

Amendment No. 3

Date: 05.12.2019

Tender Package Name:

Construction of 220 kV S/C Transmission Line on D/C Tower (WZ-VI, ACSR DEER Conductor, 25 mm Radial Ice loading) on Turnkey Basis associated with Strengthening of Transmission System of JKPDD under PMDP Scheme-15 for 220 kV Transmission Line

Tender Specification No-

Package -01: RECTPCL/PIA/JKPDD/TL-01: 220 kV Phyang to North Pullu Dated: 11-10-2019

Package -02: RECTPCL/PIA/JKPDD/TL-01: 220 kV North Pullu to Diskit Dated: 11-10-2019

Package 03- RECTPCL/PIA/JKPDD/TL-03: 220 kV Drass to Kochik Dated: 11-10-2019

Package 04- RECTPCL/PIA/JKPDD/TL 04: 220 kV Kochik to Rangdrum Dated: 11-10-2019

Package 05- RECTPCL/PIA/JKPDD/TL 05: 220 kV Rangdrum to Padum Dated: 11-10-2019

S. No.	Package	Clause No.	Existing Clause	To be Read as						
A. INVITATION FOR BIDS , SEC-I, VOL-I										
1	01 & 02	3.0	RECTPCL, on behalf of JKPDD The entire Transmission Line is being divided in two packages listed below:-	RECTPCL, on behalf of JKPDD The entire Transmission Line is being divided in two packages listed below:-						
			S.No.	Package	Name of Package	Line Length	S.No.	Package	Name of Package	Line Length
			1	01	220 kV S/C Phyang-North Pullu T/L on D/C Tower	37.6 Kms	1	01	220 kV S/C Phyang-North Pullu T/L on D/C Tower (Gantry of existing s/s at Phyang to AP-61)	37.6 Kms
			2	02	220 kV S/C North Pullu - Diskit T/L on D/C Tower	40.0 Kms	2	02	220 kV S/C	40.0

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			<table border="1"> <tr> <td></td> <td></td> <td>North Pullu - Diskit T/L on D/C Tower from AP-61 to Gantry of proposed s/s/ at Diskit.</td> <td>Kms</td> </tr> </table> <p>NOTE: Location of Angle Point (AP) & Gantry may be checked with Survey Report provided in RECTPCL website.</p> <p>However, location of APs are tentative and termination of each transmission line will be finalized with consultation among both the successful bidders and RECTPCL on the basis of detailed route survey.</p> <p>.....</p>			North Pullu - Diskit T/L on D/C Tower from AP-61 to Gantry of proposed s/s/ at Diskit.	Kms																
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2	03,04 & 05	3.0	<p>RECTPCL, on behalf of JKPDD The entire Transmission Line is being divided in two packages listed below:-</p> <table border="1"> <thead> <tr> <th>S.No.</th> <th>Package</th> <th>Name of Package</th> <th>Line Length</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>03</td> <td>220 kV S/C Drass-Kochik T/L on D/C Tower</td> <td>63.55 Kms.</td> </tr> <tr> <td>2</td> <td>04</td> <td>220 kV S/C Kochik - Rangdrum T/L on D/C Tower (upto</td> <td>65.12 Kms</td> </tr> </tbody> </table>	S.No.	Package	Name of Package	Line Length	1	03	220 kV S/C Drass-Kochik T/L on D/C Tower	63.55 Kms.	2	04	220 kV S/C Kochik - Rangdrum T/L on D/C Tower (upto	65.12 Kms	<p>RECTPCL, on behalf of JKPDD The entire Transmission Line is being divided in two packages listed below:-</p> <table border="1"> <thead> <tr> <th>S.No.</th> <th>Package</th> <th>Name of Package</th> <th>Line Length</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>03</td> <td>220 kV S/C Drass- Kochik T/L on D/C Tower (Gantry of existing s/s at Drass to AP-71)</td> <td>63.55 Kms.</td> </tr> </tbody> </table>	S.No.	Package	Name of Package	Line Length	1	03	220 kV S/C Drass- Kochik T/L on D/C Tower (Gantry of existing s/s at Drass to AP-71)	63.55 Kms.
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1	03	220 kV S/C Drass-Kochik T/L on D/C Tower	63.55 Kms.																					
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S. No.	Package	Clause No.	Existing Clause				To be Read as					
					20 KMs from Rangdrum towards padum)							
			3	05	220 kV S/C Rangdrum-Padum T/L on D/C Tower (start 20 KMs from Rangdrum towards padum)	66.63 Kms			2	04	220 kV S/C Kochik - Rangdrum T/L on D/C Tower (upto 20 KMs from Rangdrum towards padum) (AP71 to AP108)	65.12 Kms
											
											
									3	05	220 kV S/C Rangdrum-Padum T/L on D/C Tower (start 20 KMs from Rangdrum towards padum from AP 108 to Gantry of proposed S/s at Padum)	66.63 Kms
									<p>NOTE: Location of Angle Point (AP) & Gantry may be checked with Survey Report provided in RECTPCL website.</p> <p>However, location of APs are tentative and termination of each transmission line will be finalized with consultation among all three successful bidders and RECTPCL on the basis of detailed route survey.</p> <p>.....</p> <p>.....</p>			
3	01 to 05	Note-1	Note 1: - As the above Transmission Lines are				Note 1: - As the above Transmission Lines are					

S. No.	Package	Clause No.	Existing Clause	To be Read as
			<p>expected to pass through heavy avalanche prone area, provision of avalanche protection need to be taken care.</p> <p>Hence, after award of the contract the selected bidder is required to consult M/s Snow and Avalanche study Establishment (SASE), Chandigarh for the detail & check survey. In detail study, safety of individual Tower for Transmission Line from avalanche threat, required safety measures, improvisation of alignment & selection of more safe and economical alignment needs to be worked out. After detail study, if required, ground visit to be carried out jointly with SASE/RECTPCL officials. Based on the joint report of the study, Necessary provision for avalanche protection will be finalized.</p> <p>All the expenses towards detail study by SASE & ground visits of SASE official to be borne by contractor.</p>	<p>expected to pass through heavy avalanche prone area, provision of avalanche protection need to be taken care.</p> <p>Hence, after award of the contract the selected bidder is required to consult M/s Snow and Avalanche study Establishment (SASE), Chandigarh for the detail & check survey. In detail study, safety of individual Tower for Transmission Line from avalanche threat, required safety measures, improvisation of alignment & selection of more safe and economical alignment needs to be worked out. After detail study, if required, ground visit to be carried out jointly with SASE/RECTPCL officials. Based on the joint report of the study, Necessary provision for avalanche protection will be finalized.</p> <p>All the expenses towards detail study by SASE & ground visits of SASE official to be borne by contractor which will be reimbursed by RETPCL at actual on the submission of the original invoice from the SASE and other relevant documentary evidences.</p>
B. GENERAL CONDITIONS OF CONTRACT, SEC-IV, VOL-I				
1	01,02,03, 04 and 05	6	<p>Drawing: (i)..... The Engineer-in-charge shall accord and convey the</p>	<p>Drawing: (i)..... The Engineer-in-charge shall accord and convey the</p>

S. No.	Package	Clause No.	Existing Clause	To be Read as
			approval to the design calculation and drawings, if found in order, within 30(thirty) days from the receipt of the drawings from the Contractor. Otherwise he shall apprise the Contractor of his comments on such design calculations and drawings within the above mentioned period.	approval to the design calculation and drawings, if found in order, within 15(fifteen) days from the receipt of the drawings from the Contractor. Otherwise he shall apprise the Contractor of his comments on such design calculations and drawings within the above mentioned period.
2	01,02,03, 04 and 05	27	<p>LIQUIDATED DAMAGES FOR DELAY: If the Contractor fails to complete the Work as specified in Clause 24 hereof, the purchaser shall, without prejudice to its other remedies under the Contract, deduct the amount from any monies in its hands, due or which may become due to the Contractor, as liquidated damages (which is a genuine pre-estimate agreed by the parties hereto of the loss or damage which the purchaser would have suffered on account of delay without giving any proof of the loss or damages) a sum equivalent to 0.5 % of the Contract price plus GST payable thereon per week of delay or part thereof subject to a maximum of 10% of the Contract price plus GST payable thereon.</p> <p>The payment or deduction of such damages shall not relieve the Contractor from his obligations to complete the works or from any of his obligations and liabilities under the Contract.</p>	<p>LIQUIDATED DAMAGES FOR DELAY: If the Contractor fails to complete the Work as specified in Clause 24 hereof, the purchaser shall, without prejudice to its other remedies under the Contract, deduct the amount from any monies in its hands, due or which may become due to the Contractor, as liquidated damages (which is a genuine pre-estimate agreed by the parties hereto of the loss or damage which the purchaser would have suffered on account of delay without giving any proof of the loss or damages) a sum equivalent to 0.5 % of the Contract price plus GST payable thereon per week of delay or part thereof subject to a maximum of 5% of the Contract price plus GST payable thereon.</p> <p>The payment or deduction of such damages shall not relieve the Contractor from his obligations to complete the works or from any of his obligations and liabilities under the Contract.</p>
C. SAMPLE FORMS & PROCEDURES, SEC-IX, VOL-I				
1	01,02,03, 04 and	Appendix -2	Price Adjustment	Please refer Annexure-A of Amendment-3

