wires.

#### **4.0 GENERAL DETAILS OF CABLE KITS**

- 4.1 All the Cable Sealing end/end termination kits and straight through joints, rated for 245kV/132KV, shall be of pre-molded type from one of internationally reputed manufacturer of proven design which has already been extensively used and fully type tested.
- 4.2 The offered kits shall be easy in handling, simple to install without much skill with minimum tools at site.
- 4.3 All cable sealing end and Straight through joints shall be suitable for connecting single core XLPE Copper Conductor XLPE cables for a maximum continuous voltage of 245 kV/132 KV and core cross section of 1000 sq mm (as per load current & short circuit requirement) as per details in EHV cable specification
- 4.4 The kits shall be suitable for storage without deterioration at a temperature up to 55° C.
- 4.5 The offered XLPE cable Termination and straight through jointing kits for 220 kV/132 KV earthed system shall meet the technical particulars indicated in desired GTP for EHV cable for 220 KV / 132 KV .
- 4.6 Field tests of sealing end terminals shall be made in conjunction with the 220 kV/132 KV cables after installation of the cables and terminals.

#### **5.0 TYPE & MAKE OF CABLE KITS**

##### **5.1 SF6 SWITCHGEAR TYPE SEALING END:**

- 5.1.1 For the feeder bays having power cable connections, the suitable cable sealing end enclosures will be supplied by the GIS bidder but 220 kV/132 KV XLPE cables and cable sealing end terminators with cable cone will not be included in the GIS bidder's supply. Interface between GIS and power cable will be in accordance with IEC publication 60859.
- 5.1.2 The cable sealing end, conforming to IEC: 62067 / IEC 60840 for termination of the Cables for maximum continuous voltage of 245 kV / 132 KV at SF6 switchgear end will be supplied by the cable manufacturer. The contractor shall be responsible for the preparation of the cable insulation and conductors and correct termination of each cable to these sealing ends.
- 5.1.3 Bidders are requested to quote cable sealing end with design that helps reducing the works on the gas compartments. The cable sealing end shall be of plug in type

that allows easy plugging and unplugging of high voltage power cable without the need of opening the GIS and related time consuming gas works.

- 5.1.4 Cable manufacturer shall furnish large scale general assembly drawings of the SF6 sealing ends, mounting flange details, size of terminal opening in the junction box, weight of terminal including accessories, physical shape and dimensions of all live part, recommended clearances from live parts to the inside surface to permit the SF 6 switch gear manufacturer to design and supply junction boxes of adequate dimensions and construction to permit the installation and maintenance of the terminals without difficulty.
- 5.1.5 The stress cone made of silicone rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.
- 5.1.6 Manufacturer shall state the connector clearances required when the assembled cable DC proof test is undertaken for co-ordination with the SF6 switch gear design.
- 5.1.7 All supporting structures for the SF6 bus-duct connections between the XLPE cable sealing ends and the GIS shall be supplied by the GIS supplier. The supplier may specify connecting & supporting arrangements for approval of the purchaser.

## 5.2 **OUTDOOR TYPE SEALING END.**

- 5.2.1 **The cable sealing end COMPOSITE, conforming to IEC-62067 of termination for maximum continuous voltage of 245 kV cables and conforming to IEC 60840 of terminations for maximum voltage of 132 KV cables at the outdoor yard shall be supplied by the cable manufacturer. The contractor shall be responsible for correct termination of each cable to sealing ends, installation of the cable sealing end and providing of terminal connectors for connecting to terminal conductor. The requisite interconnection between line end & sealing end is required to be designed (as per safety and statutory provision aspects) and executed (after approval of MSETCL) by successful bidder.**
- 5.2.2 The silicone rubber /composite bushing termination of rated capacity, suitable for outdoor installation in moderately polluted atmosphere shall be used. It should be resistant to UV exposure. The termination stress control shall be by means of stress cone.
- 5.2.3 The stress cone made of silicone rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.

### 5.3 STRAIGHT THROUGH JOINTS

- 5.3.1 The straight through joints for 220 KV / 132 KV 1000 sq mm CU Aluminum sheathed cables XLPE cable (section I), conforming to IEC 62067/ IEC 60840 shall be suitable for underground buried installation with incorporated back fill and chances of flooding by water. The straight through joints should be absolutely impervious to the entry of water. The manufacturer shall use the proven technology and design to prevent entry of water or any other liquid inside the straight through joints and cables.
- 5.3.2 The stress cone made of silicone rubber shall inhibit possible mechanical stress and deformation of the cable insulation surface during operation and also shall be capable of accommodating minor radial and longitudinal movement without detriment to the dielectric stress in the insulation shield.