S. No.	Package	Clause No.	Existing Clause	To be Read as
	05			
D. TECHNICAL SPECIFICATION, SEC-I, VOL-II				
1	01,02,03, 04 and 05	1.1.2 (iv)	All types of tower accessories like phase plate, circuit plate (where ever applicable), number plate, danger plate, anti-climbing device, Bird guard (where ever applicable)	Supply of all types of tower accessories like phase plate, circuit plate (where ever applicable), number plate, danger plate, anti-climbing device, Bird guard (where ever applicable)
2	01,02,03, 04 and 05	1.1.2.1	<p>Employer shall provide structural drawings, shop drawings & Bill of Materials of all type of transmission line towers and its extensions, river crossing towers/special towers to the contractor as required after placement of award, in sequence, suiting the project requirement. Similarly the drawings for all type of foundations for the towers shall also be provided by Employer to the Contractor.</p> <p>However, if required, Contractor has to develop structural drgs, BOM & Shop drawings of +18/25M extension based on SLD provided by the Employer.</p>	<p>Employer shall provide structural drawings, shop drawings & Bill of Materials of all type of transmission line towers and its extensions, river crossing towers/special towers to the contractor as required after placement of award, in sequence, suiting the project requirement. Similarly the drawings for all type of foundations for the towers shall also be provided by Employer to the Contractor.</p> <p>During execution of the project, if any specific designs viz. +18/+25/+30M extensions, other equal/ unequal leg extensions, cross-arm strengthening, auxiliary cross-arms, raised chimney foundations etc. are required as per site conditions, Single line Diagram/ Design Drawing shall be provided by the Employer. The contractor shall be required to develop the corresponding structural drgs, BOM & Shop drawings etc. without any financial implication to Employer.</p>

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3	01,02,03, 04 and 05	3.1.2	The tower shall be fully galvanized using mild steel or/and high tensile steel sections as specified in relevant clause in section - IV. Bolts and nuts with spring washer are to be used for connections.	The tower shall be fully galvanized using mild steel sections as specified in relevant clause in section - IV. Bolts and nuts with spring washer are to be used for connections.																																				
4	01,02,03, 04 and 05	3.2.1	<p>Tower for 220 kV lines are classified as given below:</p> <table border="1"> <thead> <tr> <th>Type of Tower</th> <th>Deviation Limit</th> <th>Typical Use</th> </tr> </thead> <tbody> <tr> <td>DA</td> <td>0 - 2 deg.</td> <td>i) To be used as tangent tower.</td> </tr> <tr> <td>DB</td> <td>0 deg. - 15 deg.</td> <td>i) Angle towers with tension insulator string. ii) Also to be used for uplift force resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for Anti Cascading Condition.</td> </tr> <tr> <td>DB</td> <td>0 deg.</td> <td>i) To be used as Section Tower.</td> </tr> <tr> <td>DC</td> <td>15 deg. - 30 deg.</td> <td>i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for anti-cascading condition.</td> </tr> <tr> <td>DC</td> <td>0 deg.</td> <td>i) To be used as section tower.</td> </tr> <tr> <td>DD</td> <td>30 deg. - 60 deg.</td> <td>i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an</td> </tr> </tbody> </table>	Type of Tower	Deviation Limit	Typical Use	DA	0 - 2 deg.	i) To be used as tangent tower.	DB	0 deg. - 15 deg.	i) Angle towers with tension insulator string. ii) Also to be used for uplift force resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for Anti Cascading Condition.	DB	0 deg.	i) To be used as Section Tower.	DC	15 deg. - 30 deg.	i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an uplift span up to (-) 1200 m under broken wire condition. iii) Also to be used for anti-cascading condition.	DC	0 deg.	i) To be used as section tower.	DD	30 deg. - 60 deg.	i) Angle tower with tension insulator string. ii) Also to be used for uplift forces resulting from an	<p>Tower for 220 kV lines are classified as given below:</p> <table border="1"> <thead> <tr> <th>Type of Tower</th> <th>Deviation Limit</th> <th>Typical Use</th> </tr> </thead> <tbody> <tr> <td>DA</td> <td>0 - 2 deg.</td> <td>- Tangent/Suspension Tower</td> </tr> <tr> <td>DB</td> <td>0 deg. - 15 deg.</td> <td>- Angle/Tension Tower - Section Tower - To be designed for anti-cascading condition - Also to be designed for single strung condition</td> </tr> <tr> <td>DC</td> <td>0 deg. - 30 deg.</td> <td>- Angle/Tension Tower - Section Tower - To be designed for anti-cascading condition - Also to be designed for single strung condition</td> </tr> <tr> <td>DD</td> <td>30 deg. - 60 deg.</td> <td>- Angle/Tension Tower - Dead end/Terminal Tower with slack span (0 to 15 deg deviation on both line side & substation side) (considering slack side tension as 30% of line side tension) - Complete Dead End/Terminal Tower (0 to 15 Deg. dev.) - To be designed for anti-</td> </tr> </tbody> </table>	Type of Tower	Deviation Limit	Typical Use	DA	0 - 2 deg.	- Tangent/Suspension Tower	DB	0 deg. - 15 deg.	- Angle/Tension Tower - Section Tower - To be designed for anti-cascading condition - Also to be designed for single strung condition	DC	0 deg. - 30 deg.	- Angle/Tension Tower - Section Tower - To be designed for anti-cascading condition - Also to be designed for single strung condition	DD	30 deg. - 60 deg.	- Angle/Tension Tower - Dead end/Terminal Tower with slack span (0 to 15 deg deviation on both line side & substation side) (considering slack side tension as 30% of line side tension) - Complete Dead End/Terminal Tower (0 to 15 Deg. dev.) - To be designed for anti-
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			DD	0 deg.	i) Dead end with 0 deg. To 15 deg. Deviation both on line side and sub-station side (slack span) ii) for river crossing anchoring with longer wind span & 0 deg. Deviation on crossing span side and 0 deg. To 30 deg. Deviation on other side.	Note 1: The above towers can also be used for longer span with smaller angle of deviations without infringement of ground clearance.																																																									
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				DD	2000	(-) 2000	1200	(-)1200				
6	01,02,03, 04 and 05	3.4.1	<p>Ground Clearance The minimum ground clearance from the bottom conductor shall not be less than 8500 mm for 220 kV lines at the maximum sag conditions i.e. at 85° C and still air.</p>	<p>Ground Clearance The minimum ground clearance from the bottom conductor shall not be less than 8120 mm for 220 kV lines at the maximum sag conditions i.e. at 85° C and still air.</p>								
7	01,02,03, 04 and 05	4.1.1	Conductor & Earthwire		Conductor & OPGW							
			Sl. No.	Description	Unit	Earthwire	Conductor	Sl. No.	Description	Unit	OPGW	Conductor
			1	Name/Type		Galvanised steel	ACSR DEER	1	Name/Type		OPGW	ACSR DEER
			2	Size	mm	7/4.27	30/4.27 Al +7/4.27 Steel	2	Size	mm	13.60	30/4.27 Al +7/4.27 Steel
			3	Conductor per phase	No.	N.A.	1	3	Conductor per phase	No.	N.A.	1
			4	Configuration		One continuously to run on top of the towers and conductors	Vertical	4	Configuration		One continuously to run on top of the towers	Vertical
			5	Overall diameter	mm	12.81	29.89	5	Overall diameter	mm	13.60	29.89
			6	Unit mass	Kg/Km	783	1979	6	Unit mass	Kg/Km	750	1979
			7	Min. UTS	KN	93.1	178.4	7	Min. UTS	KN	150.09	178.4
			8	Ruling Design Span	Met res	350	350	8	Ruling Design Span	Met res	350	350
E. TECHNICAL SPECIFICATION, SEC-III, VOL-II												

S. No.	Package	Clause No.	Existing Clause	To be Read as
1	01,02,03,04 and 05	3.6	<p>Clearance from Ground, Building, Trees etc.</p> <p>Clearance from ground, buildings, trees and telephone lines shall be provided in conformity with the Indian Electricity Rules, 1956 as amended up to date.</p> <p>.....</p> <p>.....</p>	<p>Clearance from Ground, Building, Trees etc.</p> <p>Clearance from ground, buildings, trees and telephone lines should be as per CEA's Regulation 2010 (Measures related to Safety and Electric Supply) as amended up to date.</p> <p>.....</p> <p>.....</p>
F. TECHNICAL SPECIFICATION, SEC-IV, VOL-II				
1	01,02,03,04 and 05	1.2.1	<p>Tower Steel Sections</p> <p>IS Steel Sections of tested quality of conformity with IS 062:2006, grade E250 (Designated Yield Strength 250 MPa) and/ or grade 350 (Designated Yield Strength 350 MPa) are to be used in towers, extensions, stubs and stub setting templates. The Contractor can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards. However, use of steel grade having designated yield strength more than that of EN 10025 grade S355 JR/JO (designated yield strength 355 MPa) is not permitted, unless otherwise indicated in this specification.</p> <p>.....</p> <p>.....</p>	<p>Tower Steel Sections</p> <p>IS Steel Sections of tested quality of conformity with IS:2062:2011 grade E250 (Designated Yield strength. 250 MPa) quality "C" for mild steel is to be used in towers, extensions, stubs and stub setting templates for Snow Zone towers. The Contractor can use other equivalent grade of structural steel angle sections and plates conforming to latest International Standards viz BSEN 10025.</p> <p>However, use of steel grade having designated yield strength more than that of EN 10025 grade S355 JR/JO {designated yield strength 355 MPa) is not permitted, unless otherwise indicated in this specification.</p> <p>.....</p> <p>.....</p>
G. TECHNICAL SPECIFICATION, SEC-V, VOL-II				
1	01,02,03,04 and 05	1.1.1	The ACSR Conductor shall generally conform to IEC: 1089/ IS: 398 except where otherwise specified herein.	The ACSR Conductor shall generally conform to IEC 61089/ IS 398 except where otherwise specified