### 5.4 MAKE OF CABLE KITS

All cable sealing ends and straight through joints shall be either of following reputed make:

- i) ABB Kabeldon AB, Sweden
- ii) Nexans Switzerland Ltd. (Formerly Alcatel Cable Switzerland Ltd.)
- iii) J Power System Corporation, Japan (Formerly Sumitomo Electric Industries, Japan)
- iv) SEFAG ixosil Ltd, Power Cable System, Switzerland.
- v) CCC GmbH Berlin.
- vi) Prymian (Canada/US/Italy)
- vii) Brugg (Germany/Italy/Switzerland)
- viii) pfisterer (Switzerland)
- ix) G&W (USA)

**Note:- 1) cable manufacturer's own manufactured KIT/ Accessories with valid type test as per the relevant IEC is acceptable (Bidder to submit type test reports).**  
**2) Any other reputed make of cable Kit/ Accessories meeting the IEC requirement and type tested in the specified lab of MSETCL is acceptable**

### 6.0 ELECTRICAL CHARACTERISTICS OF CABLE KITS

- 6.1 The Cable Termination and straight through jointing kits accessories shall be capable of carrying the specified rated current continuously without exceeding the

specified temperature limitations.

- 6.2 The cable Termination and straight through jointing kits accessories to be supplied against this specification shall be rated for 40 kA for 3 second.
- 6.3 The sheath voltage under full load conditions shall not exceed 65 V specified / allowed in relevant standards for safety of personal as well satisfactory working of cable. The sheath shall solidly grounded at the switch gear end & at the substation.
- 6.4 The fault level withstand capacity of end termination and straight through jointing kits should be strictly matching with the parameters of cables for which the kits are intended to be used.
- 6.5 After jointing by straight through joints and connecting the cable with terminal ends, the complete cable composite cable sheath screen bonding system shall provide a continuous current path through the cable sheath/screen and shall be bonded and earthed at both ends.
- 6.6 The XLPE Cable Termination and straight through jointing kits shall be suitable for use where combined ambient temperature and temperature rise due to load result in conductor temperature not exceeding 90° C under normal operation and 250° C under short circuit conditions.
- 6.7 220 kV /132 KV XLPE cable Termination and straight through jointing kits shall be designed to withstand the mechanical, electrical and thermal stresses under the steady state and transient/ fault conditions and shall be suitable for proposed method of installation.

## **7.0 DESIGN & COMPONENTS FEATURES OF CABLE KITS**

The following consideration shall be taken into account in the design of the product, material properties & components of cable kits.

- 7.1. The most important part of cable accessories is the stress grading device, the stress cone. The pre-molded cone shall be made of insulating and conducting silicone rubber molded together in the shape of geometric stress control unit. The synthetic insulating compound shall be used together with stress cone to improve the electrical properties inside the termination. The compound should swell the insulation of the cone and the cable to some extent so as to improve the electrical strength along with interface.
- 7.2 For XLPE cable, the critical part of the operation is making an electrical connection between the stress relief device and insulation screen. If any air pocket created, then discharge and break down can occur. As such connection method and material should be such that no risk of cable damage arises and that the

- jointer can check the result of his work at every stage. Thus the installation instruction should be easy to follow and should be well illustrative.
- 7.3 The design shall be such that when the cone is supplied, the diameter of hole in the cone shall be smaller than the diameter over cable insulation. After the cone is pushed on, the elasticity of silicone rubber should guarantee an active pressure on the cable insulation to ensure that no voids appear between the cone and the cable even after years of load cycling.
  - 7.4 The Straight through joints shall be pre-molded construction. This design shall comprise a factory tested synthetic rubber joint, with all stress management element provided during the moulding process in the factory. The dielectric design of the Straight through joints shall be optimized. The electric stress distribution along the interface between the insulator and the cable shall take in to account the dimensions of the joint and the dielectric permittivity of the cable insulation. The material of insulator shall have good thermo mechanical behavior.
  - 7.5 The materials used in the assembly of the Straight through joints shall be compatible with the material of the insulator and the cable insulation. The conductor shall be connected by means of an approved arrangement. The tensile strength of the connector shall meet the requirements of the copper conductor.
  - 7.6 Every single stress cone & the stress grading device shall be tested electrically prior to delivery in presence of purchaser. Each stress cone shall be marked with an individual number and a certificate containing detailed specification of test shall be included with every delivery.
  - 7.7 The different accessories shall be type tested according to SEN, IEC – 62067/IEC 60840 and IEEE standards which include tests for impulse, AC, load cycling and partial discharge. Before delivery every stress cone shall be installed on cable and care fully checked to establish that it is PF free in presence of owner's representative(s).
  - 7.8 Details of proper stress control, stress grading and non tracking arrangement in the termination & joints details shall be elaborated in the offer. Detailed sectional view of assemblies shall be submitted along with the offer. The application of stress control system shall be safe, foolproof & independent of cable jointers skills. The stress control method should withstand expansion & contraction of cable during load cycling.
  - 7.9 The jointing kits offered shall be so designed so as to prevent discharge/ leakage at the cut back, nicks scratches on XLPE insulations. Full details of method of discharge prevention shall be indicated by the bidder.
  - 7.10 The cable end termination and straight through joints shall be designed in such a way so as to give track resistant, erosion & weather resistance protection to the