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2	01,02,03, 04 and 05	1.2.3 The steel wire rods shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands and the individual wires shall be of uniform quality and have the same properties and characteristics as prescribed in IEC: 888. The steel wire rods shall be of such quality and purity that, when drawn to the size of the strands specified and coated with zinc, the finished strands and the individual wires shall be of uniform quality and have the same properties and characteristics as prescribed in IEC: 60888 .																								
3	01,02,03, 04 and 05	1.5.1	Aluminium The aluminium strands shall be hard drawn from electrolytic aluminium rods having purity not less than 99.5% and a copper content not exceeding 0.04%. They shall have the same properties and characteristics as prescribed in IEC: 889.	Aluminium The aluminium strands shall be hard drawn from electrolytic aluminium rods having purity not less than 99.5% and a copper content not exceeding 0.04%. They shall have the same properties and characteristics as prescribed in IEC: 60889 .																								
4	01,02,03, 04 and 05	2.2 (h)	Wrap test on Steel & Aluminium strands IEC:888 & 889	Wrap test on Steel & Aluminium strands IEC:60888 & 60889																								
5	01,02,03, 04 and 05	2.2 (i)	DC resistance test on Aluminium strands IEC 889	DC resistance test on Aluminium strands IEC 60889																								
6	01,02,03, 04 and 05	2.14.2 <table border="1" data-bbox="619 1209 1264 1412"> <thead> <tr> <th>Sl. No.</th> <th>Indian Standard</th> <th>Title</th> <th>International Standard</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>IS: 209-1992</td> <td>Specification for zinc</td> <td>BS:3436-1986</td> </tr> <tr> <td>2.</td> <td>IS: 398 Part-I -</td> <td>Specification for</td> <td>IEC:1089-1991 BS:215-1970</td> </tr> </tbody> </table>	Sl. No.	Indian Standard	Title	International Standard	1.	IS: 209-1992	Specification for zinc	BS:3436-1986	2.	IS: 398 Part-I -	Specification for	IEC:1089-1991 BS:215-1970 <table border="1" data-bbox="1312 1166 1957 1425"> <thead> <tr> <th>Sl. No.</th> <th>Indian Standard</th> <th>Title</th> <th>International Standard</th> </tr> </thead> <tbody> <tr> <td>1.</td> <td>IS: 209-1992</td> <td>Specificati on for zinc</td> <td>BS:3436-1986</td> </tr> <tr> <td>2.</td> <td>IS: 398 Part-I - 1996</td> <td>Specificati on for Aluminium</td> <td>IEC:61089-1991 BS:215-1970</td> </tr> </tbody> </table>	Sl. No.	Indian Standard	Title	International Standard	1.	IS: 209-1992	Specificati on for zinc	BS:3436-1986	2.	IS: 398 Part-I - 1996	Specificati on for Aluminium	IEC:61089-1991 BS:215-1970
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S. No.	Package	Clause No.	Existing Clause				To be Read as			
				1996	Aluminium Conductors for Overhead Transmission Purposes				Conductors for Overhead Transmission Purposes	
			3.	IS:398 Part-II -1996	Aluminum Conductor Galvanised Steel Reinforced	BS;215-1970 IEC:1089-1991		3.	IS:398 Part-II -1996	Aluminum Conductor Galvanised Steel Reinforced BS;215-1970 IEC:61089-1991
			4.	IS:398 Part-V -1992	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above	IEC:1089-1991 BS:215-1970		4.	IS:398 Part-V -1992	Aluminum Conductor Galvanised Steel-Reinforced For Extra High Voltage (400 KV) and above IEC:61089-1991 BS:215-1970
			5.	IS : 1778-1980	Reels and Drums for Bare Conductors	BS:1559-1949		5.	IS : 1778-1980	Reels and Drums for Bare Conductors BS:1559-1949
			6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire	ISO 6892-1984		6.	IS : 1521-1991	Method of Tensile Testing of Steel Wire ISO 6892-1984
			7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron and Steel			7.	IS : 2629-1990	Recommended Practice for Hot Dip Galvanising of Iron
			8.	IS : 2633-1992	Method of Testing Uniformity of Coating on					

S. No.	Package	Clause No.	Existing Clause				To be Read as				
					Zinc Coated Articles				and Steel		
			9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 888-1987 BS:443-1969		8.	IS : 2633-1992	Method of Testing Uniformity of Coating on Zinc Coated Articles	
			10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 -		9.	IS : 4826-1992	Galvanised Coating on Round Steel Wires	IEC : 60888-1987 BS:443-1969
			11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:437-1973 NEMA:107-1964 CISPR		10.	IS : 6745-1990	Methods of Determination of Weight of Zinc Coating of Zinc Coated Iron and Steel Articles	BS:433-1969 ISO 1460 - 1973
			12.		Zinc Coated steel wires for stranded Conductors	IEC : 888-1987		11.	IS : 8263-1990	Method of Radio Interference Tests on High Voltage Insulators	IEC:60437-1973 NEMA:107-1964 CISPR
			13.		Hard drawn Aluminium wire for overhead line conductors	IEC : 889-1987		12.		Zinc Coated steel wires for stranded	IEC : 60888-1987

S. No.	Package	Clause No.	Existing Clause	To be Read as			
						Conductors	
						Conductors	
				13.		Hard drawn Aluminium wire for overhead line conductors	IEC : 60889-1987
7	01,02,03,04 and 05	Annexure A, cl no. 1.12	<p>Galvanizing Test</p> <p>The test procedure shall be as specified in IEC: 888. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.</p>	<p>Galvanizing Test</p> <p>The test procedure shall be as specified in IEC: 60888. The material shall conform to the requirements of this Specification. The adherence of zinc shall be checked by wrapping around a mandrel four times the diameter of steel wire.</p>			
8	01,02,03,04 and 05	Annexure A, cl no. 1.13	<p>Torsion and Elongation Tests on Steel Strands</p> <p>The test procedures shall be as per clause No. 10.3 of IEC: 888. In torsion test, the number of complete twists before fracture shall not be less than that indicated in the STP. In case test sample length is less or more than 100 times the stranded diameter of the strand, the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than 4% for a gauge length of 250 mm.</p>	<p>Torsion and Elongation Tests on Steel Strands</p> <p>The test procedures shall be as per clause No. 10.3 of IEC: 60888. In torsion test, the number of complete twists before fracture shall not be less than that indicated in the STP. In case test sample length is less or more than 100 times the stranded diameter of the strand, the minimum number of twists will be proportioned to the length and if number comes in the fraction then it will be rounded off to next higher whole number. In elongation test, the elongation of the strand shall not be less than 4% for a gauge length of 250 mm.</p>			
H. TECHNICAL SPECIFICATION, SEC-VII, VOL-II							

S. No.	Package	Clause No.	Existing Clause	To be Read as
1	01,02,03, 04 and 05	1.1.1	The insulators of the strings shall consist of standard Discs for a three phase, 50 Hz, effectively earthed 220kV-transmission system application in a lightly polluted environment. The Disc shall be cap and pin, ball and socket type.	The insulators of the strings shall consist of standard Discs for a three phase, 50 Hz, effectively earthed 220kV-transmission system application in a medium polluted environment. The Disc shall be cap and pin, ball and socket type.
2	01,02,03, 04 and 05	1.3.1	Security clip for use with ball and socket coupling shall be of R-shaped hump type which shall provide positive locking of the coupling as per IS: 2486-(Part-III)/IEC: 372. The legs of the security clips shall be spread after installation to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall locking device allow separation of insulator units or fittings.	Security clip for use with ball and socket coupling shall be of R-shaped hump type which shall provide positive locking of the coupling as per IS: 2486-(Part-III)/IEC: 60372 . The legs of the security clips shall be spread after installation to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall locking device allow separation of insulator units or fittings.
3	01,02,03, 04 and 05	2.1.1	The Insulator strings shall consist of Standard long rod insulators with normal sheds for a three phase, 50 Hz, effectively earthed 220 kV transmission system in a lightly polluted atmosphere. Insulators shall be long rod type with Ball and Socket connections.	The Insulator strings shall consist of Standard long rod insulators with normal sheds for a three phase, 50 Hz, effectively earthed 220 kV transmission system in a medium polluted atmosphere. Insulators shall be long rod type with Ball and Socket connections.
4	01,02,03, 04 and 05	2.1.2	Insulators shall have normal sheds / alternate sheds with good self-cleaning properties. Insulator shed profile, spacing projection etc. shall be strictly in accordance with the recommendation of IEC - 815.	Insulators shall have normal sheds / alternate sheds with good self-cleaning properties. Insulator shed profile, spacing projection etc. shall be strictly in accordance with the recommendation of IEC - 60815 .

S. No.	Package	Clause No.	Existing Clause				To be Read as					
5	01,02,03, 04 and 05	2.5	Intermediate Ball Pin Designation The dimension of the intermediate ball pin shall be in accordance with the standard dimension stated in IEC: 471.				Intermediate Ball Pin Designation The dimension of the intermediate ball pin shall be in accordance with the standard dimension stated in IEC: 60471 .					
6	01,02,03, 04 and 05	Annexure -A, clause 1.3	RIV Test (Dry) Under the condition as specified under (1.2) above, the insulator string along with complete hardware fittings shall have a radio interference voltage level below 1000 micro volts at one MHz when subjected to 50 Hz AC voltage of 154 kV line to ground under dry condition for 220kV line. The test procedure shall be in accordance with IS: 8263 / IEC: 437				RIV Test (Dry) Under the condition as specified under (1.2) above, the insulator string along with complete hardware fittings shall have a radio interference voltage level below 1000 micro volts at one MHz when subjected to 50 Hz AC voltage of 154 kV line to ground under dry condition for 220kV line. The test procedure shall be in accordance with IS: 8263 / IEC: 60437					
7	01,02,03, 04 and 05	Annexure -A, clause 2.6	Chemical Analysis of Zinc Sleeve The purity of the zinc used in zinc sleeve shall be tested as per IS: 209. The purity of zinc shall not be less than 99.8%.				-					
8	01,02,03, 04 and 05	Annexure -A, clause 6.2.1	Description		Unit	Standard Technical Particulars Value		Description	Unit	Standard Technical Particulars Value		
						120 KN Disc Insulator	160 KN Disc Insulator			120 KN Disc Insulator	160 KN Disc Insulator	
											
											
			9.0	Eccentricity of Disc								
a)	Max. radial run out	Mm	7.65/8.84	8.4								
.....												
.....												

S. No.	Package	Clause No.	Existing Clause	To be Read as
			
I. TECHNICAL SPECIFICATION, SEC-VII, VOL-II				
1	01,02,03, 04 and 05	Page 3, heading	SECTION-VII	SECTION-VIII
2	01,02,03, 04 and 05	1.6.1	<p>Ball and Socket Designation</p> <p>The dimensions of the ball and socket are furnished in section-I of this Specification. The designation should be in accordance with the standard dimensions stated in IS 2486(Part-II)/IEC 20. The dimensions shall be checked by the appropriate gauge after galvanising only.</p>	<p>Ball and Socket Designation</p> <p>The dimensions of the ball and socket are furnished in section-I of this Specification. The designation should be in accordance with the standard dimensions stated in IS 2486(Part-II)/IEC 60120. The dimensions shall be checked by the appropriate gauge after 17alvanizing only.</p>
3	01,02,03, 04 and 05	1.7.1	<p>Security clips for use with ball and socket coupling shall be R-shaped, hump type which provides positive locking of the coupling as per IS: 2486(Part-III)/ IEC : 372. The legs of the security clips shall be spread after assembly in the works to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall the locking devices allow, separation of fittings</p>	<p>Security clips for use with ball and socket coupling shall be R-shaped, hump type which provides positive locking of the coupling as per IS: 2486(Part-III)/ IEC : 60372. The legs of the security clips shall be spread after assembly in the works to prevent complete withdrawal from the socket. The locking device should be resilient, corrosion resistant and of suitable mechanical strength. There shall be no risk of the locking device being displaced accidentally or being rotated when in position. Under no circumstances shall the locking devices allow, separation of fittings</p>
4	01,02,03, 04 and 05	1.8.3	<p>The air gap shall be so adjusted to ensure effective operation under actual field conditions.</p> <p>The arcing distance between arcing horn and corona control rings/grading shall be 3440 mm for all strings for 220kV.</p>	<p>The air gap shall be so adjusted to ensure effective operation under actual field conditions.</p> <p>The arcing distance between arcing horn and corona control rings/grading shall be 3260 mm for all strings for 220kV.</p>

S. No.	Package	Clause No.	Existing Clause	To be Read as
5	01,02,03, 04 and 05	1.9	<p>Yoke Plates</p> <p>The strength of yoke plates shall be adequate to withstand the minimum ultimate tensile strength as specified in the bid drawings.</p> <p>The plates shall be either triangular or rectangular in shape as may be necessary. The design of yoke plate shall take into account the most unfavorable loading conditions likely to be experienced as a result of dimensional tolerances for disc insulators as well as components of hardware fittings within the specified range. The plates shall have suitable holes for fixing corona control rings/grading ring/arcing horn. All the corners and edges should be rounded off with a radius of atleast 3 mm. Design calculations i.e. for bearing & tensile strength, for deciding the dimensions of yoke plate shall be furnished by the bidder. The holes provided for bolts in the yoke plate should satisfy shear edge condition as per 10.2.4 of IS:800-2007.</p>	<p>Yoke Plates</p> <p>The strength of yoke plates shall be adequate to withstand the minimum ultimate tensile strength as specified in the bid drawings. Material should be Mild Steel confirming to IS 2062 Grade E250, quality C.</p> <p>The plates shall be either triangular or rectangular in shape as may be necessary. The design of yoke plate shall take into account the most unfavorable loading conditions likely to be experienced as a result of dimensional tolerances for disc insulators as well as components of hardware fittings within the specified range. The plates shall have suitable holes for fixing corona control rings/grading ring/arcing horn. All the corners and edges should be rounded off with a radius of atleast 3 mm. Design calculations i.e. for bearing & tensile strength, for deciding the dimensions of yoke plate shall be furnished by the bidder. The holes provided for bolts in the yoke plate should satisfy shear edge condition as per 10.2.4 of IS:800-2007.</p>
6	01,02,03, 04 and 05	1.13.11.4	<p>The length of the AGS preformed rods shall be such that it shall ensure sufficient slipping strength as detailed under clause 1.13.4 and shall not introduce unfavorable stress on the conductor under all operating conditions. However, the length of AGS preformed rods shall not be less than 2080 ± 25 mm</p>	<p>The length of the AGS preformed rods shall be such that it shall ensure sufficient slipping strength as detailed under clause 1.13.4 and shall not introduce unfavorable stress on the conductor under all operating conditions. However, the length of AGS</p>

S. No.	Package	Clause No.	Existing Clause	To be Read as
			for ACSR 'DEER'.	performed rods shall not be less than 2080 ± 25 mm for ACSR 'DEER'. Length of the performed rod for free centre type clamp & Armour grip suspension clamp should be same.
7	01,02,03, 04 and 05	1.19.7	<p>Socket ends, before galvanising, shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions of high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS: 2486/IEC: 120.</p> <p>The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.</p>	<p>Socket ends, before galvanising, shall be of uniform contour. The bearing surface of socket ends shall be uniform about the entire circumference without depressions of high spots. The internal contours of socket ends shall be concentric with the axis of the fittings as per IS: 2486/IEC: 60120.</p> <p>The axis of the bearing surfaces of socket ends shall be coaxial with the axis of the fittings. There shall be no noticeable tilting of the bearing surfaces with the axis of the fittings.</p>
J. TECHNICAL SPECIFICATION, SEC-IX A, VOL-II				
1	01,02,03, 04 and 05	Appendix -A	Not enclosed	Please refer Annexure-B to Amendment no.3
2	01,02,03, 04 and 05	1.2.3	<p>Buffer Tube</p> <p>Loose tube construction shall be implemented. The individually coated optical fibre(s) shall be surrounded by a single / multiple buffer tube(s) in case of central fibre optic unit is of Aluminium tube for protection from physical damage during fabrication, installation and operation of the cable. However, the individually coated optical fibre(s) may be provided directly in the central fibre optic unit in case of stainless steel tube with aluminium protective coating. The fibre coating and buffer shall</p>	<p>Buffer Tube</p> <p>Loose tube construction shall be implemented. The individually coated optical fibre(s) shall be surrounded by a buffer for protection from physical damage during fabrication, installation and operation of the cable. The fibre coating and buffer shall be strippable for splicing and termination. Each fibre unit shall be individually identifiable utilizing colour coding. Buffer tubes shall be filled with a water-blocking gel. The individually coated optical fibre(s) shall be provided directly in</p>

S. No.	Package	Clause No.	Existing Clause	To be Read as
			<p>be strippable for splicing and termination. Each fibre unit shall be individually identifiable utilizing colour coding. Buffer tubes shall be filled with a water-blocking gel. In case of central stainless steel tube, the tube housing the optical fibre(s) completely filled with a water-blocking gel shall be provided.</p>	<p>stainless steel tube in case stainless steel tube design.</p> <p>a) <u>Central Aluminium tube type</u></p> <p>The composite fibre optic overhead ground wire shall be made up of multiple buffer tubes embedded in a water tight aluminium/aluminium alloy protective central fibre optic unit surrounded by concentric-lay stranded metallic wires in single or multiple layers. Each buffer tube shall have maximum 12 no. of fibres. All fibres in single buffer tube or directly in central fibre optic unit is not acceptable. The dual purpose of the composite cable is to provide the electrical and physical characteristics of conventional overhead ground wire while providing the optical transmission properties of optical fibre.</p> <p>b) <u>Central Stainless Steel tube type</u></p> <p>The composite fibre optic overhead ground wire shall consist of a central fibre optic unit made up of stainless steel with aluminium coating/tube surrounded by concentric-lay stranded metallic wires in single or multiple layers. The dual purpose of the composite cable is to provide the electrical and physical characteristics of conventional overhead ground wire while providing the optical transmission properties of optical fibre</p>

S. No.	Package	Clause No.	Existing Clause				To be Read as					
K. TECHNICAL SPECIFICATION, SEC-X, VOL-II												
1	01,02,03, 04,05	Typical drawing	Typical Buried Cable Trench Cross-Sectional Drawing (RECTPCL/TL/220KV/23)				Please refer Annexure-C of Amendment-3					
L. Second Envelope (Price Schedule), VOL-III												
1	03	Schedule - 1 (Supply), S.no. 4.3 (b)	Item Description		Unit	Qty	Item Description		Unit	Qty		
			FODP 48F: Indoor type rack mounted with FCPC coupling and pig tails (5 mtrs each) - 1 No. for each end		No.	48	FODP 48F: Indoor type rack mounted with FCPC coupling and pig tails (5 mtrs each) - 1 No. for each end		No.	1		
2	01,02,03, 04,05	Schedule - 1 (Supply),	No such clause				New Line item:- 6 (vi) Underground Fibre Optic Cable & accessories					
							S.No.	Item Description		Unit	Qty	
							i)	Armoured Underground FO cable (24 Fibre DWSM)		KM	1	
ii)	All accessories required to connect OPGW with optical fibre at both the end		LS	1								
3	04	Schedule - 3 (Installati on Charges), S.no. 13	S.N o.	Item Description		Unit	Qty	S.No.	Item Description		Unit	Qty
			ii)	Laying of 220 kV grade, 1 core, 800sq.mm.XLPE insulated copper cable in HDPE pipes as per technical specification		KM	1	ii)	Laying of 220 kV grade, 1 core, 800sq.mm.XLPE insulated copper cable in HDPE pipes as per technical specification		KM	4
			iii)	Laying of one(1) no Fibre Optic cables alongwith joints as per technical specification		KM	4	iii)	Laying of one(1) no Fibre Optic cables alongwith joints as per technical specification		KM	1