- cable insulation. The outdoor end termination & straight through joints shall be totally sealed against ingress of moisture of environment.
- 7.11 All end outdoor terminations shall be provided with rain sheds/ creep age petticoats. The weather sheds shall be non-tracking weather resistant hydrophobic and have smooth surface to collect any water/ dirt etc. The design of rain skirts shall avoid any skirt to skirt conducting path under heavy rain condition.
- 7.12 For XLPE cables, the lugs should withstand thermal short circuit of 250 deg. centigrade. For XLPE cables, the ferrule should be suitable for compacted conductor & should withstand thermal short circuit of 250 deg centigrade.
- 7.13 Design features may be highlighted in bid and the moldings of rubber components should be aimed to achieve a smooth finish on interior and exterior of the components.
- 7.14 The kits shall be provided with protection against rodent & termite attack.
- 7.15 The kits offered shall provide for total environment sealing of the cable crutch and at the lugs end. The details of which shall be offered along with the offer. Provision for effective screening over each core shall be made and bidder shall categorically confirm this aspect in their offer.
- 7.16 The materials & components of kits, not specifically stated in the specification, but which are essential for satisfactory operation of cable shall be deemed to be included without any extra cost.
- 7.17 The earthing arrangement shall form part of the terminations joints and shall be protected from erosion either by suitable tape or tube .
- 7.18 The adequate provisions for eliminating the chances of entrapment of air at steps formed by semicon screen shall be made.
- 7.19 The terminations joints shall be supplied in kit form. All insulation and sealing materials, consumable items, conductor fittings, earthing arrangements & lugs etc. should be provided. Requisite No. and size of lugs & ferrules depending upon the type of the cable shall be provided in the kit. Lugs & Ferrules shall be of crimping type and shall confirm to the relevant standard applicable to XLPE cables.
- 8.0 LINK BOX FOR EARTHING & EARTHING CABLE WITH XLPE INSULATION**
- 8.1 Bidder shall carry out the earthing of sheath/screen in the cross bonding configuration. The successful bidder shall submit the complete sheath voltage calculation alongwith identification of major/minor sections for cross bonding. The 3 Phase Link Boxes with SVLs shall be installed at cross bonding points and

Three/ Single Phase Link boxes with direct grounding at cable termination ends at terminal substations. The bonding lead/ grounding cable of suitable sizes (as per sufficiency/adequacy calculation submitted by successful bidder and approved by MSETCL) shall be used for connecting cable sheath to earth.

## **9.0 SUPPORTING STRUCTURE & ANGLE BRACKET SUPPORTS FOR CABLE**

- 9.1 Any support structures and cable clamps required to support the cables between the trays and the sealing end supports will be supplied and installed by the bidder.
- 9.2 Fabricated wall/ fabricated support mounted angle brackets along with Anchor bolts shall be provided by manufacturer of cable for supporting the SF6 Switchgear Type Sealing Ends for installation/fixing at GIS at proposed 220 kV/ 132 KV GIS Substation to GIS supplier. The brackets which shall be constructed of galvanized steel structural sections will not be required to support the weight of SF 6 switch gear enclosure. The SF<sub>6</sub> Switchgear enclosures shall be supplied by GIS substation supplier
- 9.3 Fabricated structure of suitable height, to be approved by purchaser, shall be provided and installed by manufacturer of cable for supporting the Outdoor cable sealing end at 220 kV / 132 KV Substation. The height of the structure shall be such that the terminal connection to receive the purchaser's ACSR Zebra conductor maintaining phase to phase and phase to earth and ground clearances. Exact height shall be intimated/ confirmed to the successful bidder while approval of drawings. The structures shall be of galvanized steel structural sections. Anchor bolts, washers etc will be supplied and installed by successful bidder of cable.
- 9.4 The supporting structure shall be suitable to withstand the wind pressure, seismic forces and the short circuit forces, etc., and the design shall have with an adequate factor of safety as specified in I.E. rules 1956.
- 9.5 The bidder shall furnish the design and fabrication drawings of these structures & foundation anchor bolts, and design calculations etc.
- 9.6 The bidder shall quote for unit prices for support structures for each single core cable to suit the end terminations supplied by him.