S. No.	Package	Clause No.	Existing Clause				To be Read as			
			iv)	Laying & installation of HDPE pipes (as per technical specification) 200 NB	KM	1	iv)	Laying & installation of HDPE pipes (as per technical specification) 200 NB	KM	4
4	05	Schedule - 3 (Installation Charges), S.no. 13	S.No.	Item Description	Unit	Qty	S.No.	Item Description	Unit	Qty
			i)	Route survey of the entire route length & clearances from relevant authorities for laying of cables.	KM	4	i)	Route survey of the entire route length & clearances from relevant authorities for laying of cables.	KM	1
			ii)	Laying of 220 kV grade, 1 core, 800sq.mm.XLPE insulated copper cable in HDPE pipes as per technical specification	KM	1	ii)	Laying of 220 kV grade, 1 core, 800sq.mm.XLPE insulated copper cable in HDPE pipes as per technical specification	KM	4
			iii)	Laying of one(1) no Fibre Optic cables alongwith joints as per technical specification	KM	6	iii)	Laying of one(1) no Fibre Optic cables alongwith joints as per technical specification	KM	1
5	01 & 02	Schedule - 3 (Installation Charges), S.no. 7.0	Item Description		Unit	Qty	Item Description		Unit	Qty
			a)Random rubble stone masonry including excavation (1:5 CEMENT MORTAR)		CUM	90	a)Random rubble stone masonry including excavation (1:5 CEMENT MORTAR)		CUM	1000 0
			b) Revetment of pack 6" & above stone/boulders in heavily coated GI 4mm dia performed wire mesh size 100 mmx100mm.		CUM	30	b) Revetment of pack 6" & above stone/boulders in heavily coated GI 4mm dia performed wire mesh size 100 mmx100mm.		CUM	3000
			c) M 15 Nominal mix (1:2:4) concrete for top seal cover of revetment		CUM	5	c) M 15 Nominal mix (1:2:4) concrete for top seal cover of revetment		CUM	50
			d) Backfilling and gap levelling of volumes enclosed by revetment		CUM	33	d) Backfilling and gap levelling of		CUM	3000

S. No.	Package	Clause No.	Existing Clause	To be Read as			
				volumes enclosed by revetment			
6	01,02,03, 04,05	Schedule - 3 (Installation Charges), S.no. 7.0	No such clause	New Line item:- 13 (xiii)			
				S.No.	Item Description	Unit	Qty
				i)	Laying of Armoured Underground FO cable (24 Fibre DWDM) along with all accessories required to connect OPGW with optical fibre at both the end	KM	1
M. MISCELLANEOUS							
1	01,02,03, 04,05	Sec-IV, Vol-I, clause 18	OBLIGATIONS OF THE RECTPCL:	Employer's Responsibilities 1. The Employer shall be responsible for acquiring and providing legal and physical possession of the Site and access thereto, and for providing possession of and access to all other areas reasonably required for the proper execution of the Contract, including all requisite rights of way, to the Contract Agreement. 2. The Employer shall acquire and pay for all permits, approvals and/or licenses from all local, state or national government authorities or public service undertakings in the country where the Site is located which such authorities or undertakings require the Employer/owner to obtain them in the Employer's/Owner's name, are necessary for			
			Access to and Possession of the Site				
			The RECTPCL shall, in reasonable time grant the Contractor access to and possession of the site, which may, however, not be exclusive to the Contractor.				
2	01,02,03, 04,05	Sec-V, Vol-I, clause 16	LAND				
			The purchaser shall acquire only such piece of land as is actually required for each type of tower foundation. any extra land required by the contractor for storage of tower material, conductor, line material etc. shall be the responsibility of the contractor.				
3	01,02,03, 04,05	Sec-I, Vol-II, clause 1.4	Access to the Line and Right of Way				
			Right of way and way leave clearance shall be arranged by the Employer in accordance with work				

S. No.	Package	Clause No.	Existing Clause	To be Read as
			schedules. Employer will also secure way leave and right of way in the forest area.	the execution of the Contract (they include those required for the performance by both the Contractor and the Employer of their respective obligations under the Contract).

PRICE ADJUSTMENT

1.0 General

1.1 Prices for work and materials covered under the scope of this Specification shall be furnished by the bidder in the manner specified in the Bid Form & Price Schedules. The bidder shall quote base prices for the Ex-Works price component of the equipment/materials and installation (including civil works) price component of the equipment/materials. These price components for certain equipment/ materials, as specified, shall be subject to price adjustment to reflect changes in the cost of labour and material components as per the provisions given below:

1.2 The Ex-Works Price Components for tower accessories such as danger plate, phase plate, pole plates, number plate, anti-climbing device, span marker, bird guards, pipe & counterpoise earthing, Hardware Fittings, earthwire, Conductor accessories, earthwire accessories, HTLS Conductor, OPGW and Composite Long rod Insulator etc. and all other items not specifically mentioned below shall remain firm and no price adjustment shall be applicable for the price components of these items.

1.3 Other Charges viz. inland transportation, inland insurance, type test charges(if any), survey, soil investigation & painting of towers etc., shall be firm and no price variation shall be payable for these components.

2.0 Ex-works Price Component

The formulae for calculating the price adjustment to be applied to the Ex-works price component of the equipment/material will be as follows:

A. Fabricated Tower Parts (including Bolts & Nuts)

$$EC_1 = EC_0 [0.15 + a \times (A_1/A_0) + b \times B_1/B_0] + l \times (L_1/L_0)] - EC_0$$

Where, EC_1 is the price adjustment amount payable on ex-works prices of fabricated tower parts (including Bolts & Nuts), shipment-wise.

EC_0 = Ex-works price component of fabricated tower parts (including ex-works price of Bolts & Nuts) shipment-wise.

A = Price of Steel Blooms of size 150 mm x 150 mm, as published by IEEMA.

B = Price for Electrolytic High Grade Zinc, as published by IEEMA.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient of Steel Blooms, Value of which shall be between 0.51 & 0.57.

b = Co-efficient of Zinc, Value of which shall be between 0.08 & 0.10

l = Co-efficient of labour, Value of which shall be between 0.20 & 0.24.

and the sum of a, b & l shall be 0.85.

B. Line Materials

B.1 Earthwire

$$EC_{EW1} = EC_{EW} [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - EC_{EW}$$

Where,

EC_{EW1} = Price adjustment amount payable on Ex-works price of Earthwire, shipment-wise.

EC_{EW} = Ex-works price for Earthwire, shipment-wise.

A = Published price indices for high tensile steel galvanized wire, as published by CACMAI/Nationally recognized published index acceptable to Employer.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient of High Tensile Steel Galvanized Wire, Value of which shall be between 0.69 & 0.71.

l = Co-efficient of labour, Value of which shall be between 0.09 & 0.11.

and the sum of a & l shall be 0.80.

B.2 Hardware Fittings

$$EC_{HW1} = EC_{HW} [0.20 + a \times (A_1/A_0) + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_{HW}$$

EC_{HW1} = Price adjustment amount payable on Ex-works price of Hardware Fittings, shipment-wise.

EC_{HW} = Ex-works price for Hardware fittings, shipment-wise.

A = Price indices for EC Grade Aluminium Ingots, as published by IEEMA.

- B = Price indices for Electrolytic High Grade Zinc, as published by IEEMA.
- C = Wholesale Price Index Number for 'Ferrous Metals'(Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).
- L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).
- a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.35 & 0.45.
- b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.04 & 0.06.
- c = Co-efficient of Ferrous Metal, Value of which shall be between 0.18 & 0.22.
- l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a, b, c & l shall be 0.80.

B.3 Conductor and Earthwire Accessories:

- (i) Mid Span Compression Joint for Earthwire

$$EC_1 = EC_0 [0.20 + a \times (A_1/A_0) + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_0$$

Where,

- a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.35 & 0.45.
- b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.04 & 0.06.
- c = Co-efficient of Ferrous Metal, Value of which shall be between 0.18 & 0.22.
- l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a, b, c & l shall be 0.80.

- (ii) Mid Span Compression Joint, Repair Sleeve, Spacer Damper, Bundle Spacer & Rigid Spacer for Conductor and Rigid Spacer for Jumper.

$$EC_1 = EC_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - EC_0$$

Where,

a = Co-efficient of EC Grade Aluminum Ingots, Value of which shall be between 0.63 & 0.67.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of a & l shall be 0.80.

(iii) Vibration Damper for Earthwire, Suspension Clamp for Earthwire, Tension Clamp for Earthwire and Vibration Damper for Conductor

$$EC_1 = EC_0 [0.20 + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)] - EC_0$$

Where,

b = Co-efficient of Electrolytic High Grade Zinc, Value of which shall be between 0.06 & 0.08.

c = Co-efficient of Ferrous Metal, Value of which shall be between 0.55 & 0.61.

l = Co-efficient of labour, Value of which shall be between 0.13 & 0.17.

and the sum of b, c & l shall be 0.80.

(iv) Flexible Aluminium Bond shall be on Firm price basis.

In the above formulae,

EC_1 = Price adjustment amount of respective items, shipment-wise.

EC_0 = Ex-works price for Conductor & Earthwire Accessories, shipment-wise.

A = Price indices for EC Grade Aluminium Ingots, as published by IEEMA.

B = Price indices for Electrolytic High Grade Zinc, as published by IEEMA.

C = Wholesale Price Index Number for 'Ferrous Metals'(Group Item) (monthly) (Base: 2004-05=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

i) Subscript '0' refers to indices for material & labour as on thirty (30) days & three (3) months prior to date of opening of Bids respectively.

- ii) Subscript '1' refers to indices for material & labour as on 60 (sixty) days & four months prior to the date of shipment respectively.

C. Conductor

$$P_1 = P_0 \times \{0.15 + a \times (A_1/A_0) + b \times (B_1/B_0) + c \times (C_1/C_0) + l \times (L_1/L_0)\} - P_0$$

Where,

P_1 = Price adjustment amount, shipment-wise (if it works out negative, that would mean the amount to be recovered by the Purchaser from the Supplier).

P_0 = Ex-works price of Conductor.

A, B & L are the indices for materials and labour as below:

A = Monthly Average of "Aluminum LME SELLER Settlement Price including Premium of AL Ingots and Customs duty converted in Rs./MT" as published by IEEMA/ Nationally recognized published Price Index for EC Grade Aluminum Ingots acceptable to the Purchaser, in case index is not published by IEEMA .

B = Nationally recognized published Price Index for High Carbon Steel, acceptable to the Purchaser.

C = Nationally recognized published Price Index for High Grade Electrolytic Zinc acceptable to the Purchaser.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

a = Co-efficient for EC Grade Aluminium Ingots, which shall be 0.65.

b* = Co-efficient for High Carbon Steel, which shall be 0.13.

c* = Co-efficient for High Grade Electrolytic Zinc, which shall be 0.02.

l = Co-efficient for labour component, which shall be 0.05.

(*) For bidders who intend to quote their prices based on High Tensile Galvanized Steel wire, the coefficient for the same (i.e. coefficient 'b' for High Tensile Galvanized Steel wire) shall be 0.15 and coefficient 'c' shall not be applicable. In such a case,

B= Monthly Price exclusive of all duties of "High Tensile Galvanized Steel Wire (FE)" in Rs./MT as published by IEEMA/ Nationally recognized published Price index for High Tensile Galvanized Steel Wire acceptable to the Purchaser, in case index is not published by IEEMA

- i) Subscript '0' refers to indices as on Calendar month preceding the month of opening of Bids, for materials & Labour.
- ii) Subscript '1' refers to indices as applicable on Calendar month preceding the month of shipment, for materials & Labour.

2.1 The total adjustment for Earthwire, Hardware Fittings and Conductor & Earthwire Accessories shall be subject to a ceiling of $\pm 20\%$ of respective Ex-Works price component of Earthwire, Hardware Fittings and Conductor & Earthwire Accessories.

2.2 However, the total price adjustment of fabricated tower parts (including Bolts & Nuts) and Conductor shall not be subject to any ceiling whatsoever.

D. PVC/XLPE Insulated Power and Control Cables

$$P_1 = P_0 \times \{0.85 + 0.15 \times (A_1/A_0)\} P_0 + (M_1 M_0)$$

Where,

P_1 = Price adjustment amount per Km. of cable.

P_0 = Ex-works price per Km. of cable.

A = Price index for PVC/XLPE as published by IEEMA.

$M_1 M_0$ = Change in metal component of the Ex-Works Price of particular type & size of cable.

Where,

M = Weight in MT of metal per Km. of Cable x Price index of metal per MT as published by IEEMA.

The Bidder has to specify in his Bid metal component per Km. for each type and size of cable

3.0 Installation (including Civil Works) Price Component

The formula for calculation of the monthly price adjustments for Installation [including civil works but excluding survey, soil investigation and aviation signal for river crossing towers(if any)] price component shall be as under:

A. Installation Price Component [including Civil Works but excluding 'Supply & Placement of Reinforcement Steel', 'Concreting', Survey, Soil investigation and aviation signal for river crossing towers (if any)]

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0)] - ER_0$$

Where,

ER_1 = Price adjustment amount payable on Installation price component (excluding supply & placement of steel and concreting) for each billing.

- ER₀ = Value of erection work done (excluding supply & placement of steel and concreting) in billing period as established by Contract.
- A = **Wholesale Price Index Number for `HSD'(Individual Commodity) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in)**
- L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

Where,

a = Co-efficient of 'HSD', Value of which shall be between 0.20 & 0.24.

l = Co-efficient of labour, Value of which shall be between 0.56 & 0.60.

and the sum of a & l shall be 0.80.

B. **Supply and Placement of Reinforcement Steel**

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0) + b \times (B_1/B_0)] - ER_0$$

Where,

ER₁ = Price adjustment amount payable on price components of Supply and Placement of Steel.

ER₀ = Value of supply & placement of steel in billing period as established by Contract.

A = **Wholesale Price Index Number for `HSD'(Individual Commodity) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in)**.

B = **Wholesale Price Index Number for `Manufacture of Basic Metals'(Group Item) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in)**.

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

Where,

a = Co-efficient of 'HSD', Value of which shall be between 0.09 & 0.11.

b = Co-efficient of **'Manufacture of Basic Metals'**, Value of which shall be between 0.63 & 0.67.

l = Co-efficient of labour, Value of which shall be between 0.04 & 0.06.

and the sum of a, b & l shall be 0.80.

C. **Concreting**

$$ER_1 = ER_0 [0.20 + a \times (A_1/A_0) + l \times (L_1/L_0) + b \times (B_1/B_0) + c \times (C_1/C_0)] - ER_0$$

Where,

ER₁ = Price adjustment amount payable on price components of concreting.

ER₀ = Value of concreting in billing period as established by Contract.

A = **Wholesale Price Index Number for 'HSD'(Individual Commodity) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).**

L = Indian field labour index – namely All India average consumer price index for Industrial Workers (monthly) (Base: 2001= 100), as published by Labour Bureau, Shimla, Government of India (www.labourbureau.nic.in).

B = **Wholesale Price Index Number for 'Manufacture of cement, lime and plaster'(Group Item) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry (www.eaindustry.nic.in).**

C = **Wholesale Price Index Number for 'Cutting, shaping and finishing of stone'(Group Item) (monthly) (Base: 2011-12=100), as published by Office of Economic Advisor, Ministry of Commerce & Industry(www.eaindustry.nic.in).**

Where,

a = Co-efficient of **'HSD'**, Value of which shall be between 0.18 & 0.22.

b = Co-efficient of **'Manufacture of cement, lime and plaster'**, Value of which shall be between 0.25 & 0.35.

c = Co-efficient of **'Cutting, shaping and finishing of stone'**, Value of which shall be between 0.18 & 0.22.

l = Co-efficient of labour, Value of which shall be between 0.09 & 0.11.

and the sum of a, b, c & l shall be 0.80.

- 3.1 i) Subscript 'o' will correspond to thirty (30) days prior to date of opening of Bids.
- ii) Subscript '1' will correspond to the month of billing.
- 3.2 The total price adjustment amount for Installation (including civil works) price component shall not be subject to any ceiling whatsoever.
- 4.0 The Bidders are required to estimate and indicate the values of different coefficients for each of the items in the price variation formulae within the specified range such that their summation is as specified in the Bidding Documents. Where no value or '-' or 'shall be furnished later' is specified against the coefficient, the same will be deemed to be zero and the fixed component would be suitably adjusted. If the values of all coefficients in price variation formulae indicated by the Bidder are within the specified range but their sum exceeds the summation specified in the Bidding Documents, the values of the coefficients shall be pro-rata adjusted such that the summation remains as per the provisions of the Bidding Documents. If the values of all coefficients indicated by the Bidder are within the specified range but their summation is less than the value specified in the Bidding Documents, the values of the coefficients as indicated by the Bidder shall be considered as such and the fixed component in the price variation formulae would be suitably adjusted. Further, if any of values of the coefficients indicated by the Bidder is out of the range specified in the Bidding Documents, the lower of the values, as indicated by the Bidder vis-à-vis lower value of the range for that coefficient specified in the Bidding Documents, shall be considered and the fixed component would be suitably adjusted.
- 5.0 The above price adjustment provision shall be invoked by either party subject to the following further conditions:
- a) For the purpose of Price Adjustment on ex-works price components of the equipment, the date of shipment for Goods shall mean scheduled date of shipment or actual date of shipment, whichever is earlier. Scheduled date of shipment will be ex-works date of despatch, governed by the accepted PERT Network/Bar Chart. Similarly, for the purpose of Price Adjustment on Installation price component, the Billing period shall mean the billing period as per Contract time schedule i.e., the agreed Bar Chart or actual period, whichever is earlier. The Billing period for various Installation activities will be as per agreed Installation Bar Chart indicating monthly schedule of Installation activities for completion of works. However, when the Employer's specific approval for advancement of shipment/installation activities has been obtained in such case the said advanced date shall be treated as the schedule date of shipment/installation activities for the purpose of working out the price adjustment payable.

No price increase shall be allowed beyond the original delivery/ Installation dates unless specifically stated in the Time Extension Letter, if any, issued by the Employer. The Employer will, however, be entitled to

any decrease in the Contract Price which may be caused due to lower price adjustment amount in case of delivery of Goods/ Installation beyond the original delivery/Installation dates. Therefore, in case of delivery of Goods/Installation beyond the original delivery/ Installation dates, the liability of the Employer shall be limited to the lower of the price adjustment amount which may work out either on schedule date or actual date of despatch of Goods/ Installation.

- b) In case IEEMA does not publish any of the price indices, as mentioned above, the Bidder shall indicate any nationally recognised published index for respective items and the source of the same shall be furnished in the Bid.
- c) In case of non-publication of applicable indices on a particular date, which happens to be the applicable date for Price Adjustment purposes, the published indices prevailing immediately prior to the particular date shall be applicable.
- d) If the Price Adjustment amount works out to be positive, the same is payable to the Contractor by the Employer and if it works out to be negative, the same is to be recovered by the Employer from the Contractor.
- e) The Contractor shall promptly submit price adjustment invoices for the supplies made/work done, positively within three (3) months from the date of shipment/ work done, whether it is positive or negative.

Technical Specifications for OPGW Cable and Associated Hardware Fittings

Appendix-A

Data Requirement Sheets

Part-A : To be submitted along with Bid.

Part-B : to be submitted during detailed Engineering stage

Appendix-A

(Part-A)

Data Requirement Sheets

The following sets of Data Requirement Sheets are required to be filled up by the bidders to aid in the evaluation process. The response shall be brief and to the point and shall be supported by the printed product description and other literature. The DRS duly filled and the relevant drawings shall also be submitted during the detailed engineering along with the relevant technical brochures.