## **10.0 CABLE END TERMINALS (OUT DOOR TYPE) CONNECTORS**

- 10.1 The terminal connector/clamps shall be suitable for connection to conductor at 220 kV/132 KV Substation end. The terminal connector shall be of bimetallic type to connect the copper stud of the cable terminal end to the ACSR conductor.
- 10.2 The type and size of the conductor will be confirmed to the successful bidder.

- 10.3 The connector/clamp shall be designed to overcome:
- i) Galvanic Corrosion.
  - ii) Thermal Cycling.
- 10.4 The current carrying capacity of the connector/clamps shall be greater than the maximum capacity of the power cable. The terminal clamp shall be free from burrs, voids, and blow holes.
- 10.5 The terminals clamps shall have passed tests for short circuit current capability and temperature rise.

## **11.0 TESTING INSTRUMENTS & DEVICES**

- 11.1 The contractor shall arrange for all testing devices, instruments etc. required during assembly, erection, testing and commissioning of 220 kV/132 KV XLPE cable.
- 11.2 All the testing devices and instruments shall be responsibility of the contractor and no separate cost/ rental is payable. The testing devices etc. shall be taken back by the contractor after successful testing & commissioning.

## **12.0 EARTHING**

- 12.1 Bidder shall carry out the earthing of sheath/screen at cross bonding points as well as at both of termination ends of 245 kV/132 KV cable using insulation sheath bonding (earthing) cable of required size through Link box with/ without surge voltage limiter at cross bonding points and terminal substations.
- 12.2 Earthing shall be as per relevant standards and the details of the earthing arrangement offered for the cable accessories shall be submitted along with the offer.
- 12.3 The sheath/screen shall bound in the earth station through disconnecting type link boxes.
- 12.4 Screen continuity by using tinned copper mesh and earth continuity by tinned copper braids of appropriate size shall be provided for transfer of screen/ earth in straight through joints.

## **13.0 TESTS**

- 13.1 The testing of Cable termination for Gas Insulated Metal enclosed Switchgear, outdoor type sealing end and straight through jointing kits for XLPE Cable shall be as per IEC: 62067/IEC 60840. All the type tests, sample tests and routine tests

shall be carried out on the cable kits (referred as accessories in IEC) as per Clause 8.2 (Tests) in EHV cable specifications .

13.2 The above tests shall be carried out in presence of purchaser's representative as per relevant standard IEC: 62067/IEC 60840 at bidder's cost (Type test charges to be indicated in Schedule-F) and the sampling plan shall be 1 percent subject to minimum of one number.

13.3 The contractor shall make available to the MSETCL Engineer a complete set of detailed data, required for inspection and tests.

13.4 Details of Tests

The bidder must specify the details of the type, sample and routine tests to be conducted on offered cable kits at their works along with the standards applicable in their offer.

#### **14.0 QUALITY ASSURANCE**

14.1 Raw materials used for manufacture of cable shall be of highest quality and material received by manufacturer should be checked / tested to ensure that it meets manufacturer's material specification. The materials shall be clean and packed in moisture and dust proof packing.

14.2 As the Quality control of EHV XLPE cables termination & jointing kits and accessories while manufacturing is very critical so expert supervision is required for raw material testing, in process checks and also for final testing. A specially trained quality assurance team should be in place for maintenance of the quality at an optimum level at the plant. Complete details of manufacturing process along with details of automatic manufacturing plant, list of officers /staff to supervise the manufacturing and other details desired under heading QUALITY ASSURANCE PROGRAM of GTR/GTC shall be furnished by bidder in the bid.

14.3 Quality assurance plan indicating test /checks of raw material, process of manufacturer and final inspection with customer hold point shall be submitted to the purchaser for approval.

#### **15.0 TEST CERTIFICATES**

The latest complete type test certificates (conducted during last 5 years from date of tender along with attested drawing) in duplicate for all types of terminations & joints of offered design/ material conducted at Inter National reputed test house confirming to IEC: 62067/IEC 60840 must be enclosed with the offer. The offer without type tests results shall be ignored.

#### **16.0 INSPECTION & TRAINING AT MANUFACTURER'S WORKS**

- 16.1 The 220 kV/132 KV XLPE cable termination for Gas Insulated Metal enclosed Switchgear, outdoor type sealing end and straight through jointing kits and other accessories should be manufactured and tested while manufacturing as per approved Quality Assurance plan and foregoing specification. Supplier shall intimate the programme of manufacturing of the cable termination & jointing kits and accessories in advance. The inspection during manufacturing shall be carried out by the MSETCL engineers at various stages of manufacture. The successful bidder shall grant free access to the purchaser's representative at a reasonable time when the work is in progress.
- 16.2 Training program and associated charges shall be as per (Volume-I, ).
- 16.3 Inspection and acceptance of any equipment/material under this specification by the purchaser shall not relieve the supplier of his obligation of furnishing equipment in accordance with the specification and shall not prevent subsequent rejection if the equipment/material is found to be defective.
- 16.4 The supplier shall present the latest Calibration Certificate(s) of testing instruments / equipments to be used for the testing of the material covered in the Purchase Order to the authorized inspecting officer/ inspecting agency of the purchaser. The testing instruments /meters/apparatus etc should be got calibrated by the supplier from time to time from independent test laboratory/house having valid accreditation from National Accreditation Board for Testing and Calibrating Laboratories for the testing equipments / original manufacturer having credibility to NABL / NPL or equivalent.
- 16.5 The calibration certificate(s) should not in any case be older than one year at the time of presenting the same to the inspecting officer/ inspecting agency of the purchaser. The testing instruments/ equipments should be duly sealed by the Calibrating Agency and mention thereof shall be indicated in the calibration certificate(s).
- 16.6 The purchaser reserves the right to insist for witnessing the sample/routine tests of the bought out raw material/items used in manufacturing of cable end terminations/ joints.

## **17.0 FIRE RESISTANCE**

The cable terminations shall be fire resistant. The components of kits shall have flame retardant property.

## **18.0 INTERCHANGEABILITY**

The components of different number of the kits shall be inter-changeable in case the need arises.

## **19.0 COMPLETENESS OF CABLE KIT FOR EASY INSTALLATION**

- 19.1 The bidder shall offer complete material and components for each kit so as to meet one termination complete in all respects. The bidder shall indicate the list of the material/ components with quantities of each or cable end termination.
- 19.2 An instruction manual in English, indicating the complete method/ proceedings adopted for installations of kits, preferably with more diagrams/ pictorial presentation shall be supplied with each kit. Various items, quantity thereof against each kit must be indicated in the instruction manual.
- 19.3 The detailed bill of material and installation instructions shall be provided with each kit for verification by purchaser's inspecting officer & at MSETCL's stores/ site.
- 19.4 All components shall be sealed separately and marked clearly for the purpose of identification of each component. All components shall be supplied in single package as a complete kit for one termination joints and shall bear manufacturer's name & cable size of kit size for which it can be used.
- 19.5 The Bidder shall also indicate shelf life & ideal life of kit contents.

## **20.0 GUARANTEED & OTHER TECHNICAL PARTICULARS**

- 20.1 The bidder shall furnish the guaranteed & other technical particulars of the kit offered by him in Annexure-attached with the specifications. The particulars which are subject to guarantee shall be clearly indicated. Without schedule of GTP, completely filled, the offer shall not be acceptable.
- 20.2 The bidder shall highlight the various technical aspects of the kits offered by him.

## **21.0 GUARANTEE**

The cable termination & straight through joints shall bear guarantee for three years from the date of commissioning. Any defect noticed in the kit shall be attended by the bidder immediately but not later than three days in Pune City on getting the complaints and if required shall be replaced and installed free of cost, otherwise the same will be arranged at the supplier's risk and cost. For this purpose, successful bidder shall furnish Manufacturer's warranty on Maharashtra Non-judicial stamp paper worth Rs.100/- or as applicable in a manner as detailed in GCC.

## **22.0 SPECIAL TOOLS & TACKLES**

Complete out fit of tools, special tools, spanners and other lifting devices, instrument and appliance necessary for the complete assembly, erection at site,

dismantling and maintenance of Power Cable including all accessories (kits) covered by the contract together with suitable racks for holding them shall be supplied by the contractor.