DRS Form 1(a)

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW) – 24/48 Fibre:

Manufacturer: _____

Part #: _____

Configuration: _____

CABLE CONSTRUCTION			
Seq	Parameter:	As per Technical Specification	As per Bidder Offering
1.	No. of Fibres Dual Window Single-Mode:	24/4 8	
2.	Buffer Type:	Loose Tube	
3.	Buffer Tube material	As applicable	
4.	No. of Buffer Tubes:	As applicable	
5.	No. of Fibers per bufferTube:	As applicable	
6.	Expected Cable Life:	25 Year	
7.	Parameters of OPGW		
(i)	UTS	In Kgf	
(ii)	Effective area	In mm ²	
(iii)	Weight	In kg/m	
(iv)	Diameter	In mm	
(v)	Modulus of elasticity	In kg/ mm ²	
(vi)	Coeff. Of linear expansion		
(vii)	Central tube design	Al or Steel	

DRS Form 2

DATA REQUIREMENTS SHEETS for OPTICAL FIBRE
DUAL-WINDOW SINGLE MODE (DW-SM)

OPTICAL PARAMETERS			
Seq	Parameter :	As per Technical Specification	As per Bidder offering
1.	Fiber manufacturer(s)/Type:		
2.	Attenuation Coefficient@ 1310nm: @ 1550 nm:	≤ 0.35 dB km ≤ 0.21 dB km	
3.	Point discontinuity @ 1310nm: @ 1550nm:	≤ 0.05 dB ≤ 0.05 dB	
4.	Nominal Mode Field Diameter @ 1310 nm:	8.6 to 9.5 μm (± 0.6 μm)	
5.	Chromatic Dispersion Coefficient @ 1310 (1288-1339) nm: @ 1310 (1271-1360) nm: @ 1550 nm:	3.5 ps/(nmxkm) 5.3 ps/(nmxkm) 18 ps/(nmxkm)	
6.	Zero dispersion wavelength:	1300 to 1324 nm	
7.	Cutoff wavelength:	≤ 1260 m	
Physical and Mechanical Properties			
8.	Bend Performance: (37.5 mm radius, 100 turns) @1310 nm (30 mm radius, 100 turn) @1550 nm (16mm radius, 1 turn) @ 1550nm	≤ 0.05 dB ≤ 0.05 dB ≤ 0.50 dB	
9.	Cladding Diameter (nominal ± deviation):	125.0 μm ± 1 μm	
10.	Polarisation mode dispersion coefficient	≤ 0.2 ps km ^{1/2}	
11.	Proof test level	≥ 0.69 Gpa	

-----End of the Appendix-----

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Appendix-A

Data Requirement Sheets

(Part-B)

The DRS forms have been included for the major items; however, the DRS for each item along with sufficient details shall be submitted during detailed engineering stage.

DRS Form 1

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW):

Manufacturer: _____
Part #: _____

CABLE CONSTRUCTION			
Seq	Parameter :	Unit:	Particulars :
1	Fibre Manufacturer Dual Window Single-Mode:		
2	No. of Fibres Dual Window Single-Mode:	each	
3	Buffer Type:		
4	Buffer Tube Diameter:	mm	
5	Buffer Tube material		
6	No. of Buffer Tubes:	each	
7	No. of Fibers per Tube:	each	
8	Identification/numbering of individual tubes:		
9	No. of empty tubes (If any):	each	
10	Filling material:		
11	Filling material compliant with technical specifications?	Yes/No	
12.	Strength member(s):		
13.	Binding yarn/ tape:		
14	<u>Describe Central Core Design:</u>		

DRS Form 1 (Continued)

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW):

Seq	Parameter :	Unit:	Particulars :
14.	Aluminum Clad steel wire Diameter: Number:	mm each	
15.	Aluminum alloy wires Diameter: Number:	mm each	
16.	Aluminum tube inner diameter:	mm	
17.	Aluminum tube outside diameter:	mm	
18.	Cable Diameter: (nominal ± deviation)	mm	
19.	Cable cross-section area (Nominal):	mm ²	
20.	Cable cross-section area (Effective):	mm ²	
21.	Fully Compliant with IEEE 1138:	Yes/No	

Mechanical Properties of Cable

22.	Max. breaking load/ Ultimate Tensile Strength (UTS)/Rated Tensile Strength:	kN	
23.	Fibre strain margin:	%	
24.	Zero fibre strain up to load	kN	
25.	Weight:	kg/km	
26.	Crush strength:	kg/mm	
27.	Equivalent Modulus of elasticity:	KN/mm ²	

- Continued -

DRS Form 1 (Continued)

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW):

Seq	Parameter :	Unit:	Particulars :
28.	Minimum Bending Radius without microbending:	mm	
29.	Maximum Bending Radius: Short Term: Long Term (Continuous):	mm	
30.	Tensile proof test (Screening) level:	KN/mm ²	
31.	Maximum permissible tensile stress:	KN/mm ²	
32.	Permissible CTS. tensile stress:	KN/mm ²	
33.	Maximum sag at maximum temperature and design span with no wind:	mm	
34.	Everyday tension at 32°C, no wind:	% of UTS	
35.	Maximum tension at Every day condition with full wind pressure	Kg	

Thermal Properties of Cable

36.	Coefficient of linear expansion:	per °C	
37.	Coefficient of expansion Cladding: Core:	per °C per °C	
38.	Nominal operating temperature range:	°C	
39.	SC current transient peak temperature:	°C	
40.	Maximum allowable temperature for lightning strike:	°C	

- Continued -

DRS Form 1 (Continued)

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW):

CABLE SPOOL and DRUM			
Seq	Parameter :	Unit:	Particulars :
41.	Available length per spool Maximum: Nominal:	m	
42.	Size of drum:	m	
43.	Weight of empty drum:	kg	
44.	Weight of drum with cable: spooled	kg	
45.	Will drum length scheduling be practiced to match transmission line span lengths?	Yes/No	

46. Describe Drum materials:

47. Describe cable end capping and protection against abrasion etc.:

DRS Form 1 (continued)

**DATA REQUIREMENTS SHEETS for OVERHEAD
FIBRE OPTIC CABLE**

OPTICAL GROUND WIRE (OPGW):

INSTALLATION			
Seq	Parameter:	Unit:	Particulars :
48.	Splice Loss: Maximum: Average:	dB dB	
49.	Operating Temperature Range:	°C	
50.	Rated Isoceraunic No.		
51.	Expected Cable Life:	Years	
52.	Installation rate per team:	km/da y	
53.	No. of persons per team:	no.	
54.	Max. possible span for specified operating conditions:	M	
55.	Midspan sag at 0°C with no wind loading:	Mm	
56.	Midspan sag at max temp. with no wind loading:	Mm	
57.	Midspan sag at max temp. and wind loading	Mm	
58.	Cable swing angles: Worst Case: Everyday:		
59	<u>Describe Installation method(s):</u>		

Sag tension chart parameters like sag and tension at various spans and applicable wind and ice load conditions shall be submitted along with the DRS. The cable parameters like coefficient of liner expansion, modulus of elasticity shall also be indicated.

DRS Form 2

DATA REQUIREMENTS SHEETS for OPTICAL FIBRE
DUAL-WINDOW SINGLE MODE (DW-SM)

OPTICAL PARAMETERS			
Seq	Parameter :	Unit:	Particulars :
1.	Fiber manufacturer(s)/Type:		
2.	Fiber production method:		
3.	Attenuation Coefficient@ 1310nm: @ 1550 nm:	dB/km dB/km	
4.	Attenuation Variation with Wavelength (± 25 nm):	dB/km	
5.	Attenuation at water peak:	dB/km	
6.	Point discontinuity @ 1310nm: @ 1550nm:	dB dB	
7.	Temperature dependence (induced attenuation):	dB	
8.	Nominal Mode Field Diameter @ 1310 nm: @ 1550 nm:	μm	
9.	Mode Field Diameter Deviation @ 1310 nm: @ 1550 nm:	μm	
10.	Mode field non-circularity:	%	
11.	Chromatic Dispersion Coefficient @ 1310 (1288-1339) nm: @ 1310 (1271-1360) nm: @ 1550 nm:	Ps/nm.km	
12.	Zero dispersion wavelength:	nm	
13.	Zero dispersion Slope:	ps/nm ² .k m	
14.	Cutoff wavelength:	nm	
15.	Refractive Index:		
16.	Refractive Index profile:		
17.	Cladding Design:		
18.	Numerical aperture:		

DRS Form 2 (Continued)

DATA REQUIREMENTS SHEETS for OPTICAL FIBRE

DUAL-WINDOW SINGLE MODE (DW-SM)

PHYSICAL and MECHANICAL PROPERTIES			
Seq	Parameter :	Unit:	Particulars :
19.	Bend Performance: (37.5 mm radius, 100 turns) @1310 nm (30 mm radius, 100 turn) @1550 nm (16mm radius, 1 turn) @ 1550nm	dB dB	
20.	Core Diameter (nominal± deviation):	µm	
21.	Core non-circularity:	%	
22.	Cladding Diameter (nominal ± deviation):	µm	
23.	Core- Clad concentricity Error:	µm	
24.	Cladding noncircularity:	%	
25.	Fibre cut-off wavelength	µm	
26.	Protective Coating type & material DROP & INSERT: Secondary:		
27.	Protective Coating Diameter (nominal ± deviation):	µm	
28.	Protective Coating removal method:		
29.	Coating Concentricity	µm	
30.	Polarisation mode dispersion coefficient	ps/km ^{1/2}	
31.	Proof test level	kpsi	
32.	Colour coding scheme compliant with EIA/TIA 598 or IEC 60304 or Bellore GR-20.	Yes/No	
33.	Colouring material compliant with technical specs?	Yes/No	

Technical Specifications for OPGW Cable and Associated Hardware Fittings

DRS Form 3-A
**DATA REQUIREMENTS SHEETS for HARDWARE
 AND ACCESSORIES**

Suspension Clamp Assembly:

Manufacturer: _____
 Part #: _____

ITEM	DESCRIPTION	UNIT	PARTICULARS
1.	Minimum vertical Strength	kN	
2.	Maximum Slip Strength	kN	
3.	Minimum Slip Strength	kN	
4.	Length (nominal)	mm	
5.	Weight (nominal)	kg	
6.	Total Drop (maximum) including shackles	mm	
7.	Tightening torque (nominal)	Nm	
8.	Details of Armour Rod Set		
	a) No. of rods per clamp		
	b) Direction of Lay		
	c) Overall length	mm	
	d) Diameter of each Rod	mm	
	e) Tolerances (i) Diameter of each rod (ii) Length of each rod	±% ±%	
	f) Material of manufacture		
	g) UTS of each Rod	kN	
	h) Weight	kg	
9.	Details of Protection Splice Set (Reinforcing Rods)		
	i) No. of rods per clamp		
	j) Direction of Lay		
	k) Overall length	mm	