### **23.0 MANUALS AND LITERATURE ON CABLE & CABLE KITS**

The following documents should be furnished along with the bid:

- i) Dimensioned cross sectional details of the cable.
- ii) Current carrying capacities “with supporting calculated data” of the cable and de-rated factors.
- iii) Type, acceptance and routine test certificates on the cable as per relevant IS, IEC or other International standards.
- iv) Dimensioned cross sectional details of the straight through Joint kit alongwith bill of materials.
- v) Type, acceptance and routine test certificate on the straight through joints.
- vi) OGA drawing of the cable end termination.
- vii) Dimensioned cross sectional details of cable end terminations with bill of materials.
- viii) Type, acceptance and routine test certificate on the cable end terminations.
- ix) OGA drawing of the cable termination structure alongwith the bill of materials.
- x) Literature on special Tools & Plant.
- xi) Literature on sheath bonding, maintenance of link boxes.
- xii) Any other relevant literature/manual.

### **24.0 TRAINING DURING ERECTION**

While erection the bidder shall arrange demonstration of use of kits (ordered by purchaser) for giving the training to the 2 personnel of the MSETCL for getting acquainted with the cable jointing method/ procedure.

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**DESIRED TECHNICAL PARTICULARS OF XLPE CABLE KITS & ACCESSORIES FOR 220 KV**

<b>A.</b>	<b>OUTDOOR CABLE END TERMINATION</b>	
1	Nominal System Voltage U	220 kV( rms)
2.	Rated/Highest System Voltage Um	245 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Outdoor
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit.	To be indicated
7.	Type of Kit	Pre-molded
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 62067
12.	Maximum allowable Pd-level	As per IEC
13	Type of Insulator.	Silicone/Composite.
14.	Creepage distance	25 mm/kV
15	Colour	Brown/Grey
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	1050 kV
18.	Power frequency withstand voltage	As per standard
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20	Power frequency withstand voltage	To be indicated

	(a) Dry (kV rms.) (b) Wet (kV rms.)	
21.	Flashover voltage: (a) Dry (kV rms ) (b) Wet (kV rms)	To be indicated
22.	Stress relief cone made of	Silicone rubber
23.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
24.	Craft sensitivity and reliability	To be indicated
25.	Time required for energisation after completing the joint (curing period)	To be indicated
26.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
27.	Whether provision made for : a) Stress relief. b) Track resistance. c) Sealing.	Yes
28.	Whether any additional support is required for kit?	If so, give details.
29.	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.
30.	Class of Kits.	Details to be given by bidder
31.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
32.	Expected life of Cable joint and cable.	35 years.
33.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated
34.	Guarantee of kit.	Three (3) years from date of commissioning
35.	Details of terminal connector	
<b>B. SF6 SWITCHGEAR TYPE CABLE END TERMINATION</b>		
1	Nominal System Voltage U	220 kV( rms)
2.	Rated/Highest System Voltage Um	245 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Indoor/ Outdoor
5.	Name and address of manufacturer of end termination	

6.	Nomenclature of kit.	To be indicated
7.	Type of Kit	Premoulded/ prefabricated, Plug in type
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 62067
12.	Maximum allowable Pd-level	As per IEC
13	Type of Insulator.	Silicone/Composite.
14.	Creepage distance	25 mm/kV
15	Colour	Brown/Grey/Ivory
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	1050 kV
18.	Power frequency withstand voltage	As per Standard
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20	Power frequency withstand voltage (a) Dry (KV rms.) (b) Wet (KV rms.)	To be indicated
21.	Flashover voltage: (a) Dry (KV rms ) (b) Wet (KV rms)	To be indicated
22	Stress relief cone made of	Silicone rubber
23.	Details of terminal connector	As applicable
24	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
25.	Craft sensitivity and reliability	To be indicated
26.	Time required for energisation after completing the	To be indicated

	joint (curing period)	
27.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
28.	Whether provision made for : d) Stress relief. e) Track resistance. f) Sealing.	Yes
29.	Whether any additional support is required for kit?	If so, give details.
30.	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.
31.	Class of Kits.	Details to be given by bidder
32.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
33.	Expected life of Cable joint and cable.	35 years.
34.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated
35.	Details of terminal connector	
36.	Guarantee of kit.	Three (3) years from date of commissioning
<b>C</b>	<b>STRAIGHT THROUGH JOINTS</b>	
1	Nominal System Voltage U	220 kV( rms)
2.	Rated/Highest System Voltage Um	245 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Underground buried installation
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit.	To be indicated
7.	Type of Kit	Pre-molded
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 62067
12.	Maximum allowable Pd-level	As per IEC
13	Guarantee of kit.	Three (3) years from date of commissioning
14	Proven technology and design to prevent entry of water	Yes