Technical Specifications for OPGW Cable and Associated Hardware Fittings

	l) Diameter of each Rod	mm	
	m) Tolerances (i) Diameter of each rod (ii) Length of each	$\pm\%$ $\pm\%$	
	n) Material of manufacture		
	o) UTS of each Rod	kN	
	p) Weight	kg	

Technical Specifications for OPGW Cable and Associated Hardware Fittings

DRS Form 3-B

**DATA REQUIREMENTS SHEETS for HARDWARE
AND ACCESSORIES**

Dead End Clamp

Assembly: Manufacturer: _____
Part #: _____

ITEM	DESCRIPTION	UNIT	PARTICULARS
1.	Minimum Slip Load	kN	
2.	Length (nominal)		
	a) Reinforcing Rods	mm	
	b) Dead end	mm	
3.	Weight (nominal)		
	a) Reinforcing Rods	kg	
	b) Dead end	kg	
4.	Breaking strength (minimum)	kN	
5.	Wire Size		
	a) Reinforcing Rods	mm	
	b) Dead end	mm	

Technical Specifications for OPGW Cable and Associated Hardware Fittings

DRS Form 3-C

**DATA REQUIREMENTS SHEETS for HARDWARE
AND ACCESSORIES**

Vibration Damper:

Manufacturer: _____

Part #: _____

ITEM	DESCRIPTION	UNIT	PARTICULARS
1.	Total Weight	Kg	
2.	Weight of each Damper	Kg	
3.	Material of Damper Weight		
4.	Clamp Material		
5.	Clamp bolt tightening torque	Nm	
6.	Clamp bolt material		
7.	Messenger Cable Material		
8.	No. of Strands in Messenger Cable		
9.	Breaking Strength of Messenger Cable	kN	
10.	Resonance Frequencies		
	a) First Frequency	Hz	
	b) Second Frequency	Hz	
	c) Third Frequency	Hz	
	d) Forth Frequency	Hz	
11.	Minimum Slip Strength of Damper Clamp		
	a) Before Fatigue Test	kN	
	b) After fatigue Test	kN	

Technical Specifications for OPGW Cable and Associated Hardware Fittings

DRS Form 3-D

**DATA REQUIREMENTS SHEETS for OPGW
HARDWARES and ACCESSORIES**

Down Lead Clamp /Fastening Clamp

Manufacturer: _____
Part #: _____

ITEM	DESCRIPTION	Unit:	Particulars
			:
1.	Material:		
2.	Suitable for OPGW (range):	mm	
3.	Tightening torques	Nm	
4.	Vertical load	kN	
5.	Filler details:		
(a)	Material		
(b)	diameter:	mm	
6.	Tower attachment arrangement		

DRS Form 4-A

**DATA REQUIREMENTS SHEETS for
Splice Enclosures(Joint Box) for Overhead FO cable**

Manufacturer: _____
Model # _____

Seq	Parameter	Unit:	Particulars
			:
1.	Dimensions H * W * D:	cm	
2.	Weight:	Kg	
3.	Colour and Finish:		
4.	Cable Glanding & Fixing:		
5.	Construction materials & Gauge:		
6.	Locking arrangements:		
7.	Installation Clearances: Front Access: Rear Access: Top * Bottom *Sides:	cm	
8.	IP Protection	Class	

DRS Form 4-A
DATA REQUIREMENTS SHEETS for
Splice Enclosures(Joint Box) for Overhead FO cable

Manufacturer: _____

Model # _____

9.	Total number of optical couplings:	ea	
10.	Provision of pass through splicing:	Yes/No	
11.	Whether filled with suitable encapsulant	Yes/No	
12.	Method(s) for mounting with the tower:		

Optical Fibre Cable Accommodations

13.	Cable Glanding:		
14.	Maximum number of cables that can be accommodated:	each	
15.	Diameter(s) of cables that can be accommodated:		

16. Describe Cable entries :

Technical Specifications for OPGW Cable and Associated Hardware Fittings

DRS Form 5

**DATA REQUIREMENTS SHEETS for
Fibre Optic Distribution Panels (FODPs)**

Manufacturer: _____

Model # _____

Seq	Parameter :	Unit:	Particulars :
1.	Dimensions H * W * D:	cm	
2.	Weight:	Kg	
3.	Colour and Finish:		
4.	Cable Glanding & Fixing:		
5.	Construction materials & Gauge:		
6.	Locking arrangements:		
7.	Installation Clearances: Front Access: Rear Access: Top * Bottom *Sides:	cm	
8.	IP Protection	Class	
9.	Total number of optical couplings:	ea	
10.	Provision of pass through splicing:	Yes/No	
11.	Whether filled with suitable encapsulant	Yes/No	
12.	Method(s) for mounting		

Optical Fibre Cable Accommodations

13.	Cable Glanding:		
14.	Maximum number of cables that can be accommodated:	each	
15.	Diameter(s) of cables that can be accommodated:		

16. Describe Cable entries:

DRS Form 5 (continued)

**DATA REQUIREMENTS SHEETS for
Fibre Optic Distribution Panels (FODPs)**

Manufacturer: _____
Model # _____

Seq	Parameter :	Unit:	Particulars :
Cable Termination Splice Accomodations:			
17.	Details of Splice Trays:		
	Dimension:		
	Material/Gauge:		
	Weight:	kg	
	Colour & Finish:		
	Method of mounting:		
18.	Maximum number of splice trays:	each	
19.	Number of splices per tray:	each	
20.	Provision of Splice organisers:		
21.	Do splice trays require a separate enclosure? If so:	Yes/No	
	Manufacturer:		
	Dimensions H * W * D:	cm	
	Weight:	Kg	
	Colour and Finish:		
	Method(s) of Mounting:		
	Construction materials & Gauge:		
	Locking arrangements:		
22.	Installation Clearances Front Access: Rear Access: Top * Bottom * Sides:	m	
	Excess length of fibre service loops		

DRS Form 6
DATA REQUIREMENTS SHEETS for APPROACH
CABLE

Manufacturer: _____

Part #: _____

CABLE CONSTRUCTION			
Seq	Parameter :	Unit:	Particulars :
1.	Fibre Manufacturer Dual Window Single-Mode:		
2.	No. of Fibres Dual Window Single-Mode:	each	
3.	Buffer Type:		
4.	Buffer Tube Diameter:	mm	
5.	Buffer Tube material		
6.	No. of Buffer Tubes:	each	
7.	No. of Fibers per Tube:	each	
8.	Identification/numbering of individual tubes:		
9.	No. of empty tubes (If any):	each	
10.	Filling material:		
11.	Filling material compliant with technical specifications?	Yes/No	
12.	Strength member(s):		
13.	Binding yarn/ tape:		
14.	Describe Central Core Design:		

DRS Form 6 (Continued)
DATA REQUIREMENTS SHEETS for
APPROACH CABLE

Manufacturer: _____
 Part #: _____

Seq	Parameter :	Unit:	Particulars :
15.	Outside Jacket coating (if any)		
16.	Jacket thickness	mm	
17.	Jacket non-circularity	%	
18.	Cable Diameter: (nominal □ deviation)	mm	
19.	Cable cross-section area:	mm ²	
20.	Rip-cord provided?	Yes/No	
21.	Fully Compliant with IEC 60974-3:	Yes/No	

Mechanical Properties of Cable

22.	Max. breaking load/ Ultimate Tensile Strength (UTS):	kN	
23.	Fibre strain margin:	%	
24.	Zero fibre strain up to load	kN	
25.	Weight:	kg/km	
26.	Crush strength:	kg/mm	
27.	Equivalent Modulus of elasticity:	KN/mm ²	
28.	Minimum Bending Radius without microbending:	mm	
29.	Maximum Bending Radius: Short Term: Long Term (Continuous):	mm	
30.	Tensile proof test (Screening) level:	KN/mm ²	
31.	Maximum permissible tensile stress:	KN/mm ²	
32.	Permissible CTS. tensile stress:	KN/mm ²	

- Continued -

DRS Form 6 (Continued)

**DATA REQUIREMENTS SHEETS for APPROACH
CABLE**

Seq	Parameter :	Unit:	Particulars :
33.	Every day tensile stress	N	
34.	Torsion	twist/m	

Thermal Properties of Cable

35.	Coefficient of linear expansion:	per °C	
36.	Coefficient of expansion Cladding: Core:	per °C per °C	
37.	Nominal operating temperature range:	°C	

CABLE SPOOL and DRUM

Seq	Parameter :	Unit:	Particulars :
38.	Available length per spool Maximum: Nominal:	m	
39.	Size of drum:	m	
40.	Weight of empty drum:	kg	
41.	Weight of drum with cable: spooled	kg	
42.	Will drum length scheduling be practiced to match transmission line span lengths?	Yes/No	

43. Describe Drum materials:

44. Describe cable end capping and protection against abrasion etc.:

DRS Form 6 (continued)

**DATA REQUIREMENTS SHEETS for APPROACH
CABLE**

INSTALLATION			
Seq	Parameter:	Unit:	Particulars :
45.	Splice Loss: Maximum: Average:	dB dB	
46.	Operating Temperature Range:	°C	
47.	Expected Cable Life:	Years	

48. Describe Installation method(s) and the cable duct parameters for installation of approach cable:

DATA REQUIREMENTS SHEETS for
Test Equipment and Other Items/Materials being supplied under the Package and not
covered in DRS Forms

The following items shall be described as a minimum:

1. Name of item:
2. Make & Model Number:
3. All Major Parameters:
4. Different options available and the specific option proposed to be supplied:
5. Operation Temperature range:

However, the technical brochure from the Manufacturer must be submitted along with the above DRSs in support of the various parameters. The DRS shall also include the list of suppliers for all bought out items.

-----**End of the Appendix**-----