15.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250° C
17.	Basic impulse insulation level (1.2/50 micro second wave)	1050 kV
18.	Power frequency withstand voltage	As per Standard.
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20.	Power frequency withstand voltage (a) Dry (KV rms.) (b) Wet (KV rms.)	As per IEC
21.	Flashover voltage: (a) Dry (KV rms ) (b) Wet (KV rms	To be indicated by bidder
22.	Stress relief cone made of	Silicone rubber
23.	Details of terminal connector	To be furnished
24.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
25.	Craft sensitivity and reliability	To be indicated
26.	Time required for energisation after completing the joint (curing period)	To be indicated
27.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
28.	Whether provision made for : g) Stress relief. h) Track resistance. i) Sealing.	Yes
29.	Whether any additional support is required for kit?	If so, give details.
30.	Make Type and Material of lugs provided with kits.	Details to be given by bidder.
31.	Class of Kits.	Details to be given by bidder
32.	Expected life of Cable joint and cable.	35 years.
33.	Details of terminal connector	
34.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated

<b>D.</b>	<b>LINK BOX FOR EARTHING &amp; EARTHING CABLE WITH XLPE INSULATION</b>	
1.	Make	
2.	Type	
3.	Detailed dimension and internal arrangement of Single/ Three Phase Link boxes with direct grounding	To be submitted
4.	Detailed dimension and internal arrangement of Three Phase Link boxes for cross bonding with SVL	To be submitted
5.	Earthing of sheath/screen at cross bonding points and termination ends	Yes
6.	PVC insulated single core/ concentric/ coaxial cable to be used for sheath bonding (earthing) suitable for 40 kA for 1 second.	Size, Type to be indicated
7.	Insulation of above earthing cable	To be indicated (3 kV/ 6 kV)
8.	Voltage rise of the insulation sheath controlled within voltage	65 Volts.
9.	Surge voltage limiter	Required (3 kV/ 6 kV)
<b>E</b>	<b>SUPPORTING STRUCTURE &amp; ANGLE BRACKET SUPPORTS FOR CABLE</b>	
1	Detail drawing enclosed	Yes.
2	Overall height of structure	Shall be as per approved drawing.

**DESIRED TECHNICAL PARTICULARS OF XLPE CABLE KITS & ACCESSORIES FOR 132 KV**

A.	<b>OUTDOOR CABLE END TERMINATION</b>	
1	Nominal System Voltage U	132 kV( rms)
2.	Rated/Highest System Voltage Um	145 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Outdoor
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit.	To be indicated
7.	Type of Kit	Pre-molded
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 60840/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 60840
12.	Maximum allowable Pd-level	As per IEC
13	Type of Insulator.	Silicone/Composite.
14.	Creepage distance	25 mm/kV
15	Colour	Brown/Grey
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	650 kV
18.	Power frequency withstand voltage	As per standard
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20	Power frequency withstand voltage (a) Dry (kV rms.)	To be indicated

	(b) Wet (kV rms.)	
21.	Flashover voltage: (a) Dry (kV rms ) (b) Wet (kV rms	To be indicated
22.	Stress relief cone made of	Silicone rubber
23.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
24.	Craft sensitivity and reliability	To be indicated
25.	Time required for energisation after completing the joint (curing period)	To be indicated
26.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
27.	Whether provision made for : j) Stress relief. k) Track resistance. l) Sealing.	Yes
28.	Whether any additional support is required for kit?	If so, give details.
29.	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.
30.	Class of Kits.	Details to be given by bidder
31.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
32.	Expected life of Cable joint and cable.	35 years.
33.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated
34.	Guarantee of kit.	Three (3) years from date of commissioning
35.	Details of terminal connector	
<b>B. SF6 SWITCHGEAR TYPE CABLE END TERMINATION</b>		
1	Nominal System Voltage U	132 kV( rms)
2.	Rated/Highest System Voltage Um	145 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Indoor/ Outdoor
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit.	To be indicated

7.	Type of Kit	Premoulded, Plug in type
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 60840
12.	Maximum allowable Pd-level	As per IEC
13	Type of Insulator.	Silicone/Composite.
14.	Creepage distance	25 mm/kV
15	Colour	Brown/Grey
16.	Maximum allowable temperature for cable and accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	650 kV
18.	Power frequency withstand voltage	As per Standard
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20	Power frequency withstand voltage (a) Dry (KV rms.) (b) Wet (KV rms.)	To be indicated
21.	Flashover voltage: (a) Dry (KV rms ) (b) Wet (KV rms	To be indicated
22	Stress relief cone made of	Silicone rubber
23.	Details of terminal connector	As applicable
24	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
25.	Craft sensitivity and reliability	To be indicated
26.	Time required for energisation after completing the joint (curing period)	To be indicated
27.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated

28.	Whether provision made for : m) Stress relief. n) Track resistance. o) Sealing.	Yes
29.	Whether any additional support is required for kit?	If so, give details.
30	Make, Type and Material of lugs provided with kits.	Details to be given by bidder.
31.	Class of Kits.	Details to be given by bidder
32.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
33.	Expected life of Cable joint and cable.	35 years.
34.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated
35.	Details of terminal connector	
36.	Guarantee of kit.	Three (3) years from date of commissioning
<b>C</b>	<b>STRAIGHT THROUGH JOINTS</b>	
1	Nominal System Voltage U	132 kV( rms)
2.	Rated/Highest System Voltage Um	145 kV (rms)
3	Rated frequency & No. of phase	50 Hz $\pm$ 3%, Three ( 3)
4	Installation	Underground buried installation
5.	Name and address of manufacturer of end termination	
6.	Nomenclature of kit.	To be indicated
7.	Type of Kit	Pre-molded
8	Suitable for Single Core Copper Conductor XLPE cable Conforming to IEC 62067/IS 7098(part-3) amended upto date and as per Section -1 of the specification.	Yes
9	Maximum conductor size	To be indicated
10	Rated continuous current	Maximum current of the cable
11	Applicable standard for testing	IEC 60840
12.	Maximum allowable Pd-level	As per IEC
13	Guarantee of kit.	Three (3) years from date of commissioning
14	Proven technology and design to prevent entry of water	Yes
15.	Sectional Drawing Showing constructional details along with each item material, description enclosed.	Yes.
16.	Maximum allowable temperature for cable and	

	accessories i) At rated full load and at site condition  ii) The conductor temperature after a short circuit for one second shall not exceed (with conductor temperature at start of short circuits as 90° C).	90° C  250°C
17.	Basic impulse insulation level (1.2/50 micro second wave)	650 kV
18.	Power frequency withstand voltage	As per Standard.
19.	Symmetrical Short circuit rating	40 kA for 3 Sec.
20	Power frequency withstand voltage (a) Dry (KV rms.) (b) Wet (KV rms.)	As per IEC
21.	Flashover voltage: (a) Dry (KV rms ) (b) Wet (KV rms)	To be indicated by bidder
22	Stress relief cone made of	Silicone rubber
23.	Details of terminal connector	To be furnished
24.	Net dimensions of kit (Length x Breadth x Width and Weight)	To be indicated
25.	Craft sensitivity and reliability	To be indicated
26.	Time required for energisation after completing the joint (curing period)	To be indicated
27.	Special storage condition. If any, upto an ambient temperature of 50 degree C and period.	To be indicated
28.	Whether provision made for : p) Stress relief. q) Track resistance. r) Sealing.	Yes
29.	Whether any additional support is required for kit?	If so, give details.
30.	Make Type and Material of lugs provided with kits.	Details to be given by bidder.
31.	Class of Kits.	Details to be given by bidder
32	Expected life of Cable joint and cable.	35 years.
33.	Details of terminal connector	
34.	(a) Shelf life of the kit (years) b) Design life of the kit ( Years)	To be indicated To be indicated
<b>D.</b>	<b>LINK BOX FOR EARTHING &amp; EARTHING CABLE WITH XLPE INSULATION</b>	
1.	Make	

2.	Type	
3.	Detailed dimension and internal arrangement of Single/ Three Phase Link boxes with direct grounding	To be submitted
4.	Detailed dimension and internal arrangement of Three Phase Link boxes for cross bonding with SVL	To be submitted
5.	Earthing of sheath/screen at cross bonding points and termination ends	Yes
6.	PVC insulated single core/ concentric/ coaxial cable to be used for sheath bonding (earthing) suitable for 40 kA for 1 second.	Size, Type to be indicated
7.	Insulation of above earthing cable	To be indicated (3 kV/ 6 kV)
8.	Voltage rise of the insulation sheath controlled within voltage	65 Volts.
9.	Surge voltage limiter	Required (3 kV/ 6 kV)
<b>E</b>	<b>SUPPORTING STRUCTURE &amp; ANGLE BRACKET SUPPORTS FOR CABLE</b>	
1	Detail drawing enclosed	Yes.
2	Overall height of structure	Shall be as per approved drawing.